US Army Corps
of Engineers®
New York District

Final
Environmental Impact Statement

for the
Route 92 Project

proposed by the
New Jersey Turnpike Authority

October 2006

In cooperation with

U.S. Environmental Protection Agency
U.S. Fish and Wildlife Service
N.J. Department of Transportation

Final Environmental Impact Statement

for the
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New Jersey Turnpike Authority

Lead Agency

United States Army Corps of Engineers New York District

Cooperating Agencies

United States Environmental Protection Agency
United States Fish and Wildlife Service
New Jersey Department of Transportation

October 2006

FINAL ENVIRONMENTAL IMPACT STATEMENT
FOR DEPARTMENT OF THE ARMY APPLICATION NO. 1999-00240-J1
FOR THE ROUTE 92 PROJECT
PROPOSED BY THE NEW JERSEY TURNPIKE AUTHORITY

October 2006

Responsible Lead Agency
US Army Corps of Engineers - New York District
Regulatory Branch
26 Federal Plaza, Room 1937
Jacob K. Javits Federal Building
New York, New York 10278-0090

Cooperating Agencies
US Environmental Protection Agency - Region 2
US Fish and Wildlife Service
New Jersey Department of Transportation

Abstract

In accordance with National Environmental Policy Act (NEPA) and US Army Corps of Engineers (USACE) regulations, this Final Environmental Impact Statement (FEIS) has been prepared to assist the USACE – New York District in reaching an informed decision on an application for a Department of the Army permit, Application No. 1999-00240-J1, submitted by the New Jersey Turnpike Authority (NJTA), PO Box 5050, Woodbridge, New Jersey, 07095.

Under the federal Clean Water Act, NJTA seeks authorization to discharge fill into 12.03 acres of waters of the United States, including wetlands, as part of NJTA's proposed Route 92 highway project. A further 1.16 acres of wetlands would be permanently shaded by bridges. Proposed Route 92 would be a 6.7-mile, limited access toll highway that would serve as an east-west highway link connecting US Route 1 in South Brunswick Township with the New Jersey Turnpike at Interchange 8A in Monroe Township. The proposed project in South Brunswick, Plainsboro, and Monroe Townships would pass through land mostly used for agriculture, with lesser amounts of parkland and other open space, commercial, and residential uses also present. NJTA has proposed a wetland mitigation plan in which 57 acres of wetland would be constructed and an additional 202 acres of forested wetland and upland would be preserved.

NJTA-proposed Route 92 requires a permit pursuant to Section 404 of the federal Clean Water Act, 33 U.S.C. Section 1344. Jurisdiction for the application transferred from the New Jersey Department of Environmental Protection to USACE on October 26, 1998. After an initial evaluation of the application and a Public Hearing held on February 26, 1999, a "Notice of Intent" to prepare this EIS was published in the Federal Register on April 28, 2000. A Public Scoping Meeting was held on June 8,

2000, and a Final Scope of Work was issued on April 30, 2001. Following the publication of the Draft EIS in April 2004, a public hearing was held on May 20, 2004.

This FEIS includes the comments on the Draft EIS and the responses to those comments. Under the guidance of NEPA, this FEIS describes the purpose of and analyzes the need underlying NJTA's proposal to improve regional mobility by creating new east-west arterial highway capacity in southwestern Middlesex County, known as proposed Route 92. The EIS then evaluates alternatives to the NJTA proposal, to assess whether the project purpose might be accomplished by another plan that would result in lesser environmental impact. Finally, the EIS describes the beneficial and adverse impacts of alternative projects, including proposed Route 92, that have the potential to achieve project purpose with fewest adverse impacts, as determined through an alternatives screening analysis. USACE has not made a determination of the agency's preferred alternative in this FEIS.

The public is encouraged to review this FEIS and provide comments on the information contained therein. A USACE public notice announcing the availability of this document and providing the dates of the comment period will be published concurrently with an announcement of its availability in the *Federal Register*. The public notice is available on the District's website, accessed via **www.nan.usace.army.mil**. Comments must be submitted in writing prior to the end of the comment period to the following address:

US Army Corps of Engineers - New York District
Regulatory Branch (Attn: James Cannon)
26 Federal Plaza, Room 1937
Jacob K. Javits Federal Building
New York, New York 10278-0090

To reduce costs and the use of paper, copies of this FEIS and its printed appendices will be made available at repositories to be listed in the public notice. The FEIS is also available on the New York District website, www.nan.usace.army.mil. Individual copies of the printed FEIS are limited. Printed copies of the FEIS will be provided only upon specific request. The appendices and comments with responses will be provided on a CD-ROM. For further information on the FEIS, write to Mr. James Cannon, Regulatory Project Manager, at the above address, via electronic mail at nan.route92eis@usace.army.mil, or call him at (917) 790-8412.

Contents

Abstract

List of Figures

List of Tables

Executive Summary

ES.1 Major Findings ES-1
ES.1.1 Background ES-1
ES.1.2 Purpose and Need ES-4
ES.1.3 Alternatives ES-8
ES.1.4 Affected Environment ES-16
ES.1.5 Environmental Impacts ES-19
ES.2 Relationship to Environmental Protection Statutes and Other Environmental Requirements ES-29

Section 1 – Project Purpose and Need

1.1 Background 1-1
1.2 Transportation Needs in the Project Area 1-8
1.2.1 Existing Roadway Network 1-8
1.2.2 Roadway Network Performance 1-8
1.3 Project Purpose 1-18
1.4 Description of the NJ Turnpike Authority Proposal 1-20

Section 2 – Alternatives Evaluation

2.1 Alternatives Examined 2-1
2.2 No Action Alternative 2-4
2.3 Transportation Demand Management 2-6
2.4 Existing Local and Secondary (County) Roadway Capacity Improvements 2-11
2.4.1 USEPA Modified No-Build Alternative 2-13
2.4.2 Route 522 Widening and Extension 2-14
2.4.3 Dey Road Widening 2-17
2.4.4 Plainsboro– Cranbury Road Widening 2-18
2.4.5 Cranbury Neck Road Widening 2-19
2.4.6 Composite Local Roadway Improvements Program 2-20
2.5 Existing Regional Highway System Improvements 2-22
2.5.1 US Route 1 Widening to Six Lanes 2-22
2.5.2 US Route 1 Widening to Six Lanes with Signal Removal 2-26
2.6 New Roadway Facilities 2-30
2.6.1 Proposed Route 92 2-30
2.6.2 USEPA Suggested Alignment 2-45

2.6.3 Dey Road Parallel Alignment 2-47
2.6.4 Plainsboro–Cranbury Road Parallel Alignments (PCPA) 2-48
2.6.5 South Brunswick Alignment – Modified 2-50
2.7 Comparison of Alternatives 2-50
2.8 Summary 2-55

Section 3 – Characterization of the Affected Environment

3.1 General Environment 3-1
3.2 Topography, Geology and Soils 3-1
3.2.1 Topography 3-1
3.2.2 Geology 3-2
3.2.3 Soils 3-3
3.3 Natural Resources 3-9
3.3.1 Surface Water 3-9
3.3.2 Groundwater 3-16
3.3.3 Public Water Supply 3-21
3.3.4 Wetlands 3-26
3.3.5 Fish and Wildlife 3-38
3.4 Farmland 3-57
3.5 Historic and Cultural Resources 3-58
3.6 Air Quality 3-63
3.6.1 Standards and Attainment Status 3-63
3.6.2 Existing Air Quality 3-63
3.7 Transportation 3-65
3.7.1 Roadway System 3-65
3.7.2 Existing Traffic Patterns and Levels of Service 3-67
3.7.3 Projected Year 2028 Traffic Conditions 3-67
3.8 Noise 3-68
3.8.1 Noise Descriptors and Criteria for Assessment 3-68
3.8.2 Existing Noise Monitoring Program 3-70
3.9 Aesthetics 3-74
3.10 Known Contaminated Sites 3-75
3.11 Human Health 3-75
3.11.1 Air Quality 3-75
3.11.2 Noise 3-77
3.11.3 Water Quality 3-77
3.12 Socioeconomics 3-78
3.12.1 Population 3-78
3.12.2 Housing 3-80
3.12.3 Income 3-81
3.12.4 Educational Attainment 3-81
3.12.5 Employment 3-82

3.12.6 Community Services 3-82
3.13 Land Use and Zoning 3-86
3.13.1 Land Use 3-86
3.13.2 Zoning and Land Use Planning 3-92
3.14 Environmental Justice 3-97
3.14.1 Minority Groups 3-97
3.14.2 Economic Status 3-102

Section 4 – Direct, Indirect, and Cumulative Impacts of the Proposed Project and Alternatives

4.1 No Action 4-1
4.1.1 Air Quality 4-2
4.1.2 Transportation 4-4
4.2 Proposed Route 92 Project 4-5
4.2.1 Integrated Impacts Analysis 4-5
4.2.2 Topography, Geology and Soils 4-17
4.2.3 Natural Resources 4-19
4.2.4 Farmland 4-41
4.2.5 Historic and Cultural Resources 4-41
4.2.6 Air Quality 4-42
4.2.7 Transportation 4-45
4.2.8 Noise 4-62
4.2.9 Aesthetics 4-67
4.2.10 Known Contaminated Sites 4-70
4.2.11 Human Health 4-71
4.2.12 Socioeconomics 4-72
4.2.13 Land Use 4-74
4.2.14 Environmental Justice 4-81
4.2.15 Cumulative Impacts 4-82
4.2.16 Phased Route 92 Sub-alternative 4-84
4.3 US Route 1 Widening and Signal Removal 4-86
4.3.1 Topography, Geology and Soils 4-86
4.3.2 Natural Resources 4-87
4.3.3 Farmland 4-92
4.3.4 Historic and Cultural Resources 4-93
4.3.5 Air Quality 4-94
4.3.6 Transportation 4-94
4.3.7 Noise 4-106
4.3.8 Aesthetics 4-109
4.3.9 Known Contaminated Sites 4-110
4.3.10 Human Health 4-110
4.3.11 Socioeconomics 4-111
4.3.12 Land Use 4-112

4.3.13 Environmental Justice 4-114

Section 5 – Mitigation Actions

5.1 Goals of Mitigation Actions 5-1
5.2 Construction-Related Impacts 5-1
5.2.1 Soils 5-1
5.2.2 Fugitive Dust 5-3
5.2.3 Noise 5-3
5.3 Route 92 Mitigation Actions 5-3
5.3.1 Acid-Producing Deposits 5-3
5.3.2 Streams and Floodplains 5-4
5.3.3 Water Quality 5-5
5.3.4 Wetlands and Open Space 5-10
5.3.5 Wildlife 5-13
5.3.6 Protected Species 5-14
5.3.7 Noise 5-15
5.3.8 Land Use and Farmland 5-18
5.3.9 Socioeconomics 5-19
5.3.10 Transportation 5-19
5.3.11 Air Quality 5-22
5.3.12 Aesthetics 5-23
5.4 Route 1 Mitigation Actions 5-23
5.4.1 Acid-Producing Deposits 5-23
5.4.2 Streams and Floodplains 5-23
5.4.3 Water Quality 5-23
5.4.4 Wetlands 5-24
5.4.5 Land Use 5-24
5.4.6 Socioeconomics 5-24

Section 6 – Public Involvement

6.1 Public Coordination 6-1
6.2 Permits/Legal Requirements 6-1
6.3 Cooperating Agencies 6-2

Section 7 – List of Preparers

Section 8 – References

Appendices (in separate volume)

Appendix A – Soil Series Description
Appendix B – Air Quality
Appendix C – Traffic Modeling and Analysis
Appendix D – Noise
Appendix E – Route 92 Engineer's Reports
Appendix F – Project Correspondence
Appendix G – Excerpt from Conceptual Wetland Mitigation Plan
Appendix H – Selected Plant and Wildlife Surveys

Written Comments on the Draft Environmental Impact Statement and Responses--in Comments and Responses Volume 1

Transcript of Public Hearing and Tape Recorded Comments on the Draft Environmental Impact Statement and Responses—in Comments and Responses Volume 2

Figures

ES-1 Alternatives Analysis ES-11

1-1 Location Map 1-2
1-2 Central Jersey Highways 1-3
1-3 Southwestern Middlesex County/Northeastern Mercer County 1-4
1-4 Regional Road Network and Land Use Patterns 1-5
1-5 Screenline Intercepting East-West Roads 1-14

2-1 Alternatives Analysis--Existing Local and County Roadway Capacity Improvements 2-12
2-2 Alternatives Analysis—Improvements to Existing Regional Road Network 2-23
2-3 Alternatives Analysis—New Roadway Facility Alternatives 2-31
2-4 Alternatives Analysis—Alternative Typical Route 92 Sections 2-36
2-5 Alternatives Analysis—Proposed Route 92 without Perrine Road Interchange 2-43
2-6 Alternatives Analysis 2-51

3-1 Topography (8 sheets) 3-106
3-2 Geologic Formations 3-114
3-3a Soils (Route 92) 3-115
3-3b Soils (Route 1) 3-116
3-4 Surface Water Features with Water Quality Monitoring Locations 3-117
3-5 FEMA Flood Hazard Areas 3-118
3-6 NJDEP Flood Hazard Areas 3-119
3-7 Bedrock Aquifers 3-120
3-8 Surficial and Sole Source Aquifers 3-121
3-9 Major Wetland Systems in Route 92 Study Area 3-122
3-10 Major Wetland Systems in Route 1 Study Area 3-123
3-11 Wetland Area Locations 3-124
3-12 Study Area Habitat 3-125
3-13 Middlesex County Farmland Preservation Program 3-126
3-14 Southwestern Middlesex County/Northeastern Mercer County 3-127
3-15 2001 A.M. Modeled Peak Hour Traffic Flows and Congestion Levels 3-128
3-16 2001 P.M. Modeled Peak Hour Traffic Flows and Congestion Levels 3-129
3-17 2028 A.M. Projected Peak Hour Traffic Flows and Congestion Levels—No Action Scenario 3-130
3-18 2028 P.M. Projected Peak Hour Traffic Flows and Congestion Levels—No Action Scenario 3-131
3-19 Screenline Intercepting East-West Roads 3-132
3-20 Noise Monitoring and Modeling Locations (3 sheets) 3-133
3-21 Prior Noise Monitoring Locations (1983 and 1993) 3-136
3-22 Known Contaminated Sites 3-137

3-23a Land Use—Route 92 Impact Corridor 3-138
3-23b Land Use—Route 1 Impact Corridor 3-139
3-24a Zoning—Route 92 Corridor 3-140
3-24b Zoning—Route 1 Corridor 3-141
3-25 Minority Status for Blocks in Route 92 Corridor 3-142

4-1 Stormwater Management System 4-7
4-2 2028 A.M. Peak Hour Traffic Changes—Route 92 vs. No Action 4-48
4-3 2028 P.M. Peak Hour Traffic Changes—Route 92 vs. No Action 4-49
4-4 2028 A.M. Peak Hour Truck Volume Changes—Route 92 vs. No Action 4-51
4-5 2028 P.M. Peak Hour Truck Volume Changes—Route 92 vs. No Action 4-52
4-6 2028 A.M. Projected Peak Hour Traffic Flows and Congestion Levels—Route 92 Scenario 4-54
4-7 2028 P.M. Projected Peak Hour Traffic Flows and Congestion Levels—Route 92 Scenario 4-55
4-8 2028 A.M. Peak Hour Traffic Changes—Route 1 Widening and Signal Removal vs. No Action 4-96
4-9 2028 P.M. Peak Hour Traffic Changes—Route 1 Widening and Signal Removal vs. No Action 4-97
4-10 2028 A.M. Peak Hour Truck Volume Changes—Route 1 Widening and Signal Removal vs. No Action 4-99
4-11 2028 P.M. Peak Hour Truck Volume Changes—Route 1 Widening and Signal Removal vs. No Action 4-100
4-12 2028 A.M. Projected Peak Hour Traffic Flows and Congestion Levels—Route 1 Widening and Signal Removal Scenario 4-102
4-13 2028 P.M. Projected Peak Hour Traffic Flows and Congestion Levels—Route 1 Widening and Signal Removal Scenario 4-103

5-1 Stormwater Management System 5-6
5-2 2028 A.M. Peak Hour Truck Volume Changes with Truck Prohibitions—Route 92 vs. No Action 5-20
5-3 2028 P.M. Peak Hour Truck Volume Changes with Truck Prohibitions—Route 92 vs. No Action 5-21

Tables

ES-1 Alternatives Evaluation Summary ES-12

1-1 Base Year and Future No Action Travel Times 1-11
1-2 Year 2001 and Future No Action Intersection Delays 1-12
1-3 Year 2001 and Future No Action Levels of Service at Key Intersections 1-13
1-4 Through Traffic Volumes Crossing the Screenline 1-15
1-5 Additional Lanes Needed to Maintain Acceptable Volume-Capacity Ratio 1-16
1-6 Screenline Crossing Peak Hour Truck Volumes 1-17

2-1 Signal Removal, Interchange Construction Proposals, and Restrictions on Turning Movements at Remaining Signalized Intersections Along US Route 1 2-27
2-2 2028 Non-Local Peak Hour Traffic Crossing Screenline on Local East-West Roads 2-38
2-3 Change in 2028 Non-Local Peak Hour Traffic Crossing Screenline on Local East-West Roads (Relative to No-Build) 2-38
2-4 Change in 2028 Non-Local Peak Hour Traffic Crossing Screenline on Local East-West Roads (Relative to Proposed Route 92) 2-38
2-5 Total VOC, CO, and NO_x Loadings 2-39
2-6 Alternatives Evaluation Summary 2-52

3-1 Soil Characteristics 3-4
3-2 Water Quality Characteristics at Nearby Ambient Surface Water Monitoring Network Stations (1995-1997) 3-14
3-3 Surface Water Criteria for FW2-NT Waters 3-15
3-4 NJPDES Permits in the Study Area 3-17
3-5 Soil Phase Hydrologic Groups 3-20
3-6 Well Search Results 3-22
3-7 Wildlife Species Observed or Expected to Inhabit the Route 92 Project Corridor 3-40
3-8 Summary of Habitat Suitability for Species of Concern 3-54
3-9 Cultural Resource Survey Results (Hunter, 1993) 3-59
3-10 Existing Air Quality Near the Project Area 3-64
3-11 Decibel Changes, Loudness, and Energy Loss 3-69
3-12 FHWA Noise Abatement Criteria 3-70
3-13 Noise Monitoring Locations 3-71
3-14 Noise Monitoring Results 3-73
3-15 Known Contaminated Sites Listing – NJDEP 3-76
3-16 Demographic Data for Study Area Municipalities and Middlesex County 3-79

3-17 Occupations of Employed Residents 3-83
3-18 Racial Composition of Inhabited Census Blocks Overlapping the Proposed Route 92 Corridor 3-98
3-19 Racial Composition of Inhabited Census Blocks Near the Potential New US Route 1 Interchanges 3-100
3-20 Financial Data for Persons and Housing Units In or Near the Proposed Route 92 Corridor 3-103
3-21 Financial Data for Persons and Housing Units Near the Potential New US Route 1 Interchanges 3-104

4-1 VMTs and Average Speeds in the Traffic Study Area 4-3
4-2 Final Emission Factors 4-3
4-3 Total VOC, CO and NO_x Loadings 4-4
4-3a Projected Traffic Volumes in the Kingston Area in 2028—Proposed Route 92 vs. No Action 4-12
4-4 Soil K-Factor Listing 4-20
4-5 Regulated Activities in Design Sections 1, 2 and 3 of Proposed Route 92 4-22
4-6 EMC Values 4-28
4-7 Grouping of Land Use Codes from NJDEP Land Use/Land Cover Dataset 4-30
4-8 Existing Conditions – SMB Tributary Area by Land Use Classification 4-31
4-9 Summary of FHWA Wetland Functional Assessment 4-35
4-10 Summary of Wetland Impacts 4-36
4-11 CAL3QHC Predicted Maximum CO Concentrations, in ppm 4-44
4-12 Projected 2028 Total Daily Peak-Hour Through-Traffic Volumes (A.M.+P.M.)—Proposed Route 92 vs. No Action 4-47
4-13 Projected 2028 Total Daily Peak-Hour Truck Volumes (A.M.+P.M.)—Proposed Route 92 vs. No Action 4-53
4-14 Estimated 2028 Peak Hour Travel Times (minutes) 4-59
4-15 Intersection Level of Service—Proposed Route 92 vs. No Action 4-60
4-16 Projected Intersection Delays—Proposed Route 92 vs. No Action 4-61
4-17 Noise Modeling Receptors 4-64
4-18 Summary of Noise Modeling Results 4-65
4-19 Typical Construction Equipment Noise Levels 4-66
4-20 Projected 2028 Total Daily Peak-Hour Through-Traffic Volumes (A.M.+P.M.)—US Route 1 Widening and Signal Removal vs. No Action 4-95
4-21 Projected 2028 Total Daily Peak-Hour Truck Volumes (A.M.+P.M.)—US Route 1 Widening and Signal Removal vs. No Action 4-98
4-22 Estimated Changes in Travel Times—US Route 1 Widening and Signal Removal vs. No Action 4-104
4-23 Intersection Level of Service—US Route 1 Widening and Signal Removal vs. No Action 4-105

4-24 Projected Intersection Delays—US Route 1 Widening and Signal Removal vs. No Action 4-106
4-25 Summary of Noise Modeling Results for Residences Near the Potential New US Route 1 Interchanges 4-108
4-26 Summary of Noise Modeling Results—US Route 1 Improvements vs. No Action 4-108

5-1 Proposed Conditions in Tributary Areas and Proposed BMPs 5-8
5-2 Annual Loading of Total Suspended Solids and Projected Removal Efficiency 5-9
5-3 Average Annual Groundwater Recharge Summary 5-11
5-4 Noise Barrier Evaluation 5-18

Section ES
Executive Summary

ES.1 Major Findings

ES.1.1 Background

When the New Jersey Turnpike was constructed 50 years ago, its purpose was to provide faster, more efficient travel for north-south trips, such as those between New York City/points north and Philadelphia/points south. The New Jersey Turnpike became the route of choice for north-south trips, replacing the use of US Route 1 and US Route 130, which were designed and built to older standards.

While the New Jersey Turnpike continues to fulfill its role of serving mid-Atlantic regional transportation needs, US Route 1 remains a favored route for trips between northern Middlesex County (where many of the state's largest highways converge), the Princeton area (an area of significant economic and housing growth in New Jersey), and the Trenton, New Jersey Capital City area. For a distance of 22 miles, from the northeast Trenton area to the New Brunswick area, US Route 1 and the New Jersey Turnpike exist as nearly parallel north-south highways, about 6 miles apart.

In the New Brunswick area, US Route 1 connects to the New Jersey Turnpike, via a short (one mile) segment of Route 18, at Turnpike Interchange 9. In the Trenton area US Route 1 connects to the New Jersey Turnpike via an eight mile section of Interstate 195 and 295, at Turnpike Interchange 7A. Major traffic congestion occurs on US Route 1 between the Trenton area and the New Brunswick area that is attributable to the strong economic and population growth trends and the suburban character of the land development that has occurred. In spite of its proximity, the traffic congestion on US Route 1 cannot effectively be relieved by available capacity on the New Jersey Turnpike, in part because no arterial highway connection links US Route 1 to the New Jersey Turnpike between Interchange 9 and Interchange 7A. Alternative routes for motorists between New Brunswick and Trenton are limited, and increasingly involve use of local roadways.

Since 1980, strong population and employment growth has occurred in the communities along US Route 1 between New Brunswick and Trenton. Continued rapid growth is projected in central New Jersey over the next two decades, based on the strong economy of the area, the high demand for housing, the presence of developable land, good schools, and the desirable location between Princeton University and Rutgers University. Significant office and research development has occurred in the Princeton region, a function of the availability of a highly educated labor force. In addition, a national-scale warehousing and distribution center has developed around NJ Turnpike Interchange 8A. The office, commercial, and population growth along US Route 1, coupled with the extensive warehousing and business activity around NJ Turnpike Interchange 8A has resulted in increasing traffic volumes on the area's roads.

Two frequently observed effects of the increasing traffic volumes using US Route 1 and regional roadways are:

1. extensive traffic congestion occurs throughout this suburban region, and,

2. substantial and increasing volumes of "through" traffic, delivering goods and commerce between business "centers" compete for space on the roadway system with traffic having local work, shopping, and recreational destinations.

A new east-west highway in southwestern Middlesex County has been discussed by the Middlesex County Planning Board and the New Jersey Department of Transportation (NJDOT) for many years, to address the lack of east-west highway connectivity in this area. In 1992, the New Jersey State Legislature enacted a law transferring authority over the Route 92 project from NJDOT to the New Jersey Turnpike Authority (NJTA) (Chapter 474 of the Public Laws of 1991, codified as NJSA 27:23-23.8).

Since 1992, NJTA has further developed the concept of this toll-supported east-west arterial highway through a series of engineering and environmental studies. NJTA-proposed Route 92 would be a 6.7-mile limited-access toll highway that would provide express east-west travel capacity for through traffic, and connect US Route 1 in South Brunswick Township to US Route 130 and the New Jersey Turnpike at Interchange 8A in Monroe Township. Proposed Route 92 would consist of two travel lanes in each direction. The proposed project includes four interchanges that would connect the highway to existing roads, three of which are state or federal highways (US Route 1, US Route 130, and Interchange 8A), and the fourth is a connection to a major employment center (Perrine Road). A proposed toll plaza facility would be constructed within the proposed alignment west of US Route 130.

Construction of a new east-west arterial highway is proposed by NJTA to provide a high capacity, high speed link between the major north-south highways in central New Jersey, and between the growing business, commercial, and population centers, thus improving regional mobility. An arterial highway is defined by the NJ Dept. of Transportation as a highway primarily for through traffic, usually a continuous route.

The arterial highway proposed by NJTA would improve mobility by accommodating the increasing through traffic on a high-speed limited-access highway, thereby reducing local roadway congestion, by removing through traffic from local roads. It would also improve regional mobility by providing efficient access to alternative routes for north-south traffic that now uses US Route 1, and provide flexibility in choice of route in the event of traffic congestion or delay along any of the north-south corridors.

Between the Trenton area and the New Brunswick area only local and/or secondary (county) roads are available to traffic traveling between US Route 1 and the New Jersey Turnpike (connecting at Turnpike Interchanges 8A or 8). When congestion, or less frequently occurring events such as vehicular accidents or roadway maintenance occur on one of the north-south highways, travelers cannot efficiently change their route so as

to utilize alternative north-south highway routes (for example, by switching their route to utilize the New Jersey Turnpike or US Route 130, instead of US Route 1, or vice versa). Because the local and secondary east-west connecting roads are increasingly congested, and are not designed to operate at highway speeds, the New Jersey Turnpike cannot be effectively accessed so that it might serve as an alternate north-south travel route to US Route 1.

The capacity of the New Jersey Turnpike was expanded in central New Jersey in the 1980s, and NJTA studies show that there is currently adequate capacity on the mainline New Jersey Turnpike to accommodate regional traffic from the congested US Route 1 corridor; however, NJTA is currently planning a mainline widening to ensure that sufficient capacity continues to be available.

The need for a project such as Proposed Route 92 arises as a result of robust economic and residential development activity, both in the past and as forecast for the future. NJTA looks to couple improved regional mobility with support of coordinated efforts to reshape existing and proposed development. Managing future growth creates an opportunity to support and sustain the traffic relief that would be provided by a new arterial highway (specifically designed to improve travel for through traffic, and serve as a link between major north-south highways). This effort would involve the participation of the project area municipalities and state agencies, including NJTA. While NJTA does not have direct control or jurisdiction over the land development approval process, it seeks to collaborate with the New Jersey Department of Environmental Protection (NJDEP), the New Jersey Office of Smart Growth, the New Jersey Department of Transportation (NJDOT), the counties of Mercer and Middlesex, and local municipalities to help shape future growth into sustainable patterns.

Proposed Route 92 is the NJTA's preferred alternative; however, the US Army Corps of Engineers (USACE), the preparer of this EIS, is neither an opponent nor a proponent of the NJTA proposal, and the full range of decision options regarding the permit application is available to the USACE District Engineer in responding to the application.

NJTA applied to USACE for a federal Clean Water Act permit seeking approval of proposed wetland fill related to construction of proposed Route 92. In its review, USACE has determined that a decision upon this permit application would be a major federal action significantly affecting the quality of the human environment. This determination triggered implementation of the National Environmental Policy Act (NEPA), which calls for the USACE to prepare an EIS. An EIS provides a broad range of information and analysis designed to assist the permitting agency in reaching an informed decision on the permit application.

This EIS has been prepared to assist the USACE–New York District in reaching an informed decision on Application No. 1999-00240-J1, submitted by NJTA on January 6, 1999, for the Proposed Route 92 project. The applicant seeks a permit pursuant to Section 404 of the Clean Water Act to discharge fill material in waters of the United

States. The application submitted to USACE requests authorization to permanently discharge fill material in 12.03 acres of waters of the United States, including 11.58 acres of wetlands, as a result of construction activities related to Proposed Route 92. A further 1.16 acres of wetlands would be permanently shaded by the bridges included in the project design. In addition, 2.92 acres of temporary fill would be required during construction, but removed prior to project completion.

This EIS, under the guidance of NEPA, describes the purpose of, and analyzes the need underlying NJTA's proposal to improve regional traffic mobility by creating new east-west arterial highway capacity in southwestern Middlesex County, known as proposed Route 92. The EIS then evaluates alternatives to the NJTA proposal, to assess whether the project purpose might be accomplished by another plan that would result in lesser environmental impact. Finally, the EIS describes the beneficial and adverse impacts of alternative projects, including proposed Route 92, that have the potential to achieve project purpose with fewest adverse impacts, as determined through an alternatives screening analysis.

ES.1.2 Purpose and Need

Transportation Needs in the Project Area

The main highways serving traffic passing through the project area are all oriented in a north-south direction: the New Jersey Turnpike (with Interchanges 8 and 8A along the area's eastern edge) and US Route 130 on the eastern side of the area, and US Route 1 and NJ Route 27 on the area's western side. Residential, commercial, and industrial land use in southwestern Middlesex County and northeastern Mercer County is generally concentrated along the major north-south highways and interchanges in the area. The major peak hour traffic flows in the traffic study area are the north-south flows along the New Jersey Turnpike, US Route 1, and US Route 130.

Within the 25-mile corridor along US Route 1 — between Route 18 in New Brunswick and Interstate 195/Route 29 in southern Mercer County — motorists wishing to travel between the existing north-south corridors must use local and secondary east-west roads passing through suburban communities in Plainsboro, South Brunswick, Cranbury, West Windsor, and East Windsor Townships, or travel along US Route 1 to link to the connecting north-south highways.

Intensive development of new homes, office complexes, retail centers, warehousing facilities, and other places of employment such as medical and institutional facilities in southwestern Middlesex County and northeastern Mercer County has resulted in worsening congestion on the road network. Traffic modeling conducted for this EIS indicates that congestion will significantly worsen in the future. County and State planners have forecast that historically strong development trends will continue, but planned County and NJDOT increases in roadway capacity are limited. The high peak-hour north-south volumes cause delay at many intersections in the project area, particularly along US Route 1. However, severe congestion also occurs on two-lane east-

west roads, such as Ridge Road, Dey Road, Cranbury Neck Road, and Plainsboro Road. Regional and local mobility continues to deteriorate as travel demand increases.

When much of the road network exceeds capacity, even minor volumes of additional traffic, or any reduction in capacity (resulting from construction or accident), may trigger the uncontrolled spread of capacity losses throughout the entire road network. As the road network becomes increasingly congested network analysis must be performed at the regional level to understand how the many instances of capacity deficiency might be interrelated.

The traffic model developed for this EIS coupled a regional model (and area of analysis) to a detailed "Central (New) Jersey" area model. The Central Jersey model contains a detailed representation of the road system -- from NJ Route 18 in the north to Mercer Co. Route 571 in the south, and from the New Jersey Turnpike and Middlesex Co. Route 535 on the east to NJ Route 27 on the west. The detailed local traffic model is "nested" within the 22-county regional traffic model developed for NJDOT's Penns Neck Area EIS, , prepared between 2001 and 2004.

By the year 2028, the traffic model projects that morning westbound peak hour travel demand will exceed the total capacity of the east-west roadways by 25 percent, assuming no major changes occur in road capacity. Area-wide, morning peak hour travel times are expected to increase by about 50 percent on average. Almost all key intersections in the area will be unable to process peak hour demand in the future without significant delays.

For this EIS, the origins and destinations of trips that are projected to cross a "screenline" were evaluated. The "screenline" is an imaginary line that is used to analyze the total volume of traffic that crosses the imaginary line, which is positioned in a north-south direction roughly halfway between US Route 1 and US Route 130. Because the screenline is oriented north-to-south, the screenline helps to determine the amount of traffic that travels east to west and west to east in the traffic study area.

In the year 2028 the traffic model projects that a total of about 270,000 to 300,000 vehicles per day will cross the screenline in both directions. About 25 percent of these vehicles are expected to be through traffic, passing through the area. Through traffic traveling on the local roads contributes to traffic congestion, causes local neighborhood impacts (such as noise, vibration, dust, and reduced pedestrian safety), and creates traffic safety issues. Through traffic, by NJDOT definition, is more appropriately served on regional arterial highways, and routes for through traffic should be separate from local roadway routes.

The traffic model was used to predict future peak hour through traffic volumes crossing the screenline. The model shows significant increases in through traffic that will cross the screenline (i.e., constituting an east-west trip) in future years. The analysis shows more than a doubling of through traffic traveling east-west across the screenline by 2028, increasing from 4,565 peak hour trips to 10,117 trips.

Prior studies of proposed Route 92 also recognized another serious traffic issue—the use of local and secondary roads by trucks for goods transport, especially as related to the increasing role of the lands surrounding Interchange 8A as a national warehousing center. These roads traverse long-established residential and neighborhood commercial areas, many of which are set close to the roadways. These roads are mainly two-lane designs with tight curves and minimal turning radii at intersections. The increasing volumes of through truck traffic diminish quality of life and neighborhood character. Without any changes to the traffic network, future increases in truck volumes on local east-west roads are predicted to increase by approximately 35 percent.

Project Purpose

As discussed above, the volume of traffic, especially through traffic, traveling to and from the southwestern Middlesex County and northeastern Mercer County study area continues to increase. This is principally attributable to three factors: the strong pace of residential and business development in the overall study area, the emergence of a national-scale warehousing complex in the Interchange 8A area, and the continued growth of the Princeton area and surrounding municipalities as high prestige business and residential locations.

The increasing volume of through traffic is causing worsening traffic congestion, and regional mobility is reduced because of the absence of east-west arterial highway routes. Worsening congestion and reduced mobility lengthen the duration of the work commute by area residents and employees, reduce the convenience and safety of non-work trips by residents, reduce bicycle and pedestrian safety, impact air quality, increase the cost of trucking and business operations, and diminish the quality of life for residents and businesses located along congested local roads.

The absence of sufficient arterial highway routes to carry the increasing percentage of through automobile and truck traffic in this intensively suburbanized area contributes significantly to reduced regional mobility. The increasing volume of through traffic is exacerbating existing congestion. Traffic modeling shows that new regional transportation system capacity is needed to address the expanding traffic demands of the region and improve regional travel mobility.

Project Purpose: USACE determines that the purpose of NJTA's Route 92 project is to improve regional mobility, especially east-west mobility, for the central New Jersey area in and around southwestern Middlesex County and northeastern Mercer County.

For purposes of this EIS, USACE considers "mobility" to be the movement of people and goods conveniently, reliably, safely, and in acceptable travel time, by transportation system components that will enhance economic development and that are compatible with community and the environment. "Regional mobility" considers improvements at the transportation network scale, such as highways and freeways that principally carry through traffic, and that complement the functions of the local and county road system.

Past and projected residential and commercial growth in the study area, continued expansion of the goods distribution facilities around NJ Turnpike Interchange 8A, and vehicles traveling between the NJ Turnpike and the Princeton/Trenton areas generate significant traffic, considerably overloading the existing roadway network, especially during peak travel times.

One major factor contributing to worsening traffic congestion is that no east-west arterial highway exists in the southwestern Middlesex County/northeastern Mercer County region to serve the increasing traffic volumes traveling between the NJ Turnpike Interchange 8A (including the warehousing complex surrounding the Interchange) and the extensive US Route 1 business center that continues to develop in southwestern Middlesex County / northeastern Mercer County.

A second major factor inhibiting regional mobility is the absence of an east-west arterial highway link between existing major north-south highways to facilitate access by travelers to the least congested north-south route between the New Brunswick area and Princeton/Trenton area. Because no arterial highway linkage currently exists between north-south highways in the study area, traffic cannot efficiently re-route to alternate north-south routes that exhibit available capacity. Because there is no east-west arterial highway connector between existing north-south highway routes, these existing investments in regional mobility cannot effectively be utilized by drivers. Providing east-west linkage between major north-south highways would increase the efficiency of the existing road network by allowing through traffic to select the most direct, least-congested route for north-south travel.

Finally, because there is no east-west arterial highway in southwestern Middlesex County/northeastern Mercer County, a hierarchical road network that allows through traffic to travel on routes that are separate from local traffic does not exist, diminishing quality of life and creating congestion on the local road system. Increasingly, through traffic and regional traffic is being carried by, and is congesting, local roads.

A hierarchical roadway network is a system that promotes the use of local streets for local access and circulation, and promotes the use of highways for through traffic and large truck traffic. The goal of providing a hierarchical network of roads is to separate local traffic from through traffic. The advantages of a hierarchical network are recognized by the Middlesex County Planning Board, in its Transportation Plan for the County. Creating hierarchical roadway networks is a long-established and widely-applied transportation planning objective that protects the quality of life for residents along local roads, and supports efficient travel for non-local trips. The South Brunswick Township Master Plan recommends that "local traffic should be separated, as much as possible, from through traffic", which is an expression of hierarchical network principles.

The transportation model prepared for this EIS indicates significant and steadily worsening traffic congestion throughout the study area due to the strong past and future

development trends in the region. A hierarchical road network would reduce the impacts that have been caused by increased volumes of through traffic using local roads to travel between the Trenton/Princeton area and New Jersey Turnpike Interchange 8A, and the major warehousing/distribution center that exists around Interchange 8A.

Example locations where providing new arterial highway capacity for through traffic would help preserve local circulation characteristics and quality of life for residents and small businesses living adjacent to local roads, by reducing the presence of through traffic on local roads, include:

- Plainsboro Center (around the intersection of Plainsboro Road, Dey Road, and Scudders Mill Road). Existing land uses affected by through traffic include the municipal complex, high and low density residential areas, and local commercial areas.

- South Brunswick Center (along County Route 522 in the vicinity of Kingston Lane). Existing land uses affected by through traffic include the municipal complex, high and low-density residential areas, and schools.

- Princeton Junction Center (along County Route 571 in the vicinity of the Northeast Corridor Rail Line). Existing land uses affected by through traffic include a low-density residential area, local businesses, a train station, schools, and parks.

ES.1.3 Alternatives

NEPA requires that a review be conducted of alternative approaches to meeting the need for the project, and fulfilling the project purpose (as described in Section 1 of the EIS). The EIS (in Section 2) identifies the environmental (including socioeconomic and land use) impacts of 16 alternatives (as well as several sub-alternatives) to find those alternatives with comparatively fewer adverse environmental impacts. The Alternatives Analysis then assesses the ability of each of the comparatively lower impact alternatives to meet project purpose and respond to the need for the project.

Five types of alternatives are evaluated in Section 2 of the EIS:

1. **No Action.** This alternative is a consequence of USACE not granting a permit for the proposed project. Under this alternative, no action would be taken beyond completing other roadway projects for which funds have already been committed and that meet permit requirements. Specifically, NJTA proposed Route 92 would not be constructed, nor would any other major traffic network improvement alternative be implemented as part of this project.

2. **Transportation Demand Management (TDM) Measures.** TDM measures are focused on reducing the number of single occupancy vehicles that contribute to congestion on roadways through measures such as ride-sharing, flex hours, and public transit.

3. **Existing local and county roadway capacity improvements.** This category includes alternatives that improve the capacity of existing local and county roads by widening existing roads and improving intersections. As recommended by the North Jersey Transportation Planning Authority (NJTPA) for transportation accessibility and mobility analyses, these alternatives constitute a category of alternatives known as Transportation System Management (TSM) measures (i.e., improvements to the existing roadway system that make it function more effectively).

4. **Improvements to existing regional system.** This category includes improvements to the existing regional roadway system, specifically improvements to US Route 1.

5. **New roadway facilities.** The category includes construction of new roadways, and may include either local roads, or highways, or both.

Within each of these five broad categories, the following specific alternatives are evaluated:

1. No Action
   - No permit is issued and no implementation of the NJTA proposed action (i.e., no implementation of the proposed regional roadway capacity improvements)

2. Transportation Demand Management
   - Ridesharing-Carpooling/Vanpooling Programs
   - Alternative Work Hours
   - Parking Management
   - High Occupancy Vehicle (HOV) Lanes
   - Transit Services and Support, including Bus Rapid Transit
   - Public Transit Operational Improvement
   - Bicycle and Pedestrian Facilities
   - Transportation Management Association Involvement

3. Existing Local and County Roadway Capacity Improvements
   (New Lanes added to Existing Roads, or Intersection Improvements)
   - US Environmental Protection Agency (USEPA) Suggested Modified No-Build Alternative
   - Route 522 Widening (with and without extension to New Jersey Turnpike)
   - Dey Road Widening
   - Plainsboro – Cranbury Road Widening
   - Cranbury Neck Road Widening
   - Composite Local Roadway Improvements Program

4. Improvements to the Existing Regional Roadway System
   - US Route 1 Widening in South Brunswick
   - US Route 1 Widening in South Brunswick with Signal Removal

5. New Roadway Facilities
   - NJTA Proposed Route 92 with Terminus at Route 1, including sub-alternatives
   - USEPA Suggested Alignment
   - Dey Road Parallel Alignment
   - Plainsboro – Cranbury Road Parallel Alignment
   - South Brunswick Alignment – Modified

NJTA has authority only to implement proposed Route 92 (or a modification thereof, such as the sub-alternatives discussed in Section 2). NJTA highway facilities are paid for by toll revenues collected from its users; these funds are not co-mingled with transportation funds for non-toll roadways. (Non-toll roadways are under the jurisdiction of NJDOT, counties, or municipalities.) NJTA toll revenues cannot be used for maintenance projects, unless they involve Turnpike facilities. Nevertheless, NEPA guidance (46 FR 18026) requires that alternatives that may be beyond the capability of the project sponsor to implement should be evaluated in an EIS as long as they are reasonable and potentially effective alternatives. Although other state or local sponsors would be needed to implement many of the alternatives, they have been examined equally with respect to ability to meet the project purpose and need, and their impacts.

The following review process was used to evaluate the alternatives:

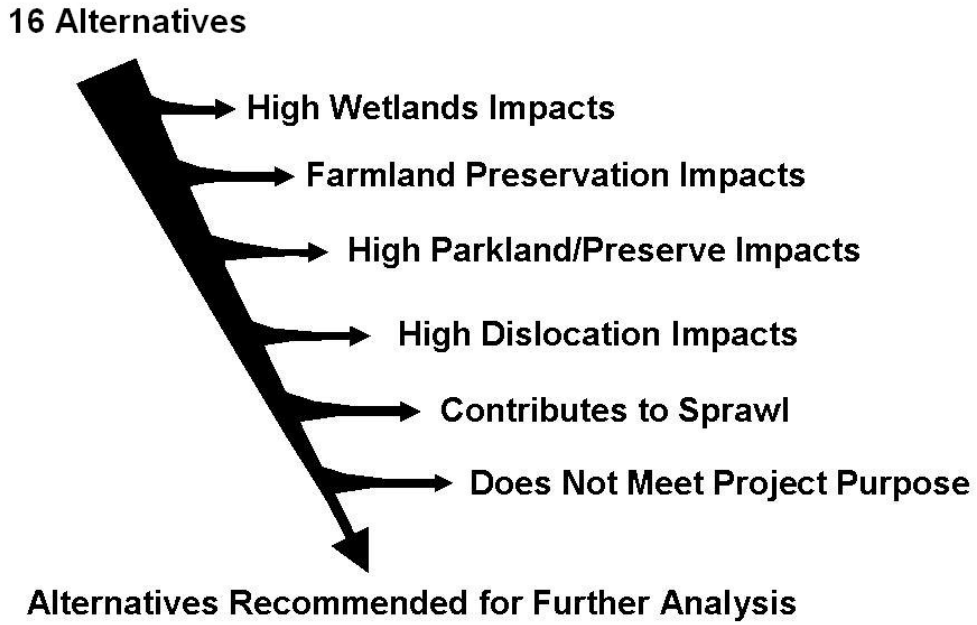
- Alternatives that are similar in their ability to fulfill the project purpose but that are found to have comparatively greater adverse environmental impact as a result of the analysis of alternatives were not recommended for further consideration or more detailed study in the FEIS. Impacts that differentiated the alternative projects included wetland fill, loss of permanently protected farmland, loss of protected parklands/preserves, residential and commercial dislocation, and facilitating sprawl development. The evaluative stepwise process used to differentiate the alternatives, based on their environmental impacts, is illustrated in Figure ES-1.

- Alternatives that exhibited consistency with smart growth planning principles and the New Jersey State Development and Redevelopment Plan, and alternatives that exhibited potential to contribute to sprawl were assessed in the alternatives screening process.

- Alternatives were further differentiated based on their relative ability to meet the basic project purpose. Alternatives that exhibited low effectiveness in achieving traffic improvement pursuant to the traffic modeling analysis were not considered for more detailed analysis in the FEIS.

- Pursuant to the analysis of alternatives, those alternatives that best met the project purpose, on a comparative basis, and that exhibited fewer adverse environmental impacts, on a comparative basis, were then evaluated in additional detail with respect to their impacts in Section 4.

Figure ES-1
Alternatives Analysis



The results of the alternatives analysis are summarized in Table ES-1 and discussed below.

Implementation of TDM and transit measures would likely provide some relief from traffic congestion in the study area, but would not substantially address the project need. TDM and transit measures are most effective in reducing traffic congestion in locations that exhibit high densities of residential development and that are located near major employment centers. Interest in implementing a public transit system along the congested US Route 1 corridor led to initiation in 2004 of the Central New Jersey Route 1 Bus Rapid Transit (BRT) Alternatives Analysis, managed by New Jersey Transit. A report of the study issued in February 2006 estimates that a BRT system would increase the percentage of work trips using transit from a range of 2% to 4% to a range of 5% to 9% in the core study area of Plainsboro, West Windsor, Princeton Township and Princeton Borough. The report estimates that the BRT system would cost $600 million to $700 million to implement. The BRT study is continuing.

Previous analyses have suggested that a BRT system, together with smart growth land use development, implementation of travel demand reduction strategies, and highway improvements could reduce the anticipated growth in roadway congestion. The preliminary assessment appears to be consistent with ongoing studies, which suggest that BRT could be a complement to expanded road network capacity, but would unlikely be a substitute for it.

Table ES-1
Alternatives Evaluation Summary

Alternative	Permanent Wetland/Open Water Impacts (acres)	Impact to Preserved Farmland (acres)	Parkland Impacts	Direct Impact to Historic Sites?	Residential Impacts	Commercial Impacts	Public Facilities Impacts	Facilitates Sprawl Development	Meets Project Purpose?
South Brunswick Alignment – Modified	43.0	0	Loss of 34 acres of Plainsboro Preserve	No	n/a	n/a	n/a	Slightly	No
Composite Local Roadway Improvements Program	20.0	0	0	Yes	180	10	6	Significantly	Partial
Dey Road Parallel Alignment	3.6	27	0	No	63	4	0	Significantly	No
Plainsboro – Cranbury Road Parallel Alignments	5.6	33	Public open space part of Estates at Grovers Mill Subdivision	Depends on alignment	12	4	0	Significantly	No
USEPA Suggested Alignment	13.0	0	Loss of 38 acres of Plainsboro Preserve	No	11	0	1	Slightly	Partial
Route 522 Widening (with/without extension to New Jersey Turnpike)	2.0 / 7.0	0	Pigeon Swamp State Park impact	No	58	1	4	Significantly	No
Plainsboro – Cranbury Road Widening	0.6	0	0	Yes	41	5	2	Moderately	No
Cranbury Neck Road Widening	4.3	0	0	Yes	63	2	0	Moderately	No
USEPA Suggested Modified No-Build Alternative	1.2	0	0	No	0	0	0	No	No
Dey Road Widening	7.5	0	0	No	18	1	0	Moderately	No
NJTA Proposed Route 92 with Terminus at Route 1	12.0	0	14 acres reserved for roadway in Plainsboro Preserve	No	4	1	0	Slightly, at Perrine Road interchange	Yes
Two-Lane Route 92	9.5	0	Same as above	No	4	1	0	Slightly, at Perrine Road interchange	Partial
Phased Route 92	12.0	0	Same as above	No	4	1	0	Slightly, at Perrine Road interchange	Yes
Route 92 without Perrine Road Interchange	12.0	0	Same as above	No	4	1	0	No	Yes
US Route 1 Widening in South Brunswick	4.0	0	0	No	3	3	0	Slightly	Partial
US Route 1 Widening in SB with Signal Removal	7.7	0	0	No	8	7	0	Slightly	Partial

Shaded cells identify the principal disadvantages of each alternative.

Experience with TDM measures in suburban New Jersey indicates that the implementation of such measures would not replace the need for roadway system improvements, primarily because of their limited effectiveness in suburban areas with dispersed residential origins and dispersed employment destinations. However, TDM measures could be effective as complementary strategies, and the combined effect of several TDM measures might slightly reduce congestion, and could offset the potential for minor additional highway-capacity-induced single-occupancy-vehicle (SOV) trips. A coordinated package of TDM measures and roadway system improvements would be consistent with the goals and objectives of the North Jersey Transportation Planning Authority (NJTPA) Regional Transportation Plan for the study area.

Compared to the other alternatives, the South Brunswick Alignment – Modified and Composite Local Roadway Improvements Program alternatives have greater permanent impacts to wetlands and open water than almost all other alternatives. The Composite Improvements Program alternative also has substantial dislocation impacts, particularly residential dislocations (180). Both alternatives have significant potential to contribute to sprawl. Neither alternative would be effective in meeting the project purpose of improving regional mobility, because neither alternative would separate through traffic from local traffic, which is necessary to optimize regional travel while reducing local congestion. Because of their extensive impacts, these alternatives were identified as the least desirable.

The Dey Road Parallel Alignment and Plainsboro-Cranbury Road Alignment alternatives, while exhibiting lesser wetland impacts than the alternatives discussed above, have substantial impacts on farmlands preserved by law, and, in the case of the Dey Road Parallel Alignment, has substantial residential dislocation impacts (63). Both alternatives have significant potential to contribute to sprawl by creating new direct road access to undeveloped areas. Neither alternative would substantially meet the project purpose of improving regional mobility, because neither would separate local and through traffic. Under New Jersey's Farmland Preservation program, use of legally preserved farmland for non-farm purposes is strongly discouraged, and legal impediments greatly restrict use of such lands for non-farm purposes. While there are several categories of farmland protection and recognition, farmland preservation is the strongest. For this reason these alternatives were identified as substantially infeasible.

The USEPA Suggested Alignment alternative has greater wetland impacts than most of the alternatives, and substantial direct and indirect parkland impacts (loss of 48 acres of Plainsboro Preserve in a very important location in the Preserve). This alternative has only slight potential to contribute to sprawl, but would result in comparatively great impacts to the natural environment. This alternative would not fully meet the project purpose of improving regional mobility, because it relies on a 2.1-mile section of Scudders Mill Road, and would therefore not separate local and through traffic.

The Route 522 Widening alternative (with or without extension to the New Jersey Turnpike) exhibits relatively fewer wetland impacts. However, it has substantial

parkland impacts with the extension to the Turnpike (Pigeon Swamp State Park) and substantial residential and public facility dislocation impacts with or without the extension. With the extension to the NJ Turnpike, its impacts to the Pigeon Swamp wetland complex, which has been designated as a USEPA Priority Wetland and is included in the National Register of Natural Landmarks, are significant. This alternative has significant potential to contribute to sprawl. Without the extension to the NJ Turnpike, this alternative would not meet the project purpose of improving regional mobility. With the extension to the Turnpike, this alternative still would not substantially meet the project purpose, because Route 522 was not designed to accommodate the volumes of mixed local and through traffic it would attract.

The Plainsboro-Cranbury Road and Cranbury Neck Road Widening alternatives have relatively less wetland impact than the other alternatives, but exhibit major residential dislocation impacts (41 and 63 dislocations, respectively). These alternatives would cause great adverse social impact to the community. These alternatives have significant potential to contribute to sprawl, and they would not substantially meet the project purpose because they would not separate local and through traffic, which is necessary to optimize regional mobility.

The USEPA Suggested Modified No-Build alternative has few physical and socioeconomic impacts and would not contribute to sprawl, but fails to meet the project purpose. Two of the three improvements suggested under this alternative have been implemented, and were considered to be part of the existing road system when future traffic congestion was analyzed. Even though the traffic modeling analysis includes these improvements as background conditions, the traffic modeling analysis still identifies significant need for road network improvements (as described in Section 1, Project Purpose and Need, and the transportation analysis in Section 4) above and beyond these already implemented intersection improvements. While a new interchange at US Route 130 and Route 32 has not been implemented, this road system improvement would yield little benefit in improving east-west travel congestion because it does not improve travel capacity to points west of US Route 130. While a new interchange would provide slightly improved linkage between the New Jersey Turnpike and Route 130, this benefit would be provided at only one of four needed interchange locations to improve linkage between north-south highways.

The Dey Road Widening Alternative exhibits moderate wetland impacts (7.5 acres) and moderate residential dislocation impacts (18), and would facilitate sprawl to a moderate degree. Most significantly, the Dey Road alternative would use local roads to carry regional traffic, and does not provide an efficient connection to the New Jersey Turnpike because it increases the burden on local intersections as traffic moves toward Interchange 8A. Because this alternative exhibits moderate wetland and residential dislocation impacts and does not meet the project purpose it was identified as less desirable than other alternatives.

The USEPA Modified No-Build alternative and the Route 522, Plainsboro-Cranbury Road, Cranbury Neck Road, and Dey Road widening alternatives would not reduce regional through traffic using the local road system. Increasing levels of local and regional through traffic would create congestion on these roads, make local travel more difficult, discourage walking and bicycling, and reduce the quality of life in adjacent communities and neighborhoods.

A two-lane Route 92 sub-alternative would reduce wetland impacts by 2 acres and slightly reduce other environmental impacts relative to a four-lane configuration. However, it would be significantly less effective at improving regional mobility by separating through traffic from local traffic. Traffic modeling shows that a two-lane Route 92 would reach 100% of its capacity by 2008. A two-lane Route 92 was determined to insufficiently fulfill the purpose of the project, because it would not adequately address reduction of projected future congestion.

Similarly, a phased two-lane to four-lane Route 92 would be inefficient from a planning perspective, and would ultimately not decrease environmental or socioeconomic impacts, because the second phase would need to begin construction almost immediately upon completion of the first two lanes. However, because the phased Route 92 sub-alternative would meet the project purpose, and would temporarily avoid some environmental effects, it was considered for further study.

Removal of the Perrine Road interchange from proposed Route 92 would reduce the loss of farmland by approximately 5 acres, but would not significantly reduce other adverse impacts. It is also predicted to cause more congestion on Route 1 and local roads in the area because it would provide fewer access options for the office development area that currently exists between Schalks Crossing Road and US Route 1 (Forrestal Center and others). Because removal of the Perrine Road interchange would have limited environmental and socioeconomic benefit and would decrease the traffic improvement that would result from proposed Route 92 (and thereby increase congestion and air pollution), this sub-alternative was also eliminated from further consideration.

The US Route 1 Widening in South Brunswick (with or without signal removals) and NJTA Proposed Route 92 have minor to moderate wetland and dislocation impacts and minor park and socioeconomic impacts, while fully or partially meeting the project purpose. US Route 1 Widening with signal removal would have moderate commercial dislocation impacts. Proposed Route 92 would have an impact on the northern section of Plainsboro Preserve; however, when Plainsboro Township created the preserve it anticipated construction of proposed Route 92 through the preserve.

Based on the comparative assessment of the alternatives, two alternatives have been identified that have low to moderate wetland impacts, do not cause substantial adverse physical and/or socioeconomic impacts, reduce potential sprawl effects, and substantially meet the project purpose of improving regional mobility. They are:

- Proposed Route 92 with Terminus at Route 1, both as-proposed and with phased implementation
- Route 1 Widening in South Brunswick with Signal Removal

In addition, the No action/No build alternative (under which no permit is issued, and no project would be implemented to address project purpose and need) is carried through for further analysis.

The alternatives evaluated in the preceding sections were screened based on their environmental, social, and smart growth impacts, and their ability to meet the project purpose of improving regional mobility.

ES.1.4 Affected Environment

Section 3 of the FEIS describes the existing conditions of the environment within the project study area, and is the basis of the more detailed impact evaluation conducted in Section 4 of the FEIS for the No Action alternative, proposed Route 92, and the US Route 1 Widening alternative. Section 3 documents the environmental, cultural, transportation, socioeconomic, and land use settings of the alternative corridors and adjacent areas. The FEIS includes subsections on geology/soils, water resources, wetlands, fish and wildlife, farmland, historic and cultural resources, air quality, transportation, noise, aesthetics, known contaminated sites, human health, socioeconomics, land use, and environmental justice.

The Potential Impact Corridor for Proposed Route 92 is defined as a 1,000-foot-wide study area spanning the centerline of the proposed Route 92 project, reaching from US Route 1 near Ridge Road in South Brunswick to the New Jersey Turnpike at Interchange 8A in Monroe, including the proposed road improvements. The Potential Impact Corridor for US Route 1 Improvements is defined as a 1,000-foot wide swath spanning the centerline of US Route 1 between US Route 130 in North Brunswick and Independence Way in South Brunswick. The general Project Study Area comprises a larger area of several square miles surrounding the alternatives in southwestern Middlesex County and northeastern Mercer County.

The Project Study Area consists of relatively flat to rolling topography with land depressions generally consisting of water features (wetlands, watercourses, ponds and lakes). The elevation ranges from a low point of approximately 70 feet above mean sea level (MSL) to a high of approximately 260 feet.

The study area is characterized by palustrine wetland systems associated with Devil's Brook, Shallow Brook, Heathcote Brook, and Oakeys Brook (refer to Section 3.3.4). The majority of the potential impact corridor of Proposed Route 92 is within and adjacent to the Devil's Brook and Shallow Brook wetlands, while the potential impact corridor for the US Route 1 Widening is within and adjacent to the Heathcote Brook and Oakeys Brook wetlands. The Devil's Brook and Shallow Brook watersheds support extensive wetland complexes along their waterways. The Devil's Brook wetlands are generally

located north of, and parallel to, Proposed Route 92; the Shallow Brook wetlands are generally located south of, and parallel to Proposed Route 92. These wetland ecosystems range from emergent to forested vegetative communities.

The wetland systems in the vicinity of the proposed Route 92 project are generally characterized by a vegetative community consisting of an upper canopy of red maple, sweetgum, pin oak and green ash; a shrub canopy consisting of spicebush, sweet pepperbush, common greenbrier, highbush blueberry, and swamp azalea; and a moderately thick herbaceous layer consisting of skunk cabbage, cinnamon fern, sensitive fern and spotted jewelweed. In limited areas, the forested wetland gives way to emergent wetlands, characterized by herbaceous emergent plants with little or no overstory. Several man-made wetlands consist primarily of broad-leaved cattail and woolgrass.

The United States Fish and Wildlife Service (USFWS) records had indicated that potentially suitable habitat for the federally listed bog turtle is located in the vicinity of the proposed Route 92 project, along Lawrence Brook. In addition, USFWS noted that Cooper's hawk, savannah sparrow, and wood turtle, all state listed as threatened, are known to occur in the vicinity of the proposed project site. Two surveys were performed in the forested wetlands in the Devil's Brook area specifically for wood turtle and bog turtle; the surveys determined that there is in fact low potential for suitable wood turtle habitat and no potentially suitable bog turtle habitat in the project study area. According to USFWS, the project area is not designated as a "critical habitat" for threatened or endangered species under USFWS regulations.

NJDEP Natural Heritage Program (NJNHP) has records for occurrences of State of New Jersey (but not federal) listed species of southern arrowhead and low spearwort within the Proposed Route 92 Corridor. Comet darner, American waterwort, tall boneset, soapwort gentian, shore quillwort, slender water-milfoil, humped bladderwort, and Britton's coast violet have been documented near the immediate vicinity of the corridor. A rare plants evaluation was completed for the project; it found that of the species previously reported in the general vicinity of the project, only southern arrowhead was determined to be likely present within the proposed right-of-way. Tall boneset was not included in the rare plants evaluation, as it was not listed at the time the evaluation was performed. In addition, the Landscape Project, NJDEP Division of Fish and Wildlife's publicly-available critical habitat mapping program, shows that suitable habitat patches of emergent wetland, forest, grassland and forested wetland occur on the project site, and has records for bobolink, savannah sparrow, and wood turtle in habitat patches within the Project Study Area. Refer to Section 3.3.5 for further discussion on fish and wildlife.

The core Traffic Study Area (see Section 3.7) consists of the towns of South Brunswick, Plainsboro, and Cranbury in southwestern Middlesex County; and the townships of West Windsor and East Windsor (including Hightstown) in northeastern Mercer County. The main highways serving traffic passing through this area are all oriented in

a north-south direction: the New Jersey Turnpike (with Interchanges 8 and 8A along the area's eastern edge) and US Route 130 on the eastern side of the area, and US Route 1 and NJ Route 27 on the area's western side. NJ Route 32 provides a connection between US Route 130 and the New Jersey Turnpike at Interchange 8A.

A series of east-west local and secondary roads connect to the four north-south highways in the Traffic Study Area, providing access to the towns as well as serving local circulation needs. These roads include County Route 610 (Deans Lane), Major Road, New Road, County Route 522, Ridge Road, Friendship Road, Broadway Road, Dey Road, Scudders Mill Road, Plainsboro Road, Cranbury Neck Road, and County Route 571. The newly constructed Hightstown Bypass (NJ Route 133) is a 3.7-mile, divided, four-lane limited-access highway in the town of East Windsor, allowing east-west traffic passing through East Windsor to bypass the town of Hightstown. The principal peak hour traffic flows in the Traffic Study Area are the north-south flows along US Route 1, the New Jersey Turnpike, and US Route 130. The most serious congestion in the Traffic Study Area, however, occurs on the two-lane east-west roads, such as Dey Road, Plainsboro Road, and Ridge Road. Currently, approximately 16 percent of traffic on these roads is through traffic.

Section 3.12.1 provides demographic information for the four municipalities in the Project Study Area. The population of South Brunswick Township, the largest of the five Traffic Study Area municipalities, increased by 46 percent between 1990 and 2000, principally as a result of land development. This was the highest growth rate among the five municipalities, and was almost four times greater than the 12 percent growth of the Middlesex County population during that decade. The population of Plainsboro Township grew 42 percent between 1990 and 2000. The Middlesex County Planning Department (MCPD) projects that the population of both South Brunswick and Plainsboro will increase by 50 percent between 2000 and 2020, three times the growth rate projected for the County as a whole. The population of Monroe Township grew 26 percent between 1990 and 2000; MCPD projects that the population of Monroe Township will increase by 35 percent between 2000 and 2020. The population of North Brunswick Township grew 16 percent between 1990 and 2000; MCPD projects that the population of North Brunswick will increase by 22 percent between 2000 and 2020.

Zoning in the project corridor study areas ranges from low-density residential to commercial to light industrial. The Proposed Route 92 Corridor passes mainly through office/research/conference and low-density residential areas. Approximately 3.9 miles of the 6.7 miles of proposed Route 92 would pass through land currently assessed as farmland for property tax purposes. The agricultural land through which Route 92 would pass is somewhat concentrated in the western and central portions of the corridor, but a significant stretch of the eastern portion of the proposed Route 92 would also pass through active agricultural land. The US Route 1 Corridor lies mostly within industrial and commercial areas. Refer to Section 3.13.2 for more information on land use and zoning.

ES.1.5 Environmental Impacts

As discussed in Section 2, the alternatives proposed over the history of the Route 92 project were evaluated to ascertain how well each meets the project purpose and to assess its comparative potential environmental impact. Among the broad set of alternatives considered in Section 2, a subset of alternatives that best met purpose and need with relatively lower levels of impact were recommended for more detailed analysis.

The environmental impacts of the No Action alternative, the Route 92 alternative (and phased subalternative), and the US Route 1 Widening and Signal Removal alternative are discussed in Section 4. Some of the US Route 1 alternative impact discussion is divided into "widening only" and "widening with signal removal", which helps to segregate impacts by construction element, because a significant portion of the impact of that alternative would be due to intersection alteration rather than the widening of US Route 1.

Several types of impacts are presented in Section 4. The Federal Council on Environmental Quality regulations (40 CFR 1508.8 and 1508.7) define the impacts that must be evaluated during the NEPA process. *Direct impacts* are those that are caused by a proposed project and occur at the same time and place. For example, the loss of wetland value and acreage from filling would be a direct impact. *Indirect impacts* are caused by a project, but occur later in time or are removed in distance. Induced development resulting from increased highway traffic is an example of an indirect impact. *Cumulative impacts* result from the incremental impact of an action when added to other past, present, and reasonably foreseeable future action that may be undertaken by any party. Economic growth in a region after increased development could be considered a cumulative impact.

Through the course of preparing this EIS, several specific impact issues have been identified that combine several environmental and/or socioeconomic parameters, and therefore are better served by an integrated discussion. Included in this list are the following:

- **Devil's Brook Watershed/Wetland Complex.** Most wetland impacts related to the proposed Route 92 project would occur within the Devil's Brook wetland complex. This entire forested system is approximately 1,650 acres. The proposed Route 92 project would traverse the southern half of the forested tract, leaving a 500-acre area south of the roadway and a 1,150-acre area north of the roadway. Originally, the Devil's Brook stream corridor and wetland complex flowed southwest through what is now the Plainsboro Preserve. A private farm road along the Plainsboro-South Brunswick border, often called Turkey Island Road, crosses Devil's Brook at the same location where proposed Route 92 would cross the brook. Formerly, a 4-foot culvert carried the flow of Devil's Brook under Turkey Island Road. At least 10 years ago, the Turkey Island Road culvert was blocked and the entire flow of Devil's Brook was diverted to the northwest through a drainage channel along the Plainsboro-

South Brunswick border. This channel flows into a drainage channel that parallels the Amtrak Northeast Corridor rail line. The drainage channel along the Amtrak line flows southwest to a point west-southwest of McCormack Lake, where it merges with the flow from the lake and the flow of Shallow Brook from Broadway Swamp to the east. Under existing conditions, the flow of the northern branches of Devil's Brook does not reach McCormack Lake or the forested wetlands along Devil's Brook northeast of the lake.

Impacts of proposed Route 92 to the hydrology of the Devil's Brook wetlands complex would be reduced by several features of the proposed roadway design, such as culverts and bridges. Specifically, two 500-foot-long bridges are proposed to span this wetland complex (one at Devil's Brook and one at the Amtrak rail line), preserving the surface and subsurface water hydrology. These structures would also enable the passage of reptiles, amphibians, and larger animals, thus reducing fragmentation effects on these populations. The placement of roadway fill would lead to some localized surface and subsurface changes to the wetlands immediately adjacent to the roadway.

Forest fragmentation is also a concern, as this could affect neotropical bird migration. While fingers of forested land crossing the Proposed Route 92 Corridor could be negatively affected by fragmentation, most of the forested Devil's Brook wetland complex would remain undisturbed (approximately 1,150 acres north of the proposed roadway and 500 acres south of the proposed roadway). Broadway Swamp, also adjacent to the proposed alignment, consists of a minimum of 2,400 acres of forested land south of the proposed roadway. About 12 acres of wetlands would be filled as part of the construction of proposed Route 92. Impacts to surface and groundwater quality due to highway runoff are also a concern along the proposed project. NJTA has committed to full compliance with stormwater management requirements recently adopted by NJDEP, which require significant improvements in the quality of runoff before discharge. A range of stormwater Best Management Practices (BMP's), including extended detention basins, low velocity overland flow, and bioretention are proposed to control water quality impacts.

- **Plainsboro Preserve.** The proposed Route 92 project would pass through the northern end of the Plainsboro Preserve. Approximately 12.5 acres of the preserve north of the proposed roadway would be separated from the rest of the preserve. As with other parts of the Devil's Brook watershed, habitat and hydrologic fragmentation is a possible result. As discussed above, however, roadway design would allow both surface water and wildlife to cross under the highway. Adverse aesthetic impacts of proposed Route 92 would be diminished by the existing forest present over much of the preserve. Because the proposed roadway is at the northern end of the Plainsboro Preserve, construction- and use-related impacts would be restricted to a relatively small portion of the preserve. The project would not significantly affect the wildlife and aesthetic value of the entire property.

- **Historic Resources.** The historic Village of Kingston has expressed concerns regarding the volume of traffic using the local roads that would travel to and from Route 92 on Kingston's local roads. Of particular concern is travel on Heathcote Road, a two-lane rural roadway without shoulders, bordered by residences constructed very close to the road. Together with Ridge Road, it provides an east-west connection between US Route 1 and NJ Route 27. The Heathcote Road intersection with NJ Route 27 is the major intersection in the Village. The network model used for this project estimates that proposed Route 92 would not increase overall traffic in Kingston, but an additional 20 trucks would use Heathcote Road and the adjacent portion of Ridge Road during each peak hour. If restrictions on truck traffic and traffic calming measures were implemented on this road, the traffic impact of proposed Route 92 on Heathcote Road would be reduced.

- **Consistency with Planning Principles and the New Jersey State Development & Redevelopment Plan.** Proposed Route 92 would draw regional through-traffic away from local roads. This is expected to make local driving more amenable and efficient and facilitate alternative forms of transportation, such as walking and bicycle riding. Removal of through traffic from neighborhood centers would improve quality of life and would tend to strengthen the identification of residents with their communities while fostering more efficient development designs (such as interconnected developments, which are generally not desirable when they become routes for through traffic).

  The areas in South Brunswick where proposed Route 92 might potentially stimulate development—the interchange areas--are areas the Township has designated for commercial and industrial development. The area in South Brunswick where Route 92 would have no interchanges, and would therefore have little potential to stimulate development, is an area South Brunswick has designated for relatively sparse development. Proposed Route 92 could stimulate development in areas where South Brunswick has planned for commercial and industrial development to occur.

  The Plainsboro Master Plan states that proposed Route 92 is "a priority for the Township," and that the Township supports Route 92 and "encourages [its] timely implementation."

  With respect to the New Jersey State Development and Redevelopment Plan, proposed Route 92 would begin and end in a Suburban Planning Area, PA2, and would pass through an Environmentally Sensitive Planning Area, PA5. The State Plan "anticipates continued growth throughout New Jersey in all Planning Areas." Development is encouraged in PA1 and PA2 and is accommodated in PA3, PA4 and PA5. The State Plan directs that infrastructure investment decisions should encourage growth in areas that are already developed or are currently developing, and should discourage development sprawl into undeveloped areas. Proposed

Route 92 would have no interchanges in the Environmentally Sensitive Planning Area, and would therefore not directly enhance access to that area.

Proposed Route 92 interchanges near the Environmentally Sensitive Planning Area (for example, the proposed Route 92-Perrine Road connection) would indirectly enhance access to that area, and potentially accelerate existing development trends. NJTA believes that improved mobility must be coupled with a coordinated attempt on the part of local municipalities and state agencies (through New Jersey's Smart Growth initiatives) to reshape existing and proposed developments that support and sustain traffic relief provided by proposed Route 92. State agencies look to collaborate closely with local communities to ensure that future development occurs in sustainable patterns.

- **Induced Development.** Much of the open land within the proposed Route 92 Corridor is currently zoned for residential or commercial development. Growth and development pressures exist independent of the development of proposed Route 92, and much of the development that is proposed would likely occur with or without proposed Route 92.

  Because proposed Route 92 would be a limited access highway, it would not enable linear development along its route. With no interchanges between Perrine Road and US Route 130, it would not connect to cross streets that would make available new lands for development. Secondary development impacts could potentially occur at the interchanges of proposed Route 92 with US Route 1, Perrine Road, US Route 130 and New Jersey Turnpike Interchange 8A. The lands surrounding the interchange areas are already extensively developed, approved, or zoned for development. Control of future development in these locations remains principally under the jurisdiction of the municipal development review process and the guidance of municipal Master Plans.

  Proposed Route 92 is designed to maintain mobility on the local and regional road networks. Transportation modeling conducted for this EIS indicates that Route 92 would not provide transportation capacity beyond what is currently needed (i.e., no excess capacity is proposed). Rather, traffic modeling indicates that Route 92 would provide only the transportation capacity needed to accommodate growth that has already occurred or is already in the process of occurring. Without improvements such as Route 92, traffic growth would continue and the gap between the volume of traffic and the capacity to accommodate traffic would become steadily larger. The effect of the widening gap is to decrease the quality of life for existing residents as a result of significant congestion.

  Because implementation of the US Route 1 Widening and Signal Removal alternative would do little to facilitate access to undeveloped areas, it would have little impact on "sprawl" development.

The remaining impacts set forth in Section 4 can be summarized as follows:

- **Floodplains.** The construction of the proposed Route 92 project would result in floodplain reduction at Heathcote, Devil's and Shallow Brooks within the Millstone River watershed. For any construction project, the Federal Emergency Management Agency (FEMA) prohibits encroachment within the 100-year flood boundary that will cause an increase in flood heights of greater than 1.0 foot. The State of New Jersey prohibits encroachment within the flood hazard area that will cause an increase in flood heights of greater than 0.2 feet. In general, the hydraulic analyses show that the construction of proposed Route 92 would not have a major impact on the water surface elevation of the affected brooks and tributaries, with the exception of the tributary to Heathcote Brook crossed by US Route 1. New Jersey Department of Environmental Protection regulations limit the fill or reduction of floodplain volume below the 100-year flood to a maximum of 20 percent of the flood fringe area within the right-of-way. Three of the proposed floodplain takings or net fills within the Proposed Route 92 Corridor exceed this 20 percent rule. NJTA requested exemption from the requirement when it submitted a new Stream Encroachment Permit Application to NJDEP in December 2004. NJTA and NJDEP look to ensure that the proposed project does not result in additional flooding impacts, and that it complies fully with recently enacted NJDEP stormwater management rules.

- **Water Quality.** Impacts to the waterways in the region from bridge and roadway construction, vehicular traffic, and application of deicing material could include effects of sediment and particulate matter, petroleum hydrocarbons, metals, solids and floatables, nutrients, pathogens, pesticides, and road salt. The estimated pollutant loads from proposed Route 92 would be reduced by use of Best Management Practices (BMPs), such as extended detention basins, manufactured treatment devices, and bioretention, to control water quality impacts. The 2004 Stream Encroachment Permit Application states that proposed Route 92 would comply with the New Jersey requirement that 80% of suspended solids be removed from highway runoff. Other pollutants in the runoff would also be reduced by the proposed stormwater management controls.

  As most of the soils in the Project Study Area are hydrologic group B, C or D, representing moderate, slow and very slow rates of water transmission, infiltration of stormwater runoff generated by proposed Route 92 or its alternatives should not pose an adverse threat to groundwater quality. Pollutant levels would be reduced by the proposed BMPs, and, after discharge, would be taken up by plants, adsorbed by sediments and soil, or broken down by microorganisms in the soil before reaching the groundwater table.

  The creation of additional impervious surfaces along US Route 1 would result in increased stormwater runoff rates compared to current conditions. If uncontrolled, the additional stormwater from US Route 1 could carry significant amounts of vehicle-related contaminants from the roadway into surface and groundwater resources. The current stormwater system in place along US Route 1 would have to be updated to convey and treat the additional stormwater runoff created by

expansion of this roadway. Various state, county and regional agencies have stormwater management regulations with which this construction would have to comply.

- **Wetlands.** As discussed in Section 4.2.3.4, 11.58 acres of wetlands and 0.45 acres of open water would be permanently filled during construction of proposed Route 92, and an additional 1.16 acres of wetlands would be permanently affected by shading from elevated sections of the roadway. To mitigate for the impact, NJTA proposes to create approximately 56 acres of wetland extending north and south from the proposed Route 92 alignment east of Haypress Road (see Section 5.3.4). The constructed wetland would be hydrologically connected to the wetland complex bordering Devil's Brook, the same wetland that would experience most of the 11.58 acres of wetland filling associated with proposed Route 92. The replacement wetland would be designed as a wetland complex composed of 12.24 acres of emergent marsh and wet meadow, 8.2 acres of scrub-shrub wetland, and 36.7 acres of forested wetland. The mitigation plan also includes creation of 0.85 acres of open water. An additional 202 acres, mostly forested wetland with some forested upland in the vicinity of Friendship Road and Miller Road, would also be preserved by NJTA as part of project mitigation.

  Widening US Route 1 by two lanes (one northbound and one southbound lane) would impact approximately 4.0 acres of palustrine forested wetlands. Construction easements associated with temporary disturbance would increase this estimate. An additional 3.7 acres of wetlands would be lost as a result of roadway improvements needed to grade-separate the five targeted intersections for the US Route 1 Widening and Signal Removal alternative. Appropriate wetland mitigation would be required.

- **Wildlife.** Implementation of the proposed Route 92 project would not significantly reduce the usable habitat within the proposed Route 92 Corridor. Some interior forest habitat would be lost; however, wildlife ability to travel and the connection of the forest to the north with the forest, lake and grassland in the south would continue to exist. Major tracts of forest north and south of proposed Route 92 would remain unaffected by the project. The post-development grassland habitat should continue to provide suitable habitat for a variety of bird species.

  US Route 1 widening would result in the loss of vegetation and associated wildlife habitat along the new roadway right-of-way. Assuming the US Route 1 widening requires an additional 8 to 10 feet of roadway to accommodate the proposed third north- and southbound lanes, approximately two acres of vegetated habitat would be taken for roadway construction. Additional vegetation would be disturbed during construction, as staging areas would be required along the approximately 7 miles of affected roadway. Although revegetation is usually required at the end of a construction period, it takes several decades to recreate forest habitat that might be lost during construction. An additional 8.5 acres of vegetation and associated habitat

would be lost as a result of roadway improvements needed to reconstruct the five targeted intersections for the US Route 1 Widening and Signal Removal alternative.

- **Threatened and Endangered Species.** USFWS lists habitat for federally listed bog turtle in the vicinity of the Proposed Route 92 Corridor (along Lawrence Brook), as well as state listed Cooper's hawk, savannah sparrow, and wood turtle. NJDEP also notes habitat for several other state listed species. Field surveys determined that suitable habitat for bog and wood turtles is not present within the proposed Route 92 right-of-way along Devil's Brook. Since Lawrence Brook drains to the north and Devil's Brook drains to the south, construction of Proposed Route 92 would not affect any listed bog turtle habitat located along Lawrence Brook. Several field surveys were previously conducted to confirm the presence or absence of individual threatened or rare plant species within the proposed right-of-way; only southern arrowhead was discovered within the right-of-way. Surveys were also conducted for Species of Concern (SOC) as identified by the New Jersey Division of Fish, Game and Wildlife (NJFGW). Although some of the SOC are not present within the project area due to lack of suitable habitat, some SOC might utilize habitat within the project area.

  No threatened or endangered species habitat would be expected to be affected by the US Route 1 Widening alternatives, since the vegetated area affected would consist of relatively narrow bands on both sides of developed US Route 1. Additional studies would be required to determine if these species inhabit this area, but the long history of US Route 1 as a major travel route and the habitat fragmentation caused by existing development indicate a low potential for suitable habitat, especially at the roadway fringe.

- **Farmland.** The proposed Route 92 roadway and associated interchanges would displace approximately 210 acres of active agricultural land. In addition, the proposed roadway would interfere with access to an additional 78 acres of agricultural land. None of the agricultural land that would be displaced or made inaccessible is in an agricultural development area (ADA), and none of the land is subject to preservation easement under the New Jersey Farmland Preservation Program.

  Because the widening of US Route 1 from four lanes to six would take place within the existing right-of-way, no significant impacts to farmland along US Route 1 would occur. However, it is likely that portions of three of the five interchanges would have to be constructed on land assessed as farmland for the Route 1 Widening and Signal Removal Alternative. Construction of a new interchange at Beekman Road and Northumberland Way could require acquisition of several acres of farmland east of US Route 1 and south of Northumberland Way. Construction of a new interchange at New Road could require acquisition of two narrow lots apparently used to access a large area of agricultural land east of US Route 1 and

New Road. It is likely that a new interchange at Route 522 would be built primarily in farmland-assessed woodland south of Route 522 on both sides of US Route 1.

- **Historic Resources.** Neither of the historic structures previously judged to be affected by proposed Route 92 (the Van Pelt-Clark House and the Dey-Bayles House) still exists. A cultural resources assessment conducted by Richard Grubb and Associates in 2002 concluded that there is a low probability that proposed Route 92 would affect archaeological or historic properties.

  Most of US Route 1 between Trenton and New Brunswick, known historically as the Trenton and New Brunswick Straight Line Turnpike, is potentially eligible for listing in the National Register of Historic Places. The interchange between US Route 1 and proposed Route 92 would fall along this stretch of US Route 1. Construction of the interchange would not change the historic alignment of the primary roadway of US Route 1, but would alter the character of the roadway at the new interchange.

  A cultural resources assessment identified five small areas near the US Route 1 interchanges that have a moderate to high probability for the presence of prehistoric and historic archaeological resources. Further background research, site assessment and subsurface testing to evaluate the potential impacts of interchange construction on prehistoric and historic archaeological resources would be required to assess the impacts of the US Route 1 Widening and Signal Removal alternative. No structures exist in the vicinity that appear to be eligible for listing in the National Register of Historic Places. It is therefore unlikely that construction of the interchanges would affect historic architectural resources.

- **Air Quality.** The air quality impact analysis indicates that air quality would improve with or without proposed Route 92, primarily in response to more stringent federal emissions standards. With Route 92, regional vehicular emissions of carbon monoxide (CO), nitrogen oxide (NOx) and volatile organic compounds (VOCs) would be reduced by 35 to 88 percent compared to existing conditions. CO and VOC reductions would be slightly smaller without Route 92. With Route 92, CO ambient concentrations at the worst congested intersections in the study area would also be further reduced.

- **Transportation.** The construction of proposed Route 92 is expected to reduce the amount of peak-hour through traffic on the local and secondary east-west roads by 18 percent in 2028, as compared with the No Action alternative. Through traffic may decrease by more than 60 percent on several of these roads. In addition to reducing peak-hour traffic levels on the existing east-west roads in the Traffic Study Area, modeling indicates that construction of proposed Route 92 would generally reduce peak-hour traffic volumes along the most constricted portion of US Route 1 in South Brunswick and North Brunswick.

  The model also indicates that the construction of Route 92 would result in a 17 percent reduction in peak-hour truck volume on the local and secondary east-west

roads in the Traffic Study Area, and along NJ Route 27 in Kingston. Peak-hour travel times between representative points are projected to decrease by an average of 10 percent as a result of the construction of proposed Route 92. Peak direction travel times between US Route 1 in Plainsboro and New Jersey Turnpike Interchange 8A are expected to improve by about 30 percent.

The US Route 1 Widening and Signal Removal alternative would be expected to reduce the amount of through traffic on the local and secondary east-west roads by 10 percent, as compared with the No Action alternative. Modest reductions in peak-hour traffic volumes on the local and secondary east-west roads in the Traffic Study Area, including in the sensitive areas listed in Section 1 (Plainsboro Center, South Brunswick Center, and Princeton Junction Center), would be expected. More significant reductions in peak-hour traffic volumes would be expected along NJ Route 27 in Kingston.

While the traffic-carrying capacity of US Route 1 would substantially increase, this increase would attract to US Route 1 a large number of vehicles that would otherwise use alternate routes to avoid congestion on US Route 1. As a result, US Route 1 would be expected to remain heavily congested in the peak hour in the peak direction. Most of the new traffic attracted to US Route 1 would be rerouted away from US Route 130 and the New Jersey Turnpike, which would likely be left with spare capacity.

If US Route 1 were widened, peak-hour truck volumes on the local and secondary east-west roads would be expected to drop by 8 percent as compared with the No Action scenario. The severe peak-hour congestion that is expected to occur in the Traffic Study Area due to the large amount of development expected over the next 25 years is not expected to be relieved. Most of the trips that would be diverted to US Route 1 would come from other north-south routes that are relatively uncongested. Peak hour travel times between representative points are projected to decrease by an average of 5 to 6 percent as a result of this alternative. Peak direction travel times between US Route 1 in Plainsboro and New Jersey Turnpike Interchange 8A would be expected to improve by 10-15 percent. The model demonstrates that US Route 1 Widening and Signal Removal would partially meet NJTA's objectives for this project.

- **Noise.** With the Route 92 alternative, eight receivers (defined in Section 4.2.8) would experience noise levels exceeding the applicable noise abatement criteria (NAC). The comparison of 2028 Route 92 Alternative projected traffic noise levels with existing and 2028 No Action noise levels indicates that projected noise levels do not exceed the existing noise levels by 10 dBA or greater. Proposed Route 92 would increase the Existing and 2028 No Action traffic noise levels by up to 9 and 7 dBA, respectively. Under the No Action alternative, two residential receivers and one institutional receiver would be impacted by noise exceeding the applicable NAC in 2028. Under the Route 92 alternative, five residential receivers would be impacted in

2028. Under existing (2002) conditions, the applicable NAC is exceeded at one residential receiver and one institutional receiver.

Noise modeling results for the five US Route 1 intersections redesigned as contemplated in this EIS indicate that for two interchanges a 67-dBA noise contour would extend approximately 300 feet from the center of the interchange on either side of US Route 1. For the other redesigned interchanges the 67-dBA-noise contour would extend approximately 200 feet from the center of each interchange on either side of US Route 1. One residential receiver would be impacted for three of these interchanges and none would be impacted at the other two interchanges. Since these are not new interchanges, but are only redesigned, the number of potential receivers that would be impacted compared to not redesigning these interchanges should be similar.

Nomograph modeling results indicated that during peak AM traffic conditions the No Action US Route 1 alternative traffic volumes and speeds would generate noise level of 66 dBA or greater approximately 150 feet from the edge of US Route 1. There are 16 residential receivers within or close to 150 feet from the edge of US Route 1. Therefore, these residences would most likely experience noise levels that would approach or exceed the 67 dBA NAC. Adding a lane of traffic to both sides of US Route 1 would increase noise levels at 150 feet from the edge of US Route 1 by approximately 2 dBA. This increase in noise level is considered barely perceptible. Both US Route 1 Improvement alternatives would generate a 67-dBA-noise level approximately 200 feet away.

- **Socioeconomics.** Construction of proposed Route 92 could potentially complicate access to a small number of business establishments, primarily near the eastern and western ends of the alignment. These include approximately seven businesses on NJ Route 32 east of US Route 130. The affected businesses are not the types that draw their customers from among passing motorists. Therefore, the economic impact is expected to be relatively small.

  Proposed Route 92 is expected to draw traffic off local roads, and would be patrolled by the New Jersey State Police. Route 92 would not generally increase the burden on local police departments, and could reduce that burden by reducing traffic and traffic-related incidents on roads for which the local police are responsible. Local fire companies and rescue squads would provide services on proposed Route 92. Although proposed Route 92 would increase the total miles of roadway to be covered by local fire companies and rescue squads, this increase would be offset by a reduction in traffic on local roads. In addition, by improving traffic movement on local roads, Route 92 would reduce the time required to respond to emergencies on local roads.

  Implementation of the US Route 1 Widening and Signal Removal Alternative would increase the capacity of the local and regional road networks. This would increase

the population and the level of economic activity that could be accommodated in the local area and the region. A widened and signal-free US Route 1 would draw traffic from local roads. This would discourage growth of traffic-related business activity on local roads to some degree, and encourage growth on US Route 1. Because US Route 1 would not be a limited access highway, the tendency for growth to concentrate at the new interchanges would be present, but would be relatively weak.

- **Land Use.** Acquisition of the right-of-way for proposed Route 92 and associated interchanges would displace four residential properties, all in South Brunswick Township. Acquisition of the right-of-way for proposed Route 92 and associated interchanges would displace one business directly in the path of the proposed ramp from southbound US Route 1 to Ridge Road. A building owned by NJTA would also be displaced. Two vacant commercial/industrial buildings would be displaced because they are at the point where the ramp connecting proposed eastbound Route 92 would merge with northbound US Route 1. Realignment of Research Way at the proposed Perrine Road-Route 92 interchange would displace three ball fields on a 20-acre recreational facility owned by Princeton University. The eastbound service road for proposed Route 92 would pass through the northern end of four developed commercial properties on the south side of NJ Route 32 between Cranbury-South River Road and Herrod Boulevard in South Brunswick. Alternate access would have to be provided for two of the properties.

  US Route 1 is a long-established major highway exhibiting linear (principally commercial) development. Widening with signal removal would reinforce its character as a regional business-oriented highway.

  The widening of US Route 1 to six lanes would occur within the existing right-of-way. Therefore, the US Route 1 Widening Alternative would not have significant impacts on existing land use. The potential land use impacts of the five new interchanges included in the US Route 1 Widening and Signal Removal Alternative include displacement of approximately 5 residences, impacts (including displacement) to 6 businesses, and the loss of up to 18 acres of agricultural land.

ES.2 Relationship to Environmental Protection Statutes and Other Environmental Requirements

Proposed Route 92 requires a permit from USACE allowing filling of wetlands under Section 404 of the Clean Water Act (33 USC 1344). This permit is commonly called a "Section 404 permit." NJTA submitted an application for a Section 404 permit for proposed Route 92 on January 6, 1999. USACE conducted a public hearing on the application on March 29, 1999. This EIS will assist USACE in determining whether to issue a Section 404 permit for the project. The EIS process is following USACE procedures for implementing NEPA in 33 CFR parts 230 and 325. A public hearing on the draft EIS was held on May 20, 2004.

NJTA submitted an application for a freshwater wetlands individual permit (FWIP) for proposed Route 92 to NJDEP in September 1996. On March 29, 1999, NJDEP issued the FWIP and Water Quality Certificate for proposed Route 92. The FWIP and Water Quality Certificate expired March 29, 2004, and NJTA reapplied for them in September 2005.

Because implementation of proposed Route 92 would involve construction in flood plains, the project also requires a stream encroachment permit from NJDEP. NJTA submitted an application for a stream encroachment permit for proposed Route 92 on November 21, 1996. Six revisions and supplements to the application were submitted, the last of which was submitted on April 21, 1999, but NJDEP did not act on the application. NJTA submitted a new stream encroachment application on December 27, 2004.

The Freehold Soil Conservation District must certify the soil erosion and sediment control plan for proposed Route 92. The plan was submitted for certification on July 30, 1997 and was certified on April 6, 1998. The certification expired on October 6, 2001. The soil erosion and sediment control plan will have to be resubmitted for certification.

Section 1
Project Purpose and Need

1.1 Background

When the New Jersey Turnpike was constructed 50 years ago, its purpose was to provide faster, more efficient travel for north-south trips, such as those between New York City/points north and Philadelphia/points south. The New Jersey Turnpike became the route of choice for north-south trips, replacing the use of US Route 1 and US Route 130, which were designed and built to older standards. A location map is provided in Figure 1-1.

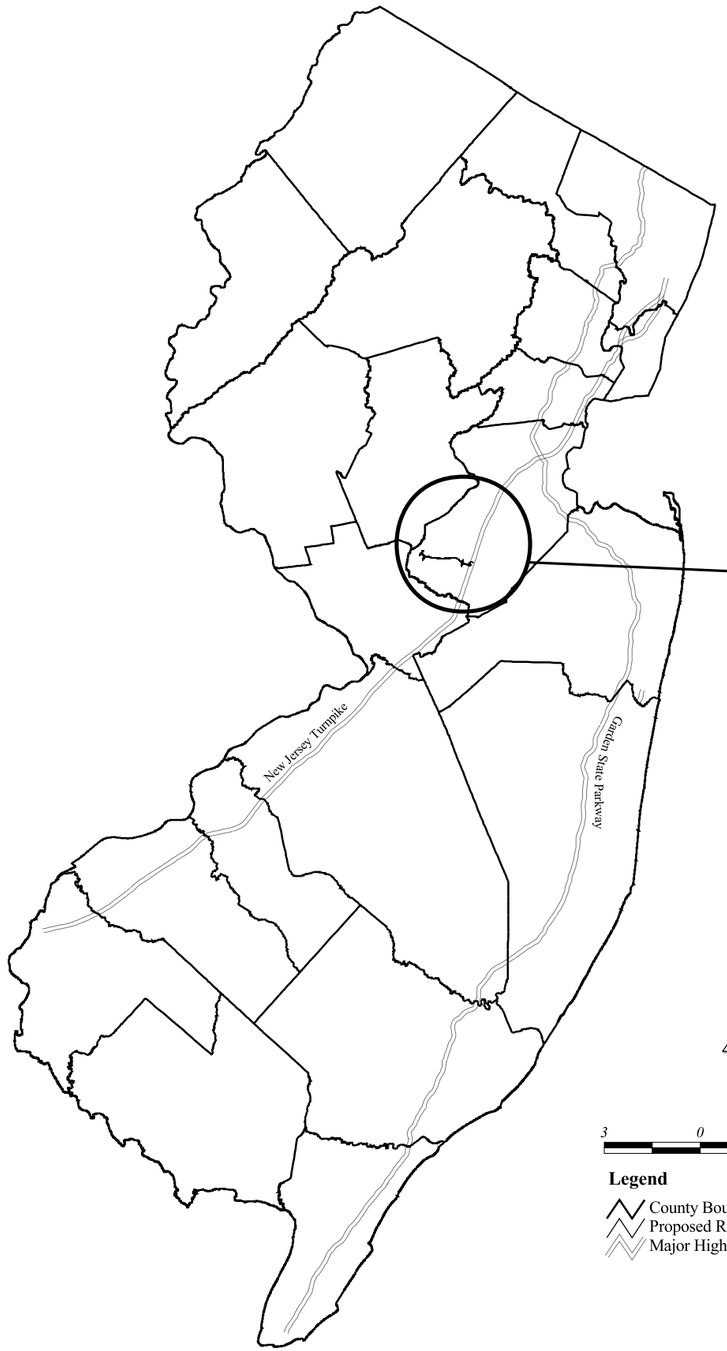
While the New Jersey Turnpike continues to fulfill its role of serving mid-Atlantic transportation needs, US Route 1 remains a favored route for trips between northern Middlesex County (where many of the state's largest highways converge), the Princeton area (an area of significant economic and housing growth in NJ), and the Trenton NJ Capital City area. For a distance of 22 miles, from the northeast Trenton area to the New Brunswick area, US Route 1 and the New Jersey Turnpike exist as nearly parallel north-south highways, about 6 miles apart (see Figure 1-2).

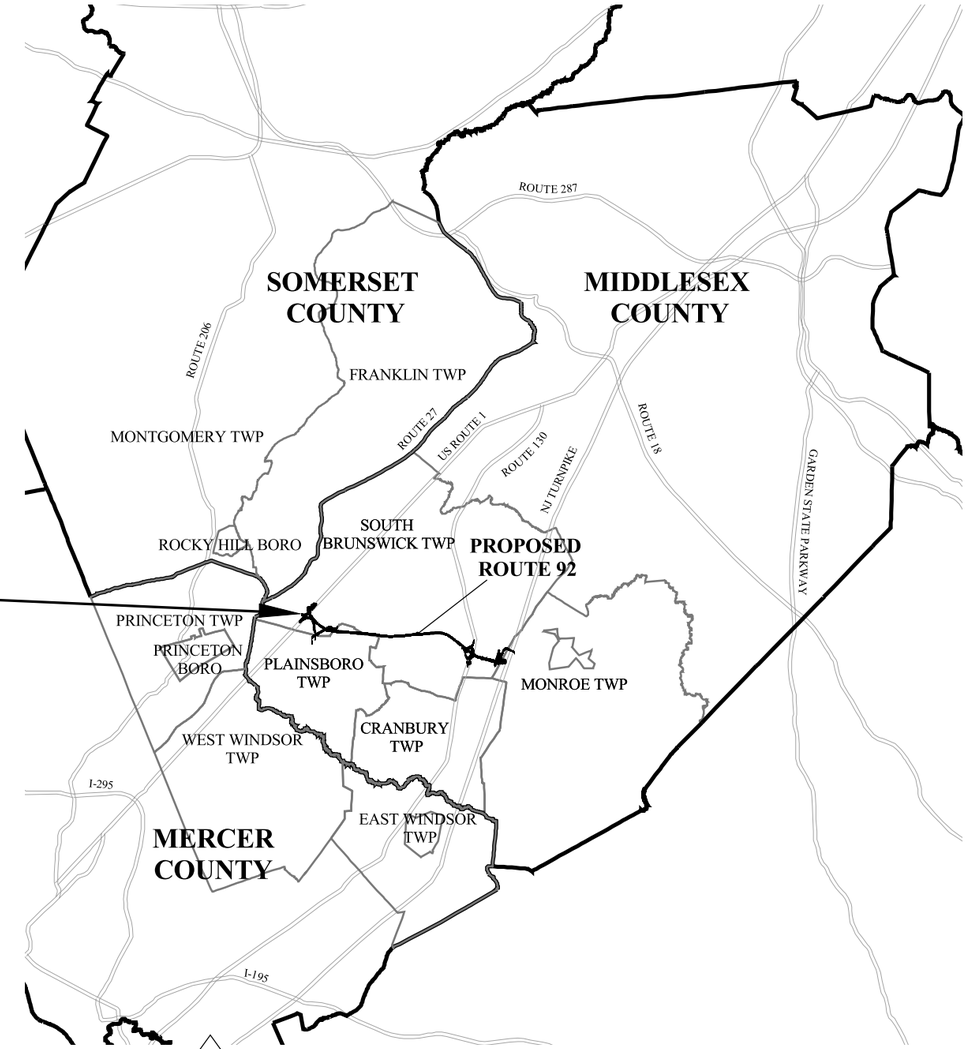
In the New Brunswick area, US Route 1 connects to the New Jersey Turnpike, via a short (one mile) segment of Route 18, at Turnpike Interchange 9. In the Trenton area US Route 1 is connected to the New Jersey Turnpike via an eight mile section of Interstate 195 and 295, at Turnpike Interchange 7A. Major traffic congestion occurs on US Route 1 between the Trenton area and the New Brunswick area, attributable to the strong economic and population growth trends and the suburban character of the land development that has occurred. In spite of its proximity, the traffic congestion on US Route 1 cannot effectively be relieved by available capacity on the New Jersey Turnpike, in part because no arterial highway connection exists that links US Route 1 to the New Jersey Turnpike between Interchange 9 and Interchange 7A. Alternative routes for motorists between New Brunswick and Trenton are limited, and increasingly involve use of local roadways.

The project study area municipalities are located in southwestern Middlesex County and northeastern Mercer County, and are shown in Figure 1-3. The project study area is generally bounded on the south by Trenton and on the north by New Brunswick. The map in Figure 1-4 illustrates the existing land use patterns, and the functional classification of roadways that serve the communities in the study area (Plainsboro, South Brunswick, Cranbury, West Windsor, and East Windsor Townships).

Since 1980, strong population and employment growth has occurred in the communities along US Route 1 between New Brunswick and Trenton. In particular, the population of Plainsboro Township (for location, see Figure 1-3) increased by 261 percent in the years 1980-2000 — more than any other municipality in Middlesex County (comparatively, population for Middlesex County as a whole increased 26 percent over the same period).

Projection: Universal Transverse Mercator
Coordinate System: State Plane
Datum: NAD83





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Legend

- County Boundary
- Proposed Route 92
- Major Highway

N

25000 0 25000 Feet

Legend

- Municipal Boundary
- County Boundary
- Proposed Route 92
- Major Highway
- Municipal Boundary

Figure 1-1

Location Map

US Army Corps of Engineers
Proposed Route 92
Environmental Impact Statement

CDM

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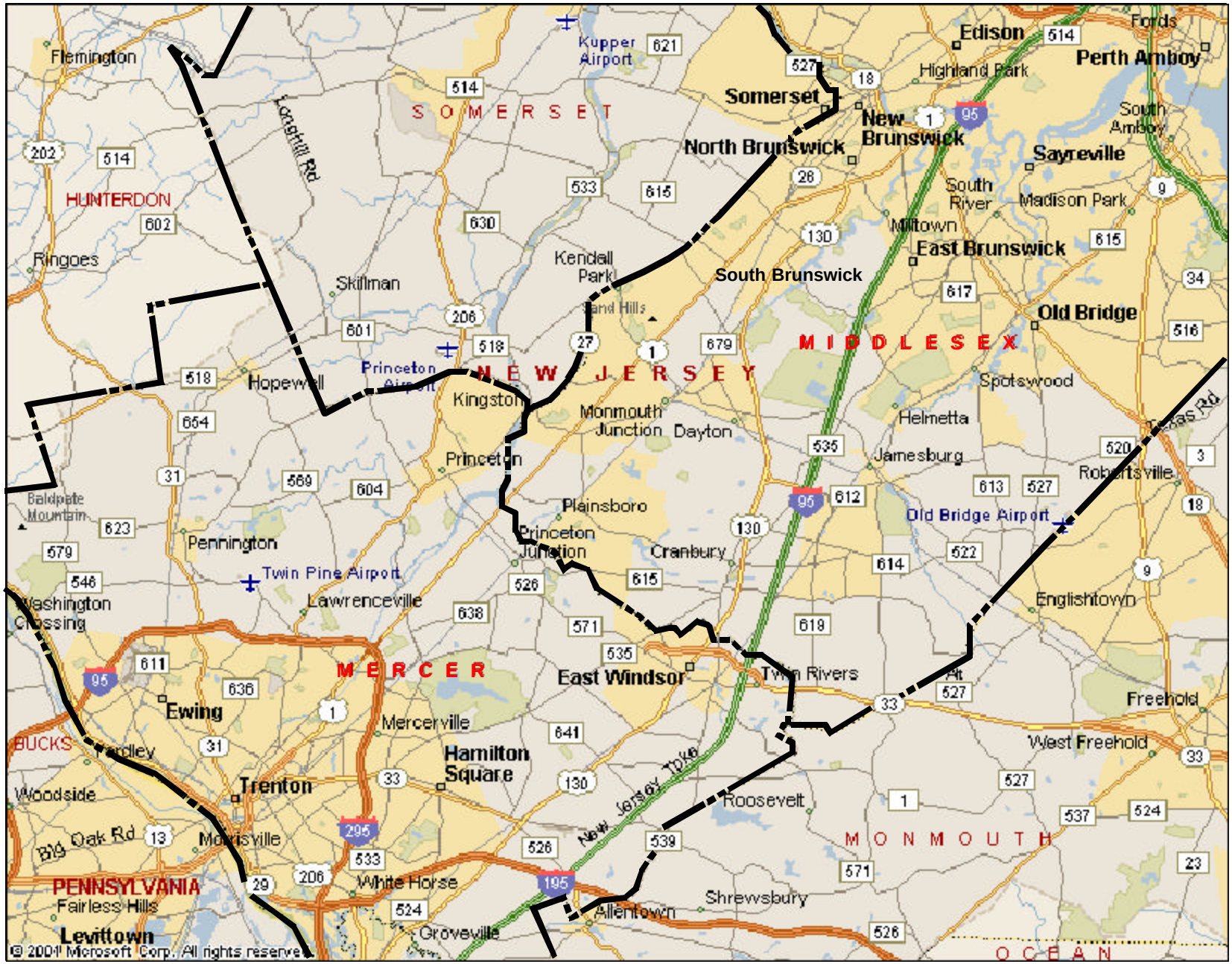


Legend:

County Boundary

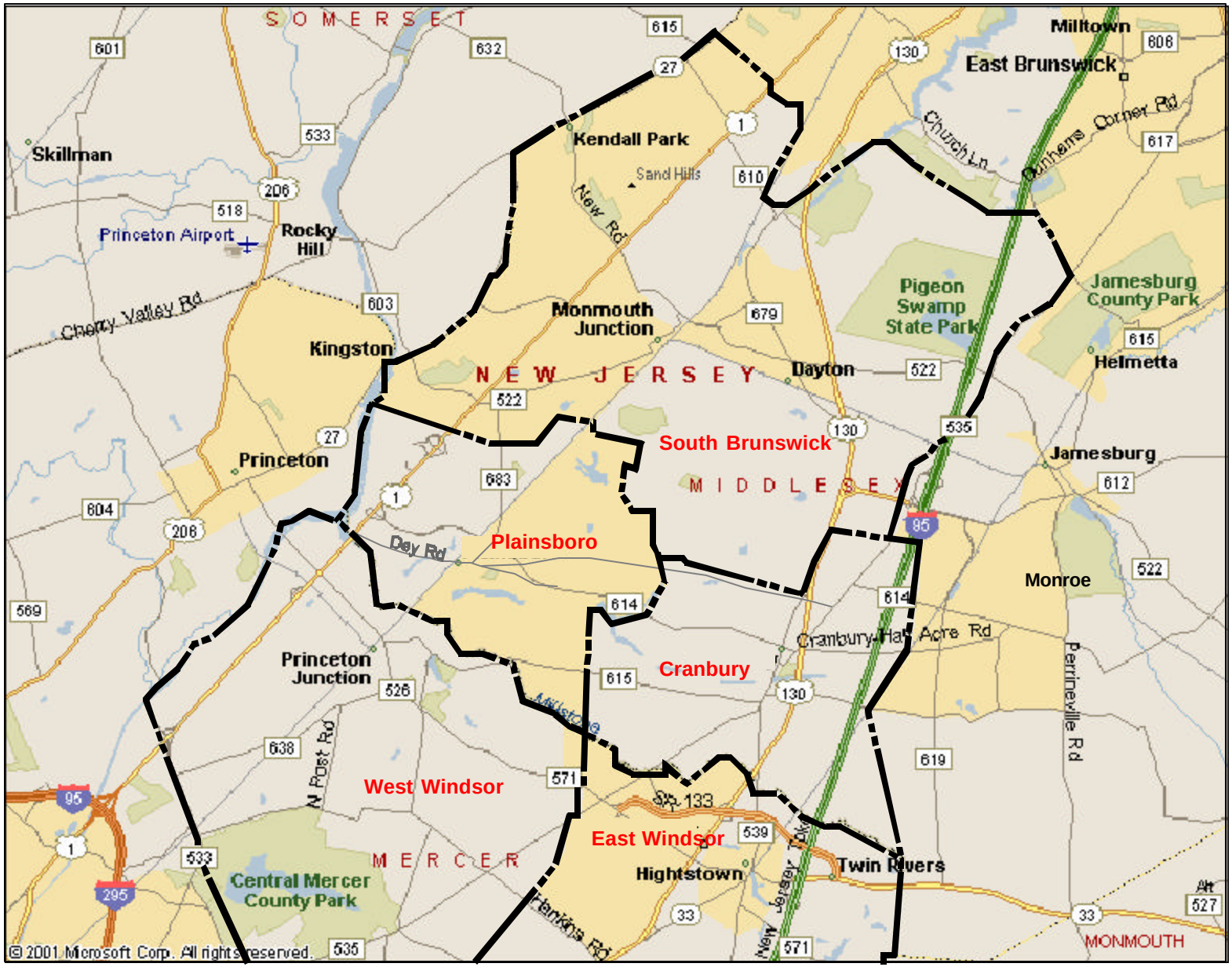
0 mi 4 mi 8 mi

Approximate Scale

Figure1-2

Urbitran

Central Jersey Highways

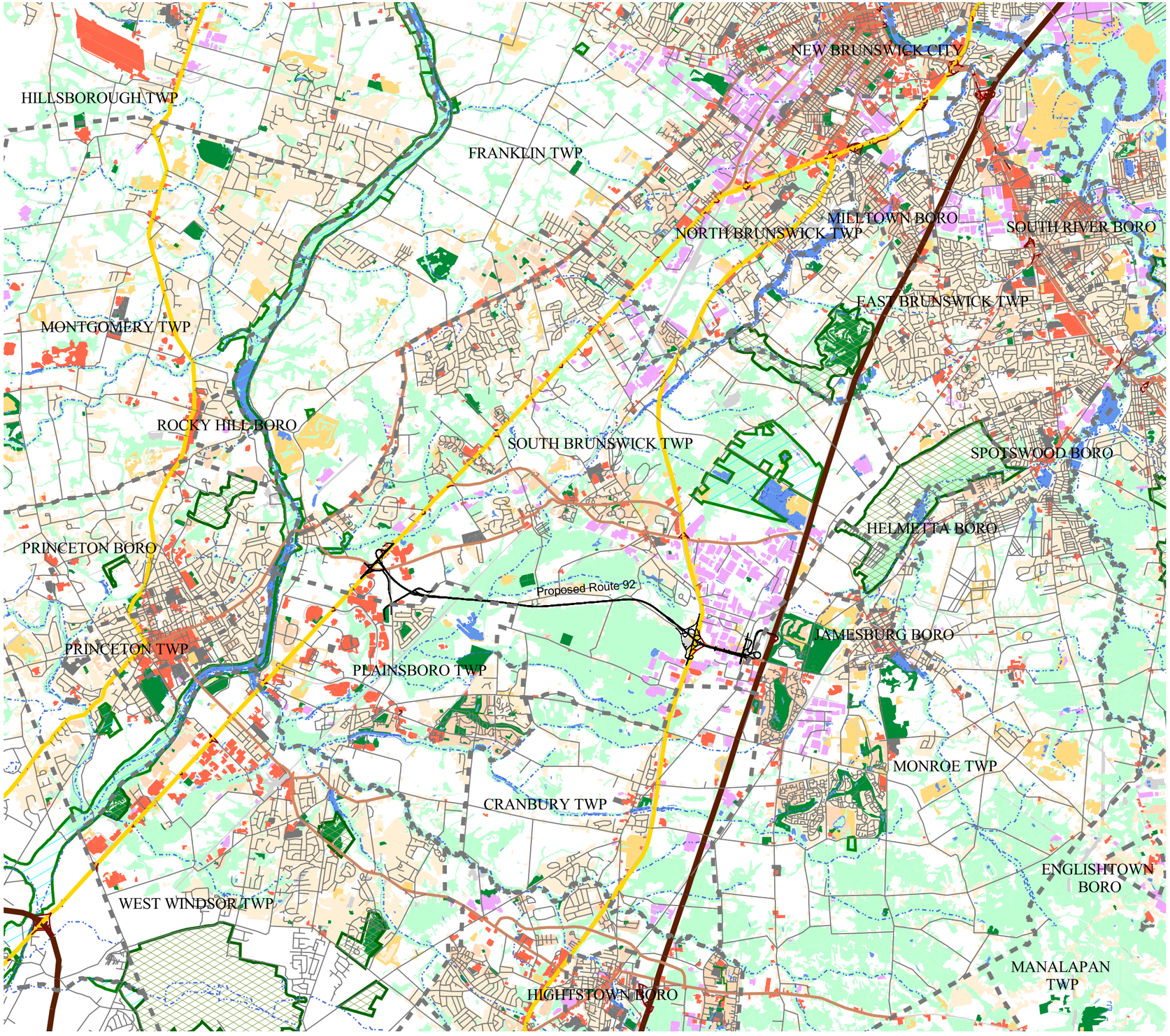


Legend:

Town Boundary

0 mi 2 mi 4 mi
Approximate Scale

Figure 1-3
Southwestern Middlesex County/Northeastern Mercer County



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1000 0 1000 2000 Meters

9000 0 9000 Feet

2 0 2 Miles

Projection: Universal Transverse Mercator
Coordinate System: State Plane
Datum: NAD83

Legend

Municipal Boundary
Proposed Route
Streams

Functional Classification of Roads

Primary road with limited access
US Highways
Secondary and connecting roads/State Highways
Local Roads
Access Ramps/Limited Access Interchange
Walkways/Trails

Parks (State Plan)

COUNTY PARK
STATE PARK

NJDEP 1995 Land Use/Land Cover

SCHOOLS/ATHLETIC FIELDS
BARREN LAND
COMMERCIAL/SERVICES
INDUSTRIAL/COMMERCIAL COMPLEXES
PARKS/RECREATIONAL LAND
RESIDENTIAL, HIGH DENSITY, MULTIPLE DWELLING
RESIDENTIAL, RURAL, SINGLE UNIT
TRANSPORTATION/COMMUNICATIONS/UTILITIES
WATER
WETLANDS

Figure 1-4

Regional Road Network and Land Use Patterns

US Army Corps of Engineers
Proposed Route 92
Environmental Impact Statement

CDM

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The population of West Windsor Township (in the area of County Route 571) grew 156 percent from 1980 to 2000, as compared with 14 percent for all of Mercer County.

Continued rapid growth is projected in the central New Jersey region over the next two decades, based on the strong economy in the area, high demand for housing, the presence of developable land, good schools, and the desirable location between Princeton University and Rutgers University. Significant office and research development has occurred in the Princeton region, a function of the availability of a highly educated labor force. In addition, a national-scale warehousing and distribution center has developed around NJ Turnpike Interchange 8A. The office, commercial, and population growth along US Route 1, coupled with the extensive warehousing and business activity around NJ Turnpike Interchange 8A, has resulted in increased traffic volumes on the area's roads, which consist of US Route 1, US Route 130, and local and secondary east-west roads.

Two frequently observed effects of the increasing traffic volumes using US Route 1 and regional roadways are:

1. extensive traffic congestion occurs throughout this suburban region, and,

2. substantial and increasing volumes of "through" traffic, delivering goods and commerce between business "centers" compete for space on the roadway system with traffic having local work, shopping, and recreational destinations.

Through traffic is traffic that is unrelated to the towns and communities that these roads serve, and is defined as trips having neither the trip origin nor destination in the town (or towns) served by that particular portion of road. Through traffic is also referred to as "non-local" or "regional" traffic.

Traffic modeling conducted for this Environmental Impact Statement (EIS) indicates that by 2028, about 25 percent of the traffic on the local east-west roads will be through traffic (see Appendix C, specifically the data for the "No-Build" alternative on pages C-307 through C-317). The presence of through traffic exacerbates the heavy congestion on the road system, impeding the local traffic circulation and roadway access needed by local residents and businesses.

Construction of a new east-west arterial highway is proposed by the New Jersey Turnpike Authority (NJTA) to provide a high capacity, high speed link between the major north-south highways in central New Jersey, and between the growing business, commercial, and population centers, thus improving regional travel mobility. An arterial highway is defined by the NJ Dept. of Transportation as a highway primarily for through traffic, usually a continuous route.

The arterial highway proposed by the NJ Turnpike Authority would improve mobility by accommodating the increasing through traffic on a high-speed limited-access

highway, thereby reducing local roadway congestion by removing through traffic from local roads. It would also improve regional mobility by providing efficient access to alternative routes for north-south traffic that now uses US Route 1, and it would provide flexibility in choice of route in the event of traffic congestion or delay along any of the north-south corridors.

Between the Trenton area and the New Brunswick area (see Figure 1-2) only local and/or secondary (county) roads are available to traffic traveling between US Route 1 and the New Jersey Turnpike (connecting at Turnpike Interchanges 8A or 8). When congestion, or less frequently occurring events such as vehicular accidents or roadway maintenance occur on one of the north-south highways, travelers cannot efficiently change their route so as to utilize alternative north-south highway routes (for example, by switching their route to utilize the New Jersey Turnpike or US Route 130, instead of US Route 1, or vice versa). Because the local and secondary east-west connecting roads are increasingly congested, and are not designed to carry traffic at highway speeds, the New Jersey Turnpike cannot be effectively accessed so that it might serve as an alternate north-south travel route to US Route 1.

The capacity of the New Jersey Turnpike was expanded in central New Jersey in the 1980s, and NJTA studies show that there is currently adequate capacity on the mainline New Jersey Turnpike to accommodate regional traffic from the congested US Route 1 corridor; however, NJTA is currently planning a mainline widening to ensure that sufficient capacity continues to be available.

NJTA looks to couple improved east-west mobility with support of coordinated efforts to reshape existing and proposed development. This effort would involve the participation of the project area municipalities and state agencies, including NJTA. While NJTA does not have direct control or jurisdiction over the land development approval process, it seeks to collaborate with the NJ Department of Environmental Protection (NJDEP), the NJ Office of Smart Growth, the NJ Department of Transportation (NJDOT), the counties of Mercer and Middlesex, and local municipalities to help shape future growth into sustainable patterns.

A new east-west highway in southwestern Middlesex County has been discussed by Middlesex County Planning Board and NJDOT for decades, to address the lack of east-west highway connectivity in this area. In 1992, the New Jersey State Legislature enacted a law transferring authority over the Route 92 project from NJDOT to NJTA. The law, Chapter 474 of the Public Laws of 1991, now codified as NJSA 27:23-23.8, contained the following authorization:

"The New Jersey Turnpike Authority is authorized to acquire, construct, maintain, repair and operate a project addition and extension to the New Jersey Turnpike consisting of a high speed limited-access superhighway beginning at or near Interchange 8A of the New Jersey Turnpike and thence in a general westerly direction through Middlesex County to an interchange with U.S. Route 1 in the general vicinity of the intersection of U.S. Route 1 and

Ridge Road (County Road 522) or U.S. Route 27 as the authority, after study, deems appropriate."

Since 1992, NJTA has further developed the concept of this toll-supported east-west arterial highway through a series of engineering and environmental studies. NJTA applied to the US Army Corps of Engineers (USACE) for a federal Clean Water Act permit seeking approval of proposed wetland fill related to construction of proposed Route 92. In its review, USACE has determined that a decision upon this permit application would be a major federal action significantly affecting the quality of the human environment. This determination under the National Environmental Policy Act called for USACE to prepare an EIS. An EIS provides a broad range of information and analysis designed to assist the permitting agency in reaching an informed decision on the permit application.

1.2 Transportation Needs in the Project Area

1.2.1 Existing Roadway Network

The traffic study area that this EIS analyzes consists of the towns of South Brunswick, Plainsboro, and Cranbury in southwestern Middlesex County; and the townships of West Windsor and East Windsor (including Hightstown) in northeastern Mercer County (Figure 1-3). These towns cover an area that is roughly bounded by the New Jersey Turnpike to the east, NJ Route 27 and the Delaware and Raritan Canal to the west, County Route 610 (Deans Lane) to the north, and County Route 571 on the south.

The main highways passing through this area are all oriented in a north-south direction: the New Jersey Turnpike (with Interchanges 8 and 8A along the area's eastern edge) and US Route 130 on the eastern side of the area, and US Route 1 and NJ Route 27 on the area's western side. NJ Route 32 provides a one mile connecting highway between US Route 130 and the Turnpike at Interchange 8A.

A series of east-west local and secondary roads connect to the four north-south highways in the Traffic Study Area, providing access to the towns and serving local circulation needs. Two lane east-west roads include County Route 610 (Deans Lane), Major Road, New Road, County Route 522, Ridge Road, Friendship Road, Broadway Road, Dey Road, Scudders Mill Road, Plainsboro Road, Cranbury Neck Road, and County Route 571. Four lane east-west roads include County Route 522 between NJ Route 27 and US Route 130, Scudders Mill Road between US Route 1 and Dey Road, and County Route 571 between Alexander Road and Hightstown. Some of these local and secondary roads, either individually (such as County Routes 522 and 571) or in combination (such as Dey Road and Scudders Mill Road) provide continuous routes between the eastern and western sides of the study area.

1.2.2 Roadway Network Performance

Residential, commercial, and industrial land use in southwestern Middlesex County and northeastern Mercer County is generally concentrated along the major north-south

highways and interchanges in the area, namely US Route 1, US Route 130, NJ Route 27, and the New Jersey Turnpike (at Interchange 8A). The major peak hour traffic flows in the traffic study area are the north-south flows along the New Jersey Turnpike, US Route 1, and US Route 130 (see figures 3-15 and 3-16, in Section 3).

Within the 25-mile corridor along US Route 1 — between Route 18 in New Brunswick and Interstate 195/Route 29 in southern Mercer County — motorists wishing to travel from one existing north-south corridor to another must use local and county east-west roads passing through suburban communities in Plainsboro, South Brunswick, Cranbury, West Windsor, and East Windsor Townships, or travel along US Route 1 to link to the connecting north-south highways. The principal local and county east-west roads used include County Route 571, County Route 615 (Cranbury Neck Road), County Route 614 (Plainsboro Road), Scudders Mill Road/Dey Road, and County Route 522/Ridge Road. North-south travelers frequently use these local and secondary east-west roads in an effort to bypass congestion on US Route 1. Traffic information for these roads shows them to be burdened by increasing local and regional traffic.

Intensive development of new homes and businesses in southwestern Middlesex County and northeastern Mercer County has resulted in steadily worsening congestion. Traffic modeling conducted for this EIS indicates that congestion will significantly worsen in the future. County and State planners have forecast that historically strong development trends will continue, but planned County and NJDOT increases in roadway capacity are limited. The high peak-hour north-south volumes cause some delays at signals, particularly along US Route 1. However, severe congestion in the traffic study area also occurs on the two-lane east-west roads, such as Ridge Road, Dey Road, Cranbury Neck Road, and Plainsboro Road. Regional and local mobility continues to deteriorate as travel demand increases.

Traffic modeling conducted for this EIS shows that large volumes of through traffic use local and county roads, which impedes the local circulation and access that the local roads were built to provide. In order to provide an orderly land use and circulation plan, it is desirable to serve longer-distance, higher-speed traffic on facilities that are separated from community features such as residential areas, neighborhood shops and services, local retail establishments, parks, and schools. By diverting through traffic from the local roads serving neighborhood land uses to the arterial highway system, the character of a community can be enhanced and the quality of life improved, while local congestion is reduced.

When much of the road network exceeds capacity, even minor volumes of additional traffic, or any reduction in capacity (resulting from road maintenance or accident), may trigger the uncontrolled spread of capacity losses throughout the entire road network. As the road network becomes increasingly congested, it ultimately becomes unstable, and network analysis must be performed at the regional level to understand how the many instances of capacity deficiency might be interrelated. A capacity deficiency on

one road can spread and accumulate on roads behind the initial instance of capacity deficiency, thereby camouflaging identification of the initial deficiency.

As a road network approaches capacity, regional monitoring and analysis is essential to identify and sort out the issues that are truly causing congestion. The traffic model developed for this EIS coupled a regional model (and area of analysis) to a more detailed "Central (New) Jersey" area model (see Section 4.2.7.1 and Appendix C). The Central Jersey model contains a detailed representation of the road system -- from NJ Route 18 in the north to Mercer Co. Route 571 in the south, and from the New Jersey Turnpike and Middlesex Co. Route 535 on the east to NJ Route 27 on the west. The detailed local traffic model is "nested" within the 22-county regional traffic model developed for NJDOT's Penns Neck Area EIS, prepared between 2001 and 2004. The regional model establishes travel characteristics specific to the study region relating to the orientation, mode choice, and route usage of relatively long trips, and also serves as the regional framework within which more detailed analysis of road system usage was conducted for the Central Jersey traffic study area.

By the year 2028, the traffic model projects that morning westbound peak hour travel demand will exceed the total capacity of the east-west roadways by 25 percent, assuming no major changes occur in road capacity. The peak-hour network model indicates that the capacity of Plainsboro Road will be exceeded by 120 percent, and that the capacity of Cranbury Neck Road will be exceeded by 84 percent. When travel demand exceeds road capacity the result is lengthy stretches of bumper-to-bumper traffic, extensive delays, and blocked driveways and intersections. As an example, the typical morning peak hour travel time from the intersection of US Route 130 and Dey Road to the intersection of US Route 1 and Washington Road (currently about 20 minutes) is projected to more than double. Area-wide, morning peak hour travel times are expected to increase by about 50 percent on average, as illustrated in Table 1-1. Almost all key intersections in the area will be unable to process peak hour demand in the future without significant delays, as shown in Table 1-2.

Level of service (LOS) is a qualitative measure of the operating conditions within a traffic stream and the perception of those conditions by motorists. LOS is based on the average stopped delay per vehicle for various movements within an intersection. Factors describing the LOS include speed, travel time, maneuverability, and safety. LOS is described by letters ranging from "A" to "F". LOS designation "A" represents the optimum condition at an intersection, which is characterized by freeflow vehicle movement where drivers are unrestricted in their ability to maneuver. LOS designation "F" represents the worst case, where the capacity of the road/intersection has reached its limit or been exceeded, traffic flow is interrupted, drivers are severely restricted in their ability to maneuver, and significant traffic congestion and delay exists.

Because signalized intersections manage the vehicle flow between two (or more) intersecting roadways, and because they require many vehicles to stop to safely share

the intersection, they serve as excellent indicators of the extent of congestion on the road system, and the ability of the road system to convey traffic.

Table 1-1
Base Year and Future No Action Travel Times

		Estimated 2028 Peak Hour Travel Times (minutes)				Change (2028 No Action vs. 2001)		Percent Change (2028 No Action vs. 2001)	
		2001		2028 No Action					
From	To	AM	PM	AM	PM	AM	PM	AM	PM
Princeton Junction	Princeton University	12.3	9.4	22.9	15.1	10.5	5.7	86%	61%
Princeton Junction	Plainsboro Center	18.2	9.8	30.3	12.4	12.1	2.6	66%	26%
Princeton Junction	South Brunswick Ctr.	23.8	26.8	41.8	38.2	18.0	11.4	76%	43%
Princeton Junction	Interchange 8A	22.3	20.9	35.7	30.4	13.4	9.5	60%	45%
Princeton Junction	Hightstown	19.1	21.1	21.4	29.0	2.3	8.0	12%	38%
Princeton University	Princeton Junction	8.5	14.8	13.1	22.4	4.6	7.6	54%	52%
Princeton University	Plainsboro Center	13.3	10.7	22.6	14.1	9.3	3.5	70%	33%
Princeton University	South Brunswick Ctr.	18.8	22.7	30.6	34.8	11.8	12.2	63%	54%
Princeton University	Interchange 8A	25.9	28.6	36.8	39.6	10.9	11.1	42%	39%
Princeton University	Hightstown	24.9	33.5	30.9	48.8	6.0	15.3	24%	46%
Plainsboro Center	Princeton Junction	10.1	15.2	15.3	25.2	5.3	10.0	52%	66%
Plainsboro Center	Princeton University	11.0	11.8	12.8	18.3	1.8	6.5	17%	55%
Plainsboro Center	South Brunswick Ctr.	16.3	23.8	21.4	36.6	5.0	12.8	31%	54%
Plainsboro Center	Interchange 8A	18.3	20.8	19.0	31.1	0.6	10.3	4%	50%
Plainsboro Center	Hightstown	21.4	27.2	25.0	44.9	3.5	17.7	16%	65%
South Brunswick Ctr.	Princeton Junction	28.5	27.0	49.7	36.3	21.2	9.3	74%	35%
South Brunswick Ctr.	Princeton University	24.4	18.9	48.5	27.3	24.2	8.4	99%	45%
South Brunswick Ctr.	Plainsboro Center	26.9	17.9	52.5	22.1	25.5	4.2	95%	23%
South Brunswick Ctr.	Interchange 8A	13.4	12.1	14.6	15.5	1.1	3.4	8%	28%
South Brunswick Ctr.	Hightstown	28.2	30.1	38.0	45.6	9.7	15.6	34%	52%
Interchange 8A	Princeton Junction	23.6	21.0	42.1	30.1	18.5	9.1	79%	43%
Interchange 8A	Princeton University	33.1	26.8	52.4	35.1	19.3	8.3	59%	31%
Interchange 8A	Plainsboro Center	32.8	18.0	47.5	20.8	14.7	2.8	45%	15%
Interchange 8A	South Brunswick Ctr.	19.5	10.8	20.2	15.4	0.6	4.5	3%	42%
Interchange 8A	Hightstown	20.3	23.4	30.4	38.0	10.1	14.6	50%	63%
Hightstown	Princeton Junction	23.6	17.9	43.9	20.2	20.4	2.3	86%	13%
Hightstown	Princeton University	33.9	24.9	64.3	32.0	30.4	7.0	90%	28%
Hightstown	Plainsboro Center	38.9	21.9	68.2	25.4	29.4	3.5	76%	16%
Hightstown	South Brunswick Ctr.	40.4	25.0	66.5	35.4	26.1	10.4	65%	42%
Hightstown	Interchange 8A	25.6	19.1	51.7	27.6	26.1	8.5	102%	44%
					Average:	13.1	8.5	54.6%	41.5%

Table 1-2
Year 2001 and Future No Action Intersection Delays

Intersection	Projected Intersection Delays (seconds per vehicle)				Percent Change (2028 No Action vs. 2001)	
	2001		2028 No Action			
	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.
US-1 @ Cozzens Lane	276	297	290	336	5%	13%
US-1 @ Major Road (Sandhill)	259	45	191	112	-26%	149%
US-1 @ New Road	88	57	172	168	95%	195%
NJ-27 @ Raymond Road	10	13	170	18	1600%	38%
NJ-27 @ CR-522	43	36	77	202	79%	461%
Scudders Mill Road @ Schalk's Crossing Road	39	26	206	154	428%	492%
Scudders Mill Road & Dey Road	364	43	697	296	91%	588%
Plainsboro Road & CR-535	23	16	67	167	191%	944%
US-130 @ Dey Road	240	99	341	333	42%	236%
Dey Road & CR-535	46	26	458	213	896%	719%
NJ-32 @ CR-535	174	129	269	234	55%	81%
US-130 @ Friendship Road	187	220	330	467	76%	112%
George's Rd & Kingston Road	17	16	38	18	124%	13%
CR-522 & Kingston Road	314	133	300	203	-4%	53%
US-1 @ CR-522	687	308	496	543	-28%	76%
US-1 @ Ridge Road	188	149	362	264	93%	77%
				Median:	85%	130%

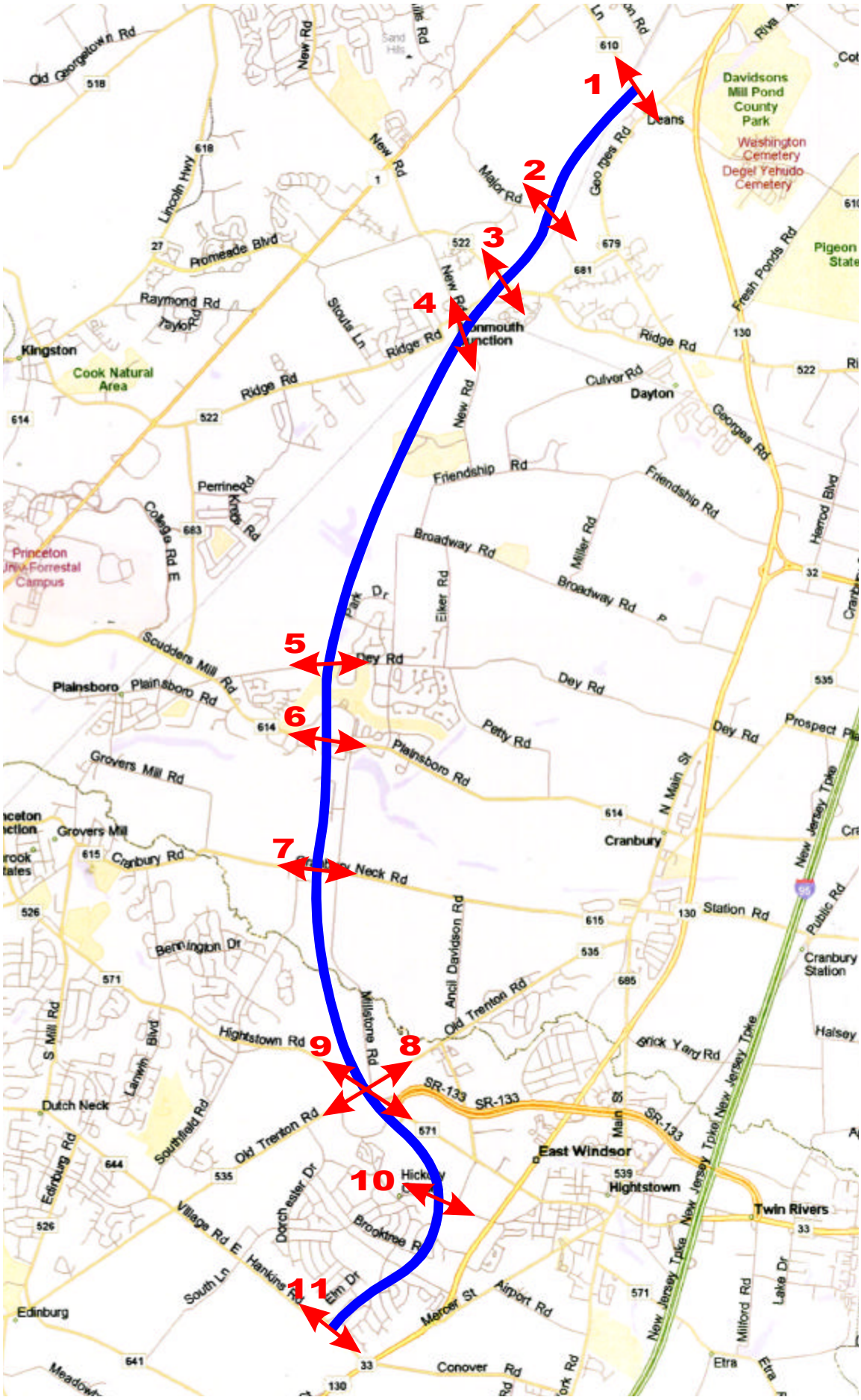
The projected 2028 Level of Service (LOS) designations (AM and PM), with no roadway improvements other than those currently funded, were evaluated using the traffic model. Many existing intersections currently exhibit poor levels of service, but the increases in traffic that are predicted throughout the study area will result in further deterioration of the levels of service at nearly every intersection. Year 2001 and year 2028 no action levels of service are shown in Table 1-3. As can be seen, in 2028 all but one key intersection is expected to exhibit saturated conditions during at least one of the peak hours, and 13 out of 17 exhibit saturated conditions during both morning and evening peak hours. This indicates severe future road congestion, and concomitant declines in regional mobility.

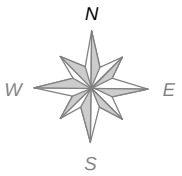
Table 1-3
Year 2001 and Future No Action Levels of Service at Key Intersections

	Intersection Level of Service			
	2001		2028 No Action	
Intersection	**A.M.**	**P.M.**	**A.M.**	**P.M.**
US-1 @ Cozzens Lane	F	F	F	F
US-1 @ Major Road (Sandhill)	F	D	F	F
US-1 @ New Road	F	E	F	F
NJ-27 @ Raymond Road	A	B	F	B
NJ-27 @ CR-522	D	D	E	F
Scudders Mill Rd @ Schalk's Crossing Rd	D	C	F	F
Scudders Mill Road & Dey Road	F	D	F	F
Plainsboro Road & CR-535	C	B	E	F
US-130 @ Dey Road	F	F	F	F
Dey Road & CR-535	D	C	F	F
NJ-32 @ CR-535	F	F	F	F
NJ-32 @ Herrod Blvd.	F	F	F	F
US-130 @ Friendship Road	F	F	F	F
George's Road & Kingston Road	B	B	D	B
CR-522 & Kingston Road	F	F	F	F
US-1 @ CR-522	F	F	F	F
US-1 @ Ridge Road	F	F	F	F

The origins and destinations of trips using the east-west roads of southwestern Middlesex County and northeastern Mercer County were estimated under various future scenarios using the peak-hour traffic network model. For this EIS, the origins and destinations of trips that are projected to cross a "screenline" were evaluated. The "screenline" is an imaginary line that is used to analyze the total volume of traffic that crosses the imaginary line, which is positioned in a north-south direction roughly halfway between US Route 1 and US Route 130. Because the screenline is oriented north-to-south, the screenline helps to determine the amount of traffic that travels east to west and west to east in the traffic study area. The location of the screenline is shown in Figure 1-5.

The screenline intersects all (eleven) key east-west roads in East Windsor Township, Plainsboro Township, and South Brunswick Township. For the EIS, the total volume of





1	CR-610 (Deans Lane)
2	Major Road
3	CR-522 (Ridge Road)
4	New Road
5	Dey Road
6	Plainsboro Road
7	Cranbury Neck Road
8	CR-535
9	CR-571
10	Dutch Neck Road
11	Hankins Road

Figure 1-5

Screenline Intercepting East - West Roads

traffic crossing the screenline is an indicator of the total demand for east-west travel in the traffic study area (assuming there is no major change in road capacity). The through trips that crossed the screenline each day were determined. This count indicated the potential number of users of a new or improved east-west through route.

In the year 2028 the traffic model projects that a total of about 270,000 to 300,000 vehicles per day will cross the screenline in both directions. About 25 percent of these vehicles are expected to be *through traffic,* passing through the area. Through traffic traveling on the east-west roads contributes to traffic congestion, causes neighborhood impacts (such as noise, vibration, dust, and reduced pedestrian safety), and creates traffic safety issues. Through traffic, by NJDOT definition, is appropriately served on regional arterial highways, and routes for through traffic should be separate from local roadway routes.

The traffic model was used to predict future peak hour *through traffic* volumes crossing the screenline. Table 1-4 shows the significant increases in through traffic that will cross the screenline (i.e., constituting an east-west trip) in future years, for each major east-west road. The analysis shows more than a doubling of through traffic traveling east-west across the screenline by 2028.

Table 1-4
Through Traffic Volumes Crossing the Screenline

	Projected Peak-Hour (A.M. + P.M.) Through Traffic Volumes		
Screenline Crossing	**2001**	**2028 No Action**	**Percent Change**
CR-610 (Deans Lane)	1,457	1,384	-5%
Major Road	83	265	219%
CR-522 (Ridge Road)	66	208	213%
New Road	169	179	6%
Dey Road	194	890	359%
Plainsboro Road	569	835	47%
Cranbury Neck Road	314	886	182%
CR-535	273	1,301	377%
CR-571	981	2,212	126%
Dutch Neck Road	0	20	-
Hankins Road	458	1,938	323%
Total	**4,565**	**10,117**	**122%**

Out of a total of 1,253 miles of federal, state, county, and local roadways (counting each direction of travel on a road as a separate roadway) represented in the traffic study area model, 476 roadway miles are predicted to operate at sub-standard conditions (volume-to-capacity ratio greater than 0.9) during at least one of the peak hours in 2028. Of these 476 miles, 62 roadway miles would require the addition of two, three, or four lanes (by the town, county, state, etc.) to achieve acceptable future volume-to-capacity ratios, as shown in Table 1-5. As the number of miles of additional roadway needed to create acceptable volume-to-capacity ratios increases, it indicates worsening traffic congestion.

Table 1-5
Additional Lanes Needed to Maintain
Acceptable Volume-Capacity Ratio

Additional Lanes Needed	Miles of Roadway	
	2001	2028 No Action
1	194.3	413.8
2	20.9	60.3
3	0.1	1.3
4	0.0	0.3
Total	215.3	475.7

Two NJDOT projects in the area (one recently constructed and one recently approved) — the Hightstown Bypass (State Route 133), and the Penns Neck Area Improvements (formerly the Millstone Bypass, located near the intersection of US Route 1 and County Route 571) — were evaluated to determine if capacity improvements in those project areas would reduce congestion on east-west roads in the proposed Route 92 project area. It was determined that the two NJDOT projects do not reduce congestion because they have different users, and do not provide the needed north-south and east-west regional mobility improvements. These are local projects intended to improve traffic flow around Hightstown and to provide intersection improvements on US Route 1 in West Windsor, respectively.

Prior studies of proposed Route 92 also recognized another serious traffic issue; the increasing use of local and secondary neighborhood roads by commercial trucks, as related to the increasing role of the lands surrounding Interchange 8A as a regional warehousing center. To travel between US Route 1, US Route 130, and the New Jersey Turnpike, a substantial number of trucks use Dey Road, Plainsboro Road, Cranbury Neck Road, Washington Road, and other local east-west roads in southwestern Middlesex County/northeastern Mercer County. Long-established residential neighborhoods and local businesses exist alongside the roadways, many of which consist of large frame dwellings set close to the roadways. These structures are subject to vibration caused by the passing of heavy trucks. In addition, these roads are mainly two-lane designs with tight curves and minimal turning radii at intersections, because

many roads evolved from horse trails and wagon trails. The increasing volumes of through truck traffic have diminished quality of life and neighborhood character. Without changes to the arterial highway network, future truck volumes on local east-west roads are predicted to increase by approximately 35 percent, as shown in Table 1-6.

On average, trucks comprise more than five percent of the traffic using the existing east-west roads. One in five of these trucks are using local roads to travel through the towns the roads serve, without servicing residents or businesses in the towns. If non-local commercial truck traffic was diverted to a highway facility designed to carry non-local truck traffic, the impact of increasing through traffic on local traffic and adjacent neighborhood land uses could be minimized.

Table 1-6
Screenline Crossing Peak Hour Truck Volumes

	PROJECTED PEAK HOUR (A.M. + P.M.) TRUCK VOLUMES		
Screenline Crossing	**2001**	**2028 No Action**	**Percent Change**
CR-610 (Deans Ln)	117	101	-14%
Major Road	27	69	155%
CR-522 (Ridge Rd)	86	203	135%
New Road	6	13	108%
Dey Road	19	79	308%
Plainsboro Road	33	79	138%
Cranbury Neck Road	46	131	186%
CR-535	550	525	-5%
CR-571	327	403	23%
Dutch Neck Road	319	449	40%
Hankins Road	201	291	45%
Total	**1,733**	**2,343**	**35%**

The distinction between local and through traffic is significant because of the direct relationship between the function and use of a road and the quality of life of those living and conducting business along the road. Roads that carry through traffic typically have significantly greater capacity, and experience greater use by trucks and commercial vehicles than local roads. To preserve quality of life, transportation and community planners generally recommend that through roads be separated from sensitive land uses, such as residences and neighborhood shops and services, using intervening non-residential zones, transitional land uses, and buffer areas.

Existing land use patterns indicate that the study area predominantly consists of suburban residential communities. The major highway corridors generally host commercial, retail, and office land uses. Many of the residential areas have evolved from a quiet rural to intensively suburban character over the past decades. Because municipal master plans and zoning ordinances guide municipal land use patterns and roadway (circulation) systems in each town, it is the municipalities who articulate the desired form of their communities. Example locations where providing new highway capacity for through traffic would help preserve local circulation characteristics and quality of life for residents and small businesses living adjacent to local roads, by reducing the presence of through traffic on local roads, include:

- Plainsboro Center (around the intersection of Plainsboro Road, Dey Road, and Scudders Mill Road). Existing land uses affected by through traffic include the municipal complex, high and low density residential areas, and local commercial areas.

- South Brunswick Center (along County Route 522 in the vicinity of Kingston Lane). Existing land uses affected by through traffic include the municipal complex, high and low-density residential areas, and schools.

- Princeton Junction Center (along County Route 571 in the vicinity of the Northeast Corridor Rail Line). Existing land uses affected by through traffic include a low-density residential area, local businesses, a train station, schools, and parks.

1.3 Project Purpose

As discussed above, the volume of traffic, especially through traffic, traveling to and from the southwestern Middlesex County and northeastern Mercer County study area continues to increase. This is principally attributable to three factors: the strong pace of residential and business development in the overall study area, the emergence of a national-scale warehousing complex in the Interchange 8A area, and the continued growth of the Princeton area and surrounding municipalities as high prestige business and residential locations.

The increasing volume of through traffic is causing worsening traffic congestion, and regional mobility is reduced because of the absence of alternate arterial highway routes. Worsening congestion and reduced mobility lengthen the duration of the work commute by area residents and employees, reduce the convenience and safety of non-work trips by residents, reduce bicycle and pedestrian safety, impact air quality, increase the cost of trucking and business operations, and diminish the quality of life for residents and businesses located along congested local roads.

The absence of sufficient arterial highway routes to carry the increasing percentage of through automobile and truck traffic in this intensively suburbanized area contributes significantly to reduced regional mobility. The increasing volume of through traffic is exacerbating existing congestion. Traffic modeling shows that new regional

transportation system capacity is needed to address the expanding traffic demands of the region and improve regional travel mobility.

Project Purpose: USACE determines that the purpose of NJTA's Route 92 project is to improve regional mobility, especially east-west mobility, for the central New Jersey area in and around southwestern Middlesex County and northeastern Mercer County.

For purposes of this EIS, USACE considers "mobility" to be the movement of people and goods conveniently, reliably, safely, and in acceptable travel time, by transportation system components that will enhance economic development and that are compatible with community and the environment. "Regional mobility" considers improvements at the transportation network scale, such as highways and freeways that principally carry through traffic, and that complement the functions of the local and county road system.

Past and projected residential and commercial growth in the study area, continued expansion of the goods distribution facilities around NJ Turnpike Interchange 8A, and vehicles traveling between the NJ Turnpike and the Princeton/Trenton areas generate significant traffic, considerably overloading the existing roadway network, especially during peak travel times.

One major factor contributing to worsening traffic congestion is that no east-west arterial highway exists in the southwestern Middlesex County/northeastern Mercer County region to serve the increasing traffic volumes traveling between the NJ Turnpike Interchange 8A (including the warehousing complex surrounding the Interchange) and the extensive US Route 1 business center that continues to develop in southwestern Middlesex County / northeastern Mercer County.

A second major factor inhibiting regional mobility is the absence of an east-west arterial highway link between existing major north-south highways to facilitate access by travelers to the least congested north-south route between the New Brunswick area and Princeton/Trenton area. Because no arterial highway linkage currently exists between north-south highways in the study area, traffic cannot efficiently re-route to alternate north-south routes that exhibit available capacity. Because there is no east-west arterial highway connector between existing north-south highway routes, the existing investments in regional mobility (i.e., existing north-south highways) cannot effectively be utilized by drivers. Providing east-west linkage between major north-south highways would increase the efficiency of the existing road network by allowing through traffic to select the most direct, least-congested route for north-south travel.

Finally, because there is no east-west arterial highway in southwestern Middlesex County/northeastern Mercer County, a hierarchical road network that allows through traffic to travel on routes that are separate from local traffic does not exist, diminishing quality of life and creating congestion on the local road system. Increasingly, through traffic and regional traffic is being carried by, and is congesting, local roads.

A hierarchical roadway network is a system that promotes the use of local streets for local access and circulation, and promotes the use of highways for through traffic and large truck traffic. The goal of providing a hierarchical network of roads is to separate local traffic from through traffic. The advantages of a hierarchical network are recognized by the Middlesex County Planning Board, in its Transportation Plan for the County. Creating hierarchical roadway networks is a long-established and widely-applied transportation planning objective that protects the quality of life for residents along local roads, and supports efficient travel for non-local trips. The South Brunswick Township Master Plan recommends that "local traffic should be separated, as much as possible, from through traffic", which is an expression of hierarchical network principles.

"Through" traffic is traffic that is unrelated to the towns and communities that the roads serve, and is defined as trips having neither the trip origin nor destination in the town (or towns) served by a particular portion of road. Thus, through trips have both their origin and destination outside the local area. Local trips have either an origin or destination (or both) within the local area.

The transportation model prepared for this EIS indicates significant and steadily worsening traffic congestion throughout the study area due to the strong past and future development trends in the region. A hierarchical road network would reduce the impacts that have been caused by increased volumes of through traffic using local roads to travel between the Trenton/Princeton area and New Jersey Turnpike Interchange 8A, and the existing regional warehousing/distribution center around Interchange 8A.

1.4 Description of the NJ Turnpike Authority Proposal

NJTA-proposed Route 92 would be a 6.7 mile limited-access toll highway that would provide express east-west travel capacity, and connect US Route 1 in South Brunswick Township to US Route 130 and the New Jersey Turnpike at Interchange 8A in Monroe Township. Proposed Route 92 would consist of two travel lanes in each direction.

Proposed Route 92 is the NJ Turnpike Authority's preferred alternative; however, USACE, the preparer of this EIS, is neither an opponent nor a proponent of the NJTA proposal. USACE does not determine a preferred alternative in this EIS. The full range of decision options is available to the District Engineer in responding to the applicants permit application.

The design for Proposed Route 92 provides for a limited number of interchanges connecting to the area road network, minimizing the potential of creating new access to undeveloped lands. Minimizing the number of interchanges that connect to local roads is consistent with New Jersey's smart growth strategy, because it limits development pressure on land slated for low density development or preservation. The project design includes four interchanges that would connect the highway to existing roads, three of which are state or federal highways, and the fourth is a connection to a major employment center.

The interchange at Perrine Road would provide commuters access to a major employment center, specifically, the approximately 4 million square feet of research and office space, occupied by about 100 corporations, in and near Princeton Forrestal Center. Employees commuting to the Princeton Forrestal Center on proposed Route 92 would be able to access their places of employment from the Perrine Road interchange, without having to travel on US Route 1. Without the Perrine Road interchange, commuters to Princeton Forrestal Center could only reach their destinations by traveling on US Route 1, thereby occupying valuable road capacity on US Route 1.

New interchanges would be constructed at the intersections of:

- proposed Route 92 and US Route 1 (western terminus)
- proposed Route 92 and Perrine Road
- proposed Route 92 and US Route 130
- proposed Route 92 and Turnpike Interchange 8A (eastern terminus)

Improvements to the connecting roads would also occur at the proposed interchanges. Additionally, the project requires the construction of bridges over US Route 1, Ridge Road, Amtrak Northeast Rail Corridor, Devil's Brook and its associated stream corridor, Friendship Road (in two locations), Miller Road, US Route 130, Cranbury-South River Road, and a relocated Route 32 westbound. A toll plaza facility is proposed west of the intersection of proposed Route 92 and US Route 130.

This EIS describes the purpose of and analyzes the need underlying NJTA's proposal to improve regional traffic mobility by creating new east-west arterial highway capacity in southwestern Middlesex County on proposed Route 92. The EIS then evaluates alternatives to the NJTA proposal, to assess whether the project purpose might be accomplished by another plan that would result in lesser environmental impact. Finally, the EIS describes the beneficial and adverse impacts of alternative projects, including proposed Route 92, that have the potential to achieve project purpose with fewest adverse impacts, as determined through an alternatives screening analysis.

The roadway design for proposed Route 92 has evolved significantly over the years, and the changes to the project are a result of:

- the long history of the project, which has allowed many iterations of review to occur. The long history and many reviews have provided an expansive period for public discussion of project issues, and has resulted in design changes by the sponsoring agencies that have avoided or reduced potential project impacts,
- increasingly detailed collection of information about environmental resources and environmental constraints in the project area over the years, and changes to respond to expanded regulation of environmental resources, and
- an improved understanding of how the project might best serve traffic needs with fewer adverse impacts, by illuminating the core function and design as meeting

regional mobility needs that have emerged after decades of public consideration of an east-west connector highway.

An improved understanding of the project's relationship to its surrounding environment and its role in addressing regional mobility needs has resulted in several rounds of improvement in the design of the project. Each round of design adjustment has been characterized by refinements that avoid or further minimize impacts to environmental resources in the project area, and allowed the project to more precisely serve the specific functions of separating through traffic from local traffic, and creating route choices for travelers by linking existing north-south highways, functions otherwise missing from the existing road network.

In the mid-1980s, the *Middlesex County Short Range and Post 1990 Transportation Plan and Program* (October 1985) contemplated the construction of an east-west connector road from New Jersey Turnpike Interchange 8A to US Route 206 in Montgomery Township. A Draft EIS (DEIS) was prepared by NJDOT in 1986. It evaluated two alignments for the right-of-way of Route 92 as then proposed. A revised design was developed to reduce impacts to wetlands in the project corridor.

Another DEIS on proposed Route 92 was prepared under the direction of NJTA in 1994. This DEIS was prepared pursuant to NJ Executive Order No. 215, which requires that environmental studies be performed for state projects. The 1994 DEIS evaluated a route for proposed Route 92 that eliminated the highway segment extending to US Route 206 (a change made in order to reduce wetland impacts).

The 1994 DEIS included an evaluation of the impacts that would result if proposed Route 92 continued its alignment past US Route 1 to NJ Route 27, in Franklin Township. Significant environmental resources were identified along the one-mile project alignment between US Route 1 and NJ Route 27, according to the 1994 DEIS. Construction of the project roadway between US Route 1 and NJ Route 27 would have resulted in impacts to the following:

- Two watercourses (Carters and Heathcote Brooks) and their associated floodplains
- Extensive forested palustrine wetlands
- Several historic archaeological and architectural resources deemed eligible for listing or already listed in the State or National Register of Historic Places
- Green Acres designated parkland

Information about these potentially significant environmental impacts led NJTA to eliminate the US Route 1 to NJ Route 27 segment from the project. NJTA planning and design documentation and NJTA's permit application for the Route 92 project establish the western boundary of the highway at US Route 1, which is the proposed configuration of the project.

In its application to the US Army Corps of Engineers for the proposed Route 92 project, NJTA proposes to improve regional mobility in the project area by providing additional arterial highway capacity that better serves the evolving needs of the region. The NJTA proposal would provide a more efficient limited-access route (i.e., proposed Route 92) for through traffic that now uses the local east-west roads in the project area to travel between US Route 1 and the New Jersey Turnpike, thereby reducing use of local roads by through traffic. In addition, proposed Route 92 would provide access to alternate highway routes for the north-south through traffic using existing US Route 1 between the Princeton area and the New Brunswick area, by improving the ability of through trips to divert from US Route 1 to US Route 130 or the NJ Turnpike.

NJTA's objectives for the proposed Route 92 project, which are consistent with the project purpose described in Section 1.3, consist of the following:

1. *Provide improved access to alternative routes for north-south traffic currently using US Route 1, to relieve congestion on the corridor while reducing the impacts of congestion on the abutting communities. Improve the ability of north-south traffic to divert from US Route 1 to US Route 130 and the New Jersey Turnpike, improving mobility in southern Middlesex County and northeast Mercer County.*

   Accomplishing this objective would improve access to other north-south highway corridors in the study area, which have available capacity, thereby providing congestion relief in critical areas along US Route 1, which is forecast to experience significant increases in traffic volume. This objective seeks to better balance future traffic volumes among network highways with available capacity, by improving the ability of traffic to divert to less-congested highways, significantly increasing the flexibility and opportunity for traffic to find less congested routes for regional travel.

2. *Establish a road system that acts to reserve local streets for local traffic and circulation, while providing arterial highway routes for through traffic (especially the increasing volumes of through traffic moving between US Route 1, US Route 130, and the New Jersey Turnpike), thereby reducing the adverse impacts to existing neighborhoods that occur when through traffic and truck traffic use local streets.*

   Accomplishing this objective would encourage through traffic to divert to more efficient and faster arterial highway routes, thereby reducing the amount of through traffic using local streets. Reducing through traffic using local streets would similarly reduce its adverse effects on the land uses that abut local streets. The adverse effects that would be reduced include noise, vibration, truck and vehicle emissions, while vehicular, pedestrian and bicycle safety would be improved for residential areas, neighborhood shops and services, community facilities, parks, and schools. Reducing through traffic on local roads would help maintain or restore an environment that is more compatible with the traditional character of the residential neighborhoods in the project study area. An important benefit of achieving this objective would be reduced traffic congestion on the local road network, which would also reduce travel times and improve air quality. Traffic seeking relief from

congestion on US Route 1 would be able to use an arterial highway route to travel to US Route 130 or the NJ Turnpike without impacting local traffic and circulation.

3. *Reduce the presence of truck through traffic on the local roadway network by providing faster and more efficient arterial highway connections for through traffic.*

   Accomplishing this objective would reduce the noise, vibration, safety, and aesthetic impacts of truck traffic on residential neighborhoods, schools, and local community facilities. Several commenters on the DEIS for proposed Route 92 indicated the impacts of truck traffic posed a serious concern because it lowered the quality of life for residents living adjacent to local roads being used as through routes.

4. *Work with State agencies and local communities to ensure that the road capacity created by proposed Route 92 is managed and sustained, and that consignment of unused road capacity occurs only through a planned and well coordinated process involving local Master Planning and careful development review. Further, any new road capacity should be designed so as to minimize the potential to contribute to sprawl, which is achieved by limiting creation of new access to undeveloped land (i.e., allow only slow and planned extension of local roads, and create limited access designs for through roads).*

   The design for proposed Route 92 features a limited number of interchanges (four are proposed) to connect proposed Route 92 to the existing highway network. The four proposed interchanges are located only at intersections with existing major highways or employment centers. For these reasons, proposed Route 92 has the opportunity to create highway capacity for through trips without significantly exacerbating pressure for uncontrolled development, or "sprawl", along the proposed corridor.

   The small number of connections between proposed Route 92 and intersecting highways (and an existing employment center) significantly reduces the potential for the project to contribute to sprawl, because no new direct access would be created to land planned for low density growth, agriculture, or open space. Given the limited-access design, there will be no direct connection between proposed Route 92 and local roads extending into undeveloped lands along the project route. Connections are proposed only at US Route 1, US Route 130, Interchange 8A, and the interchange at Perrine Rd. The Perrine Rd. interchange would provide direct access to extensive business park development, and avoid the need for commuters to occupy valuable road capacity on US Route 1.

   The limited-access design of proposed Route 92 occurred partially in response to the need to avoid creating new routes of direct access to developable land. By avoiding connections with local roads, and by providing connections only to highways and employment centers, proposed Route 92 has incorporated design principles that are consistent with New Jersey's Smart Growth policies. The design has been coordinated with municipal Master Plans and local efforts to manage future

development, and to discourage direct access to undeveloped lands (and local roads with undeveloped land) along the project corridor.

Section 2
Alternatives Evaluation

USACE determines that the primary purpose of the New Jersey Turnpike Authority's (NJTA's) proposed Route 92 project, as discussed in Section 1, is to:

Improve regional mobility, especially east-west mobility, for the central New Jersey area in and around southwestern Middlesex County and northeastern Mercer County.

As described in Section 1.4.2, the strong suburban land development trends observed in the study region over the past two decades, especially in the vicinity of Princeton, created a significant demand for both north-south and east-west travel capacity in the region, resulting in congestion in many parts of the existing area road network (see Transportation, Section 3.7). Analysis of the road network in the study area using a detailed traffic model indicates that greater capacity is needed in the road network now, and even more so in the future. Because no major east-west route currently exists in southwestern Middlesex County that adequately diverts "through" traffic from local roads, both local and regional development activity continues to add cars and trucks to the increasingly stressed local and secondary (county) road system.

Improvements in the road network that meet the following objectives would help improve regional mobility, relieve traffic congestion, and improve quality of life for residents living and traveling on local roads.

- Allow north-south traffic to divert from US Route 1 to US Route 130 and the New Jersey Turnpike by providing additional east-west highway capacity, thereby reducing traffic congestion on local east-west roads and US Route 1, and improving mobility in southeastern Middlesex County and northeastern Mercer County.

- Establish a road system that acts to reserve local streets for *local traffic* and circulation, by providing new linkage for *through traffic* moving between US Route 1, US Route 130, and the New Jersey Turnpike, and minimizing adverse impacts on existing communities from through traffic and truck traffic using local streets.

- Reduce the presence of non-local truck traffic on the local roadway network and shift such traffic to a connector highway.

- Seek to minimize the potential to contribute to sprawl development in the project region by limiting new direct road access to undeveloped land.

2.1 Alternatives Examined

The alternative actions available to the US Army Corps of Engineers (USACE) during the regulatory review process are: to issue a permit in response to the NJTA request, issue a permit subject to conditions, or to deny a permit.

The National Environmental Policy Act (NEPA) requires that a review be conducted of alternative approaches to meeting the need for and objectives of the project (as described in Section 1 and above). Alternatives are evaluated in this section with respect to their ability to meet the project purpose and their environmental impacts. Alternatives can be differentiated by the degree to which they meet the project purpose (i.e., generally, to improve mobility on the road network). The alternatives also differ in the degree to which they cause impacts to the natural environment (e.g., wetlands, wildlife, and waterways), and the built environment (e.g., land use effects, displacement of homes and businesses, noise impacts). Finally, each of these alternatives can differ in the degree to which it may cause secondary impacts that can result from possible induced land use development.

NJTA has authority only to implement proposed Route 92 (or a modification thereof, such as the sub-alternatives discussed in Section 2.6.1.1 below). NJTA highway facilities are paid for by toll revenues collected from its users; these funds are not co-mingled with transportation funds for non-toll roadways. (Non-toll roadways are under the jurisdiction of NJDOT, counties, or municipalities.) NJTA toll revenues cannot be used for maintenance projects, unless they involve Turnpike facilities. Nevertheless, NEPA guidance (46 FR 18026) requires that alternatives beyond the capability of the project sponsor to implement should be evaluated in an EIS as long as they are reasonable and potentially effective alternatives. Thus, other state or local sponsors would be needed to implement many of the alternatives.

In this EIS the following review process was used to evaluate the alternatives:

- Alternatives that are similar in their ability to fulfill the project purpose but that are found to have comparatively greater adverse environmental impact are not recommended for further detailed analysis. Differentiating impacts among the alternative projects included wetland fill, loss of permanently protected farmland, loss of protected parklands/preserve, residential and commercial dislocation, contribution to sprawl development, and inability to meet basic project purpose.

- The consistency of alternatives with smart growth planning principles and the NJ State Development and Redevelopment Plan, and the potential for the transportation improvement to contribute to sprawl were assessed in the alternatives screening process.

- Alternatives that exhibit low effectiveness in achieving traffic improvement pursuant to the traffic modeling analysis are not considered for further analysis.

- Pursuant to alternatives analysis, those alternatives that best meet the project purpose, on a comparative basis, and exhibit a comparable or lower level of adverse environmental impact, on a comparative basis, are then evaluated in additional detail with respect to their impacts in Section 4.

Five types of alternatives are evaluated in this section:

1. No Action. This alternative is a consequence of USACE denying a permit for the proposed project. Under this alternative, no action would be taken beyond completing other roadway projects for which funds have already been committed and that meet permit requirements. Specifically, NJTA proposed Route 92 would not be constructed, nor would any other major traffic network improvement alternative be implemented as part of this project.

2. Transportation demand management (TDM) measures. TDM measures are focused on reducing the number of single occupancy vehicles that contribute to congestion on roadways through measures such as ride-sharing, flex hours, and public transit.

3. Existing local and county roadway capacity improvements. This category includes alternatives that improve the capacity of existing local and county roads by widening existing roads and improving intersections. As recommended by the North Jersey Transportation Planning Authority (NJTPA) for transportation accessibility and mobility analyses, these alternatives constitute a category of alternatives known as Transportation System Management (TSM) measures (improvements to the existing roadway system that make it function more effectively).

4. Improvements to existing regional system. This category includes improvements to the existing regional roadway system, specifically US Route 1.

5. New roadway facilities. The category includes construction of new roadways.

Within each of these five broad categories, the following specific alternatives are evaluated:

1. No Action
   - No permit issued and no implementation of the NJTA proposed action (i.e., no implementation of the proposed regional roadway capacity improvements)

2. Transportation Demand Management
   - Ridesharing-Carpooling/Vanpooling Programs
   - Alternative Work Hours
   - Parking Management
   - High Occupancy Vehicle (HOV) Lanes
   - Transit Support Services, Including Park-and-Ride Facilities
   - Public Transit Operational Improvement
   - Bicycle and Pedestrian Facilities
   - Transportation Management Association Involvement

3. Existing Local and Secondary (County) Roadway Capacity Improvements (New Lanes on Existing Roads or Intersection Improvements)
   - US Environmental Protection Agency (USEPA) Suggested Modified No-Build Alternative
   - Route 522 Widening (with and without extension to New Jersey Turnpike)
   - Dey Road Widening
   - Plainsboro–Cranbury Road Widening
   - Cranbury Neck Road Widening
   - Composite Local Roadway Improvements Program

4. Improvements to the Existing Regional Roadway System
   - US Route 1 Widening in South Brunswick
   - US Route 1 Widening in South Brunswick with Signal Removals

5. New Roadway Facilities
   - NJTA Proposed Route 92 with Terminus at Route 1, including sub-alternatives
   - USEPA Suggested Alignment
   - Dey Road Parallel Alignment
   - Plainsboro-Cranbury Road Parallel Alignment
   - South Brunswick Alignment – Modified

Each of these alternatives is discussed in separate subsections below. Most of the alternatives discussed herein were evaluated previously in NJTA documents (1994 Draft Environmental Impact Statement [Harris, 1994], prepared under NJ Executive Order No. 215, and the 1999 USACE Section 404 Permit Application [Harris, 1999]). The prior material forms the basis for the evaluation presented below, with updating as needed.

2.2 No Action Alternative

Under the No Action alternative, the US Army Corps of Engineers would not issue a permit to discharge fill material into waters of the United States (wetlands) for the proposed roadway construction; specifically, NJTA proposed Route 92 would not be implemented. No new linkage between US Route 1 and the New Jersey Turnpike would be added to the existing roadway network in southern Middlesex County, nor would major highway construction occur to fulfill the purpose of the project (i.e., to improve regional mobility).

The No Action alternative provides the baseline against which all other alternatives are evaluated. The No Action alternative assumes that the study area's existing transportation network remains as it currently exists. It also assumes that the highway system improvements discussed below, that currently have funding commitments and that will meet permit requirements, will be implemented. Highway projects that have funding commitments but that are not completed (i.e., committed projects) are included as background conditions in the analyses prepared for this EIS so that cumulative impacts may be assessed. In addition, committed projects are included as background

conditions because the EIS is designed to evaluate the effects of projects 20 years in the future, so as to include the effects of existing land use and population changes in measuring effectiveness and impacts.

The No Action alternative includes a number of roadway system improvements that were recently completed (hence not included as background conditions in earlier environmental studies). Completed transportation system improvements include: addition of a right-hand turning lane from southwest-bound Dey Road to northwest-bound Scudders Mill Road; widening of US Route 1 from four to six lanes from Adams Lane in North Brunswick Township to the intersection with US Route 130; addition of a major NJTA park-and-ride lot adjacent to the US Route 130/Route 32 intersection; the Route 133 Hightstown Bypass, and widening the New Jersey Turnpike to seven lanes per direction north of Interchange 11 (increasing regional north-south travel capacity).

The No Action alternative includes as a background condition the implementation of the Penns Neck Improvements, for which funds have been committed by the New Jersey Department of Transportation (NJDOT). While the Penns Neck Improvements will improve traffic flow on US Route 1 (by eliminating signalized intersections) and provide localized east-west mobility in West Windsor, traffic modeling conducted for this EIS shows that these improvements alone do not address the regional traffic flow issues in southwestern Middlesex County and northeastern Mercer County because they do not provide connectivity between US Route 1 and the New Jersey Turnpike, or improve regional mobility. Traffic modeling also shows that current congestion along the US Route 1 corridor *north* of the Penns Neck Improvements would not be reduced by the implementation of those improvements, because that project is designed to address local, but not regional, traffic problems (see Transportation, sections 3.7 and 4.2.7).

Under the No Action alternative, increasing traffic congestion characteristic of significant portions of the existing local and regional roadway network would continue, and would worsen in future years as population, employment, and vehicular use increase. Based on traffic modeling, increasing levels of regional through traffic, including heavy truck traffic, would be experienced on the local road system, which would make the affected neighborhoods less amenable to walking and bicycling and decrease the attractiveness of the area's community centers.

Based on traffic and air quality modeling for the year 2028, air pollution from vehicular traffic would decrease substantially under the No Action alternative. This is because federally mandated reduction in motor vehicle emissions are expected to outweigh the effect of increased traffic and congestion. Improvements to the regional traffic network, such as those considered in the Alternatives Analysis, would reduce emissions still further, because of reductions that would occur in vehicle miles traveled and improvements in vehicle speeds. (See sections 3.7 and 4.2.7 for additional detail.)

Under the No Action alternative, traffic modeling conducted for this EIS shows that vehicle hours of travel associated with trips in the region would increase, causing

further delay in local and regional commutation, freight movement, and general travel. Among all alternatives examined, the No Action alternative would result in the greatest increase in Vehicle Hours of Travel and among the greatest increases in Vehicle Miles Traveled in year 2028. It exhibits the lowest average network speed, attributable to overloading the capacity of the existing road system in the project area. The No Action alternative would result in total saturation of the existing roadway network, and significant declines in the level of service on existing roads (see Section 1 and Section 4.2.7). Based on this analysis, the No Action alternative has been found to be not responsive to project goals and objectives and would not be effective in addressing the region's traffic congestion.

2.3 Transportation Demand Management

This section summarizes the analyses of Transportation Demand Management (TDM) measures as strategies to assist and complement capacity improvement alternatives in reducing traffic congestion. TDM measures are focused on reducing single occupancy vehicles on roadways (i.e., ride-sharing, park and ride facilities, alternative work hours, improved transit capacity, etc.).

The Transportation Demand Management (TDM) strategy addresses transportation problems and promotes a partnership between government and businesses. TDM measures are designed to affect travel demand by reducing the need to travel, increasing vehicle occupancy or the use of other modes, or by moving trip times outside of peak travel hours. These measures generally address peak hour travel situations by reducing either the number of total work trips or the number of Single Occupancy Vehicle (SOV) work trips taken during the peak hours. TDM alternative transportation methods include park-and-ride lots, carpools/vanpools, flexible work hours (including telecommuting), transit and parking management alternatives. As discussed below, the analysis of TDM-related strategies concludes that, although beneficial in terms of supplying traffic relief (reduction of vehicle trips), these strategies alone do not significantly meet the need for improved regional mobility. It is noted that some of these strategies are in use in the study area at present and current traffic conditions already reflect implementation of these strategies. Nevertheless, taken together, these strategies can turn SOV trips into shared trips and reduce congestion. NJTA indicates that it supports implementation of TDM measures, as indicated by its establishment of park-and-ride facilities at New Jersey Turnpike interchanges including Interchange 8A.

Ridesharing-Carpooling/Vanpooling Programs

Ridesharing includes the use of both carpooling (use of private vehicles between several people) and vanpooling (use of a single designated van). It may be company-sponsored, third-party or owner-operated. Ridesharing can lessen congestion by reducing overall vehicular traffic, thus reducing VMT, air pollution and energy consumption. Those participating in the ridesharing program will likely have reduced commuting costs and travel-related effects on their personal vehicle. Companies may reduce needed parking space. In the study area, rideshare matching services are provided by Keep Middlesex Moving (KMM), a program of the Middlesex and Monmouth County Transportation

Management Association (TMA). KMM provides information assistance to promote a variety of TDM services in Middlesex County and participates in RIDEPRO, the New Jersey Department of Transportation free electronic ride matching service. The KMM database matches one's commute patterns (origin, destination, start and stop times) with others in its database to find a suitable match. KMM has 625 commuters registered in its ridesharing database, of whom about half have been matched and use the system.

Although rideshare services such as KMM are established in the study area, the exact extent of total carpooling is not clear. In general, carpooling/vanpooling has been shown to not significantly reduce vehicular traffic, even in areas of high population. Studies in the United States of the effectiveness of TDM measures have estimated that approximately 1.5-4% traffic reduction may result from the implementation of ridesharing. (For example, a 2000 analysis of the Puget Sound, Washington vanpool program, the largest public vanpool fleet in North America at the time of the study, concluded that vanpooling in the region had accommodated a 2% share of the commute market). In an effort to make this strategy more effective, many transit/carpool incentives have been explored and implemented elsewhere. Transit/carpool incentives, economic incentives for using these alternative modes, are usually provided by individual employers or through regional programs. These incentives can be provided in several forms: subsidized vanpool services, free or reduced parking fees, or tax advantages (in the form of a pre-tax deduction for use of ridesharing or public transportation for commuting). The overall impact of this strategy is measured through a reduction in SOV vehicle trips that may otherwise increase roadway congestion. In the project study area, participation in ridesharing is currently possible, but the suburb-to-suburb nature of travel patterns in the study area tends to limit the potential of ride-sharing. As noted in the State "Congestion Buster Task Force" final report, October 2002, the number of New Jersey workers driving alone increased from 1990 to 2000 but the number carpooling decreased during that time period. This appears to be attributable to the increasing number of businesses moving to the suburbs, resulting in greater worker dispersement. In conclusion, ridesharing, while beneficial, would not alone significantly address the existing traffic congestion in the area, particularly the truck traffic.

Alternative Work Hours

Flex-time allows deviation from the standard 8-hour, 5-day work week. Whether the work arrangement is categorized as a modified hour or a modified work place category, both decrease the total and peak period trips to lessen the peak travel periods. This decrease allows the transportation system to have a greater commuter travel time period without additional peak capacity. The modified work-hours arrangement involves compressed work weeks, flex-time, and staggered work hours. A compressed work week allows employees to work their regularly scheduled hours in fewer days per week, rather than the normal five days. Flex-Time allows employees to select the hours they work each week. Flex-Time (staggered work hours) allows employees to work 8-hour shifts with varying starting and ending times and may alleviate approximately 1-1.5% of existing peak traffic, according to studies of the effectiveness of TDM measures. Flex-Time does not affect total traffic volume. The modified work place category involves telecommuting and the utilization of regional work centers. Telecommuting allows

employees to perform their regular work duties at home, either full or part-time, entirely eliminating the commute trip, or at an established telecommuting center which would be closer to their home than their usual work location. Regional Work Centers are suburban locations where employees can work at a location closer to home. Although beneficial in reducing peak vehicular travel and traffic congestion by about 1-1.5%, this strategy would not alone result in a significant reduction of east-west SOV travel in the project study area, nor would it reduce truck traffic.

Parking Management

The parking management strategy involves any plan by which parking space is provided, controlled, regulated, or restricted. This plan typically involves changes to job location parking by the limiting of available parking, implementation of a parking cost increase, removal of parking spaces, application of restrictions (time of day, duration etc.), and the control of parking required for new development (by, for example, zoning codes/ordinances). It can also include so-called "Parking Cash-out" programs, whereby office workers give up employer-provided parking spaces in exchange for their equivalent monetary value. Such actions are likely to encourage individuals to participate in a carpool/vanpool arrangement. This strategy would not significantly reduce the need for additional travel capacity in the study area because most of the major parking demands are north of the study area in the metropolitan employment centers of New York City, Newark, etc.

HOV Measures

For the purpose of maintaining travel speed and avoiding traffic congestion, High Occupancy Vehicle (HOV) lanes have been implemented. HOV lanes are reserved for use of carpools, vanpools, buses, and sometimes motorcycles and are most effective during peak travel periods. The introduction of a new HOV system may involve an added lane or restrictions on use of existing lanes. By increasing the average number of people per vehicle and reducing the total number of vehicle trips, HOV lanes can result in more efficient travel times. HOV lanes are most effective where many vehicles travel between a common set of origins and destinations to allow ridesharing. Because of the strong north-south orientation of the most heavily traveled roads in the area, this strategy is more applicable to the New Jersey Turnpike and Route 1 corridors and less applicable to the east-west roads in the study area. An HOV lane for Route 1 would present safety problems because of the numerous exits (weaving may increase congestion). Moreover, the history of HOV lanes in New Jersey has not been a success (partly because of existing scattered travel patterns). It appears that HOV measures would not produce significant benefit in the study area.

Public Transit Improvements

Transit Support Services including Park-and-Ride Facilities

This strategy involves improvements to existing facilities and construction of new facilities that offer public transportation. These services include bus stops, transit centers, rail lines and park-and-ride lots. Park-and-ride lots are locations where individuals park their vehicles and continue their commute through an established

alternative transportation mode such as transit lines, carpools/vanpools buses or other forms of public transportation. Park-and-ride lots are available and may potentially reduce 1-3% of existing traffic during morning and evening peak travel hours. This strategy requires the acquisition of public property. Two park-and-ride lots are located in the main project study area, one at the intersection of Route 130 and Route 32 and the other at College Road East and Research Way (Forrestal Center). There are several other nearby park-and-ride lots in Plainsboro and on Route 27, at the west boundary of the study area. For effective and significant relief of traffic congestion, these transit facilities must be extensively utilized. In the study area, park-and-ride facilities are oriented to accommodate commuters traveling in a north-south direction to and from New York City and Newark (as well as other high employment areas).

Public Transit Operational Improvements
Transit operational improvement alternatives can be implemented for the purpose of reducing transit travel times and improving schedule reliability. Such operational improvements include measures that primarily increase the comfort, reliability, and safety/security of transit service vehicles. Additional transit service improvements include modifications to service routing and current schedules (including express routes), additional stop locations, improved transit-related roadways and lower fares to attract more riders. The application of traffic operations such as signal priority for transit vehicles, bus turnouts, and modifications to the location or frequency of stops may allow more efficient continuous and convenient transportation and encourage additional riders. Transit operational improvement alternatives have the potential of slightly reducing vehicle trips and VMT as long as the alternatives are highly utilized; otherwise, these improvements will not fully meet the need for increased east-west mobility. Improvements to existing transit service involve adding transit capacity by increasing the number of vehicles operated, constructing new facilities and providing better and more comprehensive coordination among various transit systems. Several transit routes serve the project study area and vicinity, principally on Routes 1 and 27 destined for New York City (Port Authority Bus Terminal and Wall Street). There appears to be a potential for additional local transit service on US Route 1 and NJ Route 27 to/from Princeton/South Brunswick to New Brunswick/Edison, based on the employment growth in the corridor. Included in this concept is the potential for a bus rapid transit (BRT) system for the US Route 1 corridor.

Recognition of the potential opportunity to implement a BRT led to the initiation in 2004 of the Central New Jersey Route 1 BRT Alternatives Analysis, managed by New Jersey Transit and advanced in collaboration with NJDOT, the Delaware Valley Regional Planning Commission and the New Jersey Transportation Planning Authority. The study is an outgrowth of the work of the Central New Jersey Transportation Forum and the Greater Mercer Transportation Management Association. A report of the study issued in February 2006 estimates that a BRT system would increase the percentage of work trips using transit from a range of 2% to 4% to a range of 5% to 9% in the core study area of Plainsboro, West Windsor, Princeton Township and Princeton Borough.

The report estimates that the BRT system would cost $600 million to $700 million to implement. The BRT study is continuing.

Previous analyses have suggested that a BRT system, together with smart growth land use development, implementation of travel demand reduction strategies, and highway improvements could reduce the anticipated growth in roadway congestion. This is the same conclusion reached in the Route 92 EIS and indicates, as stated in the EIS, that BRT could be a complement to the proposed Route 92 project but would not likely be a substitute for it.

Bicycle and Pedestrian Facilities

Because of the considerable average travel distances in the project study area, bicycle and pedestrian facilities do not have the potential to achieve significant reductions in vehicle trips. However, as a complementary strategy, these facilities can increase the potential for non-motorized trips. The NJDOT 1997 "Route One Corridor Bicycle & Pedestrian Case Study" proposed several bicycle and pedestrian projects, principally to serve the needs of bicyclists and pedestrians, as opposed to reducing congestion. The projects proposed in the case study focus on improving the ability to cross US Route 1 at Route 522 and Ridge Road and on connecting local community areas. Since the projects are concerned with cross traffic from west of US Route 1 to east of US Route 1, they may conflict with proposals to remove signals on US Route 1. Nevertheless, bicycle and pedestrian facility improvements should be considered in any project design.

Transportation Management Association Involvement

Demand management is a key strategy to relieve roadway congestion. One element of any plan to address congestion in the study area would involve greater collaboration among government, the local business community, and Keep Middlesex Moving, Inc. (KMM), the Transportation Management Association (TMA) for Middlesex County. In creating complementary strategies, KMM helps to identify potential trip reduction strategies and opportunities in the study area. KMM serves as an alliance of government and businesses to provide commuter-related resources to people in Middlesex and Monmouth counties. KMM has advised and assisted employers in creating and implementing alternative commuting opportunities in areas such as Transportation Demand Measures (including carpooling/vanpooling, telecommuting, compressed work weeks), transit facilities (park & ride lots/facilities) and public transit operations (bus routes and services), non-motorized travel modes (bicycling/walking) and emergency traffic alerts.

Cumulative Effect of TDM Strategies

In the project study area, the potential cumulative reduction in vehicle miles traveled after aggressive implementation of the above-described TDM strategies is estimated to be in the 5-10% range. This estimate is based on studies of the effectiveness of TDM measures in reducing traffic volumes (for example, a transportation planning study of the I-405 corridor in the Seattle, Washington metropolitan area by the Washington State Department of Transportation included major TDM components in the study. The

TDM package was estimated to reduce trips from 2% to 5% within the corridor). These strategies, while not sufficient by themselves to eliminate the need for the proposed project, as evidenced by existing and projected congestion levels, are nonetheless important components of a coordinated transportation system.

It should also be noted that the traffic projections incorporate the fact that many TDM measures including telecommuting are in use now and will continue.

TDM Conclusions and Recommendations

The implementation of each TDM measure discussed above would likely provide some relief from traffic congestion in the study area, but overall would not substantially address the project need. TDM measures are most effective in reducing traffic congestion in locations that exhibit high densities of residential development and located near employment "centers". Experience with TDM measures in suburban NJ indicates that the implementation of each of the previously described strategies would not significantly mitigate the existing congestion problems. However, *such strategies would be effective as complementary strategies*, and the combined effect of these measures can offset the potential for additional highway-capacity-induced SOV trips.

The TDM findings and recommendations are summarized as follows:

- TDM strategies such as rideshare matching services exist in the study area and are beneficial. Enhancement of these services through increased collaboration with and support of KMM would provide some congestion relief and is recommended.

- HOV lanes could theoretically reduce congestion if fully implemented. But the dispersed travel patterns in the study area and safety concerns on US Route 1 argue against recommending HOV lanes on that roadway.

- Public transit improvements in terms of increased local bus service to/from Princeton/South Brunswick and New Brunswick/Edison (e.g., bus rapid transit) is a potential strategy that is recommended for further analysis.

- Bicycle and pedestrian facility improvements would not reduce regional congestion, but are beneficial at the local level and should be considered.

2.4 Existing Local and Secondary (County) Roadway Capacity Improvements

This group of alternatives, shown in Figure 2-1, involves the addition of new lanes to existing roads or improvements to existing intersections. As noted above, these alternatives are known as Transportation System Management measures.

Improvements to the following roads were not considered as alternatives because these roads do not provide convenient east-west connections among US Route 1, US Route 130, and the New Jersey Turnpike: CR-610/Deans Lane, Major Road, New Road,

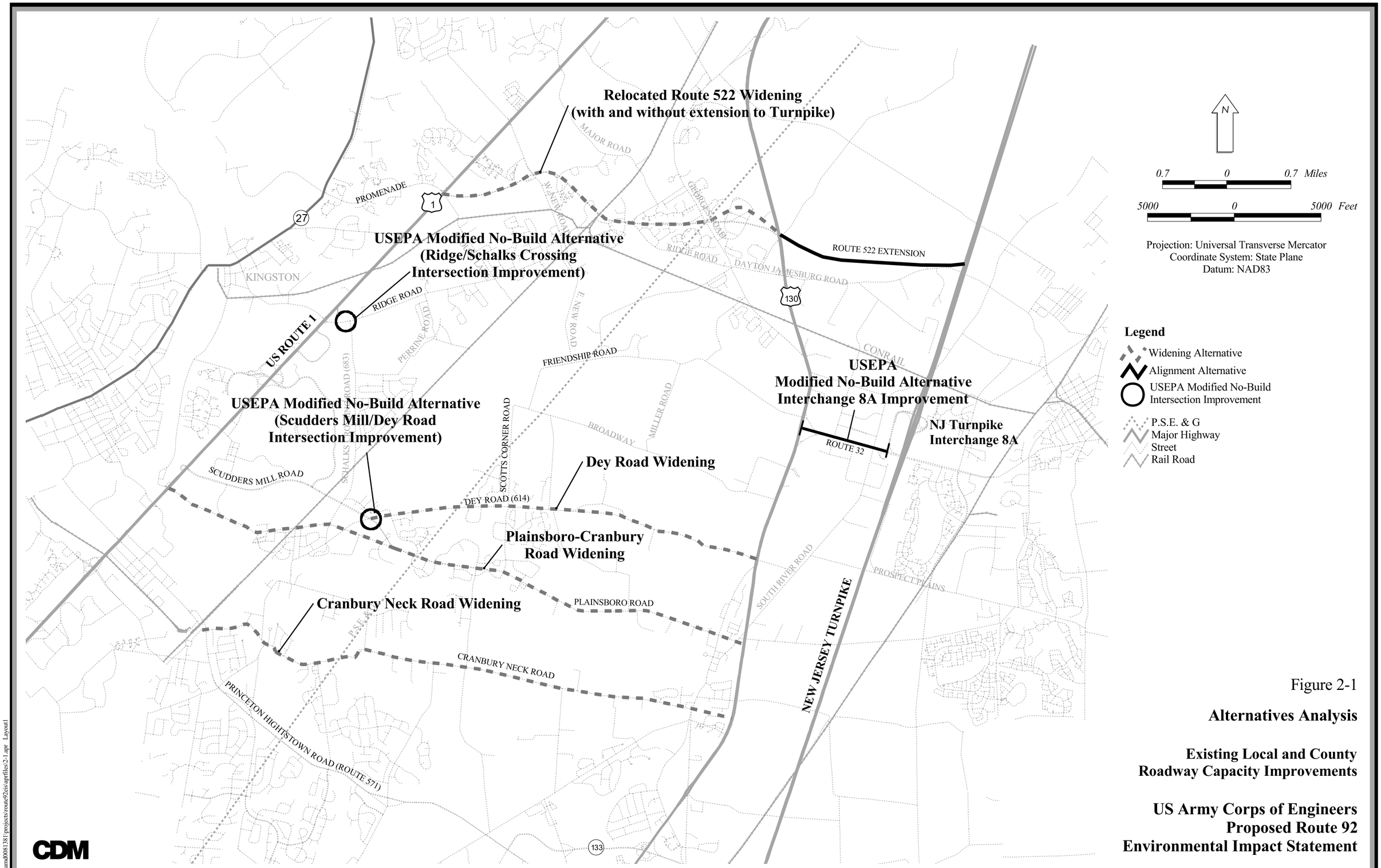


Figure 2-1

Alternatives Analysis

Existing Local and County Roadway Capacity Improvements

US Army Corps of Engineers
Proposed Route 92
Environmental Impact Statement

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CR-535, Dutch Neck Road, and Hankins Road. Improvement of CR-571 is not considered as an alternative because as part of the Penns Neck EIS process, it was decided not to widen CR-571 in West Windsor. Without widening in West Windsor, improving CR-571 could not be a viable alternative.

2.4.1 USEPA Suggested Modified No-Build Alternative

In September 1998, USEPA-Region 2 identified an alternative to Route 92 that USEPA asserted would alleviate local traffic problems without impacting wetland areas. The USEPA alternative included specific improvements to existing roadways in the area of South Brunswick and Plainsboro:

- Improvements to Route 32 and its intersections with, and between US Route 130 and the New Jersey Turnpike (also proposed by NJTA as part of the proposed Route 92 project). This would improve the performance of four intersections that are currently failing (i.e., have level of service F, indicating congestion and significant queuing).
- Addition of a right-hand turning lane from southwest-bound Dey Road to northwest-bound Scudders Mill Road
- Optimization of signal timing at the intersection of Ridge Road and Schalks Crossing Road during peak evening hours.

Two of the three suggested improvements are currently in place. A right-hand turning lane from southwest-bound Dey Road to northwest-bound Scudders Mill Road currently exists, and has been assumed as a background condition in the updated traffic modeling conducted for this EIS. Traffic modeling also indicates that signal timing during peak evening hours at the intersection of Ridge Road and Schalks Crossing Road is currently optimized. Although two of these improvements have been implemented, there is still congestion along local east-west routes in the project area, and congestion is projected to worsen (see Section 1). The USEPA Suggested Modified No-Build Alternative also identifies improvements at and around Interchange 8A. The ability of these improvements to meet project purpose and need have been evaluated.

Updated regional traffic modeling was performed for this EIS (using traffic models previously accepted by NJDOT and the Metropolitan Planning Organizations—NJTPA and DVRPC). The traffic modeling indicates that this USEPA alternative would not fulfill the purpose of and need for proposed Route 92 (as listed above and discussed in Section 1). NJTA proposed Route 92 would *decrease* westbound non-local peak hour trips using local east-west roads by 18 percent in the morning and would *decrease* eastbound non-local trips using local roads by 28 percent in the evening. (See sections 3.7 and 4.2.7 for additional detail.) Comparatively, under the USEPA Suggested Modified No-Build Alternative morning non-local trips would *increase* by four percent, and there would be no reduction in the number of evening non-local trips using local roads. Because this alternative would not reduce regional through traffic on the local east-west road system, local driving would be more difficult as a result of congestion.

Walking and bicycling would be less safe. Congestion, caused by regional traffic attempting to use local roads to reach destinations more quickly, tends to decrease the attractiveness of community centers and decrease the identification of local residents with their community. This alternative would have the additional disadvantages of the No Action alternative discussed in Section 2.2.

This alternative would have minimal environmental and socioeconomic impact and would not promote sprawl development. However, these advantages are outweighed by the inability of this alternative to fulfill the purpose of the proposed project--to address the region's need for improved mobility. For these reasons the USEPA Suggested Modified No-Build Alternative is not considered for further analysis.

2.4.2 Route 522 Widening and Extension

Route 522 is a four-lane east-west roadway in northern South Brunswick Township. It is the northernmost roadway evaluated as an alternative to Route 92 in this EIS. Traffic modeling analysis of the existing roadway network indicates that under the No Build alternative, the traffic generated by growth in the project region will result in several critical links of Route 522 exceeding capacity by year 2028. For this reason, it was determined that the Route 522 Alternative would need to include construction of additional lanes to fulfill a role as the primary east-west travel route. Thus, the Route 522 Widening alternative assumes a widening of Route 522 from four lanes to six lanes.

The existing 120-foot right-of-way of Route 522 is approximately 4.2 miles long and accommodates four travel lanes, a 16-foot median and two 12-foot shoulders. The effects of extending Route 522 approximately 2.3 miles farther east to connect to the New Jersey Turnpike near Interchange 8A have also been evaluated. The design that includes the extension provides regional travel functionality that is closer to the purpose of proposed Route 92, and more closely meets the need for expanded east-west travel capacity.

Widening Route 522, with or without an extension to the New Jersey Turnpike, would cause significant adverse environmental, social, and traffic-related impacts.

Construction of this alternative would result in property acquisition and displacement of six single-family residences, 52 multi-family residences, one commercial facility, and four public facilities. In addition to these direct property acquisitions, this alternative would bring the edge of pavement closer to a substantial number of remaining residences, resulting in increased adverse noise impacts, air quality impacts, and aesthetic impacts to those residences. Much of the land use along Route 522 is residential, and pedestrian crossing of Route 522 is typical of residential neighborhoods.

A new development built along Route 522 is the Summerfield Subdivision, a 641-unit residential development on both sides of Route 522 between US Route 130 and Georges Road. Summerfield includes approximately 230 single-family lots, 411 multifamily units,

two baseball fields, two basketball courts, several playgrounds, a 523,517 square foot commercial strip, and 15 acres of detention basins. Summerfield has four access drives onto Route 522 within a 0.6-mile distance.

Widening Route 522 from four to six lanes would have adverse impacts to many Summerfield residents, particularly those located adjacent to the proposed road. Increased noise levels and deteriorated air quality would adversely affect these residences. In addition, pedestrian safety, especially for the children who reside within Summerfield, is an important consideration. Summerfield includes recreational facilities on both sides of Route 522. It is anticipated that Route 522 will be crossed on foot extensively by children and adults moving between recreational facilities. Different types of facilities are located on each side of the road (e.g., only one side has a soccer field). Even with the use of crosswalks, there are significant safety concerns with pedestrians crossing four lanes of traffic. These concerns would be intensified with widening to 6 lanes.

NJDOT's Route 522 Final Environmental Impact Statement (FEIS, 1986) identified a total of 374 existing residences that were predicted to experience noise impacts with the construction of a four-lane Route 522. Since the publication of the Route 522 FEIS, there has been increased residential development in this area, particularly in the Summerfield subdivision. Widening Route 522 from four to six lanes is anticipated to increase noise impacts on at least the 374 residences identified in the Route 522 FEIS, plus another 100 or more residences in Summerfield, bringing the total number of residences impacted by increased noise levels to approximately 475.

In addition to requiring residential property acquisitions, widening Route 522 to six lanes would create travel lanes that would be closer to the many remaining residences than is currently the case. The edge of the widened pavement would be approximately 20 feet from an exterior wall of approximately 12 townhomes in the southwest quadrant of the intersection of New Road and Route 522. This would result in increased air quality, noise, aesthetic and safety impacts to these residences.

This alternative would also require filling of wetlands and cause displacement of parkland. Widening Route 522 without an extension to the New Jersey Turnpike would require filling of 2 acres of forested wetlands. The extension of Route 522 to the New Jersey Turnpike would require filling an additional 3 acres of forested wetlands within Pigeon Swamp State Park, and would also impact 2 acres of state open waters. In addition to being a state park, Pigeon Swamp State Park is a USEPA Priority Wetland and is included in the National Register of Natural Landmarks. Pigeon Swamp State Park overlies an aquifer utilized as a drinking water supply for nearby residential, commercial and industrial users.

In addition to social and environmental impacts, this alternative is not consistent with the intended purpose of Route 522 as expressed by NJDOT in the Route 522 FEIS. The

Route 522 FEIS states that Route 522 is designed to function as a local service road for existing and projected industrial and local transportation needs.

Traffic modeling indicates that widening Route 522 without an extension to the New Jersey Turnpike would not effectively divert local east-west traffic from other local routes because there is little advantage in using a different *local* roadway that did not improve access to the New Jersey Turnpike. The remaining local street network would not be improved, nor would substantial traffic be diverted from US Route 1 to the New Jersey Turnpike and Route 522. (See Appendix A, URS-Greiner Traffic Study, February 14, 1997 NJ Freshwater Wetlands Individual Permit application document.) Widening Route 522 without an extension to the Turnpike would encourage additional through traffic on this local road, reducing the amenity of adjoining neighborhoods and making walking and bicycling less feasible and less safe.

In contrast, extending a widened Route 522 to a terminus at the New Jersey Turnpike would carry a projected 61,900 vehicles per day (based on traffic modeling conducted for this EIS). An at-grade roadway that intersects with local roads, Route 522 was not planned and located to accommodate the impacts of such a high number of vehicles.

Extension of Route 522 would also encourage linear development instead of compact, clustered community design, because new roadways and driveways could be intersected anywhere along its length. Route 522 is essentially a county-level service road, collecting traffic from municipal roads and conveying it to state highways. Because of its "connectivity" function, an expanded Route 522 would improve access to undeveloped lands along its corridor, both directly and via intersecting local roads, thereby creating significant potential to contribute to sprawl.

Finally, the proposed route for the extension of Route 522 to the New Jersey Turnpike would require a new Turnpike interchange within a few miles of existing Interchange 8A, which would be costly, inefficient, and difficult to design with respect to traffic safety.

In summary, the alternative of widening Route 522 would result in significant residential, community, and environmental impacts. To achieve the east-west connectivity required to manage congestion in the project area, Route 522 would need to be connected to the New Jersey Turnpike, but, if a Turnpike connection were provided the roadway would carry traffic flows far in excess of its design, classification, and location. In addition, implementing a connection to the New Jersey Turnpike would increase the environmental impact of the project. The widening and extension of Route 522 would not effectively address the mobility requirements of this region, because it would use the local road network (including Route 522 itself) to carry regional through traffic. Route 522 would also increase potential for sprawl development because construction of curb cuts and intersecting roads are acceptable activities for this type of road, and because of its location in a relatively less developed area of South

Brunswick. For the reasons presented above, the Route 522 widening and extension alternatives are not considered for further analysis.

2.4.3 Dey Road Widening

This alternative would widen a 4.7-mile section of Dey Road, a local east-west road, from two lanes to four lanes. The widening would extend from Scudders Mill Road in central Plainsboro Township to US Route 130 at the southeastern corner of South Brunswick Township, on the border of Cranbury Township. This widening project would terminate at Route 130, and would connect indirectly to the New Jersey Turnpike using Route 130 and Route 32.

Approximately 7.5 acres of forested wetlands would need to be filled to widen Dey Road. In addition, widening Dey Road would require acquisition or displacement of approximately 18 single-family residences and one commercial structure.

The updated traffic modeling conducted for this EIS indicates that widening Dey Road would increase its traffic volume to approximately 37,400 vehicles per day by year 2028, an increase of 9,000 vehicles over the No Action scenario. The increased traffic volume carried by the widened Dey Road would be approximately 10 percent less than the estimated 41,000 vehicles per day that would be carried by proposed Route 92, but would occur on a local, as opposed to limited-access, road. Furthermore, widening Dey Road increases morning westbound non-local peak hour trips using local roads by 3 percent, and would not have any effect on eastbound evening non-local trips using local roads.

Widening Dey Road would impact less wetland acreage than proposed Route 92, but it would displace a larger number of residences and would increase impacts on remaining residences, specifically for air quality, noise, and aesthetic concerns. Although this alternative would not open new areas to development, it would improve access to undeveloped land along Dey Road, and would therefore facilitate sprawl development to a moderate degree. In addition, widening Dey Road would not be effective in meeting the project purpose of improving regional mobility, because as an at-grade road with many curb cuts and connecting roads, it could not separate local traffic from regional through traffic, which is necessary to optimize regional travel. Under this alternative, the increased level of local and regional through traffic sharing the same road would make local driving more difficult, discourage walking and bicycling, and reduce the quality of life in affected communities. It would not provide an efficient connection to the New Jersey Turnpike, because it would require that traffic travel on local roads, through a number of local intersections, to reach Interchange 8A. Consequently, it would not be effective in addressing the region's traffic congestion and associated vehicular air pollution. For the reasons presented above this alternative is not considered for further analysis.

2.4.4 Plainsboro-Cranbury Road Widening

Plainsboro-Cranbury Road is a local 2-lane east-west road located south of Scudders Mill Road and Dey Road. To the west, its terminus is at Scudders Mill Road. To the east, Plainsboro-Cranbury Road ends at US Route 130 just north of the historic center of Cranbury Township. Under this alternative the entire 6.6-mile length of Plainsboro-Cranbury Road would be widened from two lanes to four lanes.

Approximately 0.6 acres of wetlands would be impacted by widening bridges in the course of widening Plainsboro-Cranbury Road. Crossings of Cranbury Brook and Walker Gordon Pond would require roadway construction within these water features and their associated floodplains. In addition, widening Plainsboro-Cranbury Road would require acquisition or displacement of approximately 35 single-family residences, six multi-family residences, five commercial structures and two public facilities. Some of the properties that would be affected are in the Cranbury Village National Historic District in Cranbury Township. Although this alternative would not open new areas to development, it would improve access to undeveloped land along Plainsboro-Cranbury Road, and would therefore facilitate sprawl development to a moderate degree.

Widening Plainsboro-Cranbury Road would draw traffic from other unimproved local east-west roads, including Route 571, Dey Road, and Cranbury Neck Road. The traffic volume on Plainsboro-Cranbury Road by year 2028 would increase to approximately 46,000 vehicles per day. The traffic volume carried by a widened Plainsboro-Cranbury Road would be greater than the estimated 41,000 vehicles per day forecast for proposed Route 92. Widening Plainsboro-Cranbury Road is expected to increase morning westbound non-local peak hour trips using local roads by 12 percent, and is not expected to have any effect on eastbound evening non-local trips using local roads.

Widening Plainsboro-Cranbury Road from two to four lanes would require fill in less wetland acreage than proposed Route 92. However, there are significant residential and commercial dislocation impacts, adverse impacts to the historic setting of Cranbury Village, and increased air quality, noise, and aesthetic impacts that would be experienced by residences adjacent to the widened road. Because of the number and nature of the existing land uses along Plainsboro-Cranbury Road, and the presence of a National Historic District in Cranbury near the widening, this alternative exhibits a number of serious obstacles to implementation.

This alternative would not be effective in meeting the project purpose of improving regional mobility (see Section 1), because widening Plainsboro-Cranbury Road would not separate regional traffic from local traffic, which is necessary to optimize regional travel. The increasing volume of local and regional through traffic would create congestion, make local travel more difficult, discourage walking and bicycling, and reduce the quality of life in adjacent communities and neighborhoods. This alternative would result in substantial adverse residential, community, social, historic and environmental impacts. It does not provide an efficient connection to the New Jersey

Turnpike because it would increase the burden on local intersections to reach New Jersey Turnpike Interchange 8A. For these reasons the widening of Plainsboro-Cranbury Road is not considered for further analysis.

2.4.5 Cranbury Neck Road Widening

Cranbury Neck Road is a local two-lane east-west road located south of Plainsboro-Cranbury Road. To the west, it runs across the southern tip of Plainsboro Township and terminates at Route 571 in West Windsor Township. To the east, it terminates at Main Street at the southern end of Cranbury Village, in the center of Cranbury Township. Under this alternative, the entire 5.8-mile length of Cranbury Neck Road would be widened from two lanes to four. In addition, this alternative would extend east to US Route 130 by widening approximately 0.15 miles of Main Street and approximately 1 mile of Cranbury Station Road from two to four lanes. The widened roadway would therefore total approximately 7 miles. This alternative does not include either a direct connection to US Route 1, nor a direct connection to New Jersey Turnpike Interchange 8A.

Widening Cranbury Neck Road would draw vehicles from Route 571 in East Windsor and West Windsor townships, and Dey Road. Traffic modeling conducted for this EIS indicates that traffic volumes would increase to 46,500 vehicles per day on a widened Cranbury Neck Road. The increased level of local and regional through traffic would increase congestion on this mostly rural road, make local travel more difficult, discourage walking and bicycling, and reduce the quality of life in adjacent communities and neighborhoods.

For this alternative, approximately 4.3 acres of wetlands associated with the Millstone River would be impacted (filled or shaded). This alternative would also require widening two bridges crossing the Millstone River and a tributary to the Millstone River. Approximately 63 single-family residences and two commercial structures would be displaced. The most significant number of displacements would occur in Cranbury Village, a National Historic District near the center of Cranbury Township. Widening Cranbury Neck Road from two to four lanes would impact a smaller total area of wetlands than proposed Route 92. However, there are numerous residential and commercial displacements, adverse impacts to the historic setting of Cranbury Village, and increased air quality, noise and aesthetic impacts to the many residences remaining adjacent to the proposed improvements. Because of the extensive existing residential and commercial land uses along Cranbury Neck Road, and the presence of a National Historic District in Cranbury along the widening, this alternative presents a number of major obstacles to implementation. Although this alternative would not open new areas to development, it would improve access to undeveloped land along Cranbury Neck Road, and would therefore facilitate sprawl development to a moderate degree.

This alternative would not fulfill the project purpose of proposed Route 92—improving regional mobility--because of the lack of an effective connection to US Route 1, its

inability to separate local and through traffic, and the absence of an efficient connection with New Jersey Turnpike Interchanges 8 or 8A. For the reasons presented above, the widening of Cranbury Neck Road is not considered for further analysis.

2.4.6 Composite Local Roadway Improvements Program

The traffic modeling that was conducted for this EIS has shown that widening any single existing local road would not provide adequate east-west capacity to relieve the increasing burden on the east-west road network nor would it effectively link US Route 1 with the New Jersey Turnpike. Most widenings or improvements of local roads would result in traffic volumes that exceed capacity during rush hour, and thus the duration of the rush "hour" and the delay associated with rush hour travel would increase. Finally, individual local road widenings would also retain existing signalized and unsignalized traffic intersections, worsening existing local traffic congestion in many locations.

By letter, dated January 27, 1997, the NJ Dept. of Environmental Protection (NJDEP) previously suggested that a combination of several local alternatives might meet the goals and objectives of the NJTA proposed Route 92 project (January 27, 1997 letter from NJDEP to NJTA; and March 10, 1997 follow-up meeting). NJDEP indicated that even though a single alternative might not meet the goals and objectives for proposed Route 92, a combination of improvements to existing roads might meet the project purpose and need with fewer impacts than proposed Route 92. This EIS has considered a composite set of roadways improvements, and has assessed the cumulative environmental, social and traffic impacts that would result from implementation of the improvements listed below. The composite alternative was created to determine if widening existing roadways might have the potential to avoid impacts that are associated with a new alignment. The composite alternative consists of the following improvements:

- Widen Route 522 from four lanes to six lanes with an extension to the New Jersey Turnpike
- Widen Dey Road from two lanes to four lanes (described in section 2.4.3 above)
- Widen Plainsboro-Cranbury Road from two lanes to four lanes (described in section 2.4.4 above)
- Widen Cranbury Neck Road from two lanes to four lanes (described in section 2.4.5 above)
- Implement road and circulation improvements at Interchange 8A, consistent with the USEPA Suggested Modified No-Build Alternative

These widening and road improvement projects, if implemented together, would generally provide similar east-west travel capacity to that of proposed Route 92. Each roadway widening involves improvements to existing local roads whose capacity is reduced by existing road intersections and direct residential and business access to each of the roads. For the composite alternative, the sum of additional lanes (four additional

lanes in each direction) would need to be greater than the number of additional lanes for proposed Route 92 to provide similar capacity, because proposed Route 92 would be a limited access road that can provide higher per-lane capacity.

The travel time benefits achieved by all of these improvements would be less than the benefits of proposed Route 92, because traffic would be required to travel on arterial streets, through existing unsignalized and signalized intersections, as well as new signalized and/or stop-sign-controlled intersections.

Together, the composite set of widenings would require property acquisition displacing approximately 180 residences, 10 businesses, and at least six public facilities. In addition to these displacement impacts, local roadway improvements would bring travel lanes closer to the remaining residences, businesses, and facilities, potentially aggravating air and noise conditions for these receptors. From an aesthetic perspective, many of the existing roadways have a rural and/or historic character that is appealing to residents. Major roadway widenings and intersection improvements would degrade the existing visual appeal. Wetland impacts for the composite set of widenings would total about 20 acres. By generally expanding the capacity of the local road network, this alternative would generally increase access to undeveloped land, and would therefore facilitate sprawl to a significant degree.

The composite alternative, compared with proposed Route 92, would exhibit greater wetland impact and adverse socioeconomic impacts (especially residential and business dislocations), given the high level of disruption to the communities through which the road widenings would occur. This alternative would have a substantially greater potential to promote sprawl development. In addition, there would be potential disturbance to historic Cranbury Village under two of the program elements.

The composite alternative does not effectively address the project purpose. The composite improvements program would not optimize the efficiency of regional through travel by separating regional and local traffic. In fact, the composite improvements would attract increased traffic throughout the local roadway network, including truck traffic. The increased level of local and regional through traffic would increase congestion throughout the study area, make local travel more difficult, discourage walking and bicycling, and reduce the quality of life in adjacent communities and neighborhoods.

Individually, each of the widening projects was not considered for further analysis because it would result in high levels of disruption and impact to existing neighborhoods along the widenings; it would not divert non-local traffic from local roads; and it would be ineffective in addressing regional traffic congestion. When considered together, the composite set of alternatives would not reduce their individual impacts nor improve their relative ineffectiveness; in fact, this alternative worsens local traffic congestion and increases the adverse environmental impact associated with any single alternative.

The traffic modeling performed on this alternative indicates that traffic on each of the widened corridors would be about 30 percent greater than the traffic volumes on those corridors if proposed Route 92 were built (see Section 4.2.7).

In summary, this alternative is not considered for further analysis because there are major socioeconomic and environmental impacts caused by the component parts of this alternative, and there are no regional or local traffic benefits to be derived from the composite improvements program.

2.5 Existing Regional Highway System Improvements

One element of the alternatives analysis involved a review of whether potential improvement to the existing regional *highway* network might meet the project purpose and need. In this regard, a widening of US Route 1 from four to six lanes was assessed, with respect to the ability of a widened US Route 1 to improve regional mobility and reduce congestion, and with respect to its environmental impacts. The results of this assessment are discussed below, in Section 2.5.1. Traffic modeling performed for this EIS indicated that the US Route 1 widening alternative was significantly less effective than proposed Route 92 in meeting the project purpose. For this reason additional improvements to US Route 1 were identified to assess whether comprehensive improvements to the US Route 1 corridor might equal the traffic improvement benefits resulting from construction of proposed Route 92 corridor. The expanded set of improvements that were identified to increase capacity on US Route 1 involved removal of six intersections and restrictions on turning movements at other existing intersections. The results of this analysis are presented in Section 2.5.2.

2.5.1 US Route 1 Widening to Six Lanes

This alternative involves widening US Route 1 in South Brunswick Township from four lanes to six lanes. The widening would begin near Finnegan's Lane to the north and continue to Independence Way to the south. The section of US Route 1 to the north and south of this stretch has previously been widened to six lanes. By implementing this alternative, US Route 1 would be uniformly six lanes wide between Princeton and New Brunswick. This alternative is illustrated in Figure 2-2.

One of the principal factors leading to the increasing east-west movement of traffic (and resulting congestion) on the local road system between US Route 1 and the New Jersey Turnpike in southwestern Middlesex County is the congestion on US Route 1 between Princeton and New Brunswick. Strong population and employment growth in this region has led to increasing traffic congestion on US Route 1, as commuters and commercial truck freight travel on the area roadways. Significant volumes of local and non-local traffic traveling from the US Route 1 corridor to the New Jersey Turnpike are encountering extensive travel delays on US Route 1. Currently, the only highway route between US Route 1 in the southwestern Middlesex County area and the New Jersey Turnpike is via US Route 1 to NJ Route 18 to New Jersey Turnpike Interchange 9.

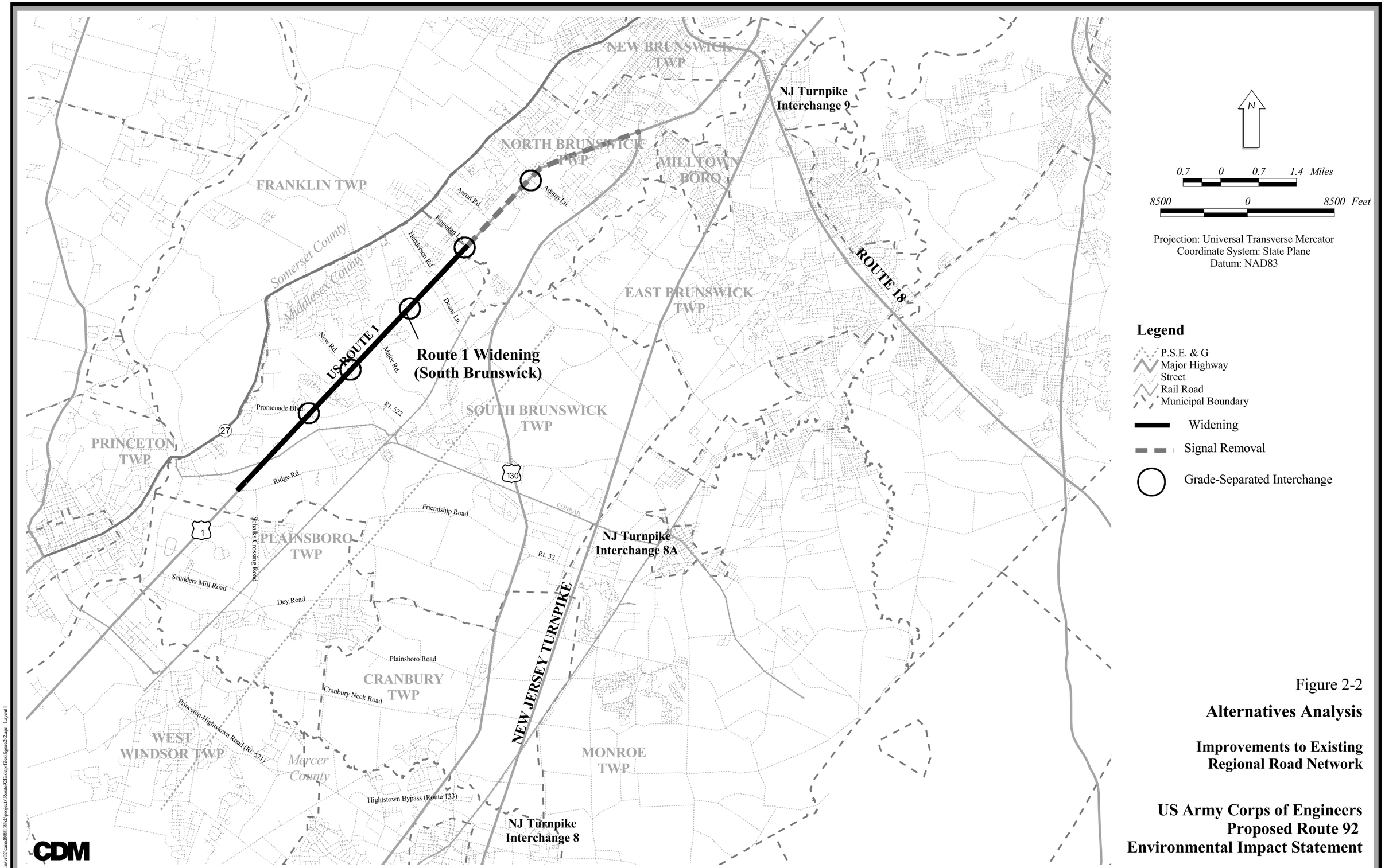

Figure 2-2

Alternatives Analysis

Improvements to Existing Regional Road Network

US Army Corps of Engineers
Proposed Route 92
Environmental Impact Statement

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NJDOT has implemented an extensive program of improvements to US Route 1, but the strong growth in this region continues to create extensive congestion.

One potential alternative to creating improved linkage between US Route 1 and the New Jersey Turnpike in southwestern Middlesex County is construction of additional capacity improvements in the US Route 1 corridor. For this EIS both the effectiveness of highway widening, and the impacts of such a widening are evaluated.

A review of existing zoning, land use mapping, land cover mapping, 1995 aerial photography and wetland mapping was conducted. This information was updated via visual inspection and site reconnaissance activities.

Vegetation and Habitat. Widening US Route 1 would result in the loss of vegetation and associated possible wildlife habitat along the new roadway right-of-way. Approximately two acres of land bordering US Route 1 would be taken for roadway construction. Because the vegetated area potentially affected consists of relatively narrow strips of land immediately bordering both sides of highly traveled US Route 1, no wildlife or threatened or endangered species are likely to be present, nor displaced.

Land Use and Zoning. The major land uses that abut US Route 1 directly are office parks, retail, services, mobile home parks, and single-family residences. Local zoning (principally commercial and office) and the current land use are for the most part consistent. The non-conforming uses include single-family homes sporadically located along the roadway. Some of the single-family residences are now abandoned, others have been converted to commercial use, and about 25 still remain as residential properties.

US Route 1 is a long-established, major at-grade highway with linear development along most of its length. Community centers and neighborhoods do not cross US Route 1. Widening US Route 1 would not fundamentally alter the character of the highway, nor the character of the adjoining land uses and residential neighborhoods, where they are present. Because widening US Route 1 would not open new areas to development, and because land along US Route 1 is substantially developed or in the process of being developed, widening US Route 1 would have little potential to promote sprawl.

Direct Land Use Impacts. Direct land use impacts refer to residential or non-residential properties that would be taken by right-of-way acquisition. The proposed widening of US Route 1 would potentially impact approximately seven existing businesses whose properties are developed to the edge of the existing roadway. Three of these businesses may not be able to function on a smaller lot. The three businesses that may not be able to function on a smaller lot caused by US Route 1 widening are a gasoline station (now closed), a foreign car repair shop, and an auto dealership (recently opened as Brunswick Kia).

Of the approximately 25 single homes along this length of US Route 1, approximately three occupied homes would likely be displaced, as they are located at or close to the current roadway edge.

Widening US Route 1 to six lanes would also require the relocation of existing utility lines that are located at the roadway edge, including poled electrical and phone lines. Also, catch basins and stormwater lines exist along the curbed section of roadway. Widening the roadway would require that these utility structures be relocated, in some cases requiring easements and construction on adjacent private property.

Indirect Land Use Impacts (Noise). As noted, approximately 25 single family homes are located along the seven to eight mile length of US Route 1 considered in this analysis for widening. There are also several hotel/motels and three mobile home parks along this corridor. Noise associated with the construction of an additional lane on either side of US Route 1 would be audible to these residences. Bringing the road and the traffic closer to these residents would increase the traffic related noise on a daily basis. Widening the roadway would also allow for increased volumes of vehicles to be carried by this roadway, another source of increased noise.

Summary

Widening US Route 1 from four lanes to six lanes from Finnegan's Lane in South Brunswick Township south to Independence Way would result in potential impact to approximately 4 acres of wetlands. Also, approximately 7 businesses would be impacted, as a portion of their properties would need to be acquired to extend the roadway easement. Three businesses would need to be acquired in their entirety. Of the approximately 25 occupied single-family homes along this corridor, 3 of these homes would likely need to be acquired.

Widening US Route 1 would help alleviate current congestion along this stretch of road. Because the road capacity would increase, traffic modeling shows that more traffic would be carried on this section of road, thereby increasing current traffic-related noise for existing homes and for travelers who stay at the hotels along US Route 1.

Widening US Route 1 is partially responsive to the project purpose because it would provide improved linkage between US Route 1 in the Princeton area and the New Jersey Turnpike at Interchange 9. However, this alternative would not fully meet the project purpose because it would not improve regional east-west mobility. Improved east-west mobility is the most critical component of the improved regional mobility that is the purpose of the project.

For this reason, widening US Route 1 without signal removal was not considered for further analysis. Instead, additional capacity improvements to US Route 1 were identified — specifically, signal removal and replacement with interchanges, and restrictions on turning movements at the remaining signalized intersections. This expanded set of improvements to US Route 1 is evaluated in Section 2.5.2, below.

2.5.2 US Route 1 Widening to Six Lanes with Signal Removal

While improving the capacity of US Route 1 through widening would improve the linkage of US Route 1 and the New Jersey Turnpike at Interchange 9, the traffic improvements resulting from a "widening only" project would not be effective in improving regional mobility. For this reason, the widening alternative was expanded further to include removal of six signalized intersections, replacement of the removed intersections with grade-separated interchanges, and restriction of turning movements at remaining signalized intersections. These additional improvements were applied to increase the capacity of US Route 1 as much as possible. In addition to widening US Route 1, as discussed in Section 2.5.1 above, this EIS evaluates further capacity improvements to US Route 1, as identified in Table 2-1.

Traffic and Transportation Effects

The changes in year 2028 peak-hour traffic flows that would result from US Route 1 Widening and Signal Removal were estimated using the detailed network model developed for this project. This model demonstrates that US Route 1 Widening and Signal Removal would partially meet the objectives of this project as stated in Section 1, Project Purpose and Need.

US Route 1 Widening and Signal Removal would be expected to reduce the amount of *through traffic* on the local and secondary east-west roads crossing the screenline (defined and mapped in Section 1) by 10 percent, as compared with the No Action Alternative. This alternative would also be expected to result in modest changes in peak-hour *truck volumes* on the local and secondary east-west roads in the traffic study area, and along NJ Route 27 in Kingston. Peak-hour truck volumes on the local and secondary east-west roads would be expected to drop by 8 percent, as compared with the No Action scenario.

Traffic modeling conducted for this EIS indicates that this alternative would be expected to result in minor reductions in peak-hour traffic volumes on *local and secondary east-west roads* in the Traffic Study Area, including in the sensitive areas listed in Section 1 (Plainsboro Center, South Brunswick Center, and Princeton Junction Center).

While the US Route 1 Widening and Signal Removal would substantially increase the traffic-carrying capacity of US Route 1, this capacity increase would not significantly relieve congestion. Rather, the capacity increase would likely attract a large number of local trips to US Route 1 that otherwise use alternate routes to avoid existing congestion on US Route 1. However, unlike a limited-access highway, a widened US Route 1 with additional capacity would not result in separation of regional and local trips. The extensive commercial and office land uses along widened US Route 1 do not allow the increased road capacity to be reserved for regional and through trips, and local traffic would consume much of the capacity being provided in support of regional commutation and trucking. As a result, US Route 1 would be expected to remain heavily congested in the peak hour in the peak direction. (See Section 4.3.6 for further detail and data on the traffic improvement effects of this alternative.)

Table 2-1
Signal Removal, Interchange Construction Proposals, and Restrictions on Turning Movements at Remaining Signalized Intersections along US Route 1

Roadway Intersecting with US Route 1	Milepost	Action	Interchange Spacing
College Rd	13.70	Interchange remains	
Independence Rd	14.12	Signal remains	
Ridge (CR 522)	14.57	Signal remains	
Raymond	15.85	Remove signal, right-in/right-out	
Promenade/Stouts (CR 522)	16.47	Remove signal, new interchange	1.47
Wynwood/Whispering Woods	16.96	Remove signal, right-in/right-out	
New Road	17.54	Remove signal, new interchange	1.07
Major/Sand Hills	18.34	Remove signal, overpass @ Major to Sand Hills	
Beekman/Northumberland	19.07	Remove signal, new interchange	1.53
Deans (CR 610)	19.74	Remove signal, right-in/right-out	
Henderson (CR 610)	19.94	Remove signal, right-in/right-out	
Blackhorse	20.42	Remove signal, right-in/right-out	
Finnegans (CR 682)	20.73	Remove signal, new interchange	1.66
Aaron	21.38	Remove signal, right-in/right-out	
Commerce	21.94	Remove signal, right-in/right-out	
Cozzens/Adams (CR 608)	22.44	Remove signal, new interchange	1.71
NJ 91 Connector	22.90	Interchange remains	0.46
NJ 26 Connector	23.05	Interchange remains	0.15
North Oak Rd	23.77	Remove signal, right-in/right-out	
Shopping Center	24.15	Remove signal, right-in/right-out	
Georges Rd	24.64	Interchange remains	1.59
Milltown Rd	25.12	Interchange remains	0.48
Ryders Lane	26.42	Interchange remains	1.30
NJ Route 18	27.19	Interchange remains	0.77

Peak hour travel times between representative origins and destinations in the project study area are projected to decrease by an average of 5 to 6 percent as a result of this alternative. Peak direction travel times between US Route 1 in Plainsboro and New Jersey Turnpike Interchange 8A would be expected to improve by 10 to 15 percent.

Projected 2028 peak hour traffic conditions at 15 key intersections within the traffic study area were evaluated for the No Action and US Route 1 Widening and Signal Removal scenarios (see Section 4.2.7). During the morning peak hour, 7 of the 12 intersections are projected to have shorter average delays, while 4 are projected to have longer average delays. In the evening peak hour, 6 of the intersections are projected to have delay reductions of at least 20 percent.

Environmental Effects

The improvements proposed to increase the capacity of US Route 1 would result principally in impacts to the built environment. The US Route 1 corridor is substantially developed, as noted in the discussion above of the US Route 1 Widening alternative, and there are limited impacts to wetlands, waterways, and natural resources that would result from implementation of this alternative. These impacts are described in Section 4.3.2. Because widening US Route 1 with signal removal would not open new areas to development, and because land along US Route 1 is substantially developed or in the process of being developed, this alternative would have little potential to promote sprawl.

However, because of the extensive development around the signalized intersections along US Route 1, there are potential business dislocations that are likely to result from this alternative. While the widening of US Route 1 would occur principally within the existing right-of-way, electrical and storm drainage utilities along the highway and around the intersections would require relocation, a potentially costly endeavor. More importantly, the removal of signalized intersections and replacement with interchanges would require the acquisition of new rights-of-way that would dislocate many existing businesses.

As described below, the additional land requirements for construction of six new interchanges greatly expands the land requirements of the US Route 1 Widening alternative, and increases the cost of the widening alternative to include acquisition of commercially valuable lands and the construction cost for such intersection improvements. Previous public discussion on US Route 1 improvements in general, and regarding replacement of intersections with interchanges, by municipalities along the US Route 1 corridor, specifically North Brunswick, indicates that upgrading signalized intersections to grade separated interchanges is not desirable, due to the land use impacts and restrictions on local turning movements at remaining intersections. US Route 1 is a long-established major highway exhibiting linear (principally commercial) development. Widening with signal removal would reinforce its character as a regional business-oriented highway.

Proposed Cozzens Lane-Adams Lane Interchange. It is likely that a new ramp from westbound Adams Lane to northbound US Route 1 would have to be routed through the eastern end of the vehicle storage area at an existing auto dealership. The ramp would probably be located in an area currently occupied by a towing and service center, and the ramp could also impact a gas station on US Route 1 north of the existing intersection.

Finnegans Lane Interchange. A new grade separated interchange at Finnegans Lane would likely include a ramp connecting eastbound Finnegans Lane to southbound US Route 1, and the new ramp would likely displace a gas station in the southwest quadrant of the existing intersection. The same ramp could (pending more detailed design) also displace one or two single-family residences on the south side of Finnegans

Lane. Constructing interchange ramps connecting northbound US Route 1 with Finnegans Lane could displace one of the catenary towers along the power line easement extending southeast from the existing intersection. A new ramp from southbound US Route 1 to westbound Finnegans Lane would likely pass close to a religious facility and the eastern end of a townhouse development, but would not directly interfere with use of either of these facilities.

Beekman Road-Northumberland Way Interchange. Constructing a new grade-separated interchange at Beekman Road and Northumberland Way would not interfere with any developed land use, but could (pending more detailed design) remove approximately 6 acres of open land from agricultural use.

New Road Interchange. Constructing ramps connecting northbound US Route 1 with New Road may displace a new furniture store on the east side of US Route 1 north of the existing intersection. A ramp connecting northwest-bound New Road with northbound US Route 1 may also displace two single-family homes on the northeast side of New Road. Constructing ramps connecting southbound US Route 1 with New Road may displace a gas station in the southwest quadrant of the existing intersection. These ramps may also displace a single-family home on the west side of US Route 1 southwest of the Exxon Station.

Route 522 Interchange. It is anticipated that the ramps required for a new US Route 1-Route 522 interchange would be concentrated in the undeveloped southwest and southeast quadrants of the existing intersection. This would have minimal impact on existing developed land uses, but would remove up to 8 acres of land from agricultural use. A surface-level ramp from southbound US Route 1 to eastbound Route 522 was completed in the southwest quadrant in 2006.

Summary

The socioeconomic impacts of this alternative are anticipated to be high due to land acquisition, business dislocation, impacts to business operations, and utility relocation impacts and costs. The implementation of signal removal and replacement with grade-separated interchanges has been previously considered by NJDOT. Meetings with NJDOT indicate that proposals to replace additional intersections with interchanges (as outlined in this section) have not been included in NJDOT's capital plans and funding proposals, because past evaluations have indicated limited effectiveness and high cost. Before being considered for inclusion in NJDOT's capital plan, the funding availability, cost effectiveness of the improvements, and the permit and implementation potential would need to be evaluated in detail by NJDOT.

However, because the US Route 1 Widening with Signal Removal alternative has the potential to meet, to some degree, the project purpose—improvement of regional mobility--in part by providing improved linkage with the New Jersey Turnpike at Interchange 9, the benefits and impacts of this alternative are evaluated in more detail in Section 4, Impacts of the Proposed Project and Alternatives.

2.6 New Roadway Facilities

This group of alternatives involves the construction of new roadway alignments to carry local and regional auto and truck traffic. The new roadway facilities are generally aligned in an east-west direction, in response to the need to provide improved linkage between US Route 1 and the New Jersey Turnpike (see Section 1). This group of alternatives is illustrated in Figure 2-3.

2.6.1 Proposed Route 92

Over the past 20 years, planning, discussion, and conceptual design of an east-west connector highway resulted in the identification of a wide range of potential routes and western terminating points for such an east-west highway. The current design for Route 92 as proposed by NJTA has been revised and improved over the years to reduce the potential environmental and socioeconomic impacts of the project. Proposed Route 92, as evolved to the current design, is NJTA's preferred alternative. USACE, the preparer of this EIS, is neither an opponent nor a proponent of the NJTA proposal, and the full range of decision options regarding the permit application is available to the USACE district engineer.

The current design for proposed Route 92 involves construction of a 6.7 mile, four-lane limited-access toll highway, serving as an east-west transportation link connecting US Route 1 in South Brunswick Township to the New Jersey Turnpike at Interchange 8A. The proposed western terminus would be a grade-separated interchange at US Route 1 just north of Ridge Road. From that interchange, the alignment would travel southeast, crossing Ridge Road, then swing east and cross the Amtrak rail line. On the east side of the Amtrak line the alignment would continue eastward, running just south of the east-west portion of Friendship Road. After crossing Miller Road, the alignment would cross Friendship Road, turn southeast along the north side of Friendship Road, then recross Friendship Road just before reaching US Route 130. On the east side of US Route 130, the alignment would proceed along existing Route 32 to the New Jersey Turnpike at Interchange 8A. The 0.9-mile section of proposed Route 92 between US Route 130 and Interchange 8A of the New Jersey Turnpike would be constructed at grade and would consist principally of widening existing Route 32.

Proposed Route 92 would consist of two 12-foot-wide lanes in each direction with 12-foot-wide right shoulders. The travel lanes would be divided by a median of varying widths. A 36-foot-wide median (two 5-foot-wide left shoulders separated by a 26-foot-wide grassed area) is proposed between US Route 1 and US Route 130, except through the Devil's Brook wetland system where, for a length of approximately 3,750 feet, a 13-foot median (two 5-foot-wide left shoulders separated by a 3-foot-wide concrete median barrier) is proposed (to minimize wetland impacts). A concrete median barrier is also proposed for the segment between US Route 130 and Interchange 8A of the New Jersey Turnpike.

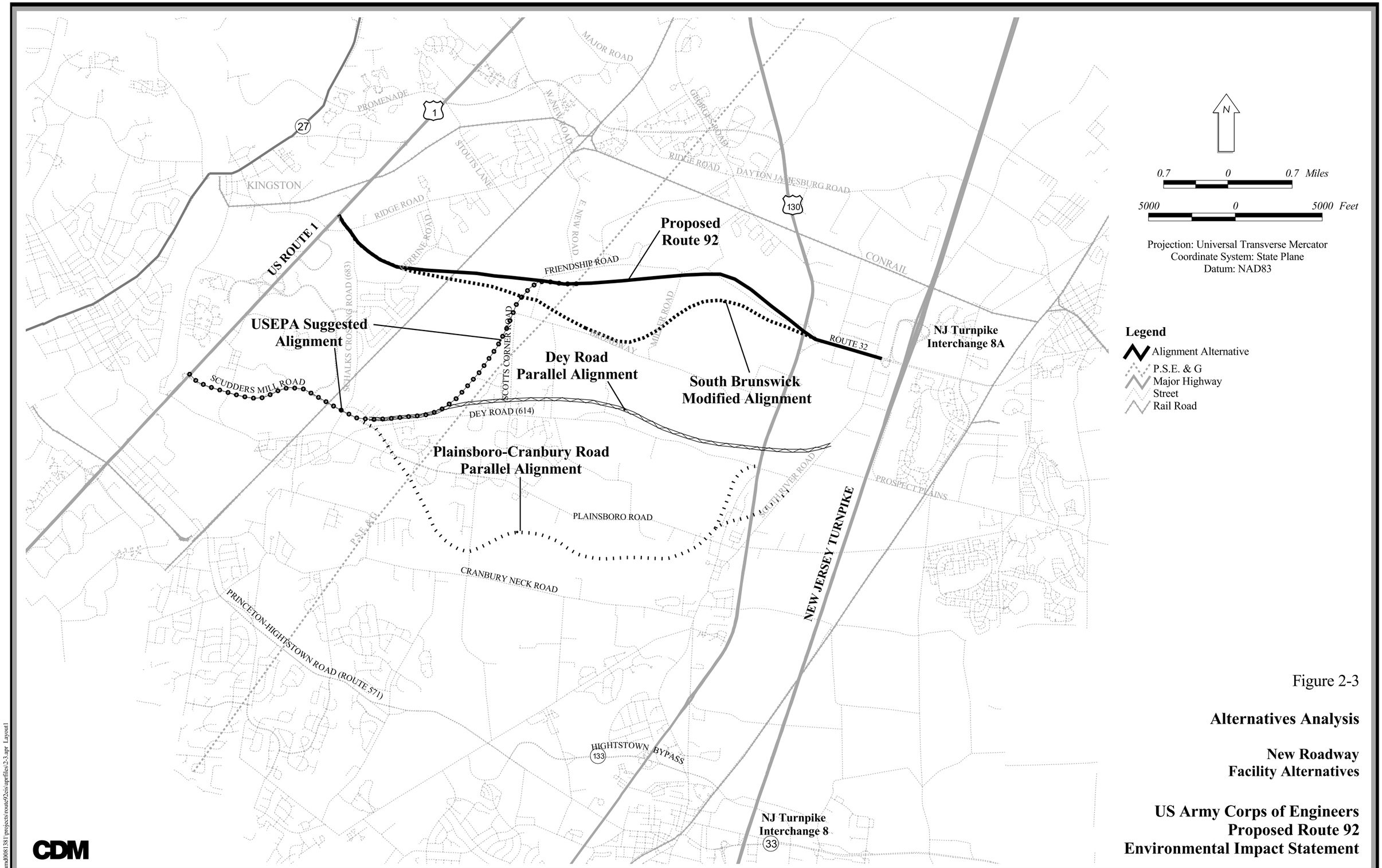

Figure 2-3

Alternatives Analysis

New Roadway Facility Alternatives

US Army Corps of Engineers
Proposed Route 92
Environmental Impact Statement

CDM

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Proposed Route 92 includes improvements to existing local roadways at the proposed interchanges of Route 92 with: US Route 1, Perrine Road, US Route 130, and New Jersey Turnpike Interchange 8A. Additionally, the project would require the construction of bridges over US Route 1, Ridge Road, Amtrak Northeast Corridor, Devil's Brook and associated floodway, Friendship Road (twice), Miller Road, US Route 130, Cranbury-South River Road, relocated Route 32 westbound and New Jersey Turnpike Interchange 8A ramps. A bridge would also be constructed to carry relocated Perrine Road over proposed Route 92. A proposed toll plaza facility would be constructed west of US Route 130. Approximately 147 acres of impervious surfaces would be added by this project.

History of the Western Terminus of Proposed Route 92

The *Middlesex County Short Range and Post 1990 Transportation Plan and Program* (October 1985) included the construction of an east-west connector road from New Jersey Turnpike Interchange 8A to US Route 206 in Montgomery Township. The DEIS prepared by NJDOT in 1986 evaluated two alignments, one of which came to be called the NJDOT Preferred Alignment. A revised design, originally evaluated in the 1994 NJTA DEIS, was developed specifically to minimize potential impacts to wetlands in the proposed project corridor. As evaluated in the 1994 DEIS, proposed Route 92 did not extend to US Route 206, but did include a connection from US Route 1 to NJ Route 27 in Franklin Township, a distance of approximately one mile. The DEIS revealed that the project corridor between US Route 1 and NJ Route 27 presented significant environmental constraints (including wetlands and forested open space). As a result, the US Route 1 to NJ Route 27 segment was eliminated from the scope of the overall project. NJTA planning for proposed Route 92 progressed with the termination of the roadway at US Route 1, which is the final design of the proposed project.

Traffic Network Effects

The traffic and transportation impacts of proposed Route 92 are discussed in detail in Section 4. A detailed traffic analysis demonstrates the following effects of the implementation of proposed Route 92:

- Given the increasing levels of congestion currently experienced on US Route 1 and local east-west roads linking US Route 1 and the New Jersey Turnpike, a regional highway such as proposed Route 92 would help maintain mobility in the region.

- By 2028, the limited access east-west highway would divert 18 percent of the westbound morning auto traffic from local roads, and 28 percent of the eastbound evening auto traffic from local roads.

- By 2028, the limited access east-west highway would divert 48 percent of the westbound morning truck traffic from local roads, and 69 percent of the eastbound evening truck traffic from local roads.

- Traffic using local east-west connector roads, such as Dey Road, Plainsboro Road, and Route 522, would be reduced in volume in the future by approximately 20 percent if proposed Route 92 were implemented. Without proposed Route 92, traffic on these local east-west routes will reach saturation capacity by 2015.

- Proposed Route 92 would draw regional through-traffic away from local roads. This would make local driving more amenable and efficient and facilitate walking and bicycle riding. Removal of through traffic from neighborhood centers would increase the centers' attractiveness and would tend to strengthen the identification of residents with their communities while allowing more efficient development designs.

- Because it would provide a direct east-west connection between US Route 1 and the New Jersey Turnpike, proposed Route 92 would improve traffic flow on US Route 1 by diverting long-distance regional traffic onto the New Jersey Turnpike, which can absorb the increased traffic because of Turnpike capacity expansions implemented over the past 15 years. Although proposed Route 92 would be a toll facility, the reduction in travel time for commercial drivers, commuters, and other drivers is expected to outweigh the toll disincentive. The traffic modeling conducted for this EIS, which predicts a high level of use for proposed Route 92, factors in the effects of the toll that will be collected.

Air Quality

The air quality impact analysis indicates that air quality would improve with or without proposed Route 92, primarily in response to more stringent federal emissions standards. With Route 92, regional vehicular emissions of carbon monoxide (CO), nitrogen oxides (NOx) and volatile organic compounds (VOCs) would be reduced by 35 to 88 percent compared to existing conditions. CO and VOC reductions would be slightly smaller without Route 92. With Route 92, CO ambient concentrations at the worst congested intersections in the study area would also be further reduced. See Section 4 for additional details on the air quality effects of this alternative.

Wetland and Land Use Effects

Proposed Route 92 would require fill in approximately 11.58 acres of wetlands and 0.45 acres of open water subject to federal jurisdiction. An additional 2.9 acres of wetlands would be temporarily impacted during construction and restored upon completion of construction (Section 4 provides additional detail regarding the wetland impacts of proposed Route 92). Proposed Route 92 also requires seven crossings of watercourses, and would pass through the northern end of the Plainsboro Preserve. The Plainsboro Preserve is a public open space preservation area in Plainsboro Township, with a right-of-way reserved by the Township in anticipation of Proposed Route 92.

NJTA proposed Route 92 would not impact Agricultural Development Areas (ADAs) or Farmland Preservation Areas. ADA's and Farmland Preservation Areas are locations delineated under the NJ Farmland Preservation Program as priority agricultural

preservation areas. This alternative would directly impact approximately 210 acres of land used for agricultural purposes (that are not within delineated ADA's or Preservation Areas) and would complicate access to an additional 78 acres of active agricultural land.

Although proposed Route 92 would cross undeveloped lands, no direct access would be available to those adjacent lands either via frontage or via connecting local roads (except at interchanges at the eastern and western terminuses) because proposed Route 92 is designed as a limited access highway. For this reason, proposed Route 92 would not create opportunities for linear development along its route, and direct access to nearly undeveloped lands would only be possible in the interchange areas. No interchanges are proposed along the road segment between Perrine Road and US Route 130, where the majority of the undeveloped land is present, and thus proposed Route 92 could not connect to local or cross streets that might provide access to new land for development. Induced development impacts could potentially occur at the interchanges of proposed Route 92 with US Route 1, Perrine Road, US Route 130 and New Jersey Turnpike Interchange 8A. However, these interchange areas have either already been extensively developed, or are zoned for development, because of the proximity of these lands to US Route 1 and the extensive office development that currently exists in this area (between US Route 1 and the Northeast Corridor railway). While the four interchanges may accelerate existing development trends for nearby parcels, proposed Route 92 is not expected to change the final amount of development anticipated in these areas because these areas are already planned for development. Development in these locations remains under the jurisdiction of the municipal development review process, and occurs under the guidance of municipal Master Plans.

Socioeconomic Effects

Acquisition of the right-of-way for proposed Route 92 and associated interchanges would displace four residences and one business.

Summary

Traffic modeling conducted for this EIS indicates that the project purpose of improving regional mobility is achieved by proposed Route 92. This alternative is also effective in reducing traffic congestion in the region and in removing truck traffic from local roads. This alternative would have greater wetland impacts than many of the alternatives, and impacts to greater areas of parkland and farmland, but would have lower impact on residences, businesses and public facilities than most alternatives. Importantly, because this alternative provides only limited access (principally at its terminal points at and near the New Jersey Turnpike Interchange 8A and at US Route 1) it does not provide new access to undeveloped lands (consistent with New Jersey's attempts to contain sprawl). Consistent with the purpose of an east-west connector highway in this region, proposed Route 92 allows for separation of local from non-local traffic.

Because proposed Route 92 achieves project purpose and because it avoids many of the adverse impacts associated with local road capacity improvements, the impacts of NJTA

proposed Route 92 are evaluated in more detail in Section 4, Impacts of the Proposed Project and Alternatives.

2.6.1.1 Sub-alternative Designs to Proposed Route 92

Three sub-alternative designs to the proposed project have been identified. These sub-alternatives involve partial and/or phased implementation of the proposed four-lane Route 92.

The three sub-alternatives are:

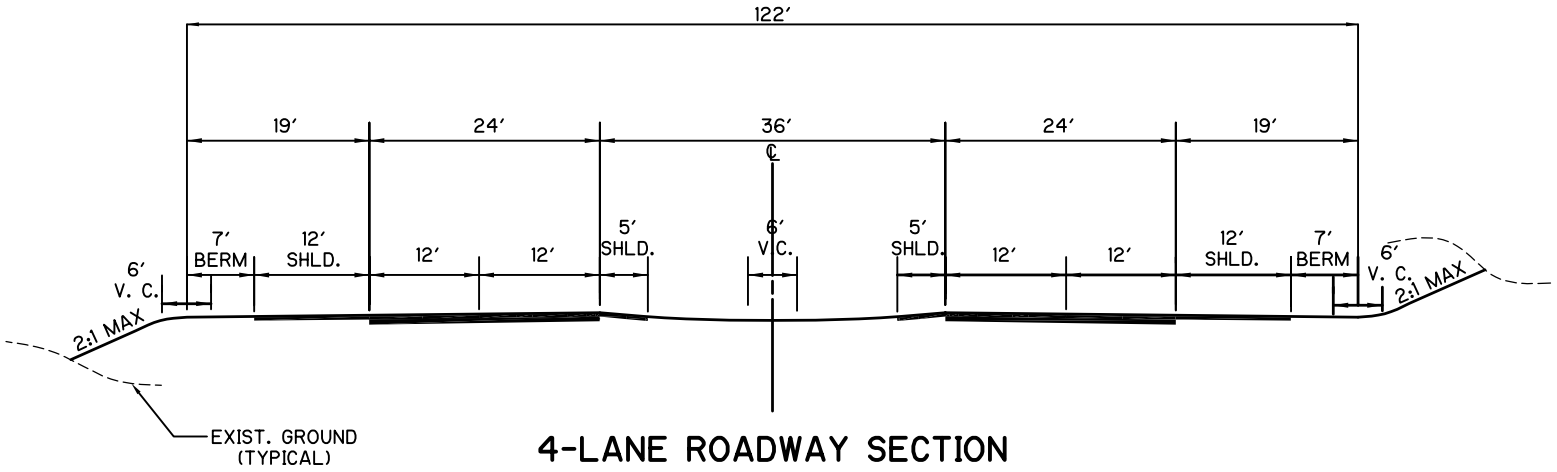
- A two-lane design for proposed Route 92 (one lane in each direction)
- Phased construction of proposed four-lane Route 92 (two-lane highway initially; demand-based expansion to four lanes at a later date)
- A four-lane or two-lane proposed Route 92, without the Perrine Road interchange

Each of the above sub-alternatives has been evaluated for transportation and environmental impacts (specifically, in terms of how their impacts may be different from the proposed four-lane Route 92 alternative). The sub-alternatives were developed to determine the degree to which they might facilitate the goals of the New Jersey State Smart Growth Program.

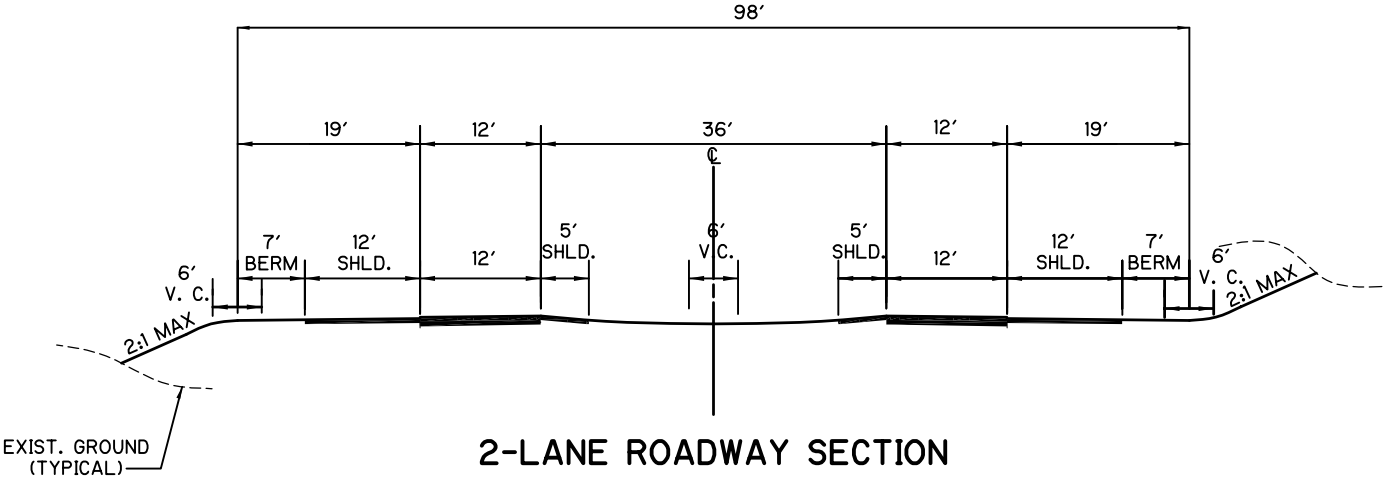
Two-Lane Route 92

A two-lane Route 92 alternative was evaluated to determine whether decreasing the roadway width would substantially decrease environmental and socioeconomic impacts (such as wetland fill and growth-inducing impacts) while still providing traffic flow improvements similar to proposed Route 92 in its four-lane configuration.

The two-lane Route 92 alternative would follow the same route and have the same interchanges as proposed Route 92. It would consist of one 12-foot-wide lane in each direction with 12-foot-wide right shoulders. For the purposes of this analysis, it is assumed that the median would vary in width in the same manner as for proposed Route 92: a 36-foot-wide median (two 5-foot-wide left shoulders separated by a 26-foot-wide grassed area) between US Route 1 and US Route 130 except for the Devil's Brook wetland system (a length of approximately 3,750 feet), which would have a 13-foot-wide median to minimize wetland impacts. A concrete median barrier (13-foot-wide median) is assumed for the segment between US Route 130 and Interchange 8A of the New Jersey Turnpike. It is also assumed that the right-of-way for a two-lane Route 92 would be reduced from 300 feet to 275 feet, corresponding to the 24-foot decrease in roadway width. A typical two-lane roadway section, juxtaposed with a typical four-lane roadway section, is shown in Figure 2-4.



4-LANE ROADWAY SECTION



2-LANE ROADWAY SECTION

SOURCE:
LOUIS BERGER & ASSOCIATES

SCALE: 1″=20′-0″

CDM

FIGURE 2-4
ALTERNATIVES ANALYSIS
ALTERNATIVE TYPICAL ROUTE 92 SECTIONS
NEW JERSEY TURNPIKE AUTHORITY
ROUTE 92
ENVIRONMENTAL IMPACT STATEMENT

It is also assumed that a two-lane Route 92 would include improvements to existing local roadways at the interchanges of proposed Route 92 with US Route 1, Perrine Road, US Route 130, and New Jersey Turnpike Interchange 8A, similar to the four-lane proposed Route 92. As in the four-lane design, the two-lane project would require the construction of bridges over US Route 1, Ridge Road, Amtrak Northeast Corridor, Devil's Brook and associated floodway, Friendship Road (twice), Miller Road, US Route 130, Cranbury-South River Road, relocated Route 32 westbound and New Jersey Turnpike Interchange 8A ramps. A bridge would also be constructed to carry relocated Perrine Road over proposed Route 92. A proposed toll plaza facility would be constructed west of US Route 130.

Traffic Network Effects

A two-lane design would have less traffic-carrying capacity than that provided by a four-lane Route 92. For this reason, this sub-alternative is less effective in achieving the goal of removing non-local traffic from the local east-west roads in the study area. This is demonstrated by analyzing the sub-alternatives using the detailed "Central Jersey" traffic model developed for this project. The results are summarized in tables 2-2, 2-3 and 2-4.

As shown in Table 2-3, a two-lane Route 92 would be less effective in removing non-local traffic from local east-west roads, as compared with proposed Route 92. Relative to the No-Build condition, morning non-local westbound autos would be reduced by 5 percent, as opposed to 18 percent for proposed Route 92. Morning non-local westbound trucks would be reduced by 19 percent, as opposed to 46 percent for proposed Route 92. By 2028, a two-lane Route 92 could remove only 60% of the non-local traffic from local roads that a four-lane Route 92 would. Because a two-lane Route 92 would not remove as much traffic from the local road network it would be less effective in maintaining the quality of the neighborhoods in the project area, and in facilitating a variety of local transportation options (such as walking and bicycling). Furthermore, traffic modeling shows that a two-lane Route 92 would have reached 90% of peak-hour capacity in 2001, and would reach its peak-hour capacity in 2008. This suggests that a two-lane Route 92 would reach its peak-hour capacity within a year or two of its earliest completion. Consequently, a two-lane Route 92 could not provide the same improvement in regional mobility that a four-lane Route 92 could provide.

Air Quality

An air quality screening-level regional emissions modeling analysis was conducted to assess the air quality impacts of the three sub-alternatives compared to proposed Route 92. The emissions modeling analysis was conducted using the USEPA MOBILE 6.2 model to estimate nitrogen oxide (NO_x), carbon monoxide (CO) and volatile organic compound (VOC) emission factors in grams per vehicle mile traveled (g/VMT) for each sub-alternative. The MOBILE 6.2 input files representing the study area were obtained from the North Jersey Transportation Planning Authority (NJTPA). The transportation modeling provided regional VMT and travel speeds for the entire transportation study

area for each sub-alternative. The VMT data and the MOBILE 6.2 results were used to calculate NO_x, CO and VOC emissions in tons per day.

Table 2-2
2028 Non-Local Peak Hour Traffic Crossing Screenline on Local East-West Roads

Scenario	AUTOS				TRUCKS			
	AM		PM		AM		PM	
	E/B	W/B	E/B	W/B	E/B	W/B	E/B	W/B
No-Build	2,141	3,472	2,450	1,652	95	132	86	89
Proposed Route 92	2,072	2,842	1,760	1,437	74	72	26	51
Two-Lane Route 92	2,096	3,297	1,940	1,416	82	107	30	53
Proposed Rt. 92 w/o Perrine Rd Interchange	2,078	2,845	1,861	1,453	72	68	35	49

Table 2-3
Change in 2028 Non-Local Peak Hour Traffic Crossing Screenline on Local East-West Roads
(Relative to No-Build)

Scenario	AUTOS				TRUCKS			
	AM		PM		AM		PM	
	E/B	W/B	E/B	W/B	E/B	W/B	E/B	W/B
No-Build	0%	0%	0%	0%	0%	0%	0%	0%
Proposed Route 92	-3%	-18%	-28%	-13%	-22%	-46%	-69%	-43%
2-lane Route 92	-2%	-5%	-21%	-14%	-14%	-19%	-65%	-41%
Proposed Rt. 92 w/o Perrine Rd Interch.	-3%	-18%	-24%	-12%	-24%	-48%	-59%	-45%

Table 2-4
Change in 2028 Non-Local Peak Hour Traffic Crossing Screenline on Local East-West Roads
(Relative to Proposed Route 92)

Scenario	AUTOS				TRUCKS			
	AM		PM		AM		PM	
	E/B	W/B	E/B	W/B	E/B	W/B	E/B	W/B
Proposed Route 92	0%	0%	0%	0%	0%	0%	0%	0%
2-lane Route 92	1%	16%	10%	-1%	11%	49%	15%	4%
Proposed Rt. 92 w/o Perrine Rd Interch.	0%	0%	6%	1%	-2%	-5%	34%	-4%

The emissions loading data in Table 2-5 show a reduction of CO, VOC and NO_x for all 2028 sub-alternatives compared to proposed Route 92. Each 2028 alternative produces similar NO_x and VOC emission loadings. However, the four-lane proposed Route 92 produces the smallest loadings for CO when compared to the 2028 No-Build alternative, resulting in a 7.9% reduction in VOC emissions and nearly a 1.4% reduction in CO emissions compared to the No-Build alternative. The two-lane Route 92 alternative results in a 5.2% reduction in VOC emissions and less than a 1% reduction in CO emissions compared to the No-Build alternative.

Table 2-5
Total VOC, CO, and NO_x Loadings

Year	Scenario	VOC (tons/day)	CO (tons/day)	NO_X (tons/day)
2001	Existing	1.17	22.39	1.81
2001	2-Lane Route 92	1.14	22.24	1.80
2028	No-Build	0.38	14.71	0.22
2028	2-Lane Route 92	0.36	14.57	0.22
2028	Route 92 w/o Perrine Road Interchange	0.35	14.54	0.22
2028	4-Lane Route 92	0.35	14.51	0.22

Noise

The transportation analysis predicts that the two-lane road would be operating at 90% capacity westbound in the morning peak hour if it had been open in 2001 and at 100% capacity by 2008. The two-lane design alternative at full capacity would generate lower noise levels than proposed Route 92 at each of the sensitive receptors because the edge of the roadway would be slightly further from the receptors and there would be an approximately 50-percent reduction in peak hour traffic volumes compared to the four-lane proposed highway. It is anticipated that the reduction in peak hour noise levels would be "perceptible" to "substantial" (5 to 10 dBA according to FHWA guidance) for those sensitive receptors identified within the corridor area. By 2028, the traffic volumes for the two-lane alternative would be approximately 25 percent lower than proposed Route 92; therefore, peak hour noise levels would still be lower than the four-lane alternative, but the difference in noise levels would be "perceptible" (about 5 dBA) and not "substantial" (about 10 dBA).

Wetlands

A two-lane Route 92 would reduce the required fill in wetlands by approximately 2 acres over proposed Route 92; approximately 9.5 acres of wetland subject to federal jurisdiction would be filled under this alternative. The amount of additional wetlands subject to temporary impact during construction and restored upon completion of construction would remain approximately 2.5 acres. A two-lane Route 92 would require seven crossings of watercourses, the same as the four-lane design.

Vegetation and Habitat

A narrower two-lane Route 92 would reduce the direct impact to vegetation and wildlife habitat by approximately 20 acres in a narrow band along the highway. This would include wetland, forested wetland and upland, grassland, and agricultural land. Like proposed Route 92, it would pass through the northern end of the Plainsboro Preserve, a public open space preservation area in Plainsboro Township.

Water Resources

Approximately 80 acres of impervious surfaces would be added by this project (roughly 20 acres less than the proposed four-lane Route 92). Therefore, runoff from a two-lane Route 92 would be somewhat less than from the proposed four-lane roadway. It is assumed that the stormwater retention facilities proposed for the four-lane Route 92 would also be built, at an appropriate scale, for a two-lane highway. Therefore, runoff quality and infiltration would remain approximately the same for either alternative.

Farmland

Assuming that the right-of-way of a two-lane Route 92 would be reduced from 300 feet to 275 feet, approximately 90 fewer acres of farmland would be taken compared to the proposed Route 92. However, a two-lane Route 92 would still pass through active farmland and would indirectly impact (by bisecting several fields) roughly the same acreage of farmland as the proposed Route 92.

Visual

The decrease in visual impacts from a two-lane Route 92 would be minimal, as the highway would have the same route and grade. Since some impacted residents would be slightly further away from the highway and the roadway itself would be narrower, the visual impact would be slightly reduced, as compared to proposed Route 92.

Land Use

A two-lane Route 92 would slightly decrease direct impacts to land use, including farmland, since the highway right-of-way would decrease by 25 feet. However, this acquisition would likely require the same property displacements as proposed Route 92. As with proposed Route 92, the two-lane alternative would cross currently undeveloped lands but no direct access would be available to these parcels because Route 92 is proposed as a limited access highway. As noted for the Proposed Route 92 alternative, induced development impacts could potentially occur at the interchanges with US

Route 1, Perrine Road, US Route 130 and New Jersey Turnpike Interchange 8A. However, these interchange areas have either already been extensively developed, or are now zoned for development. While the four interchanges may accelerate existing development trends for nearby parcels, a two-lane Route 92 is not expected to change the final amount of development anticipated in these areas. Development in these locations remains under the jurisdiction of the municipal development review process, and occur under the guidance of municipal Master Plans.

Because of its partial ability to relieve traffic on local roads, provide a separate route for regional and commercial traffic, and thereby improve regional mobility, this sub-alternative was determined to partially meet the project purpose and need. Issues include traffic safety, which is a concern when no passing opportunities are available and truck and commercial traffic will be significant. The environmental effects of this sub-alternative are very similar to the impacts of the four-lane proposed Route 92, but the ability to provide needed capacity is reduced by more than 50%, because only two lanes would be constructed, and because of the lack of passing opportunities. For these reasons, this sub-alternative is not analyzed further.

Phased Route 92

Under this sub-alternative, phased construction of the proposed four-lane Route 92 would take place. Initially, Route 92 would be built as a two-lane highway, with expansion to four lanes completed at a later date when travel demand requires.

Traffic Network Effects

The traffic model estimates that a two-lane Route 92 would have already been operating at 90 percent of capacity westbound in the morning peak hour if it had been open in 2001 and would be at 100% capacity by 2008. This strongly suggests that a "phased" approach would be inefficient from a planning perspective, since the highway's ability to further divert non-local traffic from the local east-west roads would already be constrained at the time of its opening as a two-lane road. Hence, current travel behavior would lead to use of nearly the full capacity of a two-lane facility if it were implemented today. A two-lane design would not accommodate significant projected increases in travel demand that results from build-out of already-approved development projects in the region. The traffic model indicates that a phased approach requires that the additional two lanes be built almost immediately following construction of the initial two lanes.

Environmental and Socioeconomic Effects

A phased Route 92 would ultimately be built to the proposed design specifications. Therefore, the impacts of this sub-alternative would be the same as for proposed Route 92, but would occur in a phased manner, over time.

The phased Route 92 sub-alternative was determined to meet the project purpose and need and is therefore analyzed further in Section 4.

Proposed Route 92 without the Perrine Road Interchange

A four-lane or two-lane Route 92 without the Perrine Road interchange would follow the same route and have the same interchanges in the other locations as the proposed Route 92 project. For the purposes of this analysis, it is assumed that other than the deletion of the Perrine Road interchange, the proposed relocated Perrine Road east and west of Schalks Crossing Road and the removal of Research Way would occur (see Figure 2-5).

Compared to the proposed four-lane Route 92 with the Perrine Road interchange, the deletion of the Perrine Road interchange alters the transportation and environmental impacts from a four-lane design as noted below.

Traffic Network

The removal of the Perrine Road interchange results in removing slightly less non-local traffic from east-west local roads, but the impact is relatively small. Removal also reduces local circulation and access options for the office development area between Schalks Crossing Road and US Route 1 (Forrestal Center and others). As a result, vehicle-miles of travel (VMT) are projected to increase (by more than 1,600 miles in the morning peak hour alone) as many people traveling to and from this development area would need to use more circuitous routes, adding traffic and congestion to Route 1 and other roadways. The largest increase in volume would be on US Route 1 between Route 92 and College Road, which would carry an additional 200-300 southbound vehicles in the morning peak hour, and a similar additional number of northbound vehicles in the evening peak hour.

The more severe traffic impacts, however, would occur on the lower-capacity local roads connecting US Route 1 with the office development area. Impacts would be most severe on Ridge Road between US Route 1 and Schalks Crossing Road, and on College Road east of Route 1. The traffic increases on these roads (eastbound in the morning peak and westbound in the evening peak) are projected to be about 20 percent of these roads' capacities, which are already expected to be exceeded even if the Perrine Road interchange is built.

Total projected morning peak hour VMT are 321 hours higher than for the proposed Route 92 (this is 12 minutes for each additional vehicle-mile, implying an average speed of 5 mph for the added VMT). Eliminating the Perrine Road interchange would mean not taking full advantage of the investment in Route 92 to achieve mobility improvements in the area.

Air Quality

Route 92 without Perrine Road interchange results in a 7.9% reduction in VOC emissions but only a 1.2% reduction in CO emissions compared to the No-Build alternative (see Table 2-5).

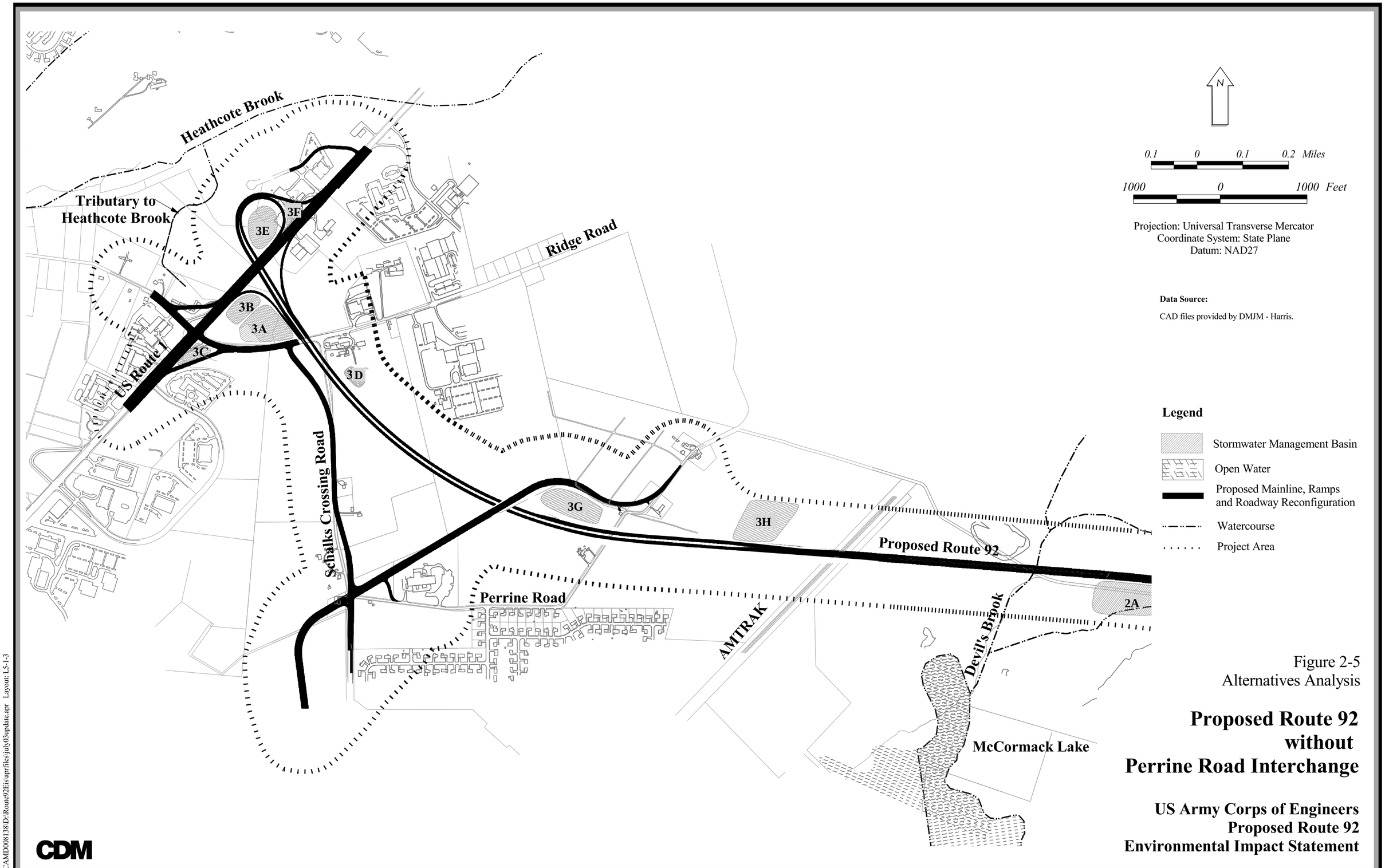


Figure 2-5
Alternatives Analysis

Proposed Route 92 without Perrine Road Interchange

US Army Corps of Engineers
Proposed Route 92
Environmental Impact Statement

\\CAMD008138\D:\Route92Eis\aprfiles\july03update.apr Layout: L5-1-3

Noise

Deletion of the Perrine Road interchange is not expected to perceptibly change noise levels generated by proposed Route 92.

Wetlands

No wetlands are present in the immediate area and thus no reduction in wetland impacts would result from eliminating the Perrine Road interchange.

Vegetation and Habitat

Deletion of the Perrine Road interchange would eliminate the removal of approximately 5 acres of upland currently in agricultural use.

Water Resources

Deletion of the Perrine Road interchange would eliminate approximately 1 acre of impervious surfacing, resulting in a slight reduction of stormwater runoff. The proposed stormwater retention facilities would lead to similar runoff water quality and recharge as for the four-lane highway.

Farmland

Deletion of the Perrine Road interchange would avoid the loss of approximately 5 acres of currently active farmland.

Visual

The primary visual effect of deleting the Perrine Road interchange is to eliminate the visual impact of the ramps on the residences fronting Perrine Road in the Princeton Collection development, on the residences along Perrine Road in the vicinity of the proposed interchange and on the facility formerly occupied by "Films for Humanities and Sciences" at 12 Perrine Road, immediately south of the proposed relocated Perrine Road.

Land Use

Elimination of the Perrine Road interchange would avoid the permanent presence of the interchange and its impact on the Perrine Road homes near the interchange, but would not significantly alter development patterns in the area. The Northeast Corridor railroad tracks forms a north-south linear barrier to the east of the proposed Perrine Road interchange. The railroad tracks are crossed by local roads in only a very few locations; most local roads and development end at the rail barrier. Because proposed Route 92 would not provide new access to the local road system east of the Northeast Corridor railroad tracks, potential induced development from proposed Route 92 in the area to the east of the rail line would remain highly constrained. The area between US Route 1 and the Northeast Corridor railroad tracks, surrounding the proposed interchange, is already extensively developed, and is zoned by the local government for further development.

The proposed Route 92 without the Perrine Road Interchange sub-alternative was determined to almost fully meet the project purpose and need. However, because the induced development potentially caused by constructing the Perrine Road interchange is limited and attributable mostly to current zoning designations, this sub-alternative is not expected to exhibit any significantly lower growth-related environmental impacts than if the interchange were built. Because the traffic effects on US Route 1 and local roads that result if this interchange is not built are significant (without the improved access provided by this interchange), and because proposed Route 92 without this interchange would not be as effective in reducing congestion this sub-alternative is not analyzed further.

2.6.2 USEPA Suggested Alignment

In 1997 USEPA Region 2 requested that NJTA evaluate an additional alternative alignment for proposed Route 92. This alternative has come to be called the USEPA Suggested Alignment. It would have a total length of approximately 9 miles. The eastern 4 miles would follow the same route as the eastern 4 miles already proposed by NJTA for Route 92. The two alignments diverge at a point near the intersection of Friendship Road and Turkey Island Road, on the Plainsboro-South Brunswick border. At this point the USEPA Suggested Alignment curves to the southwest, enters the 630-acre Plainsboro Preserve at its northeastern corner and crosses the preserve to the east of McCormack Lake. The alignment then passes through the middle of Plainsboro Community Park. Southwest of the park, the alignment curves to the west and parallels Dey Road until reaching Scudders Mill Road. The alignment then ties into Scudders Mill Road and continues west to US Route 1. The length of the USEPA Suggested Alignment from its point of divergence from the proposed Route 92 alignment to US Route 1 is approximately 5 miles.

The USEPA Suggested Alignment would be a four-lane limited access highway except for a 2.1-mile section on Scudders Mill Road at the western end of the alignment. The portion of Scudders Mill Road that is included in the USEPA Suggested Alignment would require widening from four to six lanes as well as improvements at major intersections. The bridges over Devil's Brook and the Amtrak rail line would require widening, as would the US Route 1 bridge over the Millstone River. Based on its conceptual design, the function and effect of the USEPA Suggested Alignment with respect to the regional road network would be similar to proposed Route 92. That is, it would draw through traffic away from local roads, making local driving less congested, facilitating walking and bicycling, and increasing the attractiveness of the area's neighborhood centers. Because of the greater negative impacts of this alternative (described below), the potential performance of the USEPA Suggested Alignment was not modeled.

The USEPA Suggested Alignment would be a limited access highway except where it coincides with a substantially developed segment of Scudders Mill Road. This alternative would therefore have little potential to promote sprawl development.

The USEPA Suggested Alignment would require the filling of approximately 13 acres of wetlands, and would require 10 stream crossings. The USEPA Suggested Alignment would not impact Agricultural Development Areas or Farmland Preservation Areas. However, this alternative would require acquisition of, or complicate access to, approximately 303 acres of land used for agricultural purposes. The USEPA Suggested Alignment would adversely impact 73 single-family residential units proposed or constructed as part of three subdivisions approved by the Plainsboro Township Planning Board, and 11 residences in other areas. The USEPA Suggested Alignment would also adversely impact a proposed church site and a tract proposed by Plainsboro Township for a Village Center.

A total of approximately 1.4 miles of the USEPA Suggested Alignment would be constructed on public parkland and private open space in Plainsboro Township. Southwest of the point where it diverges from proposed Route 92, the USEPA Suggested Alignment would pass through the eastern end of the Plainsboro Preserve approximately 600 feet east of McCormack Lake and approximately 400 feet east of the New Jersey Audubon Society Environmental Education Center at the preserve.. The USEPA Suggested Alignment would require acquisition of approximately 19.3 acres of the Preserve. The USEPA Suggested Alignment would cross the access road to the Preserve off Scotts Corner Road, requiring construction of a new route for public access to the Preserve.

The USEPA Suggested Alignment would pass through the center of Plainsboro Community Park, which contains several ball fields and other recreational facilities. The USEPA Suggested Alignment would require the acquisition of 8.3 acres of the park and would render an additional 10.1 acres inaccessible.

In addition to its impacts on public parkland and open space, the USEPA Suggested Alignment would require acquisition of approximately 20 acres of private land proposed for open space purposes as part of the residential subdivisions of Wicoff Estates and Windwood at Plainsboro. Total direct impacts of the USEPA Suggested Alignment to parkland and open space would be 48 acres.

The USEPA Suggested Alignment exhibits wetland and agricultural impacts comparable to those of proposed Route 92, but would exhibit greater impacts to parkland and open space. This alternative would also require extensive residential dislocation. The USEPA Suggested Alignment would not be as efficient in meeting project purpose as other alternatives because it requires a greater distance of highway construction for similar capacity improvements and because it relies on a 2.1-mile stretch of Scudders Mill Road. For these reasons this alternative was not analyzed further.

2.6.3 Dey Road Parallel Alignment

The design of the Dey Road Parallel Alignment would consist of three sections:

- A western section of approximately 2.1 miles connecting to US Route 1 via Scudders Mill Road in Plainsboro Township.

- A middle section consisting of approximately 5.4 miles of new roadway running parallel to, and an average of 2,000 feet north of, Dey Road.

- An eastern section of approximately 1.4 miles that would connect to New Jersey Turnpike Interchange 8A via Route 535 in Cranbury Township and a short stretch of Route 32 at the eastern edge of South Brunswick Township.

The western and middle sections would be aligned in an east-west direction, while the eastern section would be aligned in a northeast-southwest direction. The total length of this alignment would be approximately 8.9 miles.

This alternative would require fill in approximately 3.6 acres of wetlands and would require two stream crossings. The Dey Road Parallel Alignment would displace approximately 63 single-family residences and four commercial structures.

This alternative would cause the loss of approximately 78 acres of active agricultural land, including approximately 27 acres managed under the New Jersey Farmland Preservation Program. Under the Farmland Preservation Program public agencies cannot exercise the power of eminent domain to acquire land in a municipally approved Farmland Preservation Program, nor may nonfarm transportation facilities be built, unless the Governor declares that the action is necessary for the public health, safety and welfare and that there is no immediately apparent feasible alternative. (Agriculture Retention and Development Act, P.L. 1983, c.32, N.J.S.A. 4:1C-25) For this alignment, the only alternative to impacting the Farmland Preservation Areas would be to fill additional wetlands that are present north and south of Dey Road.

Because this alternative would not extend directly from US Route 1 to the New Jersey Turnpike, it would not separate regional though-traffic from local traffic. By requiring some use of local roads, the alternative would make local driving more congested and less efficient, and would discourage walking and bicycle riding. More through traffic in the community would decrease the quality of life and would tend to weaken the identification of residents with the local aspects of their community. The new roadway section could also open new areas to development because of the opportunity to build connecting roads, and driveways for commercial facilities. This would contribute significantly to sprawl.

The Dey Road Parallel Alignment, although displacing a smaller total area of wetlands than proposed Route 92, would cause relatively higher residential dislocation than other alternatives, as well as loss of farmland. Implementation of the proposed alignment

would require approval from the Governor because of the status of lands within the route under the Farmland Preservation Program. In addition, this alternative would not be effective in meeting the project purpose of improving regional mobility, because it does not connect directly to US Route 1, but relies instead on Scudders Mill Road, a local road where traffic flow is currently impeded by signalized intersections. Because the project does not meet project purpose, and because it exhibits significant adverse socioeconomic impacts, this alternative is not considered for further analysis.

2.6.4 Plainsboro–Cranbury Road Parallel Alignments (PCPA)

The Plainsboro-Cranbury Road Parallel Alignment (PCPA) would travel roughly east-west along Scudders Mill Road from US Route 1 to Dey Road in Plainsboro Township, a distance of approximately 2.2 miles. After crossing Dey Road the alignment would involve construction of a new roadway that would turn southeast and cross Cranbury Brook, then turn east and cross Davidson Road. The alignment would then cross Plainsboro-Cranbury Road approximately one mile east of Petty Road, and continue northeast toward US Route 130.

In response to a request from USEPA-Region 2, two alternative interchange designs were evaluated for the eastern terminus of the PCPA, in addition to the original design. The original design is designated PCPA-535 and the alternative interchange designs (described below) are designated PCPA-130/Dey Road and PCPA-130.

- The PCPA-535 design would cross US Route 130 and terminate at Route 535 at a new signalized intersection. The total length of the new roadway would be approximately 5.5 miles and the total length of the PCPA-535 alignment would be approximately 7.7 miles.

- The PCPA-130/Dey Road design would terminate at the existing US Route 130/Dey Road intersection, which is currently signalized. The total length of the new roadway would be approximately 5.4 miles and the total length of the alignment would be approximately 7.6 miles.

- The PCPA-130 design would also terminate at US Route 130, but at a new signalized intersection south of the US Route 130/Dey Road intersection. This alignment would be slightly shorter than the PCPA-130/Dey Road design.

The PCPA-535 design would impact a total of approximately 5.6 acres of wetlands, require four stream crossings, and adversely impact the associated floodplains. The PCPA-130/Dey Road design would impact approximately 10.1 acres of wetlands, require five stream crossings, and adversely impact the associated floodplains. The PCPA-130 design would impact approximately 5.2 acres of wetlands, require four stream crossings, and adversely impact the associated floodplains.

All three PCPA designs would require acquisition of 12 residences. In addition, each of the three designs would directly impact the Estates at Grovers Mill, a 149-lot residential

subdivision south of Plainsboro-Cranbury Road. All of the PCPA alignments would traverse the northeast corner of this development, impacting public open space and several home sites, as well as causing adverse air quality, noise and aesthetic impacts to the community.

The PCPA-535 design would impact approximately 156 acres of a Middlesex County Agricultural Development Area (ADA). The PCPA-130/Dey Road design would impact approximately 149 acres of the ADA, and the PCPA-130 design would impact approximately 156 acres of the ADA. The acres impacted by each design would include approximately 33 acres permanently protected by the Farmland Preservation Program within the ADA.

The PCPA-535 design would cross Main Street, Cranbury, near three homes listed on the National and State Registers of Historic Places. The three homes are listed on the Registers as individual resources as well as contributing resources to the Cranbury Village Historic District. The PCPA-130/Dey Road design was developed to avoid impacts to the three historic structures impacted by the PCPA-535 design. In the PCPA-130/Dey Road design, the PCPA connects to US Route 130 north of the historic structures, at the existing US Route 130/Dey Road intersection. Existing development east of US Route 130 prevents this alignment from extending across US Route 130 to Route 535.

Because this alternative would not extend directly from US Route 1 to the New Jersey Turnpike, it would not separate regional though-traffic from local traffic, nor would it remove through traffic from local roads. This would make local driving less amenable and efficient and would reduce the attractiveness of walking and bicycle riding as alternate forms of transportation. Concentration of through traffic in the community would decrease the quality of life and would tend to weaken the identification of residents with the local aspects of their community.

Because the proposed road improvements provide direct access to undeveloped land, the new roadway sections could contribute secondary impacts from induced development. Development and direct access is allowed and achievable along local roadways. Further, the local roadways being considered for improvement connect to a many other local roads that now cross and connect to the roadways being considered for improvement. For these reasons, improvement of the local road system has potential to induce extensive secondary sprawl development because it creates new access to undeveloped land.

The adverse environmental and socioeconomic impacts of these alternatives are only slightly less than those of proposed Route 92. However, none of the PCPA designs would be effective in meeting the project purpose because of their reliance on the signalized Scudders Mill Road. An alignment that includes a signalized local road can not separate regional traffic from local traffic, which is necessary to optimize regional travel while reducing local congestion. Most importantly, encumbrance of portions of

each alignment under the Farmland Preservation Program limits the implementability of each of the three PCPA designs. For the reasons presented above this alternative is not considered for further analysis.

2.6.5 South Brunswick Alignment - Modified

The recently superseded South Brunswick Township *Master Plan and Master Plan Reexamination* (Zimmerman, 1988) presented an alternative alignment for proposed Route 92. This alignment is called the South Brunswick Alignment. Because the route of the original South Brunswick Alignment would have crossed extensive wetlands associated with Broadway Swamp, it was shifted 1,600 feet to the south. The modified alignment is called the South Brunswick Alignment—Modified (SBAM).

The western 1.2 miles of the SBAM, from US Route 1 to a point approximately 0.4 miles west of the Amtrak rail line—are identical to the alignment of Route 92. West of the Amtrak line, the SBAM diverges to the southeast and at approximately its midpoint is about one-half mile south of the proposed alignment of Route 92. The SBAM rejoins the proposed Route 92 alignment at US Route 130 and follows the Route 92 alignment along Route 32 to Interchange 8A of the New Jersey Turnpike. The total length of the SBAM (6.8 miles) is essentially the same as that of proposed Route 92.

The SBAM would have minimal direct impacts on residences, businesses, public facilities and historic sites, and would contribute only slightly to sprawl; however, this alternative would result in the loss of approximately 43 acres of wetlands, approximately three times the wetland impact of proposed Route 92. Because the SBAM is south of the proposed Route 92 alignment, it would cross the full width of the northern portion of the Plainsboro Preserve rather than just its northern end, and the length of the SBAM within the preserve would be approximately twice that of Route 92. The SBAM would pass several hundred feet closer to McCormack Lake than proposed Route 92. Because this alternative exhibits substantial wetland and parkland impacts, it is not considered for further analysis.

2.7 Comparison of Alternatives

The environmental and community impacts exhibited by each of the alternatives studied in the preceding subsections were evaluated and compared. Those alternatives that were found to have comparatively greater environmental impacts, while meeting project purpose to a similar degree, were removed from further analysis. The remaining alternatives were compared, based on the degree to which they could meet the project purpose.

Because the proposed project is a non-water-dependent project, the evaluation and comparison of alternatives was subject to USEPA guidelines under Section 404(b)(1) of the Clean Water Act. The guidelines state that "no discharge of dredged or fill material shall be permitted if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, *so long as the alternative does*

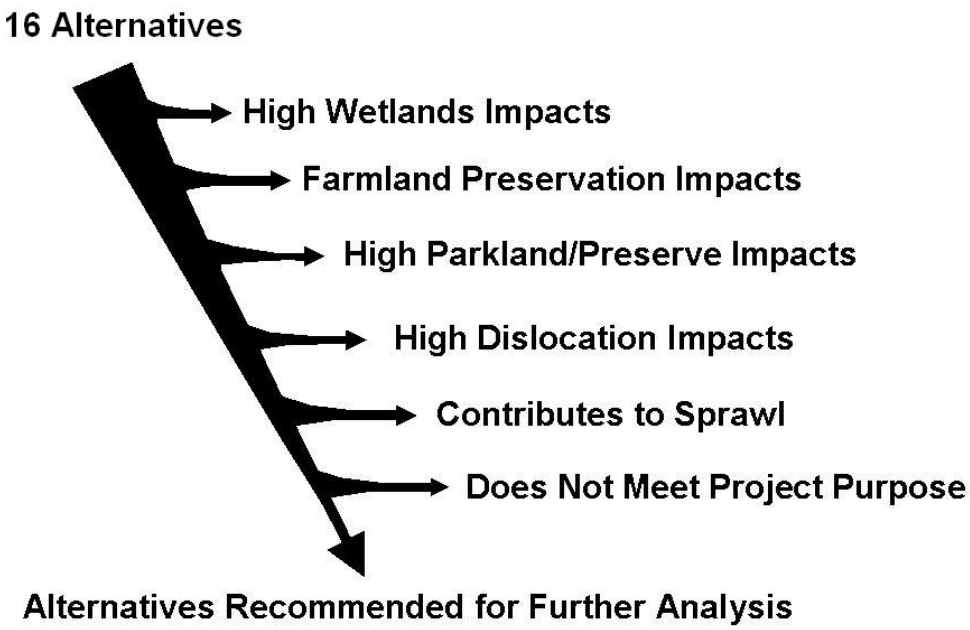
not have other significant adverse environmental consequences", and "an alternative is practicable if it is available and capable of being done after taking into consideration cost, existing technology, and logistics in light of overall project purposes." (40 CFR 230.10)

In some cases, the non-wetlands impacts (e.g., impacts to parks/preserves and socioeconomic impacts) exhibited the potential to be relatively more significant than wetland impacts because they were extensive, and could not be mitigated effectively.

Table 2-6 presents a summary of the evaluation of the alternatives. Table 2-6 presents a hierarchy of the impacts of the alternatives, with the major impacts of each alternative highlighted in the table (e.g., comparatively high wetland impact, farmland preservation impact, parkland impact, direct impact to historic sites, residential/commercial/public dislocation, contribution to sprawl, and inability to meet project purpose).

The alternatives evaluation logic is illustrated in Figure 2-6 below.

Figure 2-6
Alternatives Analysis



The results of the alternatives analysis, as summarized in Table 2-6, are presented below.

Compared to the other alternatives, the South Brunswick Alignment – Modified and Composite Local Roadway Improvements Program alternatives have greater impact to permanent wetlands and open water than almost all other alternatives. The Composite Improvements Program alternative also has substantial dislocation impacts, particularly

Table 2-6
Alternatives Evaluation Summary

Alternative	Permanent Wetland/Open Water Impacts (acres)	Impact to Preserved Farmland (acres)	Parkland Impacts	Direct Impact to Historic Sites?	Residential Impacts	Commercial Impacts	Public Facilities Impacts	Facilitates Sprawl Development	Meets Project Purpose?
South Brunswick Alignment – Modified	43.0	0	Loss of 34 acres of Plainsboro Preserve	No	n/a	n/a	n/a	Slightly	No
Composite Local Roadway Improvements Program	20.0	0	0	Yes	180	10	6	Significantly	Partial
Dey Road Parallel Alignment	3.6	27	0	No	63	4	0	Significantly	No
Plainsboro – Cranbury Road Parallel Alignments	5.6	33	Public open space part of Estates at Grovers Mill Subdivision	Depends on alignment	12	4	0	Significantly	No
USEPA Suggested Alignment	13.0	0	Loss of 38 acres of Plainsboro Preserve	No	11	0	1	Slightly	Partial
Route 522 Widening (with/without extension to New Jersey Turnpike)	2.0 / 7.0	0	Pigeon Swamp State Park impact	No	58	1	4	Significantly	No
Plainsboro – Cranbury Road Widening	0.6	0	0	Yes	41	5	2	Moderately	No
Cranbury Neck Road Widening	4.3	0	0	Yes	63	2	0	Moderately	No
USEPA Suggested Modified No-Build Alternative	1.2	0	0	No	0	0	0	No	No
Dey Road Widening	7.5	0	0	No	18	1	0	Moderately	No
NJTA Proposed Route 92 with Terminus at Route 1	12.0	0	14 acres reserved for roadway in Plainsboro Preserve	No	4	1	0	Slightly, at Perrine Road interchange	Yes
Two-Lane Route 92	9.5	0	Same as above	No	4	1	0	Slightly, at Perrine Road interchange	Partial
Phased Route 92	12.0	0	Same as above	No	4	1	0	Slightly, at Perrine Road interchange	Yes
Route 92 without Perrine Road Interchange	12.0	0	Same as above	No	4	1	0	No	Yes
US Route 1 Widening in South Brunswick	4.0	0	0	No	3	3	0	Slightly	Partial
US Route 1 Widening in SB with Signal Removal	7.7	0	0	No	8	7	0	Slightly	Partial

Shaded cells identify the principal disadvantages of each alternative.

residential dislocations (180). Both alternatives have significant potential to contribute to sprawl. Neither alternative would be effective in meeting the project purpose of improving regional mobility, because neither alternative would separate through traffic from local traffic, which is necessary to optimize regional travel. Because protection of the nation's aquatic resources, including wetlands, is a USACE priority under the Clean Water Act, these alternatives were identified as the least desirable alternatives.

The Dey Road Parallel Alignment and Plainsboro-Cranbury Road Alignment alternatives, while exhibiting lesser wetland impacts than the alternatives discussed above, have substantial impacts on farmlands preserved by law and, in the case of the Dey Road Parallel Alignment, has substantial residential dislocation impacts (63). Both alternatives have significant potential to contribute to sprawl. Neither alternative would substantially meet the project purpose of improving regional mobility, because neither would separate local and through traffic. Under New Jersey's Farmland Preservation program use of legally preserved farmland for non-farm purposes is strongly discouraged, and the legal impediments greatly restrict use of such lands for non-farm purposes. While there are several categories of farmland protection and recognition, farmland preservation is the strongest. For this reason these alternatives were identified as substantially infeasible.

The USEPA Suggested Alignment alternative has greater wetland impacts than most of the alternatives, and substantial direct and indirect parkland impacts (loss of 48 acres of Plainsboro Preserve in a heavily used part of the preserve). This alternative has only slight potential to contribute to sprawl, but would result in comparatively great impacts to the natural environment. This alternative would not fully meet the project purpose of improving regional mobility, because it relies on a 2.1-mile section of Scudders Mill Road, and would therefore not separate local and through traffic.

The Route 522 Widening alternative (with or without extension to the New Jersey Turnpike) exhibits relatively fewer wetland impacts. However, it has substantial parkland impacts with the extension to the Turnpike (Pigeon Swamp State Park) and substantial residential and public facility dislocation impacts with or without the extension. Its impacts to the Pigeon Swamp wetland complex, which has been designated as a USEPA Priority Wetland and is included in the National Register of Natural Landmarks, are significant. This alternative has significant potential to contribute to sprawl. Without the extension to the NJ Turnpike, this alternative would not meet the project purpose of improving regional mobility. With the extension to the Turnpike, this alternative still would not substantially meet the project purpose, because it would not separate local and through traffic, which is necessary to optimize regional mobility.

The Plainsboro-Cranbury Road Widening and Cranbury Neck Road Widening alternatives have relatively less wetland impact than the other alternatives, but exhibit major residential dislocation impacts (41 and 63 dislocations, respectively). These alternatives would cause great adverse social impacts to the community. These

alternatives have moderate potential to contribute to sprawl, and they would not substantially meet the project purpose because they would not separate local and through traffic, which is necessary to optimize regional travel.

The USEPA Modified No-Build alternative has few physical and socioeconomic impacts and would not contribute to sprawl, but fails to meet basic project purpose. Two of the three improvements suggested under this alternative have been implemented, and were considered to be part of the existing road system when future traffic congestion was modeled. Even though the traffic modeling analysis includes these improvements as background conditions, the traffic modeling analysis still identifies significant need for road network improvements (as described in Section 1, Project Purpose and Need, and the transportation analysis in Section 4) above and beyond the already implemented intersection improvements. While a new interchange at US Route 130 and Route 32 has not been implemented, this road system improvement would yield little benefit in improving east-west travel congestion because it does not improve travel capacity to points west of Route 130. While a new interchange would provide slightly improved linkage between the New Jersey Turnpike and Route 130, this benefit would be provided at only one of four needed interchange locations to improve linkage between north-south highways.

The Dey Road Widening alternative exhibits moderate wetland impacts (7.5 acres) and moderate residential dislocation impacts (18), and would facilitate sprawl to a moderate degree. Most significantly, the Dey Road alternative would use local roads to carry regional traffic, and does not provide an efficient connection to the New Jersey Turnpike because it increases the burden on local intersections as traffic travels toward Interchange 8A. Because this alternative does not meet project purpose and exhibits moderate wetland and residential dislocation impacts, it was identified as less desirable than other alternatives.

The two-lane Route 92 sub-alternative reduces wetland impacts by 2 acres and slightly reduces other environmental impacts over the four-lane configuration. However, it would be significantly less effective at reducing congestion and improving regional mobility by separating through traffic from local traffic. Traffic modeling shows that a two-lane Route 92 would reach 100% of its capacity by 2008. A two-lane Route 92 was determined to insufficiently fulfill the purpose of the project, because it would not adequately address projected future traffic. Similarly, a phased two-lane to four-lane Route 92 would be inefficient from a planning perspective, and would ultimately not decrease environmental or socioeconomic impacts, because the second phase would need to begin construction almost immediately upon completion of the first two lanes. However, because the phased Route 92 sub-alternative would meet the project purpose, and would temporarily avoid some environmental effects, it was considered for further analysis.

The removal of the Perrine Road interchange from proposed Route 92 would reduce the loss of farmland by approximately 5 acres, but would not significantly reduce other

adverse impacts. It is also predicted to cause more congestion on Route 1 and local roads in the area because it would provide fewer access options for the office development area that currently exists between Schalks Crossing Road and US Route 1 (Forrestal Center and others). Because the removal of the Perrine Road interchange would have limited environmental and socioeconomic benefit and would decrease the traffic improvements that would result from proposed Route 92 (and thereby increase congestion and air pollution), this sub-alternative was eliminated from further consideration.

The US Route 1 Widening in South Brunswick (with or without signal removals) and NJTA Proposed Route 92 have minor to moderate wetland and dislocation impacts and minor park and socioeconomic impacts, while fully or partially meeting the project purpose. US Route 1 Widening with signal removal would have moderate commercial dislocation impacts. Proposed Route 92 would have an impact on the northern section of Plainsboro Preserve; however, when Plainsboro Township created the preserve it anticipated construction of proposed Route 92 through the preserve.

Based on the comparative assessment of the alternatives, three action alternatives have been identified that have low to moderate wetland impacts, do not cause substantial adverse physical and/or socioeconomic impacts, reduce potential sprawl effects, and substantially meet the project purpose of improving regional mobility. They are:

- Proposed Route 92 with Terminus at Route 1, both as-proposed and with phased implementation
- Route 1 Widening in South Brunswick with Signal Removal

In addition, the No action/No build alternative (under which no permit is issued, and no project would be implemented to address project purpose and need) is carried through for further analysis.

The alternatives evaluated in the preceding sections were screened based on their environmental, social, and smart growth impacts, and their ability to meet the project purpose of improving regional mobility.

2.8 Summary

This alternatives analysis reviewed the environmental (including socioeconomic and land use) impacts of 16 action alternatives (as well as several sub-alternatives) and identified those with comparatively fewer adverse environmental impacts. The analysis then assessed the ability of each of the comparatively lower impact alternatives to meet project purpose and respond to the need for the project. The ability of TDM measures to meet the project purpose was also evaluated.

This alternatives section set forth a comparative evaluation of a number of potential alternatives that appeared to have the potential, prior to the screening analysis, to achieve the project purpose. Based on the screening analysis conducted in this section,

those alternatives that exhibit comparatively fewer environmental impacts and that best meet project purpose receive more detailed analysis in Section 4.

Based on the alternatives analysis, the majority of projects involving capacity increases on local roadways were eliminated from further consideration, because:

(1) they indicated potential to induce local development in lesser developed areas;

(2) the alternatives exhibited adverse impacts that were equal to or greater than the impacts of the projects recommended for further analysis;

(3) they did not meet the project purpose of improving regional mobility, because they did not separate local traffic from regional through traffic, which is necessary to optimize regional travel.

A number of projects involving construction of new roadway alignments were eliminated from further consideration because:

(1) they exhibited impacts that were equal to or greater than the impacts of the projects recommended for further analysis;

(2) they provided new access to areas previously characterized by low accessibility, thus exhibiting significant potential to induce sprawl development in rural areas;

(3) they did not meet the project purpose of improving regional mobility, because they did not separate local traffic from regional through traffic;.

Evaluation of TDM measures found that such measures keyed to the study area could complement any of the alternatives evaluated in this EIS and help offset possible increases in single-occupancy vehicle use that might result from any of the alternatives. Although TDM measures could not replace the need for roadway system improvements, primarily because of their limited effectiveness in suburban areas with dispersed residential origins and dispersed employment destinations, a coordinated package of TDM measures and roadway system improvements would be consistent with the goals and objectives of the NJTPA Regional Transportation Plan for the study area.

Based on the alternatives analysis, four alternatives are recommended for more detailed impact analysis. One alternative is the No action/No build scenario, in which no project would be implemented to address project purpose and need. The second and third alternatives involve construction of a new limited access east-west highway alignment, all at one time or in two phases. The fourth alternative involves construction of capacity improvements and removal of traffic flow impediments in an existing highway corridor.

The alternatives carried forward for additional analysis are:

- No Action/No Build Alternative
- NJTA Proposed Route 92 with Terminus at US Route 1, constructed at one time or in two phases
- US Route 1 Widening in South Brunswick

Please refer to Section 4 for more detailed analysis of the impacts of each of these alternatives.

Section 3
Characterization of the Affected Environment

3.1 General Environment

This section presents a summary of the existing physical, ecological, social, cultural, historical and economic conditions within the Project Study Area, the area most likely to be affected by the applicant's preferred alternative. Major characteristics of the study area's natural and human resources are identified. The existing environment has been described using methods relevant to both local and regional environmental analysis. The compiled baseline information will facilitate analysis of the alternatives.

Much of the discussion in this section was extracted from the NJTA 1994 Draft Environmental Impact Statement (Harris, 1994) and the 1999 USACE Section 404 Permit Application (Harris, 1999), and updated where new information has been acquired. The 1994 DEIS was prepared to evaluate the effects of Route 92 as it was proposed at that time, in conformity with New Jersey Executive Order 215 requiring state authorities to assess the environmental impacts of major construction projects. A revision of the DEIS was not issued because Executive Order 215 does not require it.

The Proposed Route 92 Corridor, as illustrated in the figures in this section, is defined as a 1000-foot wide study area spanning the centerline of the proposed Route 92 project, reaching from US Route 1 near Ridge Road to the New Jersey Turnpike at Interchange 8A, including the proposed road improvements. The US Route 1 Corridor (Route 1 Corridor) is defined as a 1,000-foot-wide swath spanning the centerline of US Route 1 between US Route 130 in the north and Independence Way in the south. The Project Study Area is not strictly defined, as it varies slightly for different discussions, but comprises a larger area of several square miles surrounding the alternatives in southwestern Middlesex County and northeastern Mercer County. The Proposed Route 92 Corridor and the Route 1 Corridor are the areas where actions related to construction and use of the highway would have direct impacts. The larger Project Study Area may be affected by more widespread impacts of the alternatives, such as air quality, traffic, etc. Many of the existing environmental conditions discussed below are described for the Project Study Area since the proposed impact corridors are limited in size.

3.2 Topography, Geology and Soils

3.2.1 Topography

Proposed Route 92 Corridor

The Proposed Route 92 Corridor consists of relatively flat to gently rolling topography with land depressions generally consisting of water features (wetlands, watercourses, ponds and lakes). Slopes throughout the area range from flat to no more than 10 percent. The elevation ranges from a low point of 80 feet above mean sea level (AMSL)

at the western portion of the corridor between NJ Route 27 and US Route 1, to a high point of 160 feet AMSL at the eastern portion of the corridor at the 8A Interchange of the New Jersey Turnpike. The eastern portion of the Proposed Route 92 Corridor generally has higher elevations, accounting for the westward flow of surface waters via tributaries to the Millstone River. A USGS topographic map is provided in Figure 3-1 (Sheets 1-8).

Route 1 Corridor
The Route 1 Corridor consists of rolling topography, with elevation ranging from a low of approximately 70 feet where Heathcote Brook crosses US Route 1, to a high of approximately 260 feet at Sand Hills in the central portion of the corridor.

3.2.2 Geology

The State of New Jersey comprises four physiographic provinces. From northwest to southeast, these are the Valley and Ridge Province, the Highlands Province, the Piedmont Province, and the Coastal Plain Province. The provinces located within the Project Study Area, as shown on Figure 3-2, are the Piedmont and Coastal Plain Provinces. The major differences between the two provinces are based largely upon the types of rocks, the bedrock structure, and the geomorphic history. The division of these two provinces occurs at the "fall line", which, within the Project Study Area, generally corresponds to the Amtrak Northeast Corridor Railroad. The western portion of the Project Study Area within the Piedmont Province is characterized by Triassic beds known as the Newark Group, while the portion within the Coastal Plain Province is characterized by poorly consolidated to unconsolidated Cretaceous sands and clays that dip at low angles to the southeast. Much of the bedrock within the Project Study Area is overlain by the Pensauken formation, a discontinuous layer of Quaternary alluvium. This surficial deposition ranges from stratified silt and sand with interbedded gravel to unstratified silts with minimal sand and gravel overlying coarser sediments.

According to the State of New Jersey geologic overlay of the Project Study Area (New Jersey Geologic Survey), there are no geologic faults within or adjacent to the study area.

Coastal Plain Province
The Coastal Plain Province is the largest of the four physiographic provinces in New Jersey. In the Project Study Area, this province mainly underlies the area east of the Amtrak Northeast Corridor Railroad. The Coastal Plain Province comprises sands and clays. The geologic formations in the Project Study Area include the Magothy Formation and Raritan Formation, which are generally east of the fall line. These formations are characterized by layers of light and dark colored sand that are hydrologically connected, providing good permeability through the pores between sand particles.

Piedmont Province
The Piedmont Province is the second largest of the four physiographic provinces in New Jersey. In the Project Study Area, this province mainly underlies the area west of the Amtrak Northeast Corridor Railroad. Relatively hard, erosion-resistant Triassic rocks

comprise the Piedmont Province and often occur as rounded hills above the coastal plain areas. Within the Project Study Area, the Piedmont Province includes the Stockton Formation, the Lockatong Formation, The Passaic Formation, and Jurassic diabase.

3.2.2.1 Acid-producing Deposits

Proposed Route 92 Corridor

The Magothy and Raritan Formations are known to contain acid-producing deposits (Harris, 1994). Where construction of the proposed Route 92 project would require excavation, these deposits are a concern because they contain iron sulfide minerals that, when exposed to oxygen, oxidize and produce sulfuric acid. This acid increases the solubility of any metals present and may represent a toxic source to aquatic life, vegetation, and potable water supplies. The portion of the proposed alignment most likely to contain such deposits is located between Perrine Road and US Route 130, as this is the section within the Raritan and Magothy Formations (see Figure 3-2). If the proposed Route 92 project were to proceed, soil testing would be conducted to identify acid-producing deposits. Mitigation during excavation may be required to reduce the potential for acidic conditions to develop (see Section 5.3.1).

Route 1 Corridor

While the Route 1 Corridor lies west of the fall line, the Magothy Formation underlies the section of US Route 1 approximately between Northumberland Way and New Road. Therefore, there is the potential for acid-producing deposits to be present in this area.

3.2.3 Soils

According to the Soil Survey of Middlesex County, New Jersey, published by the United States Department of Agriculture (USDA) Soil Conservation Service (now the Natural Resources Conservation Service [NRCS]), the soils within the study area are made up of 26 different soil series (USDA, 1987). These soil series are divided into 49 soil phases. These soil phases are illustrated on Figure 3-3a and Figure 3-3b. The major characteristics of the individual soil phases in the study area are summarized in Table 3-1. A general description of each soil series is provided in Appendix A.

3.2.3.1 Hydric Soils

Within the Project Study Area, wetlands are mainly associated with the Fallsington Loam (Fb), a designated hydric soil according to the Middlesex County, New Jersey Comprehensive Hydric Soils List (USDA, 1998). Hydric soils are defined as soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part of the soil (USDA, 1994).

Table 3-1
Soil Characteristics

Soil Series	Soil Phase	Symbol	Slope	Runoff	Permeability	Erosion Hazard	Drainage	Development Limitation
Atsion	Atsion sand	At	Nearly level	Slow	Moderate to moderately rapid		Poor	Seasonal high water table, low strength, potential frost action
Chalfont	Chalfont silt loam	ChA	0 to 2%	Slow	Slow	Slight		Perched water table, slow permeability
	Chalfont silt loam	ChB	2 to 5%	Medium in subsoil	Slow in subsoil	Moderate in subsoil	Somewhat poor	Wetness
Downer	Downer loamy sand	DnC	5 to 10%	Medium	Moderate to moderately rapid	Severe	Good	Sandy surface, high permeability in subsoil, erosion
Elkton	Elkton soil loam	Ek	Nearly level	Slow	Slow	Slight	Poor	Wetness, surface crusting, acidity, low fertility, and aeration in the subsoil
Evesboro	Evesboro sand	EvB	0 to 5%	Slow	Rapid	High	Excessive	Sandy surface, high permeability, available water capacity
Fallsington	Fallsington loam	Fb	Nearly level	Slow	Moderate to moderately rapid	--	Poor	Seasonal high water table and a lack of suitable drainage outlets
Fallsington Variant	Fallsington Variant loam	Fd	Nearly level	Slow	Slow in subsoil	Slight	Poor	Seasonal high water, flooding, slow permeability of the subsoil
Hammonton	Hammonton loamy sand	HeA	0 to 3%	Slow	Moderate to moderately rapid	Slight	Good	Seasonal high water table
	Hammonton sandy loam	HmA	0 to 2%	Medium	Moderate to moderately rapid	Moderate	Moderately good	Seasonal high water table
Humaquepts	Humaquepts, frequently flooded	HU	0 to 2%	--	--	--	Somewhat poor to very poor	Flooding and the instability and variability of the soil material
Keyport	Keyport sandy loam	KeA	0 to 2%	Slow	Slow	Slight	Moderately good	Permeability, moderate shrink-swell potential in subsoil, seasonal wetness
	Keyport sandy loam	KeB	2 to 5%	Moderately slow	Slow	Moderate	Moderately good	

Table 3-1
Soil Characteristics

Soil Series	Soil Phase	Symbol	Slope	Runoff	Permeability	Erosion Hazard	Drainage	Development Limitation
Keyport	Keyport loam	KfA	0 to 2%	Slow	Slow	Slight	Moderately good	Seasonal high water table, slow permeability, high frost-action potential
Lansdowne	Lansdowne silt loam	LnA	0 to 2%	Slow	Slow	Slight	Moderately good	Seasonal high water table, slow permeability, high frost-action potential, low strength
	Lansdowne silt loam	LnB	2 to 5%	Slow	Slow	Slight	Somewhat poor to moderately good	Seasonal high water table, slow permeability, high frost-action potential, low strength
	Lansdowne-Urban land complex	LUA	0 to 5%	Slow	Variable	Slight	Moderately good	--
Matapeake	Matapeake silt loam	MeA	0 to 2%	Medium	Moderate to moderately slow	Slight	Good	Suitable for most urban uses
	Matapeake silt loam	MeB	2 to 5%	Medium	Moderate to moderately slow	Slight	Good	Suitable for most urban uses
Mattapex	Mattapex silt loam	MgA	0 to 2%	Slow	Moderate to moderately slow	Slight	Moderately good	Slow permeability and high water table
	Mattapex silt loam	MgB	2 to 5%	Slow	Moderate to moderately slow	Moderate	Moderately good	
Mount Lucas	Mount Lucas silt loam	MoA	0 to 2%	Slow	Moderate to slow	--	Moderately good	Low strength, slow permeability, seasonal wetness, shrink-swell potential
	Mount Lucas very stony silt loam	MsB	0 to 5%	Medium	Moderate to slow	--	Moderately good	
Mullica	Mullica sandy loam	Mu	Nearly level	Very slow	Moderate to moderately rapid	--	Very poor	Seasonal high water table
Nixon	Nixon loam	NaA	0 to 2%	Slow	Moderate in the subsoil and moderately rapid in the substratum	Slight	Good	Suitable for most urban uses
	Nixon loam	NaB	2 to 5%	Slow	Moderate in the subsoil and moderately rapid in the substratum	Slight	Good	Suitable for most urban uses

Table 3-1
Soil Characteristics

Soil Series	Soil Phase	Symbol	Slope	Runoff	Permeability	Erosion Hazard	Drainage	Development Limitation
Nixon Variant	Nixon Variant loam	NfA	0 to 2%	Slow	Moderate in the subsoil and moderately rapid in the substratum	--	Moderately good	Seasonal high water table and slow permeability
	Nixon Variant loam	NfB	2 to 5%	Slow	Moderate in the subsoil and moderately rapid in the substratum	--	Moderately good	Seasonal high water table and slow permeability
	Nixon Variant-Urban land complex	NGA	0 to 5%	Slow	Moderate in the subsoil and moderately rapid in the substratum	Slight	Moderately good	--
Phalanx	Phalanx loamy sand	PhD	2 to 15%	Medium	Moderate in the subsoil and moderately rapid in the substratum	--	Good	Slope
--	Pits, sand and gravel	PM	--	Variable	Variable	Variable	Variable	Onsite investigation required
Psamments	Psamments, nearly level	PN	--	Variable	Variable	Variable	Moderately good to good	Onsite investigation required
Reaville	Reaville silt loam	ReA	0 to 2%	Slow	Slow to moderate	Slight	Moderately good	Seasonal high water table, depth to bedrock
Reaville Variant	Reaville Variant silt loam	Rh	0 to 2%	Slow	Moderate to moderately slow	Slight	Poor	High water table
Rowland	Rowland silt loam	Ro	0 to 2%	Slow	Moderate to moderately slow	Slight	Somewhat poor to moderately good	Seasonal high water table, flooding
Sassafras	Sassafras sandy loam	SaB	2 to 5%	Medium	Moderate in the subsoil and moderately rapid in the substratum	Slight	Good	Suitable for most urban uses
	Sassafras sandy loam	SaC	5 to 10%	Medium	Moderate in the subsoil and moderately rapid in the substratum	Moderate	Good	Slope
	Sassafras gravelly sandy loam	SgB	2 to 5%	Medium	Moderate in the subsoil and moderately rapid in the substratum	Slight	Good	Suitable for most urban uses

Table 3-1
Soil Characteristics

Soil Series	Soil Phase	Symbol	Slope	Runoff	Permeability	Erosion Hazard	Drainage	Development Limitation
Sassafras	Sassafras gravelly sandy loam	SgC	5 to 10%	Medium	Moderate in the subsoil and moderately rapid in the substratum	Moderate	Good	Slope
	Sassafras loam	SlA	0 to 2%	Slow	Moderate in the subsoil and moderately rapid in the substratum	Slight	Good	Suitable for most urban uses
	Sassafras loam	SlB	2 to 5%	Slow	Moderate in the subsoil and moderately rapid in the substratum	Slight	Good	Suitable for most urban uses
Udorthents	Udorthents, bedrock substratum	UB	0 to 3%	Variable	Variable	Variable	Variable	Onsite investigation required
	Udorthents, clayey substratum	UC	0 to 3%	Variable	Variable	Variable	Somewhat poor to moderately good	Onsite investigation required
--	Urban land	UL		--	--	--	--	Onsite investigation required
Watchung	Watchung very stony silt loam	Wa	0 to 2%	Slow	Slow	Slight	Poor	Wetness, slow permeability, abundant stones
Woodstown	Woodstown sandy loam	WdB	2 to 5%	Moderately slow	Moderate	Moderate	Moderately good	Seasonal high water table
	Woodstown sandy loam, clayey substratum	WkA	0 to 2%	Slow	Moderate in upper layers and slow in the substratum	Slight	Moderately good	Seasonal high water table
	Woodstown loam	WlA	0 to 2%	Slow	Moderate	Slight	Moderately good	Seasonal high water table
	Woodstown loam	WlB	2 to 5%	Moderately slow	Moderate	Moderate	Moderately good	Seasonal high water table

Proposed Route 92 Corridor
Fallsington loam occupies the floodplains of Heathcote Brook as well as the floodplain of Devil's Brook encompassing a substantial portion of land between Perrine Road and US Route 130 in South Brunswick Township. Most of the Fallsington Loam has been designated as freshwater wetland. Other soils in the Proposed Route 92 Corridor that are classified as hydric soils include: Elkton loam (Ek), Fallsington Variant loam (Fd), Humaquepts, frequently flooded (HU), and Reaville Variant silt loam (Rh).

Route 1 Corridor
Fallsington Variant loam (Fd) and Reaville Variant silt loam (Rh) make up the portion of the Oakeys Brook floodplain in the vicinity of the Route 1 Corridor. Fallsington loam occupies the floodplains of Heathcote Brook. Other soils in the Route 1 Corridor that are classified as hydric soils include: Atsion sand (At), Elkton loam (Ek), Humaquepts, frequently flooded (HU), Mullica sandy loam (Mu), Reaville silt loam (ReA), and Watchung very stony silt loam (Wa).

3.2.3.2 Farmland Soils

Most of the soils in the Project Study Area that are not wetland soils are suitable for agriculture and pasture. Much of the existing farmland is devoted to the cultivation of soybeans and grains. Agricultural soils in Middlesex County tend to have low fertility, and require the addition of lime and fertilizer to ensure good production. Proper drainage is also a management concern for approximately two-thirds of the farmland soils in the county. Erosion can be a problem for any soil with a slope greater than 2 percent.

Proposed Route 92 Corridor
The following soils identified within the Proposed Route 92 Corridor meet the requirements for prime farmland: Hammonton sandy loam (HmA), Matapeake silt loam (MeA), Mattapex silt loam (MgA/B), Nixon loam (NaA/B), Nixon variant loam (NfA), Sassafras sandy loam (SaB/C), Sassafras gravelly sandy loam (SgB/C), Sassafras loam (SlA/B), Woodstown sandy loam (WdB), and Woodstown loam (WlA/WlB). The general criteria for prime farmland include: an adequate and dependable supply of moisture from precipitation or irrigation, favorable temperature and growing-season length, acceptable levels of acidity or alkalinity, few or no rocks, and permeability to air and water. Prime farmland is not excessively erodible, is not saturated with water for long periods, is not flooded during the growing season, and generally has slopes between zero and 6 percent.

Route 1 Corridor
The following soils identified within the Route 1 Corridor meet the requirements for prime farmland: Hammonton sandy loam (HmA), Keyport sandy loam (KeA/B), Keyport Loam (KfA), Mount Lucas silt loam (MoA), Nixon loam (NaA/B), Nixon Variant loam (NfA/B), Sassafras sandy loam (SaB/C), Sassafras gravelly sandy loam (SgC), Woodstown sandy loam (WdB), Woodstown sandy loam, clayey substratum (WkA), and Woodstown loam (WlA).

3.3 Natural Resources

3.3.1 Surface Water

The proposed Route 92 corridor and the southern portion of the Route 1 corridor are both located within New Jersey Watershed Management Area (WMA) 10, the Millstone River drainage basin. The Millstone River drains approximately 271 square miles of New Jersey including portions of Hunterdon, Somerset, Mercer, Monmouth and Middlesex Counties. The river is approximately 38 miles long and flows from its headwaters at the Monmouth County border, north to the Raritan River near Manville (Somerset County). Much of the lower portion of the river flows parallel to the Delaware and Raritan Canal (D&R Canal) (NJWSA, 2001). Several water bodies within the study area feed the Millstone River.

The northern portion of the Route 1 corridor falls within WMA 9, the Lower Raritan River drainage basin. WMA 9 comprises approximately 33 percent of the Raritan Basin. The land use, as of 1995, was mostly urban/suburban (51 percent), including industrial and commercial centers. It lies within Middlesex, Monmouth, Somerset and Union counties and includes the Main Stem Raritan River, Bound Brook, Green Brook, Lawrence Brook, South River, Manalapan River, and Matchaponix Brook (NJWSA, 2001). The project study area, specifically a portion of the Route 1 alternatives corridor, lies partially within the Lawrence Brook subbasin.

According to the NJDEP Division of Parks and Forestry, no streams within the Project Study Area or in the vicinity of Middlesex County are designated under the National Wild and Scenic Rivers system. Furthermore, no such streams are under study status for designation under the National Wild and Scenic Rivers System. Similarly, at the state level, no Somerset or Middlesex County streams are designated under the New Jersey Wild and Scenic Rivers System (NJDEP, November 2000).

3.3.1.1 Waterways, Streams, and Lakes

Proposed Route 92 Corridor

Devil's Brook originates at the eastern portion of the Project Study Area near US Route 130 in South Brunswick (see Figure 3-4). This brook flows east to west through the study area, just north of the proposed Route 92 project right-of-way. Approximately 0.4 miles east of the Amtrak Northeast Corridor rail line, Devil's Brook turns southwest toward Plainsboro. Originally, Devil's Brook continued to flow southwest through what is now the Plainsboro Preserve. A private farm road along the Plainsboro-South Brunswick border, often called Turkey Island Road, crosses Devil's Brook at the same location where proposed Route 92 would cross the brook. Formerly, a 4-foot culvert carried the flow of Devil's Brook under Turkey Island Road. At least 10 years ago, the Turkey Island Road culvert was blocked and the entire flow of Devil's Brook was diverted to the northwest through a drainage channel along the Plainsboro-South Brunswick border. This channel flows into a drainage channel that parallels the Amtrak Northeast Corridor rail line. The drainage channel along the Amtrak line flows southwest to a point west-southwest of McCormack Lake, where it merges with the flow

from the lake and the flow of Shallow Brook from Broadway Swamp to the east. Under existing conditions, the flow of the northern branches of Devil's Brook does not reach McCormack Lake or the forested wetlands along Devil's Brook northeast of the lake. After merging with Shallow Brook, Devil's Brook flows southwest along the railroad tracks before ultimately discharging into the Millstone River.

Shallow Brook originates just east of the Proposed Route 92 Corridor in Monroe Township. It flows east to west, south of the proposed Route 92 project in Plainsboro. Shallow Brook flows into Devil's Brook at the western edge of the Plainsboro Preserve, near the Amtrak Northeast Corridor tracks.

McCormack Lake is a 46-acre lake located on the original course of Devil's Brook in the Plainsboro Preserve. The lake is man-made, a result of sand and gravel extraction that occurred in the late 1960s. This lake, fed by groundwater, is approximately 30 feet deep and contains freshwater fish. McCormack Lake is drained by Devil's Brook, which discharges into the Millstone River.

Heathcote Brook originates south of the US Route 1/New Road intersection in South Brunswick and flows southwest. Approximately 1.5 miles downstream, it is joined by a branch of Heathcote Brook that flows south from Little Rocky Hill. Approximately 1.5 miles farther downstream, Carters Brook merges with Heathcote Brook, which flows west into the Millstone River.

Route 1 Corridor
Oakeys Brook originates approximately 5,500 feet northwest of US Route 1, north of Beekman Road. It flows east, crossing US Route 1 before joining Lawrence Brook. Lawrence Brook is within the Lawrence Brook/Farrington Chain of Lakes watershed, which flows to the north and drains to the Raritan River near New Brunswick.

Heathcote Brook originates south of the US Route 1/New Road intersection in South Brunswick and flows southwest. Approximately 1.5 miles downstream, it is joined by a branch of Heathcote Brook that flows south from Little Rocky Hill. Approximately 1.5 miles further downstream, Carters Brook merges with Heathcote Brook, which flows west into the Millstone River.

3.3.1.2 Floodplains

Floodplains, as designated by the Federal Emergency Management Agency (FEMA) and delineated on the Flood Insurance Rate Maps (FIRM), exist within the study area. These floodplains are associated with Devil's Brook in Plainsboro Township and Heathcote Brook in South Brunswick Township. In addition to FEMA, NJDEP delineates Flood Hazard Areas for many water bodies found in the State. When designing structures for stream crossings, NJDEP's flood hazard delineations and floodplain boundaries are used. Figure 3-5 shows the FEMA floodplains, and Figure 3-6 shows the NJDEP Flood Hazard Areas.

Proposed Route 92 Corridor

Devil's Brook, Plainsboro and South Brunswick Township

Devil's Brook travels in a southwest direction though the Project Study Area through Plainsboro and South Brunswick Townships, ultimately discharging into the Millstone River. Devil's Brook is characterized by wide floodplain areas ranging from 200 feet to 5,000 feet wide, resulting from the typically level topography of the area.

Heathcote Brook, South Brunswick Township

Heathcote Brook also flows in a southwest direction through the Project Study Area and discharges into the Millstone River. Floodplains associated with Heathcote Brook within the Project Study Area extend to a maximum of 3,000 feet in width.

Route 1 Corridor

Oakeys Brook, North and South Brunswick Townships

Oakeys Brook flows in an easterly direction under US Route 1 toward Lawrence Brook. Floodplains associated with Oakeys Brook average approximately 650 feet, and extend to a maximum of approximately 2,850 feet east of the Route 1 Corridor.

Heathcote Brook, South Brunswick Township

Heathcote Brook also flows in a southwest direction through the study area and discharges into the Millstone River. Floodplains associated with Heathcote Brook are present within the study area and extend to a maximum of 3,000 feet in width.

3.3.1.3 Water Quality

The NJDEP, Division of Watershed Management, establishes water quality standards for the State's waterways. These standards classify surface water according to water quality and provide the basis for the determination of appropriate uses for those waters. Under this classification system, waters are classified as Freshwater (FW), Saline/Estuarine (SE), Saline/Coastal (SC) or Pinelands Water (PL). The number 1, 2 or 3 follows these designations. These numbers indicate the relative quality of the water, with 1 representing the highest quality and 3 representing the poorest quality.

The Millstone River, Heathcote Brook, McCormack Lake, Devil's Brook and Oakeys Brook are classified FW2-NT (non-trout) waters in accordance with Surface Water Quality Standards (N.J.A.C. 7:9B), Surface Water Classifications provided by the NJDEP. Non-trout waters are those designated as not suitable for trout production or trout maintenance due to physical, chemical or biological characteristics. Although not suitable for trout, these waters are generally suitable for a diversity of other fish species. In accordance with the 1998 Surface Water Quality Standards, the designated uses for all FW2 waters include the following:

1) Maintenance, migration and propagation of the natural and established biota;

2) Primary and secondary contact recreation;

3) Industrial and agricultural water supply;

4) Public potable water supply after conventional filtration treatment (a series of processes including filtration, flocculation, coagulation, and sedimentation, resulting in substantial particulate removal but no consistent removal of chemical constituents) and disinfection; and

5) Any other reasonable uses.

NJDEP has grouped the major watersheds in New Jersey into 20 Watershed Management Areas (WMAs). As shown on Figure 3-4, the Project Study Area lies within the Lower Raritan WMA (WMA 9) and the Millstone WMA (WMA 10). According to the Draft Surface Water Quality and Pollutant Loadings Technical Report (NJWSA, 2001), the water quality of the Lower Raritan WMA was evaluated between 1986 and 1995 at four monitoring stations. Data on 17 water quality parameters were assessed for trends over the nine-year period. Total ammonia plus organic nitrogen decreased over time across the Lower Raritan WMA. Manalapan Brook, which is close to the project area, showed increasing trends in biochemical oxygen demand (BOD), total dissolved solids (TDS), chloride, and sodium. Flow conditions were also assessed in relation to parameter concentrations. Alkalinity, ammonia, TDS, hardness, pH, sulfate, and chloride tended to decrease with increased flow because of dilution. The total suspended solids (TSS) concentrations tended to increase with increased flow, probably due to scouring of the sediment and stream banks. Fecal coliform, total organic carbon (TOC), and total phosphorus (TP) tended to increase during the growing season (April to October). In Manalapan Brook, ammonia also tended to increase during the growing season, while TDS and nitrate/nitrite increased during the non-growing season (November to March). The report suggests that increased TDS might be due to runoff containing road salt and that the higher nitrate/nitrite might be due to higher oxidation when oxygen levels are increased during cold weather.

A total of 17 water quality parameters for the Millstone WMA were measured periodically between 1976 and 1997. Across the area, total ammonia plus organic nitrogen concentration decreased over time while nitrate/nitrite concentrations remained similar; the report attributes both trends to improved sewage treatment facilities that convert ammonia to nitrate. Chloride, sodium, and TDS levels increased over time. The total suspended solids and dissolved oxygen levels tended to increase with higher flow, possibly due to sediment scour and increased aeration. Alkalinity, TDS, hardness, nitrate/nitrite, pH, sodium, sulfate, and temperature all tended to decrease with increasing flow. The report hypothesizes that these parameters have constant sources at low flow (i.e., point sources and groundwater influx) and that dilution occurs with higher flow; the pH decrease is explained by rainfall with pH less than 7 (the average pH of rain is 5.5). In the Stony Brook subwatershed, ammonia plus organic nitrogen, TOC, BOD, and TP tended to increase with increasing flow, while in the Bedens Brook subwatershed ammonia plus organic nitrogen and TP tended to decrease with increasing flow. The report also noted that ammonia plus organic nitrogen, TP, TOC, TSS, and fecal coliform increased during the growing season. In the Millstone River, chloride tended to increase during the non-growing season (probably

due to road salt application). In the Stony Brook subwatershed, nitrate/nitrite levels tended to increase during the non-growing season.

The Millstone River is one of the three most affected rivers in the Raritan Basin in terms of overall water quality, and had either the highest concentrations or highest frequency of not meeting water quality standards for FW2-NT waters of 14 of the 17 parameters measured for the period analyzed in the report (NJWSA, 2001). In the upper reaches of the river, 31 percent of the samples exceeded the phosphorus criterion (0.1 mg/L); downstream at Grovers Mills and Blackwells Mills the exceedances were 70 percent and 97 percent, respectively. The Millstone at Grovers Mills also produced some samples that did not meet the dissolved oxygen criterion (not less than 4.0 mg/L); this was the only location where this occurred. Stony Brook exceeded the TP criterion 38 percent of the time, and the fecal coliform criterion (400 colonies/100 mL) 26 percent of the time. Bedens Brook exceeded the TP criterion 47 percent of the time, and the fecal coliform criterion (400 colonies/100 mL) 40 percent of the time. Millstone at Grovers Mill was the only site in the Millstone WMA that did not produce any samples that exceeded the standard for TSS (40.0 mg/L).

According to the 2000 New Jersey Water Quality Inventory Report (NJDEP, 2001), five water quality monitoring locations are found within the Project Study Area. As shown on Figure 3-4, the five locations are found at Manalapan Brook near Manalapan, Millstone River near Manalapan, Millstone River at Grovers Mill Road, Stony Brook at Princeton, and Bedens Brook near Rocky Hill. Table 3-2 summarizes the results of sampling done between 1995 and 1997 at these stations. Samples were analyzed for dissolved oxygen (DO), TP, ammonia, pH, TSS, fecal coliform, and nitrate. Refer to Table 3-3 for the surface water criteria for FW2-NT waters.

DO is a good primary indicator of stream health because specific concentrations are necessary for nearly all forms of aquatic biota. Table 3-2 shows that all of the monitoring locations met the water quality standard for DO. Because of the zero percent exceedance, the attainment of these locations was found to be “Not Impaired” with respect to DO.

Excessive levels of TP are a major cause of eutrophication and can lead to excessive plant and algae growth. Each location produced at least four water samples that exceeded the TP standard (0.1 mg/L) during the sampling period, and the mean of all samples exceeded the standard at Manalapan Brook near Manalapan and Stony Brook at Princeton. These results led to an attainment status of “Not Met” (the results cannot be linked to impairment without additional assessments). Common sources of phosphorus are fertilizers, human and animal wastes, soil erosion, and phosphorus-containing chemicals (such as detergents).

High levels of ammonia are harmful to fish and other aquatic biota. None of the sampling locations produced samples that exceeded the standard, and the attainment status for each was “Not Impaired”.

Table 3-2
Water Quality Characteristics at Nearby Ambient Surface Water Monitoring Network Stations (1995-1997)

	Number of Samples	Maximum	Minimum	Mean	Number of Samples Exceeding Standard	Attainment Status
Manalapan Brook near Manalapan						
Dissolved Oxygen (mg/L)	14		8.0	10.3	0	Not Impaired
Total Phosphorus (mg/L)	14			0.126	4	None
Ammonia (ppb)	14			0.2	0	Not Impaired
pH	14	7.3	5.8	6.61	7	Impaired
TSS (ppm)	not assessed					
Fecal Coliform (/100 mL)	14			57.4*	3	Partial
Nitrate (mg/L)	14	1.20		0.844	0	Full
Millstone River near Manalapan						
Dissolved Oxygen (mg/L)	14		7.8	10.4	0	Not Impaired
Total Phosphorus (mg/L)	14			0.070	8	None
Unionized Ammonia (ppb)	13			0.1	0	Not Impaired
pH	13	8.1	6.0	6.76	4	Impaired
TSS (ppm)	not assessed					
Fecal Coliform (/100 mL)	14			122.3*	5	Partial
Nitrate (mg/L)	14	1.80		1.216	0	Full
Millstone River at Grovers Mill						
Dissolved Oxygen (mg/L)	9		6.0	9.3	0	Not Impaired
Total Phosphorus (mg/L)	9			0.099	7	None
Ammonia (ppb)	8			0.2	0	Not Impaired
pH	8	7.2	6.5	6.86	1	Impaired
TSS (ppm)	not assessed					
Fecal Coliform (/100 mL)	9			72.5*	2	Partial
Nitrate (mg/L)	9	6.30		3.771	0	Full
Stony Brook at Princeton						
Dissolved Oxygen (mg/L)	32		6.7	11.1	0	Not Impaired
Total Phosphorus (mg/L)	37			0.115	19	None
Ammonia (ppb)	33			1.7	0	Not Impaired
pH	38	9.5	6.7	7.88	8	Impaired
TSS (ppm)	22			53.2	5	Impaired
Fecal Coliform (/100 mL)	14			290.5*	6	None
Nitrate (mg/L)	36	1.57		0.707	0	Full
Beden Brook near Rocky Hill						
Dissolved Oxygen (mg/L)	15		5.5	10.7	0	Not Impaired
Total Phosphorus (mg/L)	15			0.093	4	None
Ammonia (ppb)	15			0.6	0	Not Impaired
pH	14	8.2	7.3	7.69	0	Not Impaired
TSS (ppm)	1			4.0	0	Not Impaired
Fecal Coliform (/100 mL)	14			622.7*	8	None
Nitrate (mg/L)	15	4.14		1.802	0	Full

* Geometric Mean

Source: 2000 New Jersey Water Quality Inventory Report, NJDEP, May 2001

Table 3-3
Surface Water Criteria for FW2-NT Waters

Substance	Criterion
Bacterial Quality (counts/100mL)	
Fecal Coliform:	Shall not exceed geometric mean of 200/100 mL nor should more than 10% of total samples taken during a 30-day period exceed 400/100 mL.
Enterococci:	Shall not exceed a geometric mean of 33/100 mL nor shall any single sample exceed 61/100 mL.
Dissolved Oxygen (mg/L):	24-hour average not less than 5.0, but not less than 4.0 at any time.
Floating, colloidal, color and settleable solids; petroleum hydrocarbons and other oils and grease	None noticeable in the water or deposited along the shore or on the aquatic substrata in quantities detrimental to the natural biota. None which would render the waters unsuitable for the designated uses.
pH (standard units)	6.5-8.5
Total Phosphorus (mg/L)	**Lakes:** Shall not exceed 0.05 in any lake, pond or reservoir, or in a tributary at the point where it enters such bodies of water, except where site-specific criteria are developed pursuant to N.J.A.C 7:9B-1.5(g)3. **Streams:** Except as necessary to satisfy the more stringent criteria above or where site-specific criteria are developed pursuant to N.J.A.C 7:9B-1.5(g)3, shall not exceed 0.1 in any stream, unless it can be demonstrated that total P is not a limiting nutrient and will not otherwise render the waters unsuitable for the designated uses.
Radioactivity	Prevailing regulations including all amendments and future supplements thereto adopted by the U.S. Environmental Protection Agency pursuant to Sections 1412, 1445, and 1450 of the Public Health Services Act, as amended by the Safe Drinking Water Act (PL 93-523).
Suspended Solids (mg/L)	40.0
Total Dissolved Solids (mg/L)	No increase in background which would interfere with the designated or existing uses, or 500 mg/L, whichever is more stringent (increases over 133% are not in compliance unless the discharger demonstrates that the proposed increase will not adversely affect the aquatic biota).
Sulfate (mg/L)	250
Taste and Odor Producing Substances	None offensive to humans or which would produce offensive taste or odors in water supplies and biota used for human consumption. None which would render the water unsuitable for the designated uses.
Thermal Alterations	**Streams:** None which would cause temperatures to deviate more than 2.8°C (5°F) at any time from ambient temperatures. No heat may be added which would cause temperatures to exceed 27.8 °C (82°F) for small mouth bass or yellow perch waters, or 30°C (86°F) for other nontrout waters. **Lakes:** None of more than 1.7°C (3°F) in the epilimnion of lakes and other standing waters. No discharges of heated effluent into the hypolimnion nor pumping of water from the hypolimnion (for discharge back into the same water body) shall be permitted unless it is demonstrated that such practices will be beneficial to the existing and designated uses.

Note: Refer to Surface Water Quality Standards for toxic substances criteria.

Source: NJDEP, 1998, Surface Water Quality Standards, N.J.A.C. 7:9B.

Waters that become too acidic or too basic can be harmful to the established biota. Only Bedens Brook near Rocky Hill did not produce any samples outside the standard range (pH 6.5-8.5) and was listed as "Not Impaired". The remaining four stations were listed as "Impaired", with high pH encountered at Stony Brook near Princeton and low pH the problem at the other locations.

High TSS is indicative of excessive sedimentation as well as problems with other forms of particulate matter. Five of twenty-two samples collected at Stony Brook at Princeton were above the standard (40.0 mg/L); the mean of all samples was 53.2 mg/L, leading to an attainment status of "Impaired". One sample was analyzed for TSS at Bedens Brook near Rocky Hill; it did not exceed the standard and therefore the location received an attainment status of "Not Impaired".

Elevated levels of fecal coliform, which is found in wastes from warm-blooded animals, can pose a threat to people exposed to contaminated water. Every station produced at least two samples that exceeded the standard (geometric mean of 200 colonies/100 mL and less than 10 percent of samples taken within 30 day exceeding 400 colonies/100 mL). Manalapan Brook near Manalapan, Millstone River near Manalapan, and Millstone River at Grovers Mill achieved an attainment status of "Partially Met". Stony Brook at Princeton and Bedens Brook near Rocky Hill received an attainment status of "Not Met".

Nitrate in water is often due to fertilizer runoff or wastewater treatment effluent. None of the sampling stations produced any samples that exceeded the surface water quality standard and therefore all achieved an attainment status of "Met".

The State of New Jersey requires permits for any discharge of pollutants into surface water or groundwater. These permits are referred to as New Jersey Pollutant Discharge Elimination System (NJPDES) permits. Various wastewater treatment plants, manufacturing plants, industrial complexes and research facilities within the Millstone

River drainage basin contribute point source discharges into the Millstone River itself, or into one of the Millstone's tributaries. Permitted discharges in the study area are shown on Figure 3-4 and described in Table 3-4.

3.3.2 Groundwater

The use of groundwater as a potable drinking water source is common throughout most of New Jersey. Thus, the preservation and recharge of this resource is critical. Aquifers, which are underground saturated geologic formations that yield usable water, supply various quantities of water (the quantity is dependent upon the porosity of the bedrock formation). Aquifers are capable of holding water in pore spaces found between sand and gravel particles (known as primary porosity) or within fractures and fissures in the bedrock (known as secondary porosity). The extent to which the aquifer is recharged generally depends upon the porosity and permeability of the overlying material.

Table 3-4
NJPDES Permits in the Study Area

Map ID (Fig. 3-4)	NJPDES Permit No.	Facility	Location	Type
1	NJ0020079	66 STATION RD	CRANBURY	MINOR
2	NJG0081639	APPLEGARTH CARE CENTER	MONROE TWP	MINOR
3	NJG0129208	AXIL CORPORATION	PLAINSBORO	MINOR
4	NJG0125334	BLOCK DRUG COMPANY INC	SOUTH BRUNSWICK TWP	MINOR
5	NJG0124532	DAVLYN INDUSTRIES INC	MONROE TWP	MINOR
6	NJ0031445	FIRMENICH INC	PLAINSBORO	MAJOR
7	NJG0125610	FLINT INK CORPORATION	DAYTON	MINOR
8	NJ0027731	FMC CORP	PLAINSBORO	n/a
9	NJ0031950	HUB SERVALL RECORD MFG	CRANBURY	n/a
10	NJ0103632	KESTLER REST HOME	MONROE TWP	n/a
11	NJG0123595	MOHAWK LABS OF NJ DIV	SOUTH BRUNSWICK TWP	MINOR
12	NJ0028479	NJ TRAINING SCHOOL FOR BOYS	JAMESBURG	n/a
13	NJ0131679	PRINCETON ALLIANCE CHURCH	PLAINSBORO	MINOR
14	NJ0023922	PRINCETON PLASMA PHYSICS LAB	PLAINSBORO	n/a
15	NJG0125784	REXAM BEVERAGE CAN CO	MONMOUTH JUNCTION	MINOR
16	NJG0125059	RUSSELL-STANLEY CORP	SOUTH BRUNSWICK TWP	MINOR
17	NJ0132471	SOUTH BRUNSWICK YMCA	MONMOUTH JUNCTION	MINOR
18	NJG0125555	SOUTHERN CONTAINER CORP	SOUTH BRUNSWICK TWP	MINOR
19	NJ0126233	SUBURBAN TRAILS	MONROE TWP	n/a
20	NJG0121592	SUNDOR BRANDS INC	SOUTH BRUNSWICK TWP	MINOR
21	NJ0024104	UNITED WATER PRINCETON	PLAINSBORO	n/a
ns	NJ0082317	EXXON SERV STA #3-2235	SOUTH BRUNSWICK	n/a
ns	NJ0055476	OLBRYS LANDFILL	MIDDLESEX COUNTY	n/a

n/a Information not provided
ns Not shown on Figure 3-4 due to lack of location information.

Source: NJDEP NJEMS database.

Lockatong Formation
The Lockatong Formation characterizes the portion of the Project Study Area west of US Route 1. This formation transports water via secondary porosity, defined as fractures, fissures and joints within the bedrock capable of transporting water. The Lockatong Formation is comprised mostly of argillite, which, due to its durability, is resistant to the formation of fractures, fissures and joints, resulting in relatively low well yields.

Potomac-Raritan-Magothy Aquifer System
The portion of the Project Study Area from the fall line (Amtrak Railroad) east to the New Jersey Turnpike is characterized by the Potomac-Raritan-Magothy aquifer system (which is divided into two aquifers). The upper aquifer (equivalent to the Magothy Formation) is similar in texture to the lower aquifer (equivalent to the Raritan Formation) and they exhibit extensive stratigraphic mixing in places. The upper aquifer is composed largely of sands, which produce relatively minor amounts of water due to their fine-grained nature. The lower aquifer, composed of alternating and irregular beds of clay, sand and gravel, is capable of producing substantial quantities of groundwater. This unit is exposed in the study area, but is generally confined by the overlying Merchantville-Woodbury unit.

Merchantville-Woodbury Confining Unit
The Merchantville formation is situated with the Woodbury clay forming the Merchantville-Woodbury confining unit, which overlies Potomac Raritan-Magothy aquifer system. These formations consist of clay with some sand, and range in thickness between 150-500 feet. While this unit is nearly impermeable in most places, water is transmitted when the difference in potentiometric head in the overlying and underlying formations is great enough.

Pensauken Formation
The surficial Pensauken Formation in most of the study area overlies the Lockatong Formation, Stockton Formation, and Potomac-Raritan-Magothy aquifer system. Deposits in this formation vary from well-sorted, high porosity sands and gravels to the low porosity, almost impermeable silty/clayey sands and gravels. The Pensauken Formation is more common of upland areas above 60 feet mean sea level. Although the Pensauken Formation does not generally provide large water supplies, the main importance of this formation is to transmit water derived from precipitation or runoff down to underlying aquifers. Erosion of this surficial formation has resulted in discontinuous patches.

The designated vulnerability category of soil is dependent upon the potential for groundwater recharge. The soils characteristic of the study area exhibit moderate vulnerability in the sense that they do not have a particularly high or low rate of transmissivity. Transmissivity is defined as the rate at which a particular soil transmits water through the soil layers. The longer it takes for water to be transmitted through soil, the higher the percentage of pollutant reduction by filtration, plant uptake, adsorption by soil particles and chemical break-down of pollutants by microorganisms.

Coarse-grained porous soils have a high transmissivity rate while fine grained clayey soils have a low transmissivity rate. The ability of a soil to transmit water through its layers is partially dependent on the designated hydrologic soil group. The four established hydrologic groups are A, B, C, and D, defined as follows:

Group A: Well-drained to excessively well-drained sands or gravelly sands with a high rate of water transmission.

Group B: Moderately well drained to well-drained soils with fine to moderately coarse texture and a moderate rate of water transmission.

Group C: Soils characteristic of a layer that obstructs downward water migration or soils of moderately fine to fine texture and a slow rate of water transmission.

Group D: Clays, soils that have a claypan or clay layer at or near the surface and shallow soils over impervious material. Very slow rate of water transmission.

Table 3-5 shows the hydrologic group designation for each soil found in the Project Study Area. As illustrated in Table 3-5, one of the study area soils—Evesboro sand—is in hydrologic soil group A. Therefore, this is the only soil to have a transmissivity rate resulting in a high vulnerability designation. Most of the soils are in hydrologic soil groups B or C and have moderate transmissivity rates and a moderate vulnerability designation. There are some smaller areas of soil units in the hydrologic soil group D that are associated with clayey deposits of wetlands, low transmissivity rates and low vulnerability.

3.3.2.2 Sole Source Aquifers

Sole source aquifers are aquifers that represent the sole or principal source of drinking water (more than 50 percent). Because such aquifers are a major source of potable drinking water supply, maintenance of water quality and adequate aquifer recharge is imperative. The federal government sponsors the Sole Source Aquifer Program, which enables the designation of sole or principal source aquifers. Upon designation of a sole source aquifer, federal agencies can be barred from granting financial assistance to projects that could endanger that aquifer (USEPA, 2003).

New Jersey comprises seven sole source aquifers, which cover a majority of the state. These aquifers are the Buried Valley Aquifer System, the Coastal Plain Aquifer System, the Highlands Aquifer System, the Northwest New Jersey System (New Jersey Fifteen Basin Aquifer Systems), the Ramapo System, the Ridgewood Area Aquifer System, and the Rockaway River Basin area.

Proposed Route 92 Corridor

As shown on Figure 3-8, a majority of the Proposed Route 92 Corridor lies within the Coastal Plain sole source aquifer, while the western portion of the corridor encroaches into the Northwestern New Jersey Aquifer.

Table 3-5
Soil Phase Hydrologic Groups

Soil	Hydrologic Group	Soil	Hydrologic Group
At	C/D*	NaB	B
ChA	C	NfA	B
ChB	C	NfB	B
DnC	B	NGA	B
Ek	C/D*	PhD	B
EvB	A	PM	Variable
Fb	B/D*	PN	Variable
Fd	D	ReA	C
HeA	B	Rh	D
HmA	B	Ro	C
HU	Variable	SaB	B
KeA	C	SaC	B
KeB	C	SgB	B
KfA	C	SgC	B
LnA	C	SlA	B
LnB	C	SlB	B
LUA	C	UB	Variable
MeA	B	UC	Variable
MeB	B	UL	Variable
MgA	C	Wa	D
MgB	C	WdB	C
MoA	C	WkA	C
MsB	C	WlA	C
Mu	C	WlB	C
NaA	B		

* Hydrologic groups B/D and C/D represent soils that, because of their characteristics, vary according to site specific conditions.

Source: Soil Survey of Middlesex County, New Jersey, USDA, 1987.

Route 1 Corridor
Figure 3-8 shows that more than half of the Route 1 Corridor lies within the Northwestern New Jersey Aquifer, while the central portion of the corridor lies within an area that is not a sole source aquifer.

3.3.2.3 Existing Wells

Proposed Route 92 Corridor
A well search was conducted in October 2002 in an effort to inventory all wells, particularly domestic water supply wells, within and adjacent to the Proposed Route 92 Corridor. Of the 205 wells found to exist within approximately one-quarter mile of the ROW centerline, 140 are within the Proposed Route 92 Corridor. Of these, one well type is unknown, 13 are boring wells, 27 are domestic wells, two are irrigation wells, four are industrial wells, 40 are monitoring wells, one is a public supply well, nine are test wells, and 43 are piezometer wells. NJTA owns 69 of these wells, which comprise boring, monitoring, piezometer, and the single unknown well. The sole public supply well listed is owned by South Brunswick Township, and is located in the vicinity of Friendship Road and US Route 130. As discussed in Section 3.3.3, this well is not utilized due to low productivity. Table 3-6 lists each NJDEP permit number, owner, location, and the use of each well revealed in the well search.

Route 1 Corridor
A well search was not performed for the Route 1 Corridor, since most of the improvements that might occur under the Route 1 Widening and Signal Removal alternative would occur within the existing right-of-way. In addition, there are no public water supply wells within the corridor (see Section 3.3.3).

3.3.3 Public Water Supply

South Brunswick
South Brunswick maintains its own municipal water supply and distribution system. Water is provided via various local wells, treated at a municipal treatment facility and distributed throughout the serviced portions of South Brunswick. Potable water is also purchased from the Elizabethtown Water Company. Areas that are not serviced by public water utilities derive water from private water supply wells.

With respect to public water supply wells, the Township of South Brunswick has five designated water supply wells, of which three are currently in operation. These wells include the following:

- Well No. 11 located in Dayton on Ridge Road is currently in operation. This well is located approximately 5,750 feet (1.1 miles) from the nearest portion of proposed Route 92.

- Well No. 13 located in Dayton on Georges Road is currently in operation. This well is located approximately 5,750 feet (1.1 miles) from the nearest portion of proposed Route 92.

Table 3-6
Well Search Results

ID	NJDEP Permit Number	Owner	Use	Latitude DMS	Longitude DMS
1	2813457	Prine Construction	G	402152	743552
2	2802329	Bradley Yearick	D	402200	743546
3	2810966	Sotiris Skrekas	D	402200	743546
4	2837449	NJ Turnpike Authority	B	402200	743546
5	2837450	NJ Turnpike Authority	B	402200	743546
6	2837467	NJ Turnpike Authority	Z	402200	743546
7	2837468	NJ Turnpike Authority	Z	402200	743546
8	2837469	NJ Turnpike Authority	Z	402200	743546
9	2837470	NJ Turnpike Authority	Z	402200	743546
10	2837471	NJ Turnpike Authority	Z	402200	743546
11	2837472	NJ Turnpike Authority	B	402200	743546
12	2839512	NJ Turnpike Authority	Z	402200	743546
13	2839513	NJ Turnpike Authority	Z	402200	743546
14	2839514	NJ Turnpike Authority	B	402200	743546
15	2840009	Belle Mead Development	B	402200	743546
16	2840010	Belle Mead Development	B	402200	743546
17	2811979	Clifford Sigle	D	402213	743546
18	2804465	John Yaros	D	402146	743533
19	2804965	Harold Freeman	D	402146	743533
20	2823363	Robert J. Bauer	M	402200	743533
21	2823364	Robert J. Bauer	M	402200	743533
22	2823365	Robert J. Bauer	M	402200	743533
23	2823366	Robert J. Bauer	M	402200	743533
24	2837451	NJ Turnpike Authority	B	402200	743533
25	2837452	NJ Turnpike Authority	Z	402200	743533
26	2837453	NJ Turnpike Authority	Z	402200	743533
27	2837454	NJ Turnpike Authority	Z	402200	743533
28	2837455	NJ Turnpike Authority	Z	402200	743533
29	2837456	NJ Turnpike Authority	Z	402200	743533
30	2837457	NJ Turnpike Authority	B	402200	743533
31	2837458	NJ Turnpike Authority	B	402200	743533
32	2837459	NJ Turnpike Authority	B	402200	743533
33	2837460	NJ Turnpike Authority	B	402200	743533
34	2837461	NJ Turnpike Authority	B	402200	743533
35	2837462	NJ Turnpike Authority	Z	402200	743533
36	2837463	NJ Turnpike Authority	Z	402200	743533
37	2837464	NJ Turnpike Authority	Z	402200	743533
38	2837465	NJ Turnpike Authority	Z	402200	743533
39	2837576	NJ Turnpike Authority	Z	402200	743533
40	2837577	NJ Turnpike Authority	Z	402200	743533
41	2837578	NJ Turnpike Authority	Z	402200	743533
42	2803173	Harry Stevens	D	402213	743533
43	2819568	Princeton Packet	M	402213	743533
44	2819569	Princeton Packet	M	402213	743533
45	2825959	Robert Bawer	M	402206	743526
46	2825960	Robert Bawer	M	402206	743526
47	2810010	Elizabethtown Water Co.	T	402120	743519
48	2808446	Maark Corp.	I	402133	743519
49	2806108	Ritter Pfaudler Corp.	T	402200	743519
50	2823025	Wyeth Ayerst Research	M	402200	743519
51	2823026	Wyeth Ayerst Research	M	402200	743519
52	2823027	Wyeth Ayerst Research	M	402200	743519
53	2823028	Wyeth Ayerst Research	M	402200	743519
54	2802168	Elwood Landis	D	402213	743519
55	2802257	General Devices Bldg.	D	402213	743519

Table 3-6
Well Search Results

ID	NJDEP Permit Number	Owner	Use	Latitude DMS	Longitude DMS
56	**2802479**	**Joseph Meiczinger**	**D**	**402213**	**743519**
57	**2803415**	**Frank Quimby**	**D**	**402213**	**743519**
58	**2804346**	**Baltimore Research &**	**I**	**402213**	**743519**
59	**2811137**	**Dow Jones & Co. Inc.**	**I**	**402213**	**743519**
60	**2835958**	**Dow Jones & Co. Inc.**	**M**	**402213**	**743519**
61	**2801127**	**George V.D. Perrine**	**D**	**402133**	**743506**
62	2806102	Aero-Chem Research	T	402200	743506
63	2806103	Aero-Chem Research Lab	T	402200	743506
64	2838069	NJ Turnpike Authority	Z	402200	743506
65	2838070	NJ Turnpike Authority	Z	402200	743506
66	**2802989**	**George V.D. Perrine**	**D**	**402146**	**743453**
67	2805721	William H. Perrine	D	402200	743453
68	2812323	Henry Wittman	D	402200	743453
69	2802282	American Machine & F	I	402053	743426
70	2802283	American Machine & F	I	402053	743426
71	2816502	Ralph R. McGillian	D	402139	743352
72	**2808830**	**Joseph Luther III**	**D**	**402133**	**743346**
73	**2837716**	**NJ Turnpike Authority**	**M**	**402133**	**743333**
74	**2825588**	**South Brunswick Twp.**	**M**	**402133**	**743319**
75	**2837300**	**NJ Turnpike Authority**	**B**	**402133**	**743319**
76	**2837711**	**NJ Turnpike Authority**	**M**	**402133**	**743319**
77	**2837713**	**NJ Turnpike Authority**	**M**	**402133**	**743319**
78	**2803964**	**Anthony S. Battetta**	**D**	**402133**	**743306**
79	2508162	Douglas Woolston	D	402120	743253
80	**2801914**	**Anthony Santowasso**	**D**	**402133**	**743253**
81	**2837712**	**NJ Turnpike Authority**	**M**	**402133**	**743253**
82	**2810580**	**Michael Protinick**	**G**	**402133**	**743240**
83	2811614	M R Toth Construction	D	402120	743226
84	**2837710**	**NJ Turnpike Authority**	**M**	**402133**	**743226**
85	2811090	M.R. Toth	D	402120	743213
86	2820858	Sam Fiener	D	402120	743200
87	**2837229**	**NJ Turnpike Authority**	**B**	**402133**	**743200**
88	**2837709**	**NJ Turnpike Authority**	**M**	**402133**	**743200**
89	2814378	Joseph Kremer	D	402139	743152
90	**2826761**	**Zalman Kramer**	**D**	**402133**	**743146**
91	2838754	South Brunswick Twp.	T	402120	743133
92	2842153	South Brunswick Twp.	T	402120	743133
93	**2805603**	**Rosenstark Farms**	**D**	**402133**	**743133**
94	**2826152**	**DK Campbell**	**D**	**402133**	**743133**
95	**2837714**	**NJ Turnpike Authority**	**M**	**402133**	**743133**
96	**2837715**	**NJ Turnpike Authority**	**M**	**402133**	**743133**
97	**2808684**	**Anna Hirniak**	**D**	**402133**	**743119**
98	**2812442**	**Jack A. Boekhout**	**D**	**402133**	**743106**
99	**2814796**	**Jery Wagner**	**D**	**402139**	**743059**
100	**2802126**	**Francis Dye**	**D**	**402133**	**743053**
101	**2821224**	**Anthony Jaronski**	**D**	**402133**	**743053**
102	2815319	Ernest Ceuti	D	402139	743046
103	2806691	Earl Lewis	D	402120	743040
104	**2813138**	**John Ely**	**D**	**402133**	**743040**
105	**2813217**	**George Oleynyk**	**D**	**402133**	**743040**
106	**2819071**	**Ernest Csuti**	**D**	**402133**	**743040**
107	**2813515**	**Steve Peti**	**D**	**402126**	**743032**
108	**2813934**	**John Fly**	**D**	**402126**	**743032**
109	**2815318**	**Sigmond Kovacs**	**D**	**402126**	**743032**
110	2813450	Anthony Labarbera	D	402139	743032

Table 3-6
Well Search Results

ID	NJDEP Permit Number	Owner	Use	Latitude DMS	Longitude DMS
111	2814150	John Ely	D	402139	743032
112	2814615	Andre Gruber	D	402139	743032
205	*2816723*	*Debel Brook Gun Club*	*D*	*402139*	*743032*
113	**2804249**	**Forsgate Industrial**	**M**	**402120**	**743026**
114	**2804250**	**Forsgate Industrial**	**M**	**402120**	**743026**
115	2808819	Princeton Disposal Service	M	402133	743026
116	2838755	South Brunswick Twp.	T	402133	743026
117	**2813746**	**Lothar & H Ehrich**	**D**	**402112**	**743019**
118	2802246	LeRoy Hilyard Jr.	D	402053	743013
119	**2810532**	**South Brunswick Twp.**	**P**	**402120**	**743013**
120	**2837708**	**NJ Turnpike Authority**	**M**	**402120**	**743013**
121	**2802042**	**Kimberly-Clark Corp.**	**T**	**402106**	**742946**
122	**2802043**	**Kimberly-Clark Corp.**	**T**	**402106**	**742946**
123	**2802044**	**Kimberly-Clark Corp.**	**T**	**402106**	**742946**
124	**2802045**	**Kimberly-Clark Corp.**	**I**	**402106**	**742946**
125	**2802046**	**Kimberly-Clark Corp.**	**T**	**402106**	**742946**
126	**2802047**	**Kimberly-Clark Corp.**	**T**	**402106**	**742946**
127	**2802048**	**Kimberly-Clark Corp.**	**T**	**402106**	**742946**
128	**2816519**	**South Middlesex Industr.**	**M**	**402059**	**742939**
129	**2816520**	**South Middlesex Industr.**	**M**	**402059**	**742939**
130	**2816521**	**South Middlesex Industr.**	**M**	**402059**	**742939**
131	**2816522**	**South Middlesex Industr.**	**M**	**402059**	**742939**
132	**2816523**	**South Middlesex Industr.**	**M**	**402059**	**742939**
133	**2816524**	**South Middlesex Industr.**	**M**	**402059**	**742939**
134	**2827451**	**Donna Auerback**	**D**	**402053**	**742933**
135	2831289	South Middlesex Industr.	M	402039	742933
136	2831290	South Middlesex Industr.	M	402039	742933
137	2831291	South Middlesex Industr.	M	402039	742933
138	2816159	Stauffer Chemical Co.	M	402112	742926
139	2816160	Stauffer Chemical Co.	M	402112	742926
140	2816161	Stauffer Chemical Co.	M	402112	742926
141	**2837538**	**NJ Turnpike Authority**	**B**	**402053**	**742919**
142	**2837592**	**NJ Turnpike Authority**	**B**	**402053**	**742919**
143	**2837593**	**NJ Turnpike Authority**	**B**	**402053**	**742919**
144	**2837594**	**NJ Turnpike Authority**	**B**	**402053**	**742919**
145	**2837607**	**NJ Turnpike Authority**	**Z**	**402053**	**742919**
146	**2837608**	**NJ Turnpike Authority**	**Z**	**402053**	**742919**
147	**2837609**	**NJ Turnpike Authority**	**Z**	**402053**	**742919**
148	**2837610**	**NJ Turnpike Authority**	**Z**	**402053**	**742919**
149	**2837611**	**NJ Turnpike Authority**	**Z**	**402053**	**742919**
150	**2837613**	**NJ Turnpike Authority**	**Z**	**402053**	**742919**
151	**2837614**	**NJ Turnpike Authority**	**Z**	**402053**	**742919**
152	**2837615**	**NJ Turnpike Authority**	**Z**	**402053**	**742919**
153	**2837616**	**NJ Turnpike Authority**	**Z**	**402053**	**742919**
154	**2837617**	**NJ Turnpike Authority**	**Z**	**402053**	**742919**
155	**2837618**	**NJ Turnpike Authority**	**Z**	**402053**	**742919**
156	**2837619**	**NJ Turnpike Authority**	**Z**	**402053**	**742919**
157	**2837620**	**NJ Turnpike Authority**	**Z**	**402053**	**742919**
158	**2837621**	**NJ Turnpike Authority**	**Z**	**402053**	**742919**
159	**2837622**	**NJ Turnpike Authority**	**Z**	**402053**	**742919**
160	**2837623**	**NJ Turnpike Authority**	**Z**	**402053**	**742919**
161	**2837624**	**NJ Turnpike Authority**	**Z**	**402053**	**742919**
162	**2837625**	**NJ Turnpike Authority**	**Z**	**402053**	**742919**
163	**2837626**	**NJ Turnpike Authority**	**Z**	**402053**	**742919**
164	**2837627**	**NJ Turnpike Authority**	**Z**	**402053**	**742919**

Table 3-6
Well Search Results

ID	NJDEP Permit Number	Owner	Use	Latitude DMS	Longitude DMS
165	**2837628**	**NJ Turnpike Authority**	**Z**	**402053**	**742919**
166	**2837640**	**NJ Turnpike Authority**	**Z**	**402053**	**742919**
167	**2837642**	**NJ Turnpike Authority**	**A**	**402053**	**742919**
168	**2837643**	**NJ Turnpike Authority**	**Z**	**402053**	**742919**
169	2808359	James Warga	D	402106	742906
170	**2804106**	**Forsgate Farms #6**	**T**	**402053**	**742906**
171	**2837591**	**NJ Turnpike Authority**	**B**	**402053**	**742906**
172	**2837632**	**NJ Turnpike Authority**	**Z**	**402053**	**742906**
173	**2837633**	**NJ Turnpike Authority**	**Z**	**402053**	**742906**
174	**2837634**	**NJ Turnpike Authority**	**Z**	**402053**	**742906**
175	**2837635**	**NJ Turnpike Authority**	**Z**	**402053**	**742906**
176	**2837636**	**NJ Turnpike Authority**	**Z**	**402053**	**742906**
177	**2841761**	**NJ Turnpike Authority**	**M**	**402053**	**742906**
178	**2841762**	**NJ Turnpike Authority**	**M**	**402053**	**742906**
179	**2841763**	**NJ Turnpike Authority**	**M**	**402053**	**742906**
180	2811770	International Flavor	T	402026	742906
181	2815313	Monroe Township MUA	M	402032	742859
182	2815314	Monroe Township MUA	M	402032	742859
183	2827647	Wheeling-Pittsburgh	M	402106	742853
184	2835250	Sudler Construction	B	402106	742853
185	2835251	Sudler Construction	B	402106	742853
186	2839397	NJ Turnpike Authority	M	402106	742853
187	2839398	NJ Turnpike Authority	M	402106	742853
188	2839400	NJ Turnpike Authority	B	402106	742853
189	**2827646**	**Wheeling-Pittsburgh**	**M**	**402053**	**742853**
190	**2827649**	**Wheeling-Pittsburgh**	**M**	**402053**	**742853**
191	**2827650**	**Wheeling-Pittsburgh**	**M**	**402053**	**742853**
192	**2837637**	**NJ Turnpike Authority**	**Z**	**402053**	**742853**
193	**2837638**	**NJ Turnpike Authority**	**Z**	**402053**	**742853**
194	**2837639**	**NJ Turnpike Authority**	**Z**	**402053**	**742853**
195	**2819741**	**George Harms Construction**	**M**	**402039**	**742853**
196	**2819742**	**George Harms Construction**	**M**	**402039**	**742853**
197	**2819743**	**George Harms Construction**	**M**	**402039**	**742853**
198	2831317	BNP Leasing Corp.	M	402026	742853
199	2831318	BNP Leasing Corp.	M	402026	742853
200	2801554	Arthur Perrine	D	402026	742840
201	2810192	BASF Wyandotte Corp.	I	402026	742840
202	2811720	Monroe Township MUA	P	402026	742840
203	2838374	Monroe Township MUA	T	402026	742840
204	2840082	Monroe Township MUA	O	402026	742840

A = Unknown
B = Boring
D = Domestic
G = Irrigation
I = Industrial
M = Monitoring
P = Public Supply
T = Test
Z = Piezometer

Entries in **boldface** are within the Route 92 primary project impact corridor.

Note: Location coordinates are estimated from well logs and have not been field verified.

- Well No. 15 located in the vicinity of US Route 130 and Broadway in South Brunswick and is currently in operation. This well is located approximately 2,750 feet (0.5 miles) from the nearest portion of proposed Route 92.
- The fourth well is located in the vicinity of US Route 130 and Friendship Road in South Brunswick. This well is not utilized, nor is utilization anticipated, due to low productivity (Larry Merk, personal communication).

A fifth well was drilled to determine the viability of a future water supply for South Brunswick. This well is located along Miller Road and is not currently in use. This well is located approximately 1,200 feet (0.23 miles) south of proposed Route 92.

In addition, the township purchases bulk water from the Elizabethtown Water Company via two wells at Independence Way and Scott's Corner. No active public water supply wells are located in the vicinity of the proposed Route 92 project (Larry Merk, personal communication).

Plainsboro
Most of Plainsboro Township is serviced by the Elizabethtown Water Company, which obtains water from various sources. The remaining portions of the Township not serviced by public water utilities derive water from private wells.

Monroe
The Monroe Township Municipal Utility Authority (MTMUA) provides public water service to portions of Monroe Township, while water for other portions of the Township comes from private individual water supply wells. Additional water is purchased from the Elizabethtown Water Company. The water is supplied by a combination of groundwater and surface water sources. Groundwater is provided by wells owned and operated by MTMUA with minimal treatment necessary.

North Brunswick
The American Water Company administers the township-owned public water system. The water source is the D&R Canal, and there are no public water supply wells within the township (Dan Berardinelli, personal communication).

3.3.4 Wetlands

3.3.4.1 Wetland Regulations

Freshwater wetlands in the study area are regulated by Section 404 of the Federal Clean Water Act (33 U.S.C. 1344), generally administered by the USACE, and the State of New Jersey Freshwater Wetland Protection Act (N.J.S.A. 13:9B), administered by NJDEP. In 1994, NJDEP assumed regulatory control over the Section 404 program in New Jersey although USACE and USEPA retain program oversight. In accordance with the Clean Water Act Regulations (40 CFR 232.2), a wetland is defined as follows:

"Those areas inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs and similar areas. "

In accordance with the New Jersey Freshwater Wetlands Protection Act Rules (N.J.A.C 7:7A-1.4), a freshwater wetland is defined as follows:

"an area that is inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances does support, a prevalence of vegetation typically adapted for life in saturated soil conditions, commonly known as hydrophytic vegetation; provided, however, that the Department, in designating a wetland, shall use the three-parameter approach (that is, hydrology, soils and vegetation) enumerated in the 1989 Federal Manual for Identifying and Delineating Jurisdictional Wetlands and any subsequent amendments thereto incorporated herein by reference. "

The New Jersey Freshwater Wetlands Protection Act Rules restrict most types of development within wetlands. The NJDEP regulations promulgated under the Act require transition areas around wetlands, intended to reduce the potential for wetland impacts where activities will occur near, but not in, wetlands. The NJDEP specifies a minimum of a 50-foot wide transition area for wetlands designated as intermediate resource value. The majority of New Jersey's wetlands have this designation. No transition area is required for ordinary resource value wetlands such as man-made drainage features. A transition area width of up to 150 feet may be required for wetlands that have been determined by NJDEP to have exceptional resource value.

3.3.4.2 Methodology

The wetlands within the study area were delineated during two separate field investigations by Amy S. Greene Environmental Consultants, Inc. (ASGECI) from June to August 1993 and by F.R. Harris, Inc. (Harris) from June to September 1995. ASGECI performed the wetland investigation in the area from US Route 130 to Interchange 8A of the New Jersey Turnpike and west of US Route 1, while Harris conducted the delineation between US Route 1 and US Route 130.

Wetlands were delineated using the methodology outlined in the *Federal Manual for Identifying and Delineating Jurisdictional Wetlands* (Federal Interagency Committee on Wetland Delineation, 1989). In order to be identified as wetland, an area must have hydrophytic vegetation, hydric soils, and be saturated by groundwater or inundated by surface water for one week or more during the growing season. Existing published information was studied to determine the approximate extent of wetlands in the project area. In all cases of wetland delineation within the study area, the routine onsite method was utilized due to the undisturbed and natural condition of the wetlands. A detailed discussion of the methodology and results of the wetland delineation performed for this project may be found in the Wetland Delineation Report (Harris, 1995), previously submitted to NJDEP.

With the transfer of Section 404 permit jurisdiction of this project from NJDEP to USACE in 1998, the delineation of the wetland boundary in the disturbed areas of the proposed Route 92 project was revisited because USACE utilizes the 1987 *Corps of Engineers Wetlands Delineation Manual* for delineation of wetlands rather than the 1989 manual. USACE can not use the 1989 manual because it identifies wetlands not within the jurisdiction of USACE under 33 CFR 328.3(a).

Although both the 1987 and 1989 manuals employ a "three parameter approach" whereby the presence of hydric soils, a dominance of hydrophytic vegetation, and wetland hydrology must be present to be deemed a wetland, only the 1989 manual provides procedures for delineating disturbed and problematic areas where one of the three parameters is usually absent.

In the case of proposed Route 92, there are several agricultural areas within the NJDEP-delineated wetland boundary that are missing one or more of the required wetland parameters. These areas are either defined as prior converted cropland or farmed wetland. Prior converted cropland is not under USACE jurisdiction, as it is specifically excluded from the definition of Waters of the United States pursuant to 33 CFR 328.3(a)(8). Prior converted cropland is defined by the Natural Resources Conservation Service in Section 512.15 of the National Food Security Act Manual as "wetlands which were both manipulated (drained or otherwise physically altered to remove excess water from the land) and cropped before 23 December 1985, but which continue to exhibit important wetland values."

As a result of the re-delineation, two sites were determined to meet the definition of prior converted cropland and therefore are not under USACE jurisdiction. The first site was a pasture field west of Friendship Road, elimination of which led to a 1.24-acre reduction in the computed amount of wetlands to be permanently filled, and a 0.39-acre reduction in temporary wetlands impact. The second site was a soybean/corn field west of the bend in Friendship Road, elimination of which led to a 0.39-acre reduction in computed permanent wetland impacts and a 0.02-acre reduction in temporary impacts. The result of the demapping of these two sites was to reduce the permanent wetland impact of proposed Route 92 by 1.63 acres to 11.58 acres, and to reduce the temporary wetland impacts by 0.41 acres to 2.87 acres (see letter to Joseph J. Seebode [USACE] dated November 10, 1999 in Appendix F). The impacted wetland acreage discussed in Section 4.2.3.4 is that determined using the USACE delineation methodology.

3.3.4.3 Field Verification

During March, April, and May of 1996, NJDEP personnel, accompanied by Harris staff, field verified the wetlands delineation. Revisions to the original Wetlands Delineation Boundary Maps were finalized on May 10, 1996 (19 plan sheets) and forwarded to NJDEP for final approval and issuance of a Letter of Interpretation (LOI) via the process set forth by the New Jersey Freshwater Wetlands Protection Act Rules, N.J.A.C. 7:7A. The LOI was issued by NJDEP on August 27, 1997. The LOI was reissued in October 2002, its term extended to August 27, 2007. Based upon NJDEP criteria, the resource

classification of the study area's wetlands was determined to be "ordinary" and "intermediate". None of the wetlands are classified as having exceptional resource value, which indicates that no threatened or endangered species are known to occur in this area.

A subsequent field visit was held in October 1999 to re-evaluate the delineation according to USACE methods, as discussed in Section 3.3.4.2.

3.3.4.4 Wetlands Within the Study Area

Proposed Route 92 Corridor

The study area is characterized by palustrine wetland systems associated with Devil's Brook, Shallow Brook and Heathcote Brook. These wetland ecosystems range from emergent to forested vegetative communities. A general description of the wetlands was developed in the Freshwater Wetlands Individual Permit Application (Harris, 1996) and is reproduced in the paragraphs below, which detail the wetland classification type and corresponding community structure. In addition, the predominant species composition of each wetland area is noted.

Forested wetlands are characterized by woody vegetation that is greater than twenty feet in height and typically consists of a canopy of trees, an understory of young trees or shrubs, and herbaceous ground growth. Scrub-shrub wetlands are dominated by woody vegetation less than 20 feet in height, consisting of shrubs and young trees. Scrub-shrub wetlands are often a successional stage progressing toward a forested wetland, or they may be relatively stable communities where vegetative growth is stunted because of environmental conditions. Emergent wetlands are characterized by erect, rooted, herbaceous hydrophytes, excluding mosses and lichens. Vegetation is present in emergent wetlands for the majority of the growing season each year.

The majority of the wetlands within the study area are palustrine, forested, broad-leaved deciduous wetlands. Typical wetland plant species within the project area include red maple (*Acer rubrum*), American elm (*Ulmus americana*), sweetgum (*Liquidambar styraciflua*) and green ash (*Fraxinus pennsylvanica*).

All scrub-shrub wetlands in the study area are palustrine, broad-leaved deciduous wetlands. Typical wetland plant species within the project area include small red maple and box elder maple (*Acer negundo*), multiflora rose (*Rosa multiflora*) and arrowwood (*Viburnum dentatum*). Scrub-shrub wetlands in the project area typically represent successional growth from relatively recent land disturbance. If no further disturbance occurs in these areas, they should evolve into forested wetlands.

Emergent wetlands are present within the study area and are usually in proximity to or located wholly within existing waterways; however, these wetlands may or may not be hydrologically connected to a larger wetland system. Emergent wetlands are dominated by herbaceous plants and grasses including woolgrass (*Scirpus cyperinus*), soft rush (*Juncus effusus*), tussock sedge (*Carex stricta*), jewelweed (*Impatiens capensis*), skunk

cabbage (*Symplocarpus foetidus*), false nettle (*Boehmaria cylindrica*), purple loosestrife (*Lythrum salicaria*), swamp rose mallow (*Hibiscus palustris*), broadleaf cattail (*Typha latifolia*), and sensitive fern (*Onoclea sensibilis*).

Devil's Brook supports the majority of the forested wetlands within the study area. This watercourse and its tributaries flow through forested areas that support broad-leaved deciduous (hardwood) wetlands. The hardwood wetlands are dominated by red maple, black cherry (*Prunus serofina*), red oak (*Quercus rubra*), pin oak (*Quercus palustris*), sweetbay magnolia (*Magnolia virginiana*), green ash, sweetgum and black willow (*Salix nigra*). The shrub and herbaceous understory is somewhat open, but frequently dense near the water's edge. Characteristic species include highbush blueberry (*Vaccinium corymbosum*), arrowwood, sweet pepperbush (*Clethra alnifolia*), skunk cabbage, sensitive fern, jewelweed, catbrier (*Smilax hispida*), Virginia creeper (*Parthenocissus quinquefolia*), and multiflora rose.

The major wetland systems within approximately 0.6 miles of proposed Route 92 are shown on Figure 3-9. These systems are briefly described below in terms of general classification and functional value.

US Route 1 to Perrine Road
Wetlands located within the study area between US Route 1 and Perrine Road consist of a man-made wetland system. This man-made wetland system is located east of Schalks Crossing Road and south of Ridge Road. It consists of a small farm pond and an associated pocket of palustrine emergent wetlands containing cattail and smartweed. A detention basin intended to accommodate stormwater runoff from an adjacent industrial/commercial complex serves as an emergent wetland.

Federal Highway Administration's (FHWA) wetland functional assessment system indicated high values for groundwater recharge, flood storage, sediment trapping, and long-term and seasonal nutrient retention in this wetland. Moderate values were obtained for groundwater discharge, shoreline anchoring, passive recreation and heritage; low values for general diversity of wildlife habitat and for all types of fishery habitat; and very low values for downstream and in-basin food-chain support, habitat for all waterfowl groups assessed, and all categories of active recreation.

Perrine Road to US Route 130
The wetlands located between Perrine Road and US Route 130 are predominantly palustrine forested broad-leaved deciduous wetlands associated with the Devil's Brook and Shallow Brook floodplains. Much of the wetland south of the Proposed Route 92 Corridor is known locally as the Broadway Swamp. The Broadway Swamp is the largest single wetland in the study area. It is bordered by US Route 130 to the east, Friendship Road to the west (where Friendship Road runs north-south), Broadway Road to the south, and Friendship Road to the north (where Friendship Road runs east-west). It is primarily composed of large, undeveloped forested wetlands associated with the floodplain of Shallow Brook and its tributaries. Broadway Swamp possesses a unique

mix of predominantly forested wetland with upland inclusions scattered throughout. Sweet pepperbush, arrowwood, and highbush blueberry are the predominant understory species with sensitive fern, cinnamon fern, and several species of Lycopodium also common. According to the Soil Survey of Middlesex County (USDA, 1987), most of Broadway Swamp is underlain by Fallsington loam.

Miller Road, which runs north-south, divides Broadway Swamp into two parcels of approximately equal size. Red maple, sweetgum, gray birch (*Betula populifolia*), American beech, and various species of oaks are the dominant canopy species.

Portions of the agricultural fields adjacent to Broadway Swamp were also found to contain jurisdictional wetlands. These wet fields were observed to be very similar in their species composition, which generally included soft rush, woolgrass, steeplebush (*Spiraea tomentosa*), and seedbox (*Ludwigia alterniflora*). There are also several small isolated, ponded wetlands and numerous ditch systems that exist in the area.

In the vicinity of the intersection of Friendship and Miller Roads, the hydrology is characterized by a northerly flow towards Devil's Brook. Devil's Brook meets the Millstone River a few miles south of the study area limits. Where Friendship Road runs north-south, drainage generally flows west to meet Devil's Brook. Drainage from Broadway Swamp flows in a southerly direction to Shallow Brook, which then flows west and meets Devil's Brook near the Amtrak Northeast Corridor.

FHWA's wetland functional assessment system, when applied to Broadway Swamp, indicated high values for groundwater recharge, flood storage, shoreline anchoring, long-term and seasonal nutrient retention, and warm water fishery habitat. The assessment indicated moderate values for groundwater discharge, sediment trapping, in-basin food-chain support, habitat for some waterfowl groups assessed, canoeing, and passive recreation and heritage. The assessment indicated low values for general diversity of wildlife habitat; habitat for some waterfowl groups; downstream food-chain support; cold water, cold water riverine, and anadromous riverine fishery habitat; and swimming, power boating, and sailing.

US Route 130 to New Jersey Turnpike

The area between US Route 130 and the New Jersey Turnpike, including Interchange 8A, is devoid of any natural freshwater wetlands. The wetlands found within the eastern portion of the study area are associated with man-made drainage features such as culvert discharges, drainage ditches, and stormwater retention facilities. Vegetation found within these man-made wetlands consisted primarily of broad-leaved cattail; however, woolgrass was found in the wetland ditch adjacent to US Route 130.

FHWA's wetland functional assessment system indicated high values for groundwater recharge and nutrient removal/transformation; moderate values for sediment stabilization; and low values for groundwater discharge, flood flow alteration, sediment/toxicant retention, production export, aquatic diversity/abundance, wildlife diversity/abundance, recreation, and uniqueness/heritage.

Wetland Areas Adjacent to Proposed Route 92
In the Freshwater Wetlands Individual Permit Application (1996), Harris separated the wetlands adjacent to the limits of the proposed Route 92 project into seven wetland areas. More than one sub-wetland may be present within any wetland area. Each wetland area was evaluated for diversity, productivity, uniqueness and value. The seven wetland areas are illustrated in Figure 3-11: Area 1 - emergent wetlands found between US Route 130 and Interchange 8A of the New Jersey Turnpike; Area 2 - lands associated with Broadway Swamp, located between Friendship Road (where Friendship Road runs north-south) and US Route 130; Area 3 - lands associated with the northern stem of Devil's Brook, immediately north of Friendship Road; Area 4 - pasture lands associated with the northern stem of Devil's Brook, immediately west of Friendship Road; Area 5 - forested lands associated with the northern stem of Devil's Brook located west of Friendship Road (where Friendship Road runs north-south) and the Amtrak Northeast Corridor; Area 6 - lands located in the vicinity of the Amtrak Northeast Corridor; and Area 7 - lands in the vicinity of Ridge Road/US Route 1 intersection.

The wetland systems in the vicinity of the proposed Route 92 project are generally characterized by a vegetative community consisting of an upper canopy of red maple, sweetgum, pin oak and green ash; a shrub canopy consisting of spicebush, sweet pepperbush, common greenbrier, highbush blueberry, and swamp azalea; and a moderately thick herbaceous layer consisting of skunk cabbage, cinnamon fern, sensitive fern and spotted jewelweed. In limited areas, the forested wetland gives way to emergent wetlands, characterized by herbaceous emergent plants with little or no overstory. Several man-made wetlands were observed that consisted primarily of broad-leaved cattail and woolgrass.

Description of Wetland Area 1
Wetland Area 1 is composed of palustrine emergent wetlands (PEM) and palustrine open waters (POW). The wetland sub-areas are incidental to construction, found adjacent to road embankments, turn-arounds, and ramps associated with the New Jersey Turnpike and NJ Route 32. They function as wetland swales, ditches, or detention basins and occur on Matapeake silt loam, Mattapex silt loam, Sassafras loam, and Sassafras sandy loam soils.

Four of the wetland sub-areas within Wetland Area 1 are considered isolated wetlands of ordinary resource value by NJDEP. These wetlands result from moisture seeping out of the side slopes of constructed New Jersey Turnpike entrance/exit ramps, in combination with soil compaction and site grading, which prevents drainage. The remaining wetlands delineated in Wetland Area 1 are variously connected to Shallow Brook via constructed culverts, ditches, and swales.

An area of State open water exists as an intermittent stream in proximity to the former channel of Shallow Brook, approximately 1,000 feet south of the NJ Route 32 intersection with County Route 535. Two additional areas of State open water are located on the north side of NJ Route 32, where they serve as stormwater management facilities for

office parks. They were not designated as freshwater wetlands because the ponds are constructed with a concrete subsurface.

Description of Wetland Area 2
Wetland Area 2 contains the largest contiguous portion of wetlands within the project corridor, lying between US Route 130 and Friendship Road, where Friendship Road runs in a north-south direction. Wetland Area 2 is primarily composed of undeveloped forested wetland (PFO1) known as the Broadway Swamp. Miller Road, which runs north-south and intersects Friendship Road, bisects Broadway Swamp dividing it into two parcels of approximately equal size. A small number of agricultural and residential areas occupy sections adjacent to the south side of Friendship Road and along its length. Dominant canopy species include red maple, sweetgum, pin oak and swamp white oak (*Quercus bicolo*). Predominant understory species include sweet pepperbush, arrowwood, highbush blueberry, spicebush, cinnamon fern and sensitive fern. As illustrated in the Middlesex County Soil Survey (USDA, 1987), almost the entire area of Broadway Swamp is underlain by Fallsington loam, the remaining areas being primarily Woodstown soils.

A series of inroads and man-made trenches used to drain the adjacent agricultural fields exist at various intervals along the edge of the forested wetlands. Water-stained leaves and buttressed trees were also common throughout this wetland area, as well as sphagnum moss (*Sphagnum* spp.). Upland intrusions occurring within the forested wetlands are characterized by a canopy of American beech, shagbark hickory (*Carya ovata*), sassafras and black cherry and an understory of common greenbrier, Virginia creeper and tree clubmoss (*Lycopodium obscurum*). Agricultural fields of either corn (*Zea mays*) or soybean also comprise uplands in this area. Upland meadows containing Queen Anne's lace (*Daucus carota*), goldenrod (*Solidago* spp.), grasses and greenbrier also appear throughout the area.

Description of Wetland Area 3
Wetland Area 3 primarily consists of smaller isolated wetlands, north of Friendship Road. Agricultural fields and scattered residences along Friendship Road underlain by Sassafras and Woodstown soils characterize this area. Five (5) wetland sub-areas within the proposed project corridor exist in this area: one is just north of the Friendship Road/Miller Road intersection; the second is approximately midway between Miller Road and US Route 130 just north of Friendship Road; the third is a large forested wetland tract approximately 950 feet west of US Route 130; the fourth is the Devil's Brook headwaters adjacent to US Route 130 approximately 1,650 feet north of Friendship Road; and the fifth consists of two emergent wetlands in the northeast quadrant of the US Route 130/Friendship Road intersection.

The wetlands (PFO1/PEM/POW) located north of the Friendship Road/Miller Road intersection are entirely underlain by Elkton loam soils. A nursery borders the wetland's northern and eastern sides. This forested (PFO1) portion of wetland is dominated by a red maple, sweetgum and river birch (*Betula nigra*) canopy and a sweet pepperbush,

swamp rose (*Rosa palustris*) and highbush blueberry understory. A small man-made drainage ditch containing emergent wetlands (PEM) runs south, away from the main wetland area and east, along the north side of Friendship Road. The emergent wetlands in this area consist of such species as soft rush, porcupine sedge (*Carex hystricina*), yellow flatsedge (*Cyperus flavescens*), sweet pepperbush, and black willow. The northwestern portion of the area contains a small pond (POW). The remainder of the area consists of meadow.

The wetland sub-area midway between the Friendship Road/Miller Road intersection and US Route 130 is entirely underlain by Fallsington loam. A lowland scrub/shrub (PSS1) area consisting of red maple, purple loosestrife, poison ivy and jewelweed occurs within a complex of agricultural fields. The associated upland areas consist of black cherry, curly dock (*Rumex crispus*), Queen Anne's lace and cornfields. Associated with an unnamed tributary of Devil's Brook are other forested (PFO1), scrub/shrub (PSS1), and emergent (PEM) wetlands. This wetland complex consists of a dominant canopy species of red maple, sweetgum and pin oak. Predominant understory species include sweet pepperbush and arrowwood. The eastern portion of the wetland is defined by a scrub/shrub (PSS1) and emergent (PEM) lowland surrounded by cornfields. This scrub/shrub lowland consists of red maple and sweetgum saplings while the emergent wetlands are dominated by goldenrod and soft rush.

A large forested wetland (PFO1) sub-area occurs just north of Friendship Road, approximately 950 feet west of US Route 130. This wetland contains a tributary to Devil's Brook that flows perpendicular to Friendship Road in a northerly direction. Fallsington loam soils occupy this area, which contains depressional features. Dominant vegetation consists of sweetgum, red maple, pin oak, sweet pepperbush, common greenbrier, multiflora rose, silky dogwood (*Comus amomum*), jewelweed, and sensitive fern.

The main stem of Devil's Brook crosses under US Route 130 approximately 1,650 feet north of Friendship Road. The Fallsington soils underlying the area support a vegetative community composed of red maple, sweetgum, and pin oak in the overstory and multiflora rose, common greenbrier, and silky dogwood in the understory. Agricultural fields occur both north and south of the wetlands.

In the northeast quadrant of the US Route 130/Friendship Road intersection are two emergent (PEM) wetlands. One is associated with a drainage channel that collects stormwater runoff from the adjacent roadways, while the other is a depressional area. Both are underlain by Sassafras loam soils and contain similar vegetation. The predominant species include tickseed sunflower (*Bidens aristosa*), brambles, soft rush, porcupine sedge, smooth goldenrod (*Solidago gigantea*) and woolgrass.

Description of Wetland Area 4
Wetland Area 4 consists of emergent (PEM) wetlands associated with the southern stem of Devil's Brook (classified as an intermittent stream in this area) and is situated on

Fallsington loam. The wetlands traverse a series of maintained grass fields (pasture) and consist of a stream channel and its adjacent floodplain area. The emergent wetland vegetation consists of soft rush, goldenrod, meadow foxtail, sedges and asters. The upland maintained fields consist of common milkweed (*Asclepias syriaca*), bluegrass (*Poa pratensis*), common dandelion (*Taraxacum officianle*), Queen Anne's lace and goldenrod.

Description of Wetland Area 5
Wetland Area 5 consists of a large forested wetland (PFO1) system associated with the main stem of Devil's Brook, which is underlain by Fallsington loam. A large maintained field near the center of Wetland Area 5 is bisected by a drainage channel running northwest along the Plainsboro-South Brunswick border from Devil's Brook to the Amtrak Northeast Corridor rail line. Originally, the Devil's Brook stream corridor and wetland complex flowed southwest through what is now the Plainsboro Preserve. A private farm road along the Plainsboro-South Brunswick border, often called Turkey Island Road, crosses Devil's Brook east of the field, at the same location where proposed Route 92 would cross the brook. Formerly, a 4-foot culvert carried the flow of Devil's Brook under Turkey Island Road. At least 10 years ago, the Turkey Island Road culvert was blocked and the entire flow of Devil's Brook was diverted to the northwest through the drainage channel along the Plainsboro-South Brunswick border. This channel flows into a drainage channel that parallels the Amtrak Northeast Corridor rail line. The drainage channel along the Amtrak line flows southwest to a point west-southwest of McCormack Lake, where it merges with the flow from the lake and the flow of Shallow Brook from Broadway Swamp to the east. Under existing conditions, the flow of the northern branches of Devil's Brook does not reach McCormack Lake or the forested wetlands along Devil's Brook northeast of the lake. Maintained fields in Wetland Area 4 define the easternmost boundary of these forested wetlands, while the Amtrak Northeast Corridor right-of-way delimits the western edge. Red maple, sweetgum, pin oak and green ash (*Fraxinus pennsylvanica*) are the dominant canopy species. Dominant understory species include sweet pepperbush, poison ivy, jewelweed, skunk cabbage, cinnamon fern and sensitive fern. The fringes of upland areas consist of vegetation such as Russian olive (*Elaeagnus angustifolia*), black cherry, Queen Anne's lace, greenbrier, Virginia creeper and white oak.

Description of Wetland Area 6
Wetland Area 6 is located adjacent to and in the immediate vicinity of the Amtrak Northeast Corridor right-of-way, which fragments a large forested wetland (PFO1) system associated with Devil's Brook. These wetlands are completely underlain by Fallsington loam with the adjacent uplands underlain by Nixon soils. A large man-made pond exists in this area with a water surface elevation corresponding to the existing groundwater table. The Amtrak Northeast Corridor eastern boundary denotes the northern bank of the tributary of Devil's Brook just prior to a 90-degree bend in the stream channel. This channel runs parallel to the Amtrak Northeast Corridor for approximately 6,000 feet, prior to its confluence with the main stem of Shallow Brook. The eastern bank of the tributary to Devil's Brook has been modified by the construction of an access road through the forested wetlands.

The canopy of this wetland system is dominated by red maple, sweetgum, pin oak and green ash. The understory consists of highbush blueberry, sweet pepperbush, jewelweed, poison ivy, cinnamon fern, sensitive fern, royal fern (*Osmunda regalis*), and skunk cabbage. The upland areas associated with the Amtrak Northeast Corridor, its associated access road and the agricultural lands west of the railway consist of sassafras, Queen Anne's lace, goldenrod, black cherry, Russian olive and greenbrier.

Description of Wetland Area 7
Wetland Area 7 consists of forested wetlands in the vicinity of the US Route 1 and Ridge Road intersection. A large forested wetland sub-area occurs north of Ridge Road and west of US Route 1 and extends to the western edge of a pasture, located approximately 2,000 feet to the north. The forested wetlands continue from the northern border of an abandoned railroad bed to the north, extending across Heathcote Brook. A large upland "island" is located within the eastern portion of this wetland, north of the abandoned railroad bed, while two smaller upland "islands" occur south of the abandoned railroad bed. The large forested wetland contains an emergent man-made pond adjacent to the uplands. This man-made pond is connected to two ditches, which drain the east-central portion of the large forested wetland.

A second, smaller forested wetland sub-area occurs north of Ridge Road and east of US Route 1. This wetland has a tributary to Heathcote Brook as its hydrological source and is underlain by Fallsington loam soils. The wetlands extend south of Ridge Road via a 12-inch reinforced concrete pipe (RCP) to a ditch along Ridge Road that supports emergent wetlands.

Route 1 Corridor
The length of US Route 1 under evaluation for widening passes through an extensive freshwater wetland system associated with Oakeys Brook at the north end and Heathcote Brook at the central and southern end of the subject corridor (see Figure 3-10). The majority of the freshwater wetlands along this corridor are characterized as PFO1 according to the National Wetland Inventory Maps. PFO1 corresponds to palustrine freshwater, forested wetlands. Forested is defined as broadleaved deciduous. Vegetative species common to the PFO1 system within New Jersey include red maple (*Acer rubrum*), black gum (*Nyssa sylvatica*), ashes (*Faxinus spp*.), silver maple (*Acer saccharinum*), sycamore (*Platanus occidentallis*), pin oak (*Quercus palustris*), black willow (*Salix nigra*), river birch (*Betula nigra*), and swamp white oak (*Quercus bicolor*). These wetland areas are visible as one travels along US Route 1. The wetland areas are fairly continuous on the west side of US Route 1. The wetland systems are broken up at intersections and as a result of development along the US Route 1 corridor.

Also present are pockets of POW wetland areas. These freshwater wetland areas are palustrine, open water. These pockets are visible from US Route 1 and associated with both Oakeys Brook and Heathcote Brook. They vary in size and have limited to no visible vegetation associated with them.

The forested wetland habitats provide much of the remaining natural habitat for wildlife as much of this corridor has been developed for housing, offices, shopping and services. Open water wetlands provide habitat for water dependent fowl. In general, these wetland areas provide limited recreational value as there is limited public access from US Route 1.

3.3.4.5 Vernal Pools

The New Jersey Division of Fish and Wildlife (DFW) defines vernal pools as meeting the following criteria:

- Confined wetland depressions (either natural or manmade) without a permanently flowing outlet
- Hold water for at least two contiguous months between March and September
- Dry up during the year or are otherwise free of breeding fish populations
- Demonstrate breeding activity of various reptile and amphibian species (as per NJDF lists)

Vernal pools exhibit high biodiversity and are necessary for the survival of several amphibian species, including endangered species.

A map produced by Rutgers University Center for Remote Sensing and Spatial Analysis (CRSSA) was used as a general guide for identifying potential vernal pools within the study area. Because of their ephemeral nature and small size, locating vernal pools with conventional mapping is a challenging task. CRSSA developed a suite of computer-aided techniques to identify and delineate vernal pools in New Jersey using on-screen digitizing, image processing and GIS-based classification techniques. To determine the potential for occurrence of vernal pools in the vicinity of proposed Route 92, the CRSSA maps were used as a general reference and these areas were investigated in the field. Areas investigated consisted of forested wetlands known not to be perpetually flooded throughout the study area, as well as adjacent cultivated fields. Actively cultivated fields throughout the study area were eliminated from consideration as they are routinely disturbed, especially in spring.

Vernal pools within the project area were informally surveyed in June and July 2004 by qualified environmental and wetland scientists from DMJMHarris. All forested wetlands within the study area were preliminarily investigated, whether or not potential vernal pools were shown on the CRSSA maps. During one field investigation in June, DMJMHarris scientists were accompanied by Brian Zarate, NJDEP vernal pool specialist. Confirmation and certification of potential vernal pools was not possible when the field surveys were conducted, as all confined depressions observed at the site were devoid of water, thereby not providing conditions conducive to amphibian and reptile breeding. All potential vernal pools were assigned a number and data forms were completed for each. Potential vernal pools found within the study area contain

evidence of inundation, usually consisting of matted leaf litter, water marks on trees, adventitious roots, and lack of vegetation within the depression indicating that the area was submerged long enough to forestall vegetative growth due to severe anaerobic conditions. Any vegetative species surrounding or within the depressions was noted and recorded. These depressions, which may potentially meet the criteria listed above in other months, were marked, measured, and photographed for future reference and observation. In addition, the approximate location of each depression was indicated on a map.

All potential vernal pools identified within the project study area are situated within a large wetland complex determined to be of intermediate resource value by the NJDEP in the 2002 LOI. Therefore, these potential vernal pools would likely be classified as intermediate resource value unless it can be demonstrated that they are being used by threatened or endangered reptiles or amphibians. None of the potential vernal pools identified in the study area are situated within the Route 92 right-of-way and none would be impacted by the proposed project.

3.3.5 Fish and Wildlife

Proposed Route 92 Corridor

Wildlife surveys and habitat assessments were performed by Harris and ASGECI for the proposed Route 92 project; these are discussed below. Prior to this field work, literature searches were undertaken in order to ascertain identifying features, habitat preferences, parameters that would constitute potentially suitable habitat, and the best time of year and applicable search methodologies to use to survey for various wildlife species. Aerial maps and site survey maps were reviewed prior to and following field investigations to determine and document the locations and extents of potentially suitable habitats. In addition, staff from the NJDEP Division of Fish, Game and Wildlife (NJFGW) were consulted regarding habitat usage, search methodologies, and the best time period to survey for certain species. NJFGW provided additional information regarding the suitability of the project area habitat for barred owl, Cooper's hawk, wood turtle, bog turtle, great blue heron, and the peregrine falcon. Habitat Suitability Index Models, prepared by the USFWS, for barred owl and osprey were also consulted.

An Ecological Resource Inventory (ERI) of the Turkey Island Corporation property, prepared by Eastern States Environmental Associates, Inc. (Fishback, 1994) was reviewed. The ERI covered an 817-acre study area, the northernmost portion of which coincides with the central portion of the Route 92 project area. The ERI study area is bounded by the Penn-Central (Amtrak) Railroad tracks to the west, Scott's Corner and Friendship Road to the east, and Shallow Brook to the south. South Brunswick parklands, north of the Devil's Brook, form the northern boundary. The ERI included McCormack Lake, a 46-acre man-made lake. This lake is located approximately 1000 feet south of the Route 92 alignment, outside of the Proposed Route 92 Corridor. The ERI contains a compilation of over 1700 hours of research and 700 hours of field investigation conducted over a period of one year, and documents all rare, threatened and endangered species observed within that time.

Field Investigations
In June 1995, ASGECI conducted site reconnaissance on the entire project area to verify vegetative cover types (e.g., forest, agricultural field, late successional field, etc.) up to 300 feet on either side of the proposed Route 92 right-of-way. Limits of areas investigated were identified in the field using digitized mapping prepared by Harris. Since the majority of the alignment passes through open fields of various types, each distinct field area was investigated as a separate potential habitat unit. Field mapping from these site walks was then used to help determine the location and quality of habitat for each. The "study area" for wildlife searches was determined from the extent of potential habitat in the project area and similar contiguous habitat that extended outside the project area. For example, if an early successional field habitat unit was present within 300 feet of the proposed right-of-way, but also extended beyond this limit, and was determined to be potentially suitable habitat, the field was searched up to the first reasonable break point outside of the project area. Therefore, the study area extended beyond the Proposed Route 92 Corridor along some points of the alignment.

Subsequent visits to the study area were made to perform rare species and general wildlife surveys in mid-June, July and early August 1995. Additional visits to the wetlands in the central portion of the site were made in early October 1995 to survey these areas for wood and bog turtles. During field surveys for general wildlife, NJFGW Species of Concern (SOC) were searched for where habitat was deemed appropriate (refer to page 3-44 for discussion).

Searches were conducted only for those SOC for which it was determined that any potentially suitable habitat existed within the study area. Surveys were conducted in accordance with published methodologies. In general, walking meander surveys through potentially suitable habitat were used to search for turtles and raptors. Transect surveys were used for grassland birds. A call and response survey was used for barred owl.

Findings
Based upon the literature search, consultation with agency experts and detailed field studies, the listing in Table 3-7 provides commonly found fauna species having range within the proposed Route 92 project area for at least a portion of the year. This list was compiled using popular field guides for this region and includes, but is not limited to, those species observed on-site and mentioned in the 1994 DEIS for this project. Use of the asterisk (*) in Table 3-7 indicates those species that have been observed within the Project Study Area.

Route 1 Corridor
US Route 1 has been a major thoroughfare since the 1800s. Wildlife is currently limited to pockets of remaining natural habitat on either side of the road. In addition to the developed lands along US Route 1, there are areas of forested wetland (as discussed above), open water areas, forested uplands, and farmland in the corridor. All are capable of supporting a variety of common fauna and avian species. Those species

Table 3-7
Wildlife Species Observed or Expected to Inhabit the Route 92 Project Corridor

MAMMALS

Common Name	**Scientific Name**
shorttail shrew	*Blarina brevicauda*
coyote	*Canis latrans*
starnose mole	*Condylura cristata*
least shrew	*Cryptotis parva*
opossum	*Didelphis virginiana*
river otter	*Lutra canadensis*
striped skunk *	*Mephitis mephitis*
meadow vole	*Microtus pennsylvanicus*
longtail weasel	*Mustela frenata*
mink	*Mustela vison*
whitetail deer *	*Odocoileus virginianus*
muskrat	*Ondatra zibethicus*
eastern pipistrel	*Pipistrellus subflavus*
raccoon *	*Procyon lotor*
eastern mole	*Scalopus aquaticus*
eastern gray squirrel *	*Sciurus carolinensis*
eastern cottontail *	*Sylvilagus floridanus*

SHOREBIRDS

Common Name	**Scientific Name**
wood duck	*Aix sponsa*
American wigeon	*Anas americana*
mallard *	*Anas platyrhynchos*
Canada goose *	*Branta canadensis*
green heron	*Butorides striatus*
American coot	*Fulica americana*
hooded merganser	*Lophodytes cucullatus*
yellow-crowned night heron	*Nyctanassa violacea*
double crested cormorant	*Phalacrocorax auritus*
pied-billed grebe	*Podilymbus podiceps*

BIRDS OF PREY

Common Name	**Scientific Name**
Cooper's hawk (transient)	*Accipiter cooperii*
sharp-shinned hawk*	*Accipiter striatus*
saw-whet owl	*Aegolius acadicus*
red-tailed hawk*	*Buteo jamaicensis*
red-shouldered hawk	*Buteo lineatus*
broad-winged hawk *	*Buteo platypterus*
turkey vulture *	*Cathartes aura*
American kestrel *	*Falco sparverius*
common screech owl	*Otus asio*
barn owl	*Tyto alba*

Table 3-7 (continued)
Wildlife Species Observed or Expected to Inhabit the Project Corridor

PASSERINES

Common Name	**Scientific Name**
red-winged blackbird *	*Agelaius phoeniceus*
yellow warbler	*Dendroica petechia*
bobolink	*Dolichonyx oryzivorus*
acadian flycatcher	*Empidonax virescens*
rusty blackbird	*Euphagus carolinus*
common yellowthroat *	*Geothlypis trichas*
barn swallow *	*Hirundo rustico*
tree swallow *	*Iridoprocne bicolor*
purple martin	*Martin prognesubis*
belted kingfisher	*Megaceryle alcyon*
swamp sparrow *	*Melospiza georgiana*
song sparrow *	*Melospiza melodia*
brown-headed cowbird *	*Molothrus ater*
ring-necked pheasant *	*Phasianus colchicus*
downy woodpecker *	*Picoides pubescens*
hairy woodpecker *	*Picoides villosus*
prothonotary warbler	*Protonotaria citrea*
Common grackle *	*Quiscalus quiscula*
bank swallow	*Riparia riparia*
eastern phoebe *	*Sayornis phoebe*
white-breasted nuthatch	*Sitta carolinensis*
American tree sparrow	*Spizella arborea*
rough-winged swallow	*Stelgidopteryx ruficollis*
eastern kingbird *	*Tyrannus tyrannus*

REPTILES & AMPHIBIANS

Common Name	**Scientific Name**
<u>Salamanders</u>	
spotted salamander	*Ambystoma maculatum*
marbled salamander	*Ambystoma opacum*
dusky salamander	*Desmognathus fuscus*
two-lined salamander	*Eurycea bislineata*
four-toed salamander	*Hemidactylium scutatum*
red salamander	*Pseudotriton ruber*
<u>Newts</u>	
eastern newt	*Notophthalmus viridescens*
<u>Frogs</u>	
northern cricket frog	*Acris crepitans*
copes gray frog	*Hyla chrysoscelis*
spring peeper	*Hyla crucifer*
common gray treefrog	*Hyla versicolor*
bullfrog *	*Rana catesbeiana*
green frog	*Rana clamitans*

Table 3-7 (continued)
Wildlife Species Observed or Expected to Inhabit the Project Corridor

Frogs (cont'd)	
pickerel frog	*Rana palustris*
southern leopard frog	*Rana sphenocephala*
wood frog	*Rana sylvatica*
Turtles	
snapping turtle	*Chelydra serpentina*
spotted turtle	*Clemmys guttata*
painted turtle *	*Chrysemys picta*
stinkpot	*Sternotherus odoratus*
eastern box turtle *	*Terrapene carolina*
Toads	
American toad	*Bufo americanus*
eastern spadefoot	*Scaphiopus holbrookii*
Skinks	
five-lined skink	*Eumeces fasciatus*
Snakes	
copperhead	*Agkistrodon contortrix*
worm snake	*Carphophis amoenus*
racer	*Coluber constrictor*
ringneck snake	*Diadophis punctatus*
rat snake	*Elaphe obsoleta*
eastern hognose snake	*Heterodon platyrhinos*
milk snake	*Lampropeltis triangulum*
smooth green snake	*Opheodrys vernalis*
brown snake	*Storeria dekayi*
eastern ribbon snake	*Thamnophis sauritus*
common garter snake *	*Thamnophis sirtalis*
smooth earth snake	*Virginia valeriae*

FISH & SHELLFISH

Common Name	**Scientific Name**
White sucker	*Catostomus commersoni*
redfin pickerel	*Esox americanus*
tessellated darter	*Etheostoma olmstedi*
redbreast sunfish	*Lepomis auritus*
pumpkinseed	*Lepomis gibbosus*
bridle shiner	*Notropis bifrenatus*
eastern mudminnow	*Umbra pygmaea*
crayfish species	*Parastacidae* spp.

* Indicates those species that have been definitively observed within the project study area.

listed in Table 3-7 as having range within the Proposed Route 92 Corridor would also commonly be found within the US Route 1 corridor.

3.3.5.1 Rare, Threatened or Endangered Species

Proposed Route 92 Corridor

According to NJDEP, the New Jersey Landscape Project classifies McCormack Lake and an area up to 590-feet-wide around the lake as foraging habitat for a pair of bald eagles. The bald eagle is federally listed as a threatened species. The NJDEP Division of Fish and Wildlife reports that this pair of bald eagles has established a nest near Carnegie Lake. Carnegie Lake is on the border of Plainsboro and Princeton, approximately 3 miles southwest of the closest part of the proposed Route 92 right-of-way. McCormack Lake is approximately 900 feet south of the proposed right-of-way, on the same side of the right-of-way as Carnegie Lake.

According to USFWS (2002), potentially suitable habitat for the federally listed bog turtle (*Clemmys muhlenbergii*) is located in the vicinity of the proposed Route 92 project. USFWS did not report bog turtle sightings in the vicinity of proposed Route 92.

In addition, USFWS notes that Cooper's hawk (*Accipiter cooperii*), savannah sparrow (*Passerculus sandwichensis*), and wood turtle (*Clemmys insculpta*), all state listed as threatened, are known to occur in the vicinity of the proposed project site.

NJDEP Natural Heritage Program (NJNHP) has records (2002) for occurrences of southern arrowhead (*Sagittaria australis*) and low spearwort (*Ranunculus pusillus var. pusillus*) within the Proposed Route 92 Corridor. The rare dragonfly comet darner (*Anax longpipes*) and the plant species American waterwort (*Elatine americana*), tall boneset (*Eupatorium Altissimum*), soapwort gentian (*Gentiana saponaria var. saponaria*), shore quillwort (*Isoetes riparia var. riparia*), slender water-milfoil (*Myriophyllum tenellum*), humped bladderwort (*Utricularia gibba*), and Britton's coast violet (*Viola brittoniana var. brittoniana*) have been documented near the immediate vicinity of the corridor. In addition, the Landscape Project shows that suitable habitat patches of emergent wetland, forest, grassland and forested wetland occur on the project site, and has records for bobolink (*Dolichonyx oryzivorus*), savannah sparrow, and wood turtle in habitat patches within the Project Study Area.

Since July 15, 2002, in responding to requests for searches of the Natural Heritage Database, NJDEP has also searched the Landscape Project database maintained by the Endangered and Nongame Species Program (ENSP) and provided information from both databases in its responses. The species listed above include species ENSP considers extant in the project area.

USEPA has not listed the Broadway Swamp or the Devil's Brook wetland complex as a "Priority Wetland" (see Section 3.3.4.4 for a description of these two wetland complexes). In addition, a NJDEP LOI was issued on August 27, 1997 and has been reissued to expire on August 27, 2007. Based upon NJDEP criteria, the resource value

classification of the study area's wetlands was determined to be ordinary and intermediate. None of the wetlands are of exceptional resource value, which indicates that no threatened or endangered species are known to occur in this area with the exception of the state endangered southern arrowhead plant (regulated pursuant to the state Flood Hazard Control Act Rules, N.J.A.C. 7:13). Detailed surveys were conducted as part of the review process and are described below.

Swamp Pink Survey
To determine the presence of state listed (threatened) swamp pink in the Project Study Area, Harris conducted a Swamp Pink Vegetative Survey (See 1994 DEIS Appendix D: Natural Ecosystems Technical Environmental Study). Swamp pink was not detected during the survey, and it was concluded that the local hydrology is not conducive to the preferred habitat of swamp pink. Additionally, the vegetative composition in the area does not support the common tree associates typically found with swamp pink.

Rare Plants Evaluation
The Evaluation of the Proposed Right-of-Way for Potential Habitat for Rare Plants for New Jersey Turnpike Authority Proposed Route 92 was prepared by ASGECI in November 1996 (Harris, 1999c) as a supplement to the Wildlife Inventory Report for Proposed Route 92 completed by them in February of that year (Harris, 1996a). The species of concern for the rare plants evaluation were those listed on the Natural Heritage Database as existing within the immediate vicinity of the proposed right-of-way at the time. These species were American waterwort (rare), soapwort gentian (rare), riverbank quillwort (rare), southern mudwort (rare), slender water-milfoil (state endangered), low spearwort (rare), southern arrowhead (state endangered), hyssop hedge-nettle (rare), humped bladderwort (rare), and coast violet (rare). The New Jersey Natural Heritage Database was consulted to determine the location of each of the reported rare plant observations, the State status of each plant, and to determine whether these reports have been confirmed. Additionally a literature search was conducted consisting of consulting several botanical manuals, viewing collected species specimens at the Rutgers University-Chrysler Herbarium, and locating the previously reported sightings on a map. These locations were mapped in relation to the proposed right-of-way. Habitat requirement information on each species was analyzed to determine whether the species had potential to be present within the proposed alignment.

American waterwort, soapwort gentian, riverbank quillwort, southern mudwort, slender water-milfoil and humped bladderwort are reported to occur on the shore of McCormack Lake, a minimum of 800 feet south of the proposed Route 92 right-of-way (ROW). It is unlikely that American waterwort would exist in the area where the proposed ROW would cross Devil's Brook, because this area has little defined shoreline and has already been disturbed. Slender water-milfoil is also unlikely to occur along Devil's Brook, because the stream bed is peaty or muddy rather than sandy and lacks a defined stream margin. The entire area along the proposed ROW between Friendship Road and the Amtrak railroad tracks was the subject of a 700-hour rare plant survey

conducted by John Fishback of Eastern States Environmental Associates (Fishback, 1994). Neither Fishback nor the NJDEP Natural Heritage Program has reported finding any of these plants at any location near the proposed ROW except along the shoreline of McCormack Lake. Other than the area covered by Fishback's survey, no potential habitat for these plants exist along the proposed ROW of Route 92.

Hyssop hedge-nettle is reported to occur in a field just west of Scott's Corner Road, nearly a mile south of the proposed Route 92 ROW (NHP, 1995). Fishback did not report finding this plant during his extensive survey of the area along the proposed ROW between Friendship Road and the Amtrak line. Although the proposed ROW crosses many fields in other areas, the annual agricultural activities in these fields would have destroyed any hyssop hedge-nettles that tried to establish themselves.

Low spearwort is reported to occur north of Devil's Brook, approximately 850 feet north of the proposed Route 92 ROW. Although potential habitat for low spearwort exists along the proposed ROW between Friendship Road and the Amtrak line, Fishback did not report finding this plant closer than 850 feet to the ROW. Outside the area surveyed by Fishback, no potential habitat exists along the proposed ROW.

In a comment on the DEIS, USFWS inquired about the possible presence of tall boneset in the project corridor. Tall boneset has been reported to occur in three New Jersey counties--Hunterdon, Somerset and Warren--but not in Middlesex County. No tall boneset plants have been found during any of the numerous field surveys conducted by qualified botanists and ecologists along the proposed Route 92 ROW.

Of the rare plant species previously reported in the general vicinity of the project, only southern arrowhead was determined to be likely present within the proposed right-of-way, based upon the existence of potential habitat within this area and previously reported observations of the species within the immediate vicinity of the proposed right-of-way.

Due to the potential presence of the state-endangered southern arrowhead within the proposed right-of-way, a field survey specifically for this species was included in the rare plants evaluation. This survey consisted of field reconnaissance during the plant's flowering period (July through October). An initial search took place in late August 1996, and focused on the forested wetland area within the limits of the proposed Route 92 right-of-way in the vicinity of the Devil's Brook. Three colonies (20+ individuals), part of a fourth colony, one individual plant and two small clusters (less than ten plants) were found within the proposed right-of-way. However, of these plants located within the proposed 300-foot right-of-way, only two colonies and part of a third colony are located within the proposed limit-of-disturbance.

An additional search, covering areas outside of the proposed right-of-way along the Devil's Brook corridor, was performed in October 1996 to determine the actual extent of the southern arrowhead population outside of the right-of-way. Three additional colonies, four clusters and one individual specimen were located outside of the

proposed right-of-way. The locations of all plant colonies, plant clusters and individual plants within and outside of the right-of-way were field surveyed by a licensed surveyor. The October 30, 1996 Evaluation of the Proposed Right-of-Way for Potential Habitat for Rare Plants for New Jersey Turnpike Authority Proposed Route 92 was provided to NJDEP and USACE and included in the Stream Encroachment Permit Application submitted in December 2004.

The project area was revisited in August 2004 to determine whether any changes in the abundance or location of southern arrowhead plants had occurred in the 5 years since the previous survey. The 2004 survey revealed that the location of southern arrowhead colonies had not changed and that several of the southern arrowhead colonies appeared to have fewer plants. Reduction in the number of plants could have been caused by filling in of the forest canopy as the forest matures, which reduces the amount of light reaching the southern arrowhead plants on the forest floor. The survey indicated that southern arrowhead colonies in areas where the canopy is relatively open are relatively healthy.

Wildlife Inventory – Species of Concern
Consultation with NJFGW resulted in a list of SOC including 18 avian species, two reptiles (turtles), and three invertebrates (mussels). These species are: pied-billed grebe (*Podilymbus podiceps*), great blue heron (*Ardea herodias*), American bittern (*Botaurus lentiginosus*), osprey (*Pandion haliaetus*), northern harrier (*Circus cyaneus*), Cooper's hawk (*Accipiter cooperii*), red-shouldered hawk (*Buteo lineatus*), peregrine falcon, upland sandpiper (*Bartramia longicauda*), barred owl, red-headed woodpecker (*Melanerpes erythrocephalus*), cliff swallow (*Hirundo pyrrhonota*), loggerhead shrike (*Lanius ludovicianus*), vesper sparrow (*Pooecetes gramineus*), savannah sparrow, Henslow's sparrow (*Ammodramus henslowii*), grasshopper sparrow (*Ammodramus savannarum*), bobolink, wood turtle (*Clemmys insculpta*), bog turtle (*Clemmys muhlenbergii*), triangle floater (*Alasmidonta undulata*), brook floater (*Alasmidonta varicosa*), and yellow lampmussel (*Lampsilis cariosa*).

ASGECI performed a Wildlife Inventory for the project area during the summer and fall of 1995 (See Appendix B of the EO 215 Response Document). The Wildlife Inventory focused on the information provided by NJNHP and NJFGW, and was presented in the Route 92 Executive Order No. 215 Response Document (Harris, 1996a). The report concluded that although some of the SOC are not present within the project area due to lack of suitable habitat, some SOC might utilize habitat within the project area. Cooper's hawk, barred owl, upland sandpiper, savannah sparrow, and bobolink were determined to be the most likely to inhabit the project area based on the presence of potentially suitable habitat and reported sightings by others.

Forty fields in the project area were searched for grassland birds, including the upland sandpiper, savannah sparrow and bobolink, between 6:00 a.m. and 10:00 a.m. on six days between mid-June and August 1995. May and June are considered the best months to survey for grassland birds. Fields determined to have higher potential as grassland

bird habitat were surveyed on three or four different mornings. Fields determined to contain potential habitat were surveyed again on four days from May 12 through June 23, 1996, between 6:00 a.m. and 11:30 a.m. No protected grassland birds were observed.

Surveys for Cooper's hawk, red-shouldered hawk and other raptors were performed in 1995 on the same days as the grassland bird species. Searches of forested habitat were performed after the morning surveys of open fields. No Cooper's hawks were positively identified during the field investigations, but a hawk too distant for identification could have been a Cooper's hawk, and an unidentified hawk call could have been that of a Cooper's hawk. No evidence of red-shouldered hawks was found during the survey.

In addition, ASGECI performed two surveys in the forested wetlands in the Devil's Brook area specifically for wood turtle and bog turtle; it was determined that there is low potential for suitable wood turtle habitat and no potentially suitable bog turtle habitat in the study area.

The first turtle survey was conducted between 9:30 a.m. and 1:30 p.m. on October 3, 1995 and between 10:30 a.m. and 2:30 p.m. on October 10, 1995. No wood turtles or bog turtles were found during the survey, and neither potentially suitable bog turtle habitat nor suitable wintering habitat for wood turtles was found within 300 feet of the proposed Route 92 right-of-way. Wood turtles must have wintering habitat within approximately 1 mile of where they spend the warmer months.

As a result of NJDEP's review of the previously described Wildlife Inventory, a second wood turtle survey was also conducted on May 12, May 26, June 9 and June 23, 1996, generally between 9:30 a.m. and 1:00 p.m. The survey methodology was approved by NJFGW staff prior to survey. On three of the four days of the survey, the temperature was above 70 degrees F. No wood turtles were found, and no overhanging stream banks typical of wood turtle winter habitat were found. One of the participants in the survey was William H. Smejkal, who is included in a list of "Recognized Qualified Bog Turtle Surveyors" provided by the USFWS and dated October 2001.

The 1995 survey extended 300 feet from the proposed Route 92 right-of-way. The 1995 survey covered all potentially suitable stream banks, the wetlands associated with Devil's Brook, and adjacent upland fields. The 1996 survey extended along Devil's Brook 1,000 feet from the proposed right-of-way, and included wetlands and adjacent upland forests and fields.

Also as a result of NJDEP's review of the Wildlife Inventory, additional field surveys were conducted by ASGECI during the spring and summer of 1996 for barred owl and grassland birds. All field survey methodology was approved by NJFGW staff prior to survey events; NJFGW staff was invited to attend survey events, and did attend barred owl field survey events. The barred owl survey resulted in no observations of this species and concluded that it is unlikely that this species utilizes the area for breeding activities.

The grassland bird survey was conducted for grasshopper sparrow, vesper sparrow, savannah sparrow, upland sandpiper, and bobolink. During these surveys, no evidence was found of any of these species. Additionally, it was determined to be unlikely that any of the SOC are utilizing the fields within the vicinity of the proposed right-of-way for breeding or nesting (ASGECI, 1996). The Barred Owl Survey and Habitat Suitability Evaluation (ASGECI, 1996), the second Wood Turtle Survey (ASGECI, 1996), and the Additional 1996 Avian Surveys: Grassland Birds for New Jersey Turnpike Authority Proposed Route 92 (ASGECI, 1996) were submitted to NJDEP in November 1996 as part of the initial Route 92 Stream Encroachment Permit application and were provided to USACE.

Findings
The results of the 1994 survey (Fishback) and the surveys performed by ASGECI with regard to threatened and endangered species are not consistent. The 1994 survey reported sightings of barred owl, savannah sparrow, bobolink, and upland sandpiper; these species were not sighted during the 1996 surveys. The Barred Owl Survey and habitat Suitability Evaluation (ASGECI, 1996) notes that the barred owl observed by Fishback and the sighting noted by NJNHP were during the same time frame, and suggests that both sightings may have been of the same transient owl. The Additional 1996 Avian Surveys: Grassland Birds (ASGECI, 1996) discusses the discrepancy between grassland bird survey results. The report states that Fishback sighted savannah sparrow in late April and early May 1994, and that the latest sighting by NJNHP was April 30, 1994 (another sighting was listed in 1982). Since Fishback did not observe savannah sparrow in 1992 or 1993, and ASGECI made no observations in 1995 and 1996, the report suggested that savannah sparrow is not normally present in the project area, but may occur during migration. Similarly, the Fishback and NJNHP bobolink sightings coincide (May 1994). However, Fishback reported sightings of bobolink in May of 1992 and 1993 as well. ASGECI suggested that these sightings might have been due to yearly migration of bobolinks to established breeding locations, since no birds were observed during their 1996 surveys. Upland sandpiper was only sighted by Fishback in April 1992 and the only sighting listed by NJNHP occurred in 1976; therefore, ASGECI concluded that upland sandpiper is not present within the study area and the 1992 sighting was probably a migrant.

Route 1 Corridor
The proposed Route 92 project includes a new intersection that would connect it to US Route 1 at Ridge Road. As part of the extensive studies conducted for the proposed Route 92 project, a request to USFWS and NJNHP was made to determine if the study area contained suitable habitat for any federal or state threatened or endangered species. As discussed above, several species had records for occurrence in the area. Field reconnaissance has been limited to the study area surrounding the proposed Route 92. Although a portion of the US Route 1 Widening and Signal Removal alternative would occur within the same study area, there is a large area to the north associated with Heathcote and Oakeys Brooks that were not included in the field surveys for these species. Additional studies would be required to determine the potential for suitable

habitat and actual individuals that may find this to be suitable habitat, but given the long history of US Route 1 as a major travel route and the fragmentation of habitat caused by the extensive development along the corridor, the potential for suitable habitat for threatened and endangered species must be considered low.

3.3.5.2 Critical Habitat

Proposed Route 92 Corridor
According to USFWS, the Project Study Area potentially contains habitat for the federally listed threatened bog turtle (although none was discovered by ASGECI as part of the 1995 Wildlife Survey); however, the project area is not defined as a "critical habitat" under USFWS regulations.

Route 1 Corridor
Additional study would be required to determine if any area along the Route 1 Corridor is considered critical habitat. However, due to the extensive development along the corridor, it is considered unlikely that any critical habitat exists.

3.3.5.3 Other Wildlife Habitat

Evaluation of Existing Habitats Along the Project Corridor
There are essentially three habitat types present along the Proposed Route 92 Corridor: agricultural fields (cropland), grassland (early and late successional fields), and forest (upland and wetland forests). Cropland is not a natural habitat type and is subject to regular human activity, which reduces its wildlife habitat value. Grassland and forests provide native habitats.

The three existing habitat types are currently fragmented to a certain degree by the existing roads, easements, railroad tracks and the patchwork of land uses. Thus, it is necessary to assess the habitat presently available to endemic species before assessing the potential impacts from the proposed Route 92 project. Adverse vegetative edge impacts to forest patches (the invasive growth of normal edge plant species or plant species from outside the patch) have been documented to extend from 10-30 meters (33-98 feet) into a temperate forest patch fragment. Adverse impacts to wildlife can extend 100-300 meters (328 to 984 feet) into forests (Wilcove et al., 1986). Interior forest dwelling species, especially birds, are subject to higher predation and nest parasitism rates in forest fragments (Day, 1996). As small patches have large edge-to-area ratios, the size of "undisturbed" area capable of supporting endemic populations is effectively reduced. Highly fragmented habitats often provide only edge habitats. Temple and Carey (1988) used a stochastic computer model to evaluate the effects of habitat fragmentation on a hypothetical population of interior forest birds. Parameters for the model simulation were derived from their fieldwork in southern Wisconsin and other field data. This work concluded that the major factor that influenced population dynamics was reproductive success. The model predicted significant differences in reproductive performance of these interior birds at varying distances from a forest edge. The results of the model identified good quality territory as 200 meters (656 feet) or more

from the edge, marginal territory 100–200 meters (328 to 656 feet) from an edge, and poor territory being less than 100 meters (328 feet) from a forest edge.

Based on the Temple and Carey (1988) study, this assessment will conservatively estimate adverse edge impacts extending 100 meters (328 feet) into a forest. Therefore, only those portions of forest habitat greater than 100 meters from an edge will be assumed to provide interior forest habitat. The majority of habitat fragmentation research has focused on birds. Although these are not the only animals present in forests, this research does provide valuable information to assess the effects of habitat fragmentation and habitat value of existing woodlands along this highway corridor based on size. No research was identified by CDM during this assessment to document the presence or extent of adverse edge impacts to grassland habitats, although it is reasonable to assume that a similar phenomenon may exist for grassland habitats as well. Woods adjacent to open fields provide habitat for predators and therefore ground nesting birds closer to wooded edges would be expected to experience higher predation rates than those further away from wooded edges. For this assessment, however, all grasslands will be assumed to provide suitable habitat.

Forest Habitat
Review of Figure 3-12 shows the proposed Route 92 project would be constructed through five forested patches. All five are linear patches connected to larger forested tracts north or south of the proposed alignment. Each patch is evaluated starting from the east.

The first patch is located about 1,500 feet west of US Route 130. This woodland is about 500 feet wide (east to west), bounded by cropland to the east and west and Friendship Road to the south. It is connected to the larger forest tract to the north and a large forested area is located south of Friendship Road. This patch is not considered to provide any interior forest habitat because it is too narrow and adverse edge impacts from the east, south and western boundaries converge, resulting in no interior forest habitat. It is essentially all edge habitat. It may provide travel corridor habitat for animals moving between the forests to the north and south of Friendship Road, and habitat for small mammals and other species adapted to living in close proximity to humans.

The next patch is located about 3,200 linear feet west of US Route 130. This woodland is less than 500 feet wide and thus provides no interior forest habitat for the same reasons described above. It is essentially a tree row separating two fields.

The third forest crossing is the riparian forest bordering on Devil's Brook, located approximately 2,500 linear feet east of the Amtrak Northeast Corridor. At the proposed roadway crossing, the forest tract is about 750 feet wide. This riparian forest is a finger-like projection of the forest extending south to McCormack Lake from the larger forest north of the highway alignment. There are four patches of early successional fields surrounding this woodland. Assuming adverse edge impacts extend 300 feet into a

forest fragment, this forested area provides about a 150-foot wide strip of undisturbed interior forest habitat. If adverse edge impacts extend to the maximum documented in the literature, than the entire swath is edge habitat. Due to its geometry, this interior habitat is small. However, this woodland can provide excellent travel corridor habitat for species moving between McCormack Lake and the large forest to the north. It also can provide relatively secluded corridor habitat within the interior forest. This forest tract borders on Devil's Brook, thus providing a water source, potential food source and travel corridor for a variety of species.

Inspection of this woodland reveals the presence of an east-west dirt road crossing in the vicinity of the proposed highway alignment. This road has the capacity to further fragment the woodland and diminish the extent of interior forest habitat. Rich et al. (1994) studied the effect of corridor width to define discreteness of forest fragments. That study evaluated the edge effects created by narrow corridors of varying widths on forest-nesting birds in southern New Jersey. Corridors evaluated included dirt roads (approximately 8 meters wide), paved roads (approximately 16 meters wide) and power line easements (approximately 23 meters wide). The results indicated that interior forest-nesting birds did not avoid the narrow corridor margins, but these margins attracted nest predators and cowbirds resulting in increased levels of predation and brood parasitism. In comparing their work to others, Rich et al. noted that their study indicates interior forest birds do not avoid forest margins along narrow corridors (8–23 meters wide) while others had reported avoidance of forest margins by interior forest species along wide corridors (50 meters or more). This suggests that this dirt road may not directly inhibit use of this tract by interior forest-nesting birds, although birds that do utilize this margin for nesting may be exposed to higher rates of predation and brood parasitism. For this assessment, it is assumed that this forest tract is not further fragmented by the presence of the east-west dirt road as the associated corridor margins are not perceived as edge habitat by interior forest-nesting birds.

The fourth forest crossing is the woodland immediately east of the Amtrak Northeast Corridor. This area is also a finger-like projection of woodland extending south to the McCormack Lake area from the large forest to the north. At the proposed highway crossing it is about 1,375 feet wide. This woodland is wider than the forest patch described above, but similarly may be entirely edge habitat. Assuming adverse edge impacts limited to 300 feet, there is an approximately 775-foot-wide strip of interior forest habitat at the core of this woodland patch. This can provide suitable habitat for species with small home ranges, and secluded travel corridor habitat for species moving between McCormack Lake and the forest to the north. This forest tract also borders on a tributary to Devil's Brook, which provides a water source, potential food source and travel corridor for a variety of species.

This forest tract is also bisected by the east-west dirt road, but at the northern extent of the highway corridor. For the reasons cited above, this dirt road will not be considered to further fragment this tract.

The fifth forest crossing is found immediately to the west of the Amtrak Northeast Corridor. This is an isolated woodland about 625 feet wide at the proposed highway crossing. This woodland is approximately 7,000 feet long and averages about 600 to 700 feet wide. It is bounded by the railroad tracks to the east and agricultural fields to the west. This woodland is essentially all edge habitat. It is likely to provide perching and resting habitat for avifauna that feed in the adjacent fields, travel corridor habitat for small mammals moving along the field margins, and habitat for species with small home ranges and that are adapted for living in close proximity to human disturbances.

In conclusion, the two extensions of the northern forest towards McCormack Lake provide the best forest habitat that would be directly affected by NJTA's proposed highway project. These areas provide secluded travel corridor habitat as well as a limited area of interior forest habitat. The extensive forests north of the alignment, along Devil's Brook, and south of the alignment provide large tracks of interior forest habitat. Since the highway project is sited in generally cleared areas no additional adverse edge impacts to those forests (north and south of the alignment) are anticipated. In addition to the areas described above, there is a small forest fragment immediately west of the power line easement. This woodland is approximately 750 feet wide by 1000 feet long. It is bordered by agricultural fields to the north, west and south, and forest to the east on the other side of the cleared power line easement. Due to its configuration and dimensions, it is essentially all edge habitat. This small patch of forest would not be directly altered for highway construction; however, increased human activity would occur along its northern boundary.

Grassland Habitat

The majority of the alignment crosses agricultural fields. The proposed Route 92 project would segment these fields. The primary crops are corn, soybean and oats. It was previously reported that forty species, almost all birds, were observed using cropland. These species were most closely associated with hedgerows or the perimeter of woodlands. The proposed Route 92 alignment greatly avoids forested areas and is located in open lands for the majority of its length. Agricultural fields were documented to support fewer species and at lower concentrations in general. Therefore, planning to construct the highway through croplands reduces habitat loss.

A small proportion of the alignment would cross grasslands (early and late successional fields). With the decline of agricultural fields (hay fields, pasture and cropland) in the northeastern United States there has been a correlated decline in populations of grassland birds adapted to such habitats (Vickery and Jones, undated). Remaining farmland provides smaller, more fragmented grassland habitat that is isolated and no longer suitable for many species that require large tracts of grassland habitat. In the past, large tracts of grassland habitat in the northeastern United States provided habitat for numerous grassland birds, including grasshopper sparrow, savannah sparrow, vesper sparrow, upland sandpiper, eastern meadowlark, and bobolink. As large tracts are lost, only those species adapted to living in smaller fields remain. For example, bobolink, eastern meadowlark and savannah sparrow rely on the remaining fields for

their existence (Vickery and Jones, undated). Vickery and Jones (undated) report that the minimum grassland size for bobolink is about 5 acres (5–10 acres), whereas eastern meadowlark requires 15–20 acres and savannah sparrow requires 20–40 acres of grassland habitat. Others (Vickery et al., 1994) have documented the need of large grassland areas on the order of 200 hectares (ha) (approximately 495 acres [ac]) to support diverse grassland populations. Results of their study of grassland birds in Maine showed an increased species richness in the small plot sizes of 2- 4 ha (5–10 ac) and 4-8 ha (10–20 ac) and in the highest plot sizes of 64 ha (158 ac) or greater. Lower species richness was observed in smaller plots (0–2 ha) and mid-sized plots (8-16 ha, 16–32 ha, and 32–64 ha). Increased species richness in the smallest patch sizes was attributed to increased edge habitat and the preponderance of edge species.

Based on these data and habitat requirements presented in Table 3-8, this assessment assumes that grasslands less than 5 acres provide poor habitat for grassland birds, grasslands 5–25 acres are ranked as marginal, while areas greater than 25 acres are assumed to provide suitable habitat. Note that grasslands greater than 100 acres would provide more optimal habitat, but are not identified as a separate rank.

Evaluating the alignment from east to west (refer to Figure 3-12), the first grassland area encountered is at the intersection of Friendship Road and Miller Road. A late successional field is found on the eastern side of Miller Road and an early successional field is found to the west. The late successional field is approximately 8 acres, and the early successional field to the west is approximately 5 acres. Based on size, the late successional field provides poor to marginal habitat and the early successional field provides poor grassland habitat. These fields likely support a greater proportion of edge species as each has two or more margins defined by trees or hedgerows.

Farther west, the alignment crosses two late successional fields, one each on the east and west side of the power line easement. The eastern field is approximately 2.5 acres and the western field is approximately 4.5 acres. Both fields are small and presumed to provide poor grassland habitat based on size.

The proposed Route 92 project crosses a complex of cropland and hay fields (early successional fields) between the power line easement and the railroad tracks. This complex provides greater than 25 acres within the highway corridor study area (an approximately 1,000-foot-wide corridor centered on the highway alignment), with contiguous grassland habitat extending farther south. Based on size, this field complex is ranked as suitable habitat; however, its actual value may be diminished depending on the percentage of cultivated land to other fields in any given year.

The remaining grassland area is an early successional field that abuts the western margin of the woodland found on the west side of the Amtrak Northeast Corridor. This old field is approximately 11.5 acres, yielding a marginal habitat rank based on size. The highway alignment would follow its southerly margin resulting in a small decrease of habitat area.

Table 3-8
Summary of Habitat Suitability for Species of Concern

Species	Optimal Habitat	Breeding/ Nesting Season	Observed in Study Area	Migration Dates		Habitat Ratings		Location of Potential Habitat
				Arrives	Departs	Breeding	Other	
Pied-Billed Grebe	Well vegetated lakes, ponds & marshes	April – June	No	March	Nov.	0	0	None
Great Blue Heron	Marshes, swamps & tidal flats	April – July	Yes	March	Nov.	0	3	Impounds north and south of dirt road; Turkey Island prop. & Devil's Brook and adjacent fields
American Bittern	Marshes & meadows	May – July	No	April	Oct.	0	0	None
Osprey	Coastal & open waters	May – August	No	March	Oct.	0	0	None
Northern Harrier	Marshes, wet meadows & coastal areas	May – June	Yes***	Permanent	Resident	0	2	Wet meadow, hayfields/cow pastures north & south of dirt road. Turkey Island property
Cooper's Hawk	Riparian forest margins	Spring; nesting resident	Possible	Some	Resident	2	3	Forest northeast. of McCormick Island prop.
Red-Shouldered Hawk	Swampy woods	Spring: uncommon nesting resident	No	Transient		2	2	Devil's Br. area, forest N.W. of McCormick Lake, Turkey Island property
Peregrine Falcon	Cosmopolitan, waterbody areas	March – June	No			0	0	None
Upland Sandpiper	Large grasslands, mowed or grazed far from forest	May – July	Yes***	April	Sept.	2	2	Pasture & hayfields, Turkey Island property and central study area
Red-Headed Woodpecker	Open deciduous woods, park-like groves, forest edges	May – July	No	Permanent	Resident	3	3	Forest edges central study area, cow pasture, Turkey Island property and dead/dying deciduous trees

Table 3-8
Summary of Habitat Suitability for Species of Concern

Species	Optimal Habitat	Breeding/ Nesting Season	Observed in Study Area	Migration Dates		Habitat Ratings		Location of Potential Habitat
				Arrives	Departs	Breeding	Other	
Barred Owl	Wetlands and upland deciduous forest	March – may	Yes***	Permanent	Resident	3	3	Wetland forests north of McCormick Lake, upland forest south and east of Friendship Road
Cliff swallow	Barn eaves, cliffs, agricultural fields	May – July	No	April	Sept.	2	2	Barn at western and of study area, near Ridge Road and Schalks Crossing Road intersection
Loggerhead Shrike	Hedgerows, cedar or hawthorn	No data	No	May	Sept.	2	2	Hedgerows & barbed fencerows, cow pastures, Turkey Is. property, edges of cedar forest between Route 1 & Ridge Road
Vesper Sparrow	Grasslands 50 ac or greater w/hedgerows	May – July	No	May	Nov.	2	2	Grass fields (cow pasture) central study area, Turkey Is. property, corn fields
Savannah Sparrow	Short grass fields & salt marshes 25-ac or greater	May – June	Yes***	March	Nov.	3	3	Mowed hayfield north of McCormick lake, Turkey Island property, & wet emergent pasture
Grasshopper Sparrow	Cultivated grasslands, old fields 200-ac or greater	May – July	No	March	Oct.	1	1	Fields west of Friendship Road & Turkey Island property
Henslow's Sparrow	Low wet meadows, early successional fields unmowed and not brushy	May – July	No	May	Oct.	1	1	Fields west of Friendship Road & Turkey Island property

Table 3-8
Summary of Habitat Suitability for Species of Concern

Species	Optimal Habitat	Breeding/ Nesting Season	Observed in Study Area	Migration Dates		Habitat Ratings		Location of Potential Habitat
				Arrives	Departs	Breeding	Other	
Bobolink	Dense fields & hayfields	May – June	Yes***	May	Sept.	3	3	Old fields north of Rte 32, hayfields on Turkey Island property, old field east of Friendship Road south of tree row
Wood Turtle	Stream, rivers, forest, (wetland & upland) fields	March – May or September – October	No	March September	May October	2	2	Wetlands, Devil's Brook area
Bog Turtle	Open bogs, swamps, marshy meadows, pure water	April – July	No	N/A		0	0	None
Triangle Floater	Aquatic, small streams	Unknown	No	N/A		1	1	Channelized portion of Devil's Brook
Brook Floater	Rapids of small rivers, creeks	Unknown	No	N/A		0	0	None
Yellow Lampmussel	Lacustrine or large rivers	Unknown	No	N/A		0	0	None

Sources: F.R. Harris. 1996
DeGraaf and Rudis. 1986.

Habitat Ratings: 0 = No Potential
1 = Minimal Potential
2 = Low Potential
3 = Potential
4 = High Potential

Notes: * = Federal listed species
** = Leck, 1975
*** = sighting reported by Fishback (1994)
**** = Feeding, cover or resting habitat

3.4 Farmland

South Brunswick, Plainsboro and Monroe townships, the three municipalities in the Proposed Route 92 Corridor, were primarily agricultural communities until the second half of the twentieth century. In recent decades the economic pressure to develop farmland for residential and other uses has grown. New Jersey's Farmland Preservation Program is an effort by the State of New Jersey to preserve farmland from non-agricultural development. The State Agriculture Development Committee (SADC) administers the Farmland Preservation Program through the County Agriculture Development Boards (CADBs).

Farmland preservation measures in New Jersey include the following:

- Farmland assessment: Active farmland is assessed for property tax purposes based on its value as farmland rather than its much greater value on the open market. Land assessed as farmland can be sold for development after payment of a tax penalty.

- Eight-year development restriction: In exchange for accepting restrictions on development of their land for 8 years, landowners qualify for cost-sharing grants for soil and water conservation projects.

- Designation of agricultural development areas (ADAs): CADBs identify land where agriculture is the preferred use and the SADC certifies the land as an ADA.

- Development easement: Land that is in an ADA and is either assessed as farmland or subject to an eight-year development restriction is eligible for preservation through a development easement. The landowner either sells or donates the development rights on the land to the SADC, the CADB, or a nonprofit organization. Donating development rights brings tax benefits. The development easement is a permanent restriction recorded in the deed to the property.

- Purchase: Occasionally, the SADC may purchase farmland at fair market value and resell it with a deed restriction against development for nonagricultural use.

Approximately 3.9 miles of the 6.7 miles of proposed Route 92 would pass through land currently assessed as farmland for property tax purposes (see Figure 3-13). Of the 3.9 miles, 3.4 miles would pass through agricultural land in South Brunswick Township. The remaining 0.5 miles would pass through agricultural land in Plainsboro Township on the west side of the Amtrak Northeast Corridor. The agricultural land through which Route 92 would pass is somewhat concentrated in the western and central portions of the corridor, but a significant stretch of the eastern portion of the proposed Route 92 would also pass through active agricultural land.

A one-mile stretch in the middle section of proposed Route 92 would pass through privately owned land in active agricultural use on the south side of Friendship Road in South Brunswick Township (see Figure 3-13). This land is among the land assessed as farmland. The portion of the land between Friendship Road and the proposed Route 92

right-of-way has been designated an ADA by CADB and has been certified by the SADC. None of the land is subject to preservation via development easement.

3.5 Historic and Cultural Resources

The following cultural resource studies have been conducted along various alternative alignments of proposed Route 92 throughout the project history: Bureau of Environmental Analysis, NJDOT, in-house cultural resources assessment, 1981; Louis Berger & Associates, Phase I report, 1984 (revised 1986); Federal Highway Administration, DEIS Section 4(f) Evaluation, October 1986; Louis Berger & Associates, Phase II investigations at four sites, 1991; Louis Berger & Associates, New Jersey Route 92 Phase I Archaeological Investigations of a Portion of Alternative VI From U.S. Route 1 to N.J. Route 130, October 1991; Hunter Research, Inc., Phase I Cultural Resource Survey for Proposed NJ Route 92, 1993; and Hunter Research, Inc., Cultural Resources Supplemental Investigation, February 1996.

The Phase I Cultural Resource Study (Hunter, 1993) was conducted in accordance with applicable federal and state legislation and guidelines governing the evaluation of impacts on archaeological resources including: Section 101(b)(4) of the National Environmental Policy Act of 1969 (NEPA); Section 1(3) and 2(b) of Executive Order 11593; Section 106 of the National Historic Preservation Act; FWHA Environmental Impact and Related Procedures (23 CFR 771), as amended October 30, 1980; USACE Procedures for the Preservation of Historic Properties (33 CFR 325, Appendix C); the guidelines developed by the Federal Advisory Council on Historic Preservation published November 26, 1980; the amended Procedures for the Protection of Historic and Cultural Properties as set forth in 36 CFR Part 800 (October 1, 1986); and New Jersey Executive Order 215. In an effort to identify cultural resources, the following tasks were conducted:

- Background and documentary research.
- Fieldwork including pedestrian survey and subsurface testing.
- Laboratory and data analysis.
- Preparation of a Phase I Cultural Resource Survey.

Table 3-9 lists the potential prehistoric and historic cultural resources located within the Project Study Area (not necessarily within the Proposed Route 92 Corridor) as identified by the Cultural Resource Survey.

The Cultural Resources Supplemental Investigation (Hunter, 1996) was the result of Phase I and II studies on five sites most likely to be impacted by the proposed Route 92 project. The study focused on those sites that were most likely to be eligible for listing on the National Register of Historic Places, based on a State Historic Preservation Officer opinion dated September 4, 1986. Such sites could require mitigation if a permit were issued and Route 92 constructed. It concluded that two sites eligible for listing on the State or National Registers of Historic Places, the Van Pelt-Clark House (Perrine Road) and the Dey-Bayles House (Friendship Road), would be impacted by the construction of

Table 3-9
Cultural Resource Survey Results (Hunter, 1993)

Site	Description
U.S. Route 1 to Perrine Road	
Haviland Farmstead Site	An historic archeological resource located near the southeast quadrant of the proposed Route 92/U.S. Route 1 interchange.
Yaros House	An historic archeological and architectural resource located at the intersection of Schalks Crossing and Ridge Roads, east of U.S. Route 1.
Major-Mount House	An historic archeological and architectural resource located west of the intersection of Schalks Crossing Road and Perrine Road. It is of architectural significance in several respects and is thus eligible for the National Register. This house is one of two houses recorded in the study area to have an uncovered chimney base, a feature distinctive to traditional New Jersey architecture.
Van Pelt-Clark House (destroyed by fire)	**An historic archeological and architectural resource situated near the proposed Route 92/Perrine Road interchange. It is the result of three, and possibly four, building phases, assembled in the linear fashion common in traditional domestic construction in the region from the mid-18th to mid-19th centuries.**
Schalks Field 2	A prehistoric archeological site located near the southeast quadrant of the proposed Route 92/Route 1 interchange. Surface finds were revealed at this site.
Yaros Field	A prehistoric archeological resource located approximately 1200 feet east of the Ridge Road/Schalks Crossing Road intersection. The historic artifacts recovered from date to the late 19th and 20th centuries. As Yaros Farm is a recent agricultural enterprise, the potential of additional historic archeological features is considered low within and in the immediate vicinity due to the disruptive nature of the agricultural activities.
Perrine Road to U.S. Route 130	
T. Griggs House	An historic archeological and architectural resource located south of proposed Route 92, approximately 1200 feet west of Miller Road. Excavations in the vicinity of the house documented construction activities associated with the house. Historic materials recovered and recorded during subsurface testing included 20th century window glass and 19th century material, in addition to two sherds of 18th century stoneware. The level of disturbance has reduced the potential for additional resources within this site.
Madsen House	An historic archeological and architectural resource located on the north side of Friendship Road, approximately 1200 feet west of U.S. Route 130. Excavation in the vicinity of the house documented a high level of disturbance. A sample of 16 historic materials was recovered from three subsurface tests. Construction activities in the vicinity of this structure have removed surface soils and possibly truncated subsurface layers.
Dey-Bayles House	**An historic archeological and architectural resource located north of Friendship Road. The architectural features characteristic of this house illustrate the influence of popular style on traditional building practices in the area and thus qualifies the house for the National Register of Historic Places.**
Szymanski House and Site	An historic archeological and architectural resource located on the north side of Friendship Road, approximately 1000 feet west of the Friendship Road/ Miller Road intersection. A single shovel test was excavated on the south side of the house and a surface survey conducted within the site, located to the north of the associated outbuildings. Historic artifacts were recovered ranging in date from the late 18th century to the present.

Table 3-9
Cultural Resource Survey Results (Hunter, 1993)

Site	Description
Ayers-Lane House (John W. Lott House)	An historic archeological and architectural resource located at the intersection of Miller and Friendship Roads. Intact original window sash, shutters and an exposed stone chimney base contribute to the architectural significance of the Ayers-Lane House. However, the Phase II study concluded that the deteriorated condition and loss of integrity precludes the house from being eligible for listing on the National Register of Historic Places.
W.R. Dey Farmstead	An historical architectural resource located on the north side of Friendship Road, just west of Haypress Road.
Boekhaut House	An historic architectural resource located south of Friendship Road, approximately 800 feet east of Haypress Road. The house was moved to its current location in the 1960s. In addition, research has indicated the presence of another structure (W. Breeze) in the vicinity in the mid-19th century. The high level of disturbance at this site is due to the destruction of the Breeze structure and the excavation of a foundation for the present structure.
Former G. Groves House	An historic architectural resource located south of Friendship Road, just east of the Boekhaut House. Subsurface investigations surrounding this house revealed artifacts of architectural and domestic debris dating to the 19th and 20th centuries. The level of disturbance recorded indicates that no intact historic features are extant in this vicinity. Disturbance of archeological deposits were caused by the removal in 1990 of the G. Groves structure to a location 1300 feet to the east along Friendship Road.
G. Groves House	An historic architectural resource located south of Friendship Road, approximately 1300 feet east of the Former G. Groves House.
Elkins House	An historic archeological and architectural resource located north of Friendship Road, approximately 1600 feet east of Haypress Road. It is considered that all locations within potential historic deposits in the vicinity of the Elkins House have been disturbed.
Litwin House	An historic archeological site located on the south side of Friendship Road. Foundation walls for a small rectangular structure were encountered during field reconnaissance on the south side of Friendship Road, referred to as the Litwin foundation. Further analysis has suggested that these foundations are dated in the early 20th century. Historic materials were recovered from surface strata. The destruction of the superstructure of the Litwin foundation apparently impacted surface strata south of the foundation. This destruction has removed the potential for additional archeological features or deposits.
Macabel House	An historic archeological and architectural resource located south of Friendship Road, approximately 2200 feet west of U.S. Route 130. Subsurface investigation of this site revealed fragments representing glass liners for canning jars. This may be an indication of 20th century disposal patterns rather than a reflection of the popularity of mid to late 19th century canning activities. It is considered that plowing and landscaping have destroyed any formerly present historic features.
Perrine Field 1A	A prehistoric archeological resource located approximately 800 feet east of the proposed Route 92/Perrine Road intersection.
Turkey Island fields 1 and 3	Prehistoric archeological resources. Turkey Island Field 1 is located approximately 1000 feet north of the Broadway Road/Friendship Road intersection, on the west side of Friendship Road. Turkey Island Field 3 is located approximately 1200 feet northwest of Turkey Island Field 1.
Capp Field	A prehistoric archeological resource located approximately 1200 feet north of the Friendship Road/Broadway Road intersection, on the east side of Friendship Road.

Table 3-9
Cultural Resource Survey Results (Hunter, 1993)

Site	Description
Boyko Site	A prehistoric archeological resource located approximately 2000 feet north of the Broadway Road/Friendship Road intersection, on the east side of Friendship Road. Subsurface investigation at the site revealed lithic artifacts and shovel tests recovered prehistoric artifacts. Phase II investigations revealed no significant evidence of prehistoric occupation.
Broadway Fields 4 and 5	Prehistoric archeological resources located south of Friendship Road and west of Miller Road. Several stray prehistoric finds were revealed at these sites.
Bechenstein Field 1	A prehistoric archeological resource located east of the Friendship Road/Miller Road intersection, on the south side of Friendship Road. Prehistoric stray finds were revealed at this site.
Volk Site	A prehistoric archeological resource located northwest of the intersection of Haypress and Friendship Roads. Contains a high artifact density as well as a large collection of lithic artifacts. A surface reconnaissance of the entire Volk field did not reveal artifacts in any area other than a site approximately 50 feet south of Devils Brook.
Ely Field I	A prehistoric archeological resource located north of Friendship Road, approximately 1200 feet east of Haypress Road. Prehistoric stray finds were revealed at this site.
Matrix Fields 3 and 4	Situated on the north side of Friendship Road, west of U.S. Route 130. Prehistoric stray finds were revealed at this site.
Amtrak Northeast Corridor	The railroad tracks are situated between Perrine Road and U.S. Route 130. The corridor has been designated an historic archeological resource.
Miller Road	A north-south road with connections between Broadway Road to the south and Friendship Road to the north. It has been designated an historic archeological resource.
U.S. Route 130	A north-south transportation corridor associated with light industrial facilities, small office complexes and commercial premises. It has been designated an historic archeological resource.
U.S. Route 130 to the New Jersey Turnpike	
No cultural resources were identified within the project study area between U.S. Route 130 and the New Jersey Turnpike.	

Sites in **boldface** were determined to require mitigation as a result of the Cultural Resources Supplemental Investigation (Hunter, 1996).

Route 92 as proposed. The Van Pelt-Clark House was destroyed by fire on August 12, 2000, and the Dey-Bayles House also no longer exists (Richard Grubb & Associates, 2002).

With respect to the Dey-Bayles House, South Brunswick Township construction official Anthony Lombardo sent a "Notice of Unsafe Structure" and "Notice of Imminent Hazard" to South Brunswick Industrial Park Association, owner of the property, on March 18, 1998. The notice stated that the buildings on the property were uninhabitable and had to be demolished. South Brunswick issued a permit for demolition of a barn on the property in March 1998 and a permit for demolition of the Dey-Bayles House and other associated buildings in May 1998.

Please refer to Section 4.2.5 for additional discussion of the results of the cultural resources investigation and the potential impact of proposed Route 92 on cultural and historic resources in the study area.

A third site, the Ayres-Lane farmstead, is in the proposed Route 92 right-of-way and would be displaced by the project. This site is also called the John W. Lott house and the R. Applegate farmhouse. The Cultural Resources Supplemental Investigation concluded that the highly deteriorated condition of this building diminished its significance to the point that it is not eligible for the State or National Register.

With respect to the Ayres-Lane farmstead, details are provided in a combined Phase I and Phase II cultural resources investigation of the proposed Route 92 alignment completed by Hunter Research in 1996. Hunter stated that although the house retained some historic integrity, the building's extremely deteriorated condition greatly diminished its architectural significance. Hunter observed that the property has no outstanding historical associations and is an unexceptional example of traditional building practice in central New Jersey in the early-to-mid 19th century. Hunter also believed the archaeological research potential of the Ayres-Lane farmstead had been "suitably exhausted" by the Phase I and II surveys already completed. Hunter concluded that the property did not meet the criteria for inclusion in the National Register of Historic Places. Richard Grubb & Associates concurred with this conclusion in 2002.

The proposed Route 92 project has been reviewed by the State Historic Preservation Office of NJDEP (SHPO) pursuant to Section 106 of the National Historic Preservation Act of 1966 (NHPA), as amended. In a letter to NJTA dated December 11, 1996, NJDEP stated that no archaeological resources have been identified within the area of potential impacts, and that the proposed project could adversely impact two historic architectural properties, the Van Pelt-Clark House and the Dey-Bayles House. As noted above, the cultural resources assessment conducted by Richard Grubb & Associates in 2002 found that these two houses no longer exist.

In contrast to SHPO's lack of comment on the issue, many commenters on the DEIS stated that proposed Route 92 would adversely affect the Kingston Village Historic

District, the center of which is approximately 1 mile west of the western terminus of the proposed highway. The historic district includes Route 27 from Raymond Road to the Delaware and Raritan Canal, Heathcote Road, Laurel Avenue, Church Street and Academy Street. Impacts to Kingston are addressed in Section 4.2.1.3 of this FEIS.

3.6 Air Quality

The study area contains a range of land use activities that affect air quality. Since the Clean Air Act was passed in 1970, significant improvements in air quality have been achieved in New Jersey. The 1990 Clean Air Act Amendments designated areas in the country with air quality problems as non-attainment areas (NAA) of the National Ambient Air Quality Standards (NAAQS), and required measures to reduce emissions in such areas. In 2001 in New Jersey, all criteria pollutants (see below) except ozone were within the NAAQS primary (health) standards (NJDEP, 2003).

3.6.1 Standards and Attainment Status

NAAQS have been established for six pollutants (criteria pollutants), all of which are monitored by NJDEP as part of the maintenance and reporting requirements of the State Implementation Plan. The criteria air pollutants are sulfur dioxide, nitrogen dioxide, particulates less than 10 microns in diameter (PM10), lead, carbon monoxide and ozone. The NAAQS are divided into primary (health) and secondary (public welfare) standards. The primary standards are intended to protect public health with an ample margin of safety. Secondary standards are intended to protect the public welfare from identified or expected adverse effects of a pollutant other than those to human health. Refer to Table 3-10 for New Jersey AAQS and NAAQS, as well as results from monitoring locations in the vicinity of the project area. Air basins or regions are classified as attainment or non-attainment as defined by USEPA in the Code of Federal Regulations (40 CFR Part 81). Ozone non-attainment areas are further classified as marginal, moderate, serious, severe, or extreme. Particulate (PM10) and carbon monoxide non-attainment areas may be designated as either moderate or serious. The project area is located within the New Jersey-New York-Connecticut Interstate Air Quality Control Region established in 40 CFR Section 81.13.

3.6.2 Existing Air Quality

The quantitative description of existing air quality conditions is based upon the 2001 Air Quality Report published by NJDEP, Division of Environmental Quality. The report is a summary of New Jersey air quality data compiled for 2001 from the statewide monitoring station network. The monitoring stations nearest the study area are as follows: the Middlesex air quality monitoring station is located northeast of the study area. This station monitors ambient air quality for carbon monoxide. Monitoring locations at Rutgers and Rider Universities monitor ozone and nitrogen dioxide. The Perth Amboy station monitors sulfur dioxide and carbon monoxide. Fine and inhalable particulates are monitored at the Trenton station, and fine particulates are also monitored at a New Brunswick station. An additional monitoring location in New Brunswick monitors lead. Table 3-10 lists the pollutant concentrations measured at each

Table 3-10
Existing Air Quality Near the Project Area

Pollutant	Monitoring Station	Period	2001 Maximum Concentration	Ambient Air Quality Standards		
				Standard	New Jersey[a]	National[b]
Carbon Monoxide	Middlesex	1-hour	5.0 ppm	Primary & Secondary	35 ppm	35 ppm[c]
		8-hour	4.6 ppm	Primary & Secondary	9 ppm	9 ppm[c]
	Perth Amboy	1-hour	6.0 ppm	Primary & Secondary	35 ppm	35 ppm
		8-hour	3.4 ppm	Primary & Secondary	9 ppm	9 ppm
Sulfur Dioxide	Perth Amboy	3-hour	0.071 ppm	Secondary	0.5 ppm	0.5 ppm
		24-hour	0.030 ppm	Primary	0.14 ppm	0.14 ppm
				Secondary	0.10 ppm	---
		12-month	0.005 ppm	Primary	0.03 ppm	0.030 ppm
				Secondary	0.02 ppm	---
Fine Particulates (PM2.5)	New Brunswick[1]	annual	13.2 ug/m^3	Primary & Secondary	---	15 ug/m^3
		24-hour	45.1 ug/m^3	Primary & Secondary	---	65 ug/m^3
	Trenton	annual	14.9 ug/m^3	Primary & Secondary	---	15 ug/m^3
		24-hour	36.0 ug/m^3	Primary & Secondary	---	65 ug/m^3
Inhalable Particulates (PM10)	Trenton	annual	23.5 ug/m^3	Primary & Secondary	---	50 ug/m^3
		24-hour	68 ug/m^3	Primary & Secondary	---	150 ug/m^3
Ozone	Rutgers University	8-hour	0.120 ppm	---	---	---
		8-hour	0.103 ppm[d]	Primary & Secondary	---	0.08 ppm[e]
	Rider University	8-hour	0.115 ppm	---	---	---
		8-hour	0.105 ppm[d]	Primary & Secondary	---	0.08 ppm[e]
Nitrogen Dioxide	Rutgers University	annual	0.019 ppm	Primary & Secondary	0.05 ppm	0.053 ppm
	Rider University	annual	0.017 ppm			
Lead	New Brunswick[2]	3-month	0.230 ug/m^3	Primary & Secondary	1.5 ug/m^3	---
		quarterly mean	0.150 ug/m^3	Primary & Secondary	---	1.5 ug/m^3

Monitoring Stations:

Middlesex	Route 1 & Georges Road
Perth Amboy	130 Smith Street
New Brunswick	Log Cabin Road[1], Delco-Remy[2]
Trenton	120 Academy Street
Rutgers University	Horticultural Farm #3, Ryders Lane
Rider University	Rider University, Route 206

[a] Not to be exceeded more than once in any 12-month period
[b] Not to be exceeded more than once in a calendar year
[c] No secondary standard
[d] 3-year average of fourth highest 8-hour averages
[e] Standard met when the 3-year average of the fourth highest daily maximum 8-hour average is less than or equal to 0.08 ppm

Source: 2001 Air Quality Report, NJDEP Bureau of Air Monitoring

monitoring station near the study area during 2001. Measured data are also compared with the New Jersey AAQS and NAAQS.

The 2001 Air Quality Report indicates that criteria pollutant concentrations with the exception of ozone meet the applicable New Jersey AAQS and NAAQS at the monitoring stations near the Project Study Area (See Table 3-10). Across New Jersey, the ozone standard was exceeded on 35 days.

To summarize, because the Project Study Area is in a non-attainment area for ozone, proposed highway alignment alternatives within the study area will have to demonstrate a reduction in air quality impacts for ozone-causing pollutants. Proposed transportation alternatives will have to result in lower vehicle miles traveled, vehicle hours traveled and congestion. This is discussed further in Section 4.

3.7 Transportation

3.7.1 Roadway System

The Traffic Study Area (see Figure 3-14) consists of the townships of South Brunswick, Plainsboro, and Cranbury in southwestern Middlesex County; and the townships of West Windsor and East Windsor (including Hightstown) in northeastern Mercer County. These municipalities cover an area that is roughly bounded by the New Jersey Turnpike to the east, NJ Route 27 and the D&R Canal to the west, County Route 610 (Deans Lane) to the north, and County Route 571 on the south.The main highways serving traffic passing through this area are all oriented in a north-south direction: the New Jersey Turnpike (with Interchanges 8 and 8A along the area's eastern edge) and US Route 130 on the eastern side of the area, and US Route 1 and NJ Route 27 on the area's western side. NJ Route 32 provides a connection between US Route 130 and the New Jersey Turnpike at Interchange 8A.

The New Jersey Turnpike is a divided toll highway facility extending from the Delaware Memorial Bridge at Deepwater, New Jersey to the Interstate Route 95/Interstate Route 80 junction in Ridgefield Park, near the George Washington Bridge. Access to the Traffic Study Area from the Turnpike is provided at Interchange 8 in East Windsor, and Interchange 8A on the South Brunswick/Monroe border. The area can also be accessed from New Jersey Turnpike Interchange 9 via NJ Route 18 to US Route 1. The New Jersey Turnpike is a ten-lane facility in this area.

US Route 130 is a state arterial highway running from the Delaware Memorial Bridge to an intersection with US Route 1 a few miles north of the Traffic Study Area in the town of North Brunswick. The US designation conveys that it is a roadway of national importance, but does not imply any connection with federal control; an arterial highway is a highway designed for through traffic on a continuous route (California DOT Highway Design Manual). Within the Traffic Study Area, US Route 130 is a four-lane facility that serves both through and local north-south traffic movements in East Windsor, Cranbury, and South Brunswick. It intersects with several east-west roads

within the Traffic Study Area. Auxiliary lanes, such as left-turn bays, are provided at major intersections. Shoulders are provided adjacent to both the median and curb lanes.

US Route 1 is a principal state arterial highway running from Trenton to the George Washington Bridge. US Route 1 serves both through traffic as well as local north-south traffic movements in South Brunswick, Plainsboro, and West Windsor. In South Brunswick, US Route 1 has four lanes with flanking shoulders. In Plainsboro and West Windsor, it is a six-lane facility. A concrete barrier separates opposing traffic flows. Jughandles are available at major signalized intersections for vehicles exiting the highway. A total of eighteen signalized intersections are located along US Route 1 within the Traffic Study Area. Grade-separated interchanges are provided at College Road, Scudders Mill Road, Alexander Road, and Quaker Bridge Road. Parking lanes are not available along either curb lane. Curb cuts providing lane service for a variety of commercial establishments are found along this entire section of US Route 1.

NJ Route 27 is a north-south roadway running from Newark to Princeton via the western edge of South Brunswick. Within the Traffic Study Area, NJ Route 27 is a two-lane road, except in the Kendall Park section of South Brunswick, where it has five lanes. Its alignment is generally without parking lanes and shoulders. Opposing traffic flows are separated by a painted median, with auxiliary turning lanes provided in areas of development.

NJ Route 32 is a 1.2-mile east-west connector between US Route 130 in South Brunswick and New Jersey Turnpike Interchange 8A. The roadway has an eight-foot-wide service lane adjacent to the curb and two mainline travel lanes in each direction. The opposing traffic flows are separated by a grass median. There is a signalized intersection at County Route 535.

A series of east-west local and secondary roads connect to the four north-south highways in the Traffic Study Area, providing access to the towns as well as meeting local circulation needs. These roads include County Route 610 (Deans Lane), Major Road, New Road, County Route 522, Ridge Road, Friendship Road, Broadway Road, Dey Road, Scudders Mill Road, Plainsboro Road, Cranbury Neck Road, and County Route 571. These are two-lane roads, except for the new alignment of County Route 522 between NJ Route 27 and US Route 130, Scudders Mill Road between US Route 1 and Dey Road, and County Route 571 between Alexander Road and Hightstown, which have four lanes. Some of these roads, either individually (such as County Routes 522 and 571) or in combination (such as Dey Road and Scudders Mill Road) provide continuous routes between the eastern and western sides of the area.

The newly constructed Hightstown Bypass (NJ Route 133) is a 3.7-mile, divided, four-lane limited-access highway in the town of East Windsor, allowing east-west traffic passing through East Windsor to bypass the town of Hightstown.

3.7.2 Existing Traffic Patterns and Levels of Service

As can be seen in the traffic flow diagrams in Figures 3-15 and 3-16, the principal peak hour traffic flows in the Traffic Study Area are the north-south flows along the New Jersey Turnpike, US Route 1, and US Route 130. The high peak-hour north-south volumes cause some delays at signals, particularly along US Route 1. The most serious congestion in the Traffic Study Area, however, occurs on the two-lane east-west roads, such as Ridge Road, Dey Road, and Plainsboro Road. Currently, approximately 16 percent of traffic on these roads is through traffic.

3.7.3 Projected Year 2028 Traffic Conditions

With only those projects that have currently committed funding in place, traffic modeling shows that severe congestion will be much more widespread in the Traffic Study Area by the year 2028. As can be seen in Figures 3-17 and 3-18, increased congestion levels will occur on both north-south and east-west roads in the area. An increasing percentage of peak hour traffic on the east-west roads is expected to be through traffic passing through the area, reaching about 25 percent by the year 2028 (compared to 16 percent currently).

Projected traffic conditions at key intersections within the Traffic Study Area were evaluated (see Figure 3-19). The projected peak hour levels of service (LOS) were computed for each of the intersections studied in accordance with the 1985 Highway Capacity Manual (HCM).

LOS is a qualitative measure of the operational conditions within a traffic stream and their perceptions by motorists. LOS is based on the average stopped delay per vehicle for various movements within the intersection. Factors describing the LOS include speed, travel time, maneuverability and safety. LOS is described by letters ranging from A to F; designation A represents the best condition characterized by freeflow conditions where the drivers are unrestricted in their ability to maneuver while designation F represents the worst case where the capacity of the facility has reached its limit, traffic flow is interrupted, and the drivers are severely restricted in their ability to maneuver. The LOS designations are defined as shown in the following table.

Level of Service	Description	Stopped Delay per Vehicle (seconds)
A	Little or no interruption in service	Up to 5
B	Short interruption in service	5+ up to 15
C	Average interruption in service	15+ up to 25
D	Long interruption in service	25+ up to 40
E	Very long interruption in service	40+ up to 60
F	Approaching capacity in service	Greater than 60

The table below shows existing (2001) and projected 2028 Level of Service designations (AM/PM), with no roadway improvements other than those currently funded.

	Intersection LOS			
	2001		2028 No Action	
Intersection	**A.M.**	**P.M.**	**A.M.**	**P.M.**
US-1 @ Cozzens Lane	F	F	F	F
US-1 @ Major Rd (Sandhill)	F	D	F	F
US-1 @ New Road	F	E	F	F
NJ-27 @ Raymond Road	A	B	F	B
NJ-27 @ CR-522	D	D	E	F
Scudders Mill Road @ Schalk's Crossing Road	D	C	F	F
Scudders Mill Road & Dey Road	F	D	F	F
Plainsboro Road & CR-535	C	B	E	F
US-130 @ Dey Road	F	F	F	F
Dey Rd & CR-535	D	C	F	F
NJ-32 @ CR-535	F	F	F	F
NJ-32 @ Herrod Blvd.	F	F	F	F
US-130 @ Friendship Rd	F	F	F	F
George's Rd & Kingston Ln	B	B	D	B
CR-522 & Kingston Ln	F	F	F	F
US-1 @ CR-522	F	F	F	F
US-1 @ Ridge Rd	F	F	F	F

As shown in the preceding table, all but one of these intersections are expected to exhibit saturated conditions during at least one of the peak hours, and 13 out of 17 exhibit such conditions during both peak hours.

3.8 Noise

This section presents background information on environmental sound levels in the Project Study Area.

3.8.1 Noise Descriptors and Criteria for Assessment

Noise is measured in decibels (dB) and is a measurement of sound pressure level. The human ear perceives sound, which is mechanical energy, as pressure on the ear. The sound pressure level is the logarithmic ratio of that sound pressure to a reference pressure, and is expressed in decibels. Environmental sounds are measured with the A-weighted scale of the sound level meter. The A scale simulates the frequency response of the human ear, by giving more weight to the middle frequency sounds, and less to the low and high frequency sounds. A-weighted sound levels are designated as dBA. The figure on the next page shows the range of sound levels for common indoor and outdoor activities, in dBA.

COMMON OUTDOOR NOISES	Sound Pressure (uPa)	Sound Pressure (dB)	COMMON INDOOR NOISES
Jet Fly Over at 300 feet	6,324,555	110	Rock Band at 15 feet
Gas Lawn Mower at 3 feet	2,000,000	100	Inside Subway Train (New York)
Diesel Truck at 50 m	632,456	90	Food Blender at 3 feet
Noisy Urban Daytime	200,000	80	Garbage Disposal at 3 feet Shouting at 3 feet
Gas Lawn Mower at 100 feet Commercial Area	63,246	70	Vacuum Cleaner at 10 feet Normal Speech at 3 feet
	20,000	60	Large Business Office
Quiet Urban Daytime	6,325	50	Dishwasher Next Room
Quiet Urban Nighttime Quiet Suburban Nighttime	2,000	40	Small Theatre, Large Conference Room Library
Quiet Rural Nighttime	632	30	Bedroom at Night Concert Hall (Background)
	200	20	Broadcast and Recording Studio
	63	10	Threshold of Hearing
	20	0	

Source: FHWA, Noise Fundamentals Training Document, "Highway Noise Fundamentals," September 1980.

The impact of increasing or decreasing noise levels is presented in Table 3-11. For example, it shows that a change of 3 dBA is barely perceptible and that a 10-dBA increase or decrease would be perceived by someone to be doubling or halving of the noise.

Table 3-11
Decibel Changes, Loudness, and Energy Loss

Sound Level Change (dBA)	Relative Loudness	Acoustical Energy Loss (%)
0	Reference	0
-3	Barely Perceptible Change	50
-5	Readily Perceptible Change	67
-10	Half as Loud	90
-20	1/4 as Loud	99
-30	1/8 as Loud	99.9

Source: FHWA, *Highway Traffic Noise Analysis and Abatement Policy and Guidance*, June 1995.

The applicable regulatory noise standard proposed for this roadway project is the FHWA noise abatement criteria (NAC) (23 CFR Part 772). The FHWA noise abatement criteria, presented in Table 3-12, are based on specific land use categories. There are two optional noise descriptors: the one-hour L_{10} and the one-hour L_{eq}. The L_{10} is the sound level that is exceeded 10 percent of the time (the 90th percentile) for the period under consideration. The L_{eq} is defined as the equivalent steady-state sound level, which in a stated period of time contains the same acoustic energy as the time-varying sound level during the same period (FHWA, 1982). The regulations specify using either one or the other, but not both to determine noise impacts. For this project, the one-hour L_{eq} noise level descriptor was used.

Table 3-12
FHWA Noise Abatement Criteria

Activity Category	L_{eq}(1hr) [1] (dBA)	Description of Activity Category
A	57 (exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve intended purpose.
B	67 (exterior)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.
C	72 (exterior)	Developed lands, properties, or activities not included in Categories A or B above.
D	--	Undeveloped lands.
E	52 (interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

Note: [1] No single hourly average L_{eq} in a 24-hour day can exceed this value.
Source: *23 CFR Part 772.*

Land uses along the Proposed Route 92 Corridor are predominantly Activity Categories B and C (see Table 3-12). The FHWA noise standards indicate that noise mitigation must be considered when the Horizon-Year project levels approach or exceed the stated noise abatement criteria. The NJDOT policy defines "approach the noise abatement criteria" (23 CFR 772.5(g)) as 1 dBA below the NAC; therefore, 66 dBA and 71 dBA noise levels were used to assess exterior noise impacts for Activity Categories B and C. In addition, the FHWA and NJDOT noise standards also indicate that noise mitigation must be considered when the Horizon-Year project levels "substantially" exceed existing noise levels. The NJDOT defines "substantially" as a predicted incremental impact equal to or greater than 10 dBA over existing noise levels.

3.8.2 Existing Noise Monitoring Program

The goals of the noise monitoring program prepared in October 2002 for this EIS was to capture representative samples of existing noise levels at sensitive receptor locations in the Proposed Route 92 Corridor and to update the noise level data previously presented in the 1994 DEIS (Harris, 1994). The data collection was conducted as outlined in Measurement of Highway-Related Noise (FHWA, 1996).

The following sections describe the measurement locations, noise monitoring procedures, equipment used for the field program and the results of the noise monitoring program.

3.8.2.1 Noise Monitoring Location Selection

Three 15-minute data sets were collected at each of seven monitoring locations, as shown in Figure 3-20 (Sheets 1-3). Table 3-13 lists these locations, and contains a brief rationale for the selection of each site. The locations are numbered starting from the east end of the corridor and heading west. This was accomplished by making successive "loops" through all the monitoring locations. Monitoring locations along the Proposed Route 92 Corridor were selected near receivers that have land use categories that correspond to the most stringent FHWA noise criteria and that are located closest to the Proposed Route 92 Corridor. In addition, some of the monitoring locations are the same as those used in the 1994 EIS.

Table 3-13
Noise Monitoring Locations

Monitoring Location	Description	Selection Rationale
1	Route 32 commercial area between Exit 8A and US Route 130	Represents commercial development area
2	West of Residence (84 Friendship Road)	Represents nearest residence to proposed Route 92 and was a previous monitoring location in the 1994 DEIS
3	Residence east of Harmony Lane and north of Friendship Road	Represents residential area north of proposed Route 92
4	Residential area on Friendship Road (east of 271 Friendship Road)	Represents nearby residential area and current East/West Friendship Road traffic and was a previous monitoring location in the 1994 DEIS
5	End of Silvers Lane (Perrine Road residential subdivision)	Represents nearby residential area south of the proposed Route 92
6	Perrine Road residence	Represents a residence north of proposed Route 92 and adjacent to the Perrine Road reroute
7	Central New Jersey Council – Boy Scouts of America	Represents institutional area adjacent to US Route 1

Figure 3-21 shows the monitoring locations assessed during the 1993 study. The purpose of selecting the same monitoring locations was to document any changes in ambient noise level conditions since 1993. The land use category for each receptor was determined using aerial photographs, field reconnaissance and design plans and drawings. The monitoring locations were selected to represent residential and commercial areas along the proposed roadway corridor that could be evaluated in the noise impact analysis. Other criteria used to select monitoring locations included: 1) placement of monitoring locations in area of frequent human use; 2) representation of residential and commercial areas along the corridor, and 3) collection of measurements near other existing noise sources.

3.8.2.2 Equipment

A Quest 1900 Type I Precision Sound Level Meter (SLM) was used to collect ambient noise level data. The sound level meter was factory calibrated. The Quest 1900 SLM collected 15-minute measurements at each monitoring location and was calibrated with a sound calibrator before the first reading of the day. At the end of each hour of monitoring the calibration was checked and end-calibration values were recorded on the field data sheets.

In addition to collecting noise data, also noted were general weather conditions: average temperature, wind speed and sky conditions at each monitoring location.

The sound level meter was equipped with a windscreen and placed on a tripod approximately 5 feet above ground, not less than 10 feet away from any reflective surfaces at each monitoring location. In addition, noise monitors were set up 50 feet from the edge of the roadway. A "random-incidence" microphone was used. This microphone is capable of capturing uniform weighted frequency and sound pressure levels for incoming sound from all directions simultaneously if aimed straight up (90° incidence to the sound field). The sound level meter was set for automatically timed integration mode at fast response.

3.8.2.3 Measurement Procedures

Field personnel conducted noise monitoring for three time periods (i.e., 7:00 a.m. to 10:00 a.m., 10:00 a.m. to 1:30 p.m. and 3:00 p.m. to 7:00 p.m.) on October 24, 2002. The following data were gathered:

- Continuous energy equivalent A-weighted noise levels (L_{eq})
- Statistical noise levels (L_{90}, and L_{10}).

The L_{90} noise level is the sound, in dBA, exceeded 90 percent of the time during the measurement period. The L_{90} is close to the lowest sound level observed during the measurement period. It is essentially the same as the residual sound level, which is the lowest sound level observed when there are no obvious nearby intermittent sources.

The L_{10} noise level is the sound, in dBA, exceeded 10 percent of the time during the measurement period. The L_{10} is close to the maximum sound level observed during the measurement period. The L_{10} is sometimes called the intrusive noise level because it is caused by occasional louder noises like passing motor vehicles.

Although the statistical noise levels (L_{90} and L_{10}) are required to compare with FHWA noise standards for this project, they were taken to provide a more complete picture of noise level distribution at each monitoring location.

Noise monitoring was conducted during fair weather conditions (i.e., dry weather and wind speeds less than 12 miles per hour). The crew, time, wind speed and direction,

temperature and general weather conditions were noted at each site before each set of readings.

Dominant noise sources, and direction of dominant noise sources were documented. During noise monitoring, if any unusual noise events occurred (e.g., lawn mower), monitoring was interrupted until the unusual noise event stopped. Prolonged unusual noise events would require moving the monitoring location or sampling at a different time period. These unusual noise events and noise monitoring stop and start times were noted. For those monitoring locations beside existing roadways, during each 15-minute sample, traffic counts for five types of vehicle classifications (i.e., passenger vehicles, medium truck, heavy truck, bus and motorcycle) were collected at each monitoring location. All field notes, and noise level and traffic count data were recorded on data sheets.

3.8.2.4 Noise Monitoring Results

Noise monitoring was conducted during dry, cold and light wind conditions. The results of the noise monitoring program indicated that there are significant variations in ambient noise levels throughout the Proposed Route 92 Corridor**.** The daytime L_{eq} noise levels along the corridor ranged from 48 dBA to 71 dBA. The peak L_{eq} noise levels did not exceed the 67 dBA NAC, except at Monitoring Location 7 (Boy Scouts of America property). The lower noise levels were measured in areas away from major roadways and the higher noise levels were measured in areas adjacent to major roadways. This range of noise levels is typical for ambient conditions ranging from quiet residential to urban residential and commercial areas adjacent to major roadways. A summary of peak daytime L_{eq} noise levels used to represent existing conditions is presented in Table 3-14.

Table 3-14
Noise Monitoring Results

Monitoring Location	Description	L_{eq} Noise Level (dBA)		
		Morning	Midday	Afternoon
1	Route 32 commercial area between Exit 8A and US Route 130	65.9	65.1	62.1
2	West of Residence (84 Friendship Road)	63.2	56.5	60.7
3	New residential subdivision off of Harmony Lane and north of Friendship Road	61.1	52.4	58.0
4	Residential area on Friendship Road (east of 271 Friendship Road)	60.5	58.4	59.4
5	End of Silvers Lane (Perrine Road residential subdivision)	--	47.8	49.7
6	Perrine Road residence	--	52.0	50.3
7	Boy Scout Council	71.0	--	69.2

Note: -- Noise level measurements not taken at those times.

3.8.2.5 Existing and Future No-Build Conditions

Existing noise levels in the project study area were determined from the noise monitoring conducted in 2002 and noise monitoring data presented in the 1994 DEIS. Some of the 2002 noise monitoring locations were the same as those in the 1994 DEIS. The 1994 DEIS used both noise monitoring data collected in 1993 and noise levels measured by NJDOT in 1983. Since the 2002 noise monitoring results are similar to those used in the 1994 DEIS, the 1994 DEIS results were used to represent existing conditions at locations where noise monitoring was not conducted in 2002, to evaluate potential Horizon Year noise impacts.

The Horizon Year (2028) No Action noise level was based on adjusting the existing noise levels by the logarithm of the ratio of 2028 transportation network traffic projections for each Horizon Year alternative to the existing traffic volume. The increase in traffic volume projected for each Horizon Year alternative, excluding the proposed Route 92 alternative, would increase noise levels by about 2 dBA (i.e., by approximately 4 percent over the next 24 years). Table 4-19 presents a summary of the Existing and Horizon Year noise conditions.

3.9 Aesthetics

Proposed Route 92 Corridor

The aesthetic character along the Proposed Route 92 Corridor varies. The western portion in the vicinity of US Route 1 consists of commercial development. The portion between US Route 1 and US Route 130 generally consists of single-family residential development, which is scattered throughout the area and more concentrated in some locations (for example, near Schalks Crossing and Perrine Roads). This portion also consists of sparse commercial developments, farmland and an abundance of upland forest and forested wetland. The topography of this portion is generally flat which maximizes sight distance. The eastern portion of the corridor between US Route 130 and the New Jersey Turnpike is also flat; however, this area contains dense commercial, corporate and light industrial development, in contrast to most other portions of the Proposed Route 92 Corridor.

Route 1 Corridor

The aesthetic character of this 7-mile stretch of US Route 1 varies from relatively densely developed in the northern section near Cozzens Lane/Adams Lane to somewhat more sporadically developed farther south. The development along the 7 miles of roadway includes single-family residential, mobile park homes, commercial, and offices. Upland forest and forested wetland areas are commonly present between developed parcels. Two large cluster home developments have recently been established, adding to the diverse character of the area.

3.10 Known Contaminated Sites

Proposed Route 92 Corridor

According to the 2001 NJDEP Known Contaminated Sites (KCS) list (see Table 3-15), two contaminated sites are found within the Proposed Route 92 Corridor, both of which are in South Brunswick Township. The location of these sites, at 24 Friendship Road and 298 Friendship Road (Kozachek Farm) is illustrated on Figure 3-22. The 298 Friendship Road site is currently in active status. As defined by the NJDEP, active status is designated when a contaminated site is assigned to a remedial program and measures such as a preliminary assessment, remedial investigation or cleanup work is underway. According to Mike Thompkins, the NJDEP Site Remediation Program (SRP) project manager of this site, the soil is contaminated with pesticides (personal communication). The site is classified as Level B, which requires a single-phase remedial action. Mr. Thompkins indicated that site remediation was not complete as of October 2002, and that the likely alternatives were blending, consolidation, or possibly capping of the affected soil. The 24 Friendship Road site is currently in pending status, meaning that this site awaits the execution of oversight documents such as a Memorandum of Agreement or an Administrative Consent Order or the availability of resources for publicly funded action. This site is classified as Level C1, which means it has the potential for (unconfirmed) ground water contamination. No information was available from the SRP Southern Field Office regarding the specific situation.

Route 1 Corridor

According to the 2001 NJDEP KCS list (see Table 3-15), 11 contaminated sites are found within the Route 1 Corridor, in both North Brunswick and South Brunswick townships. Four sites are located in North Brunswick Township. Two sites are classified Level C2 (groundwater contamination confirmed), one is classified Level D (contamination is not quantifiable), and one is unclassified. Seven sites are located in South Brunswick. Two sites are classified Level C1 (may include potential for groundwater contamination), four are classified Level C2, and one is proposed.

3.11 Human Health

The following discussion focuses on those environmental parameters that directly influence human health: air quality, noise and water quality.

3.11.1 Air Quality

The 1970 Clean Air Act identified six pollutants that were particularly problematic due to high levels in many places and the potential for adverse human health and environmental effects. These pollutants are carbon monoxide, nitrogen dioxide, lead, ozone (the major harmful constituent in smog), particulate matter, and sulfur dioxide. Exposure to these pollutants is associated with health effects such as increased respiratory symptoms (e.g., asthma), heart and lung disease, and, in severe cases, early death. Primary and secondary air quality standards were developed for these criteria pollutants to protect health and public welfare. The 1990 Clean Air Act Amendments designated areas in the country that chronically exceeded these standards as

Table 3-15
Known Contaminated Sites Listing - NJDEP

Site Name	Address	City	Status
Route 92 Corridor:			
298 FRIENDSHIP ROAD	298 FRIENDSHIP ROAD	South Brunswick	ACTIVE
24 FRIENDSHIP ROAD	24 FRIENDSHIP ROAD	South Brunswick	PENDING
Route 1 Corridor:			
AMOCO SERVICE STATION NORTH BRUNSWICK	1890 RTE 1 N	North Brunswick	ACTIVE
OKONITE COMPANY	1600 RTE 1	North Brunswick	ACTIVE
HESS SERVICE STATION NORTH BRUNSWICK TWP	RTE 1 & APACHE ST	North Brunswick	ACTIVE
FINNIGAN PLAZA	1550 FINNIGAN LN	North Brunswick	ACTIVE
GULF SERVICE STATION SOUTH BRUNSWICK TWP	3781 RTE 1	South Brunswick	ACTIVE
NJ DEPT OF TRANSPORTATION SAND HILLS	RTE 1	South Brunswick	ACTIVE
EXXON STATION SOUTH BRUNSWICK (PROPOSED)	4150 RTE 1 & STOUTS LN	South Brunswick	ACTIVE
STEARNS & FOSTER BEDDING COMPANY	3730 RTE 1 & BLACK HORSE LN	South Brunswick	ACTIVE
AMOCO SERVICE STATION SOUTH BRUNSWICK	RTE 1 N & NEW RD	South Brunswick	ACTIVE
EXXON SERVICE STATION SOUTH BRUNSWICK	RTE 1 & NEW RD	South Brunswick	ACTIVE
SHELL SERVICE STATION SOUTH BRUNSWICK	RTE 1 & FINNEGAN LN	South Brunswick	ACTIVE

Sources: NJDEP KCS Sites Listing, 2001; NJDEP Site Information Program; NJDEP BEECRA; NJDEP BUST

and implementation of measures to reduce emissions in such areas was required. The Project Study Area is located in a designated severe NAA for ozone.

In 2001, criteria pollutant concentrations, with the exception of ozone, met the applicable New Jersey AAQS and NAAQS at the monitoring stations near the Project Study Area (NJDEP, 2003).

Refer to Section 3.6 for additional discussion on air quality in the Project Study Area.

3.11.2 Noise

Proposed Route 92 Corridor
Existing noise levels were monitored in 2002 at sites representing noise sensitive receptors closest to the proposed project (predominantly residential communities). Findings of the noise monitoring program indicated that noise levels varied from 48 dBA in areas situated away from major traffic arterials to 71 dBA in areas bordering major traffic arterials. These noise levels span the range representative of rural residential areas and suburban residential areas near highways. Many areas have noise levels approaching or exceeding the 67 dBA FHWA design noise level for residential receivers. However, these levels are below the threshold for health impacts.

Route 1 Corridor
The Boy Scouts of America site was the only location along US Route 1 monitored for noise. As shown in Table 3-14, neither morning nor afternoon noise levels exceed the 72 dBA FHWA design noise level for developed areas.

Refer to Section 3.8 for additional discussion on noise in the Project Study Area.

3.11.3 Water Quality

Wells

Proposed Route 92 Corridor
No active public water supply wells have been identified within the Proposed Route 92 Corridor. Public water supply to the project area is obtained from Elizabethtown Water Company, the South Brunswick municipal water supply system, and the Monroe Township Municipal Utility Authority. Approximately 140 well locations have been identified within the Proposed Route 92 Corridor, of which approximately 20 percent are designated as private/domestic by the NJDEP well files.

Route 1 Corridor
No active public water supply wells have been identified within the Route 1 Corridor. Public water supply to the area is obtained from the South Brunswick municipal water supply system as well as the North Brunswick municipal water supply system (administered by the American Water Company), whose water is obtained from the D&R Canal.

Surface Water
Both alternative corridors are located within the Millstone River drainage basin. Several surface water bodies occur within the vicinity of the Proposed Route 92 Corridor and the Route 1 Corridor; their quality is classified as FW2-NT. These water bodies are not significant recreational resources. Surface water from the D&R Canal is utilized as the water supply for North Brunswick Township; this water source is not within the immediate vicinity of either alternative.

Refer to Section 3.3 for additional discussion on water quality in the Project Study Area.

3.12 Socioeconomics

3.12.1 Population

Table 3-16 provides demographic data for the four municipalities in the Project Study Area and for Middlesex County as a whole. The population of South Brunswick Township, the largest of the four municipalities, grew by 46 percent between 1990 and 2000. This was the highest growth rate among the four municipalities, and was almost four times greater than the 12 percent growth of the Middlesex County population during that decade. The Middlesex County Planning Department (MCPD) projects that the population of South Brunswick will increase by 50 percent between 2000 and 2020, three times the growth rate projected for the County as a whole.

The population of South Brunswick Township is approximately 8 percent Black or African American and approximately 18 percent Asian, similar to the Middlesex County total of 9 percent Black or African American and 14 percent Asian. Five percent of South Brunswick residents identified themselves as Hispanic or Latino, the highest rate among the three municipalities, but still much lower than the County total of 14 percent.

The median age of South Brunswick Township residents is 35 years, close to the Middlesex County value of 36 years.

The population of Plainsboro Township grew 42 percent between 1990 and 2000, three and a half times the rate of growth in Middlesex County as a whole. As with South Brunswick, MCPD projects that the population of Plainsboro will increase by 50 percent between 2000 and 2020, three times the growth rate projected for the County as a whole.

Plainsboro has a large Asian population, almost 31 percent of the total. Almost eight percent of the population is Black or African American, comparable to the Middlesex County total of approximately nine percent.

The median age in Plainsboro Township is 33, the lowest among the three municipalities, and only seven percent of the households in the Plainsboro have a member over 65 years of age.

Table 3-16
Demographic Data for Study Area Municipalities and Middlesex County

Demographic parameter	South Brunswick Township	Plainsboro Township	Monroe Township	North Brunswick Township	Middlesex County
Population in 1990	25,798	14,213	22,255	31,287	671,780
Population in 2000	37,734	20,215	27,999	36,287	750,162
Change from 1990 to 2000	46%	42%	26%	16%	12%
MCPD projection for 2020	56,511	30,386	37,724	44,220	873,878
Projected change from 2000	50%	50%	35%	22%	16%
Median age	35	33	59	35	36
Households with a member over 65 years of age	15%	7.4%	65%	20%	25%
Households with a member under 18 years of age	45%	34%	17%	35%	37%
Racial composition					
White	70%	58%	93%	63%	68%
Black/African American	7.9%	7.6%	2.9%	15%	9.1%
Asian	18%	31%	0.1%	14%	14%
Other	3.6%	3.7%	3.7%	7.8%	8.6%
Total	100%	100%	100%	100%	100%
Hispanic or Latino	5.1%	4.6%	2.4%	10.4%	13.6%
Percentage of single-family detached housing units	50%	23%	47%	41%	54%
Percentage of housing units in structures of 5 or more units	19%	53%	5.5%	28%	21%
Percentage of occupied housing units that are rented	24%	58%	5.2%	37%	33%
Median contract rent	$864	$850	$777	$842	$770
Median value of owner-occupied housing units	$192,900	$229,600	$165,300	$164,700	$164,400
Median household income	$78,737	$72,097	$53,306	$61,325	$61,446
Per-capita income	$32,104	$38,982	$31,772	$28,431	$26,535
Percent below poverty level	3.1%	3.0%	3.2%	4.7%	6.4%
Percent over 25 with bachelors degree or higher	49%	70%	30%	37%	33%

Source: 2000 Census unless otherwise indicated
MCPD = Middlesex County Planning Department

The population of Monroe Township grew 26 percent between 1990 and 2000, less than in South Brunswick or Plainsboro but still more than twice the rate of growth in Middlesex County as a whole. MCPD projects that the population of Monroe Township will increase by 35 percent between 2000 and 2020, less than in South Brunswick or Plainsboro but more than twice the projected growth of the County population.

As shown in Table 3-16, Monroe Township has very small minority populations. The Black or African American and Hispanic populations are both less than three percent and the Asian population is 0.1 percent.

Monroe Township's median age of 59 is by far the highest among the three municipalities in the study area, and is 23 years higher than the median age for Middlesex County as a whole. Forty-nine percent of Monroe Township residents are over the age of 60, due to the large number of planned retirement communities. Sixty-five percent of the households in Monroe Township include one or more members over the age of 65.

The population of North Brunswick Township grew 16 percent between 1990 and 2000, a lower growth rate than in the three municipalities of the Proposed Route 92 Corridor, but still higher than the growth rate in Middlesex County as a whole. MCPD projects that the population of North Brunswick will increase by 22 percent between 2000 and 2020, also lower than in the Proposed Route 92 Corridor municipalities but higher than projected for the County.

The racial composition of North Brunswick is similar to the racial composition of Middlesex County, except that North Brunswick is 15-percent Black or African American compared to nine percent for the county as a whole. Both North Brunswick and Middlesex County are 14-percent Asian. North Brunswick has a higher percentage of Hispanics and Latinos than any of the three Route 92 municipalities, but a lower percentage than Middlesex County as a whole.

The median age and age distribution in North Brunswick are similar to those in the county as a whole.

3.12.2 Housing

As in Middlesex County as a whole, about half of the housing units in South Brunswick Township are single-family detached units, and approximately one fifth of the housing units are in buildings with five or more units. Approximately 24 percent of the housing units in South Brunswick are rented, less than the County value of 33 percent. Both the median contract rent and the median value of owner-occupied homes are higher than the County medians (see Table 3-16).

Plainsboro Township does not have a typical suburban housing stock. Less than one quarter of the housing units in Plainsboro are single-family detached units, and more than half of the housing units are in buildings with five or more units. Approximately 58

percent of the housing units in Plainsboro are rented. The median contract rent is similar to that in South Brunswick, but the median value of owner-occupied homes is higher.

As in South Brunswick Township and in Middlesex County as a whole, about half of the housing units in Monroe Township are single-family detached units. Monroe has relatively few buildings with five or more housing units, accounting for less than six percent of the housing units in the Township. Only five percent of Monroe's housing units are rented, far below the percentages in South Brunswick, Plainsboro and Middlesex County. The median contract rent and the median value of owner-occupied homes in Monroe are essentially the same as in the County as a whole.

North Brunswick Township has a lower percentage of single-family detached homes than does Middlesex County as a whole, and a higher percentage of North Brunswick housing units are in buildings with five or more units. Approximately 37 percent of the housing units in North Brunswick are rented, slightly greater than the County value of 33 percent. The median contract rent is higher than the county median and is comparable to the medians in South Brunswick and Plainsboro (see Table 3-16). The median value of owner-occupied housing is the same as in the county as a whole.

3.12.3 Income

In both South Brunswick Township and Plainsboro Township, median household income and per-capita income are significantly higher than in Middlesex County as a whole. In Monroe Township, median household income is below the County value; however, per-capita income is higher than the County value and almost as high as in South Brunswick. The combination of relatively low household income and relatively high per-capita income is the result of a small average household size, which is caused by the large number of retired people in Monroe Township.

South Brunswick, Plainsboro and Monroe townships all had 3-percent poverty rates in 1999, half the Middlesex County rate of 6 percent.

The median household income and the per-capita income in North Brunswick are similar to the Middlesex County values. North Brunswick has a lower percentage of residents below the poverty level than the county, but a higher percentage than the three municipalities surrounding the Proposed Route 92 Corridor.

3.12.4 Educational Attainment

In South Brunswick Township, the percentage of residents over 25 that have bachelor's degrees or higher is 50 percent higher than in Middlesex County as a whole. The percentage in Plainsboro Township is twice the County percentage. In Monroe Township, the percentage is approximately the same as in the County as a whole (see Table 3-16). In North Brunswick Township, the percentage of residents over 25 that have bachelor's degrees or higher is slightly higher than in Middlesex County as a whole, but is lower than in South Brunswick or Plainsboro.

3.12.5 Employment

The economy of South Brunswick Township provided approximately 0.55 private sector jobs per resident in 1999, above the Middlesex County average of 0.45 private sector jobs per resident. The Plainsboro Township economy provided 0.68 private sector jobs per resident, while the Monroe Township economy provided only 0.12 private sector jobs per resident. Like the population of the study area, the number of private-sector jobs has grown rapidly in recent decades. The number of public-sector jobs is relatively small in all three municipalities.

More than half of employed South Brunswick Township residents are in management, professional, and related fields, and more than a quarter are employed in sales and office occupations (see Table 3-17). In Plainsboro Township, more than two-thirds of employed residents are in management, professional and related occupations, and a fifth are in sales and office occupations. In Monroe Township and in Middlesex County as a whole, about 40 percent of employed residents are in management and professional occupations, significantly less than in South Brunswick or Plainsboro. Each of the other five occupational categories in Table 3-17 is more prevalent in Monroe Township and the County than in South Brunswick and Plainsboro.

Based on information obtained from a sample of the population, the 2000 Census reported that no residents of South Brunswick or Plainsboro are employed in farming. Farms are operating in both municipalities, however. In South Brunswick, active farms are present along the alignment for proposed Route 92.

The economy of North Brunswick Township provided approximately 0.40 private sector jobs per resident in 1999, slightly lower than the Middlesex County average of 0.45 and significantly lower than the averages in South Brunswick and Plainsboro.

3.12.6 Community Services

3.12.6.1 South Brunswick Township

Many of the community services in South Brunswick Township are located in the central section of the Township between Georges Road and Monmouth Junction Road and at the intersection of Ridge Road and New Road, more than a mile north of proposed Route 92. The South Brunswick Township Municipal Building is located in the area on Monmouth Junction Road.

Schools

The South Brunswick Township public school system includes seven elementary schools, two middle schools and a high school. Four of the elementary schools are in the Kendall Park section of the Township, more than 3 miles north of proposed Route 92, and the other three are in or near the Monmouth Junction section, at least 1 mile north of proposed Route 92. The two middle schools and the high school are also in the Monmouth Junction area. The high school is on Ridge Road approximately 1 mile north of proposed Route 92. The middle schools are farther north.

Table 3-17
Occupations of Employed Residents

Type of occupation	South Brunswick Township	Plainsboro Township	Monroe Township	North Brunswick Township	Middlesex County
Management, professional, and related occupations	53.9%	69.2%	39.7%	46.3%	40.6%
Sales and office occupations	26.2%	20.4%	30.8%	28.4%	28.4%
Service occupations	8.0%	5.1%	10.5%	9.3%	11.0%
Farming, fishing, and forestry	0.0%	0.0%	0.4%	0.0%	0.09%
Construction, extraction, and maintenance	5.4%	2.1%	8.5%	5.2%	7.1%
Production, transportation, and material moving	6.5%	3.2%	10.1%	10.7%	12.8%

Source: 2000 Census

Police Department
The South Brunswick Township Police Department has its headquarters at the municipal complex on Monmouth Junction Road, a central location in the Township.

Fire Companies
Three volunteer fire companies serve South Brunswick Township. The Monmouth Junction Volunteer Fire Department serves the area east of US Route 1, which includes most of the geographic area of the Township. The service area of the Monmouth Junction Volunteer Fire Department includes the entire primary right-of-way of proposed Route 92, with the exception of a stretch of approximately 0.8 mile that would cross the northern end of Plainsboro Township.

The Kendall Park Volunteer Fire Department serves the portion of South Brunswick west of US Route 1 and north of Stouts Lane and Promenade Boulevard. The Kingston Volunteer Fire Company serves the Kingston area in the southwest corner of the Township, as well as the US Route 1 corridor from the Plainsboro border to Route 522, including the proposed interchange between Route 92 and US Route 1.

Emergency Medical Services
South Brunswick Township also has three rescue squads that are located in Monmouth Junction, Kendall Park, and Kingston, serve the same areas as the three volunteer fire

companies. Traffic congestion sometimes makes it difficult for the rescue squads to respond rapidly to emergencies.

Hospitals
No hospitals are located in South Brunswick Township.

3.12.6.2 Plainsboro Township

Community services and facilities in Plainsboro Township are located primarily at the Municipal Complex Center, near the center of the Township in the vicinity of the proposed Village Center. The Municipal Complex Center is located north of Plainsboro Road near the intersection of Scudders Mill Road and Dey Road, approximately 1.75 miles south of proposed Route 92.

Schools
Plainsboro Township is part of the West Windsor-Plainsboro Regional School District. The district includes five schools in Plainsboro and six in West Windsor Township. The five Plainsboro schools include an elementary school in the municipal complex, an elementary school just west of the municipal complex, and a high school, a middle school and a third elementary school on Grovers Mill Road, south of the municipal complex. All five schools are at least 1.5 miles south of proposed Route 92.

Police Department
The Plainsboro Township Police Department is headquartered in the Municipal Complex Center.

Fire Company
Plainsboro has only one firehouse, on Plainsboro Road just west of the Amtrak rail lines. The fire company is staffed by volunteers and has mutual aid agreements with neighboring townships. Because the fire company is unable to reach all areas of Plainsboro Township in 5 minutes, planning is underway for possible construction of a second firehouse on College Road in the northwestern area of the Township.

Emergency Medical Services
The Plainsboro Township Rescue Squad is based in the Municipal Complex Center. Like the fire company, the rescue squad has mutual aid agreements with neighboring Townships.

Hospitals
No hospitals are located in Plainsboro Township.

3.12.6.3 Monroe Township

Community service facilities in Monroe Township are located primarily in the central area of the Township and at the extreme northern and southern ends of the Township area. The Monroe Township municipal complex is at the intersection of Perrineville Road and School House Road, approximately 2 miles southeast of New Jersey Turnpike

Interchange 8A. The municipal complex includes the Township administrative office, public library, and police and emergency rescue services.

Schools
The Monroe Township public school system includes four elementary schools, a middle school and a high school. The high school is adjacent to the municipal complex, and the other schools are still farther from New Jersey Turnpike Interchange 8A. To keep up with current enrollment projections, the Township has created a facilities-improvement plan. The plan does not require any new school sites.

Police Department
The Monroe Township Police Department is headquartered at the municipal complex.

Fire Companies
Monroe Township is served by three fire companies known as District #1, District #2 and District #3. Each district has its own fire station. The stations are in the extreme northeast and southwest sections of the Township and at the center of the Township, near the municipal complex. To better serve the planned retirement communities and a nearby industrial park, a new fire station has been proposed at the intersection of Applegarth Road and Prospect Plains Road, approximately 1.6 miles south of New Jersey Turnpike Interchange 8A.

Emergency Medical Services
The ambulance service of Monroe Township has both full-time employees and volunteer staff. The ambulance service has two stations, one on Monmouth Road in the northeastern corner of the Township and the other in the municipal complex. The station at the municipal complex serves the planned retirement communities south and southeast of New Jersey Turnpike Interchange 8A. The residents of the retirement communities generate the greatest demand for emergency services.

Hospitals
No hospitals are located in Monroe Township.

3.12.6.4 North Brunswick Township

Community service facilities in North Brunswick are concentrated in the northeastern and north central portions of the township.

Schools
The North Brunswick Township public school system includes four elementary schools, a middle school and a high school. All of the schools are at least 0.25 mile from US Route 1 and at least 0.5 mile from all of the five new interchanges identified in the US Route 1 Widening and Signal Removal Alternative.

Police Department
The North Brunswick Township police department is headquartered at the municipal building on Hermann Road, approximately 0.3 mile north of the US Route 1-US Route 130 interchange.

Fire Companies
North Brunswick is served by three volunteer fire companies. Company #1 is based near Georges Road (US Route 130) approximately 0.25 mile north of the US Route 1-US Route 130 interchange, in the northeastern area of the township. Company #2 is based on US Route 130 southwest of Adams Lane, in the south central area of the township. Company #3 is based on Cozzens Lane near Route 27, in the northwestern section of the township. All three fire companies are relatively far from the area along US Route 1 in the southwestern area of the township.

Emergency Medical Services
The North Brunswick First Aid and Rescue Squad is based on Ridgewood Avenue off Livingston Avenue, north of US Route 1, in the north central area of the township.

Hospitals
No hospitals are located in North Brunswick Township.

3.13 Land Use and Zoning

Figure 3-23a depicts land use along the Proposed Route 92 Corridor. Figure 3-23b depicts land use along the Route 1 Corridor.

3.13.1 Land Use

3.13.1.1 Farmland

Proposed Route 92 Corridor
The dominant land use along proposed Route 92 is agriculture. Approximately 3.9 of the 6.7 miles of the highway would pass through land assessed as farmland for property tax purposes. To qualify for farmland assessment, land must be in active agricultural use.

Route 1 Corridor
A significant amount of land assessed as farmland borders US Route 1 between Raymond Road in South Brunswick and Silzer Road in North Brunswick. This indicates that the land is in some kind of revenue-producing agricultural or silvicultural use. The farmland-assessed property is concentrated in the following three areas:

- The open portion of the Johnson & Johnson property on the east side of US Route 1 in the area of Aaron Road.
- Between New Road and Deans Lane, primarily on the east side of US Route 1. Only a minority of this concentration of farmland is immediately adjacent to US Route 1.
- On both sides of US Route 1 in the area of Raymond Road and Route 522.

None of the farmland along US Route 1 is in an Agricultural Development Area, and none of the land is subject to easements restricting nonagricultural development.

3.13.1.2 Parkland

Proposed Route 92 Corridor

Proposed Route 92 would pass through the northern end of the Plainsboro Preserve, a 630-acre nature preserve east of the Amtrak Northeast Corridor in northern Plainsboro Township. The stretch of Route 92 that is proposed to be constructed in the preserve would be approximately one-third of a mile long. A 300-foot right-of-way would therefore replace approximately 12 acres of the preserve. In addition, the proposed route would separate an additional 12.5 acres of the preserve from the rest.

The Middlesex County Open Space and Farmland Preservation Trust Fund provided $2.9 million for purchase of the land that is now the Plainsboro Preserve. The federal government contributed $850,000 toward development of the visitors center.

In passing through the northern end of the Plainsboro Preserve, Route 92 would pass through Plainsboro Township block 6, lots 6.03 and 7.02. According to Nancy Lawrence of the NJDEP Green Acres program, these lots are encumbered under Green Acres. This means the land in these lots may not be diverted to nonpark use unless the following three conditions are met (see NJAC 7:36-20.2 and 7:36-21.1(c)):

- The diversion to nonpark use "fulfills a compelling public need or yields a significant public benefit" (NJAC 7:36-21.1(c)).
- There are no feasible alternatives to the diversion.
- Replacement land is provided.

The publicly-owned land through which proposed Route 92 would pass is owned by NJTA, NJDOT, Amtrak, Plainsboro Township, and the Middlesex County Improvement Authority (MCIA). NJTA, NJDOT and Amtrak acquired the land for transportation purposes, with which proposed Route 92 is consistent. Plainsboro Township owns land west of the Amtrak line through which proposed Route 92 would pass. Plainsboro applied for and received Green Acres funding for a portion of the land west of the railroad, known as the Perrine tract, but excluded from Green Acres involvement the land in the proposed Route 92 right-of-way.

On the east side of the Amtrak line is the Plainsboro Preserve. The MCIA owns the portion of the preserve through which proposed Route 92 would pass. MCIA's purchase of the preserve was funded by the Middlesex County Open Space and Farmland Preservation Trust Fund rather than by Green Acres. Nonetheless, conversion of a portion of the preserve to transportation use may be subject to Green Acres restrictions under NJSA 7:36-20.2(b).

Proposed Route 92 would pass within approximately 350 feet of Friendship Park, a 35-acre property acquired by South Brunswick Township in 2000. Route 92 would pass within approximately 500 feet of Sondek Park, an adjacent 111-acre South Brunswick facility. Friendship Park is on the north side of Friendship Road and the west side of New Road. The southwestern corner of Friendship Park is within 700 feet of the northeastern corner of the Plainsboro Preserve. Proposed Route 92 would pass between the park and the preserve. Devil's Brook passes through Friendship Park from east to west. The southern half of the park, south of Devil's Brook, is open; the northern half, along Devil's Brook and north of the brook, is wooded.

Sondek Park has three distinct sections of roughly equal size: an eastern section adjoining Friendship Park to the north off New Road, a northwestern section and a southwestern section. The eastern section, approximately a quarter mile from proposed Route 92, is open and developed as athletic fields. This section of the park is used heavily for soccer, softball and baseball. The northwestern section of the park is a closed municipal landfill covered with grass. A municipal brush collection facility occupies a portion of this area. The southwestern section consists of woods that extend to Devil's Brook, within 500 feet of proposed Route 92.

According to Nancy Lawrence, Sondek Park (South Brunswick block 52, lot 23) and Friendship Park (block 52, lots 24 and 25) are encumbered under Green Acres. Because the right-of-way of Route 92 would not include any part of Sondek or Friendship parks, construction of Route 92 through this area would not raise a Green Acres issue.

The proposed interchange between Route 92 and US Route 1 would extend to within approximately 600 feet of preserved land along Heathcote Brook. Like the Plainsboro Preserve, this land was acquired with funds from the Middlesex County Open Space and Farmland Preservation Trust Fund.

Route 1 Corridor

The only parkland along US Route 1 between US Route 130 in North Brunswick and Ridge Road in South Brunswick is on the east side of US Route 1 in the southwestern area of North Brunswick. Two parcels of land in that area are included in the Middlesex County Open Space Trust. One is a small parcel directly on US Route 1. A much larger parcel has one section that extends to within 190 feet of US Route 1, but the bulk of the property is more than 1,100 feet from US Route 1.

3.13.1.3 Residential Areas

Proposed Route 92 Corridor

NJTA advises that proposed Route 92 was designed to minimize impacts to residential areas. Most of the proposed right-of-way passes through undeveloped land. The residential developments in or near the path of proposed Route 92 are described below, from west to east.

Princeton Collection
The Princeton Collection is a subdivision of single-family detached homes in Plainsboro Township, south of Perrine Road and east of Schalks Crossing Road. New homes are currently under construction immediately south of Perrine Road and immediately east of Schalks Crossing Road. The Princeton Collection subdivision and the homes currently under construction are close to three features of proposed Route 92 and associated interchanges:

The main roadway of proposed Route 92 would pass within 700 feet of the closest residential properties in the Princeton Collection.
A roadway proposed as part of the Perrine Road-Schalks Crossing Road interchange of Route 92 would cross the intersection of Perrine Road and Schalks Crossing Road within approximately 200 feet of the closest homes currently under construction.
The subdivision is adjacent to a section of Schalks Crossing Road that would be realigned.

A hedgerow of deciduous trees screens the eastern third of the subdivision from the proposed main right-of-way of Route 92. Woods currently screen most of the western third of the subdivision from proposed Route 92, but some of the trees would be cut down during construction of the Perrine Road-Schalks Crossing Road interchange.

Heather Knolls of South Brunswick
Heather Knolls is a subdivision of single-family detached homes north of New Turkey Island Road on both sides of Perrine Road in South Brunswick. Route 92 would cross agricultural land south of New Turkey Island Road, approximately a quarter mile south of the homes nearest New Turkey Island Road. Some vegetative screening is in place between the homes and New Turkey Island Road.

Homes South of Friendship Road Opposite East New Road
Proposed Route 92 would pass through a small group of residential lots on the south side of Friendship Road opposite the south end of East New Road in South Brunswick. To acquire the required right-of-way for Route 92, it would be necessary to purchase two residential properties in this area.

Drinking Brook Estates
This is a development of detached single-family homes on the north side of Friendship Road in South Brunswick. Route 92 would pass along the opposite side of Friendship Road. Some vegetative screening is in place between the subdivision and proposed Route 92.

Homes on Friendship Road West of Interchange 8A
There are several residences along the northeast-southwest stretch of Friendship Road west of New Jersey Turnpike Interchange 8A. Acquisition of the right-of-way for proposed Route 92 would probably require purchase of at least one of these homes.

Rossmoor Planned Retirement Community
The Rossmoor community was the first planned retirement community in the State of New Jersey. Rossmoor is in Monroe Township immediately southeast of New Jersey Turnpike Interchange 8A (see Figure 3-23a). Rossmoor has approximately 2,500 housing units surrounding a golf course.

Forsgate Country Club
The Forsgate Country Club, designated a "planned residential golf community" by Monroe Township, is immediately north of Rossmoor and immediately east of Turnpike Interchange 8A. The Forsgate development includes a private golf course and three residential cluster developments.

Route 1 Corridor
Residential communities adjacent to US Route 1 include the following:

- Townhouse development on Society Way and adjoining streets on the south side of US Route 1 in North Brunswick Township, west of US Route 130 and east of Livingston Avenue
- Single-family detached homes between Cozzens Lane and the southern end of Jersey Avenue in North Brunswick
- Single-family detached homes on the east side of US Route 1 on Thalia, Cordelia and Edwin streets in North Brunswick, south of Adams Lane
- Oakdale mobile home park on the west side of US Route 1 south of Finnegans Lane in South Brunswick Township
- Brookside mobile home park immediately south of the intersection of US Route 1 and Black Horse Lane in South Brunswick
- Several single-family detached homes south of the Brookside mobile home park
- Several isolated single-family detached homes on the west side of US Route 1 north and south of Sand Hills Road in South Brunswick
- Monmouth mobile home park on the west side of US Route 1 north of New Road in South Brunswick
- Several single-family detached homes on the east side of US Route 1 south of New Road in South Brunswick
- Townhouse development on the east side of US Route 1 between New Road and County Route 522, opposite the South Brunswick Square shopping center

3.13.1.4 Commercial and Industrial Establishments along Route 92

The westernmost portion of Route 92 and its interchange with US Route 1 would be constructed in a light industrial and commercial area near Ridge Road in South Brunswick. Acquisition of the Route 92 right-of-way would require the purchase of four properties in this area. For additional information see Section 4.2.13.

3.13.1.5 Land Use along US Route 1

The following paragraphs describe existing land uses at the five new US Route 1 interchanges identified in the US Route 1 Widening and Signal Removal Alternative, as of December 2002.

Cozzens Lane-Adams Lane Interchange
The intersection of Cozzens Lane and Adams Lane with US Route 1 has the Malouf Buick-Pontiac car dealership in the northeast quadrant, the Malouf Lincoln-Mercury dealership in the southwest quadrant, and a manufacturing facility of the Vertis Company in the southeast quadrant. The northwest quadrant has smaller businesses including a Midas Muffler shop. North of these businesses, on the north side of Cozzens Lane, is a neighborhood of single-family detached homes. There are a few homes on the south side of Cozzens Lane as well. Farther west, on the south side of Cozzens Lane, is the Italian-American Social Club of North Brunswick. North of Malouf Buick-Pontiac, on the east side of US Route 1, is Coppa's Towing and Service Center behind an abandoned gas station. North of Coppa's is a functioning BP gas station.

Finnegans Lane Interchange
The existing intersection of Finnegans Lane and US Route 1 is a T-intersection with Finnegans Lane to the west. The land on the east side of US Route 1 is wooded except for a power line easement with catenary towers extending to the southeast. Beyond the power line easement, on the east side of US Route 1, is a new Comfort Suites motel. At the southwestern corner of the intersection is an Exxon gas station. South of the gas station is a vacant lot, a used car business, and the Oakdale mobile home park. West of the gas station are several single-family detached homes.

At the northwestern corner of the Finnegans Lane-US Route 1 intersection is a ramp from southbound US Route 1 to westbound Finnegans Lane. At the northern end of the ramp is Middlesex Welding. An office building used by law firms is at the western end of the ramp. West of the office building is the Bnai Tikvah temple. West of the temple is the Indian Head townhouse development on Sassafras Court.

Beekman Road-Northumberland Way Interchange
The intersection of Beekman Road and Northumberland Way with US Route 1 is wooded to the southwest, northwest, and northeast, and is an open field to the southeast. The land to the northeast and southeast is assessed as farmland for property tax purposes, which indicates some kind of agricultural or silvicultural activity on the land.

New Road Interchange
An Exxon gas station occupies the southwest quadrant of the intersection of New Road and US Route 1. Beyond the gas station, this quadrant is largely wooded. Close to the intersection, the northeastern and southwestern quadrants are also wooded, but widely spaced single-family homes are located farther south along New Road. North of the intersection on the east side of US Route 1 is a Lazy Boy furniture store with a parking lot to the south and a stormwater detention basin in front. The northwestern quadrant of the intersection is an open field. West of the field is a Red Roof Inn. North of the field and the Red Roof Inn, on the west side of US Route 1, is the Monmouth Mobile Home Park.

Route 522 Interchange
The intersection of Route 522 and US Route 1 has an Exxon gas station in the northeast quadrant. The land beyond the Exxon station is partly open and partly wooded and is assessed as farmland for property tax purposes. The southeast and southwest quadrants are wooded and are also assessed as farmland, except that a surface-level ramp from southbound US Route 1 to eastbound Route 522 was completed recently in the southwest quadrant. The community center and school of the Islamic Society of Central New Jersey occupies the northwestern quadrant of the intersection. West of the Islamic Society, north of County Route 522, is the Princeton Gate residential development.

3.13.2 Zoning and Land Use Planning

3.13.2.1 Zoning

Proposed Route 92 Corridor
From its interchange with US Route 1 east to the Plainsboro border, proposed Route 92 would pass through an OR Office/Research/Conference zone in South Brunswick (see Figure 3-24a). This zone allows executive and corporate offices, laboratories, assembly of electronic equipment, certain outpatient healthcare facilities, and certain retail commercial and service establishments. The Route 92-US Route 1 interchange and the interchange with Perrine Road would both be constructed in this zone.

An accessory roadway associated with the Perrine Road interchange, as well as realignment work on Schalks Crossing Road, would extend south into a PMUD planned unit development zone in Plainsboro Township. This zone allows a variety of light industrial, commercial and residential uses, but the minimum size for a development is 500 acres.

Upon crossing Perrine Road into Plainsboro, the main roadway of Route 92 would pass into an R-200 low-density residential zone. This zone allows single-family detached homes on lots of at least 0.8 acres, as well as agricultural use. After crossing the Amtrak rail lines, Route 92 would enter Plainsboro's R-350 Low Density Residential Light Impact Zone. Although this zone allows detached single-family homes on minimum 3-acre lots, the portion of this zone through which Route 92 would pass is part of the Plainsboro Preserve and is not currently available for residential development.

After passing through the northern end of the Plainsboro Preserve and reentering South Brunswick, proposed Route 92 would enter a rural residential zone and would remain in this zone for approximately 2.75 miles, but would have no interchanges. The South Brunswick Master Plan of December 2001 states that this zone is "designed to promote the preservation of farms and the rural character of the sections" so zoned. The principal permitted uses in the rural residential zone are single-family homes on minimum 2-acre lots, agricultural activities, public recreational and community center buildings, and children's day camps.

Heading southeast toward US Route 130, Route 92 would enter an I-3 General Industrial zone and remain in that zone until reaching New Jersey Turnpike Interchange 8A. The I-3 zone allows offices, lumberyards, wholesale distribution centers, laundry and dry cleaning, and manufacturing and assembly plants, with a minimum lot size of 6 acres. The proposed interchange of Route 92 with US Route 130 and the South Brunswick portion of the tie-in with the Turnpike interchange would be constructed in this zone.

The section of Monroe Township adjacent to New Jersey Turnpike Interchange 8A, the eastern terminus of proposed Route 92, is zoned for light industry, planned retirement communities (Rossmoor), and planned residential golf communities (Forsgate). Two ramps that would be constructed as part of the Route 92 project would pass through the western edge of Monroe Township. One of the ramps would be constructed within Interchange 8A itself. The other ramp would pass through an L-I light industrial zone. This zone allows altering, assembly, and finishing operations, distribution and warehousing, research laboratories, data processing and computer centers, and offices.

Route 1 Corridor

Because the widening of US Route 1 to six lanes would occur within the existing right-of-way, zoning is not an issue for US Route 1 widening. The following paragraphs describe existing zoning in the vicinity of the five new interchanges included in the US Route 1 Widening and Signal Removal Alternative (see Figure 3-24b).

Cozzens Lane-Adams Lane Interchange

This interchange would be in North Brunswick Township. The area south of the existing intersection of Cozzens Lane and Adams Lane with US Route 1 is zoned I-2 Industrial. Permitted uses in this zone include light manufacturing and processing, laboratories, offices, warehouses and distribution centers. A 100-foot setback from US Route 1 is required.

The area east and immediately north of the existing intersection is zoned C-1 Neighborhood Commercial. Permitted uses include stores, banks, offices, and service establishments. A 100-foot setback from US Route 1 is required. The area immediately north of Cozzens Lane and behind the businesses on US Route 1 is zoned R-3 Single Family Residential. The principal permitted use in this zone is single-family detached homes.

The area west of the existing intersection is zoned Transitional Mixed Use (TMU). Permitted uses include offices, warehousing, research, stores, hotel and convention facilities, high-technology industrial uses compatible with residential use, and all types of housing. A 100-foot setback from US Route 1 is required.

Finnegans Lane Interchange
This interchange would be in both North Brunswick Township and South Brunswick Township. The area east of the existing intersection is in North Brunswick and is zoned I-2 Industrial. Permitted uses include light manufacturing and processing, laboratories, offices, warehouses and distribution centers. A 100-foot setback from US Route 1 is required. The area north of the existing intersection is also in North Brunswick and is zoned C-2 General Commercial. Permitted uses include shopping centers, banks, offices, publishing newspapers and periodicals, and service establishments. Setbacks of 75 feet from US Route 1 and 60 feet from other streets are required.

The area immediately west of the intersection is in South Brunswick and is zoned C-3 Highway Commercial. This zone allows highway-oriented commercial businesses such as automotive businesses, lumberyards and home supply stores, appliance stores, garden centers, and restaurants other than fast-food restaurants. Permitted uses also include movie theaters, offices, and indoor recreation businesses. A 100-foot setback from all streets is required. West of the C-3 district is an R-1 Single Family/Cluster zone on the south side of Finnegans Lane.

Beekman Road-Northumberland Way Interchange
This interchange would be in South Brunswick Township. The areas north, west and south of the existing intersection are zoned OP Office Park. Permitted uses include professional offices and related support services (including medical), banks, fitness and recreation facilities, conference and training centers, nursing homes and assisted living facilities, and child care centers. A 100-foot setback from US Route 1 is required.

The area east of the intersection is zoned OR Office/Research/Conference. This zone allows executive and corporate offices, laboratories, assembly of electronic equipment, certain outpatient healthcare facilities, and certain retail commercial and service establishments. A 100-foot setback from all streets is required.

New Road Interchange
This interchange would be in South Brunswick Township. The area immediately north and west of the existing intersection is zoned C-3 Highway Commercial. This zone allows highway-oriented commercial businesses such as automotive businesses, lumber yards and home supply stores, appliance stores, garden centers, and restaurants other than fast-food restaurants. Permitted uses also include movie theaters, offices, and indoor recreation businesses. A 100-foot setback from all streets is required.

Southwest of the intersection is a narrow extension of a large R-1 Single Family/Cluster zone. The area east and immediately southeast of the intersection is zoned OR Office/Research/Conference. This zone allows executive and corporate offices,

laboratories, assembly of electronic equipment, certain outpatient healthcare facilities, and certain retail commercial and service establishments. A 100-foot setback from all streets is required. Proceeding southeast along New Road, the zoning changes quickly to R-2 Single Family/Cluster.

Route 522 Interchange
This interchange would be in South Brunswick Township. The area west of the existing intersection is zoned C-2 General Commercial. Permitted uses include shopping centers, banks, offices, publishing newspapers and periodicals, and service establishments. Setbacks of 75 feet from US Route 1 and 60 feet from other streets are required. The area south of the intersection is zoned OR Office/Research/Conference. This zone allows executive and corporate offices, laboratories, assembly of electronic equipment, certain outpatient healthcare facilities, and certain retail commercial and service establishments. A 100-foot setback from all streets is required.

The area immediately north and east of the existing intersection is zoned C-3 Highway Commercial. This zone allows highway-oriented commercial businesses such as automotive businesses, lumber yards and home supply stores, appliance stores, garden centers, and restaurants other than fast-food restaurants. Permitted uses also include movie theaters, offices, and indoor recreation businesses. A 100-foot setback from all streets is required.

A small area southeast of the existing intersection is zoned I-3 General Industrial. Permitted uses include light manufacturing and processing, laboratories, offices, warehouses and distribution centers. A 100-foot setback from US Route 1 is required.

3.13.2.2 Land Use Planning

Local Land Use Planning
The South Brunswick Master Plan Reexamination Report of December 2000 states that the Planning Board strongly opposes construction of proposed Route 92. The Reexamination Report states that the recently relocated Route 522 "significantly" meets the goal of enhancing east-west travel in the South Brunswick area. On the other hand, the Reexamination Report states the principle that "local traffic should be separated, as much as possible, from through traffic".

The South Brunswick Master Plan of December 2001 recommends that a "new zoning category be introduced south of Friendship Road" requiring a minimum of 5 acres per dwelling unit. Approximately 1.9 miles of proposed Route 92 would be south of Friendship Road. The Master Plan gives the following reasons for the proposed zoning initiative south of Friendship Road:

- The area lacks utilities.
- The area contains significant environmental constraints.

- The State Development and Redevelopment Plan designates the area a PA5 Environmentally Sensitive Planning Area.

- Major sections of the area are designated as an Agricultural Development Area and two farms are presently preserved.

The Monroe Township Master Plan of December 1998 does not explicitly oppose proposed Route 92, but expresses concern that construction of Route 92 could increase through-traffic on local roads in Monroe. The Master Plan recognizes that a number of changes have been made in the original design of Route 92 in an attempt to minimize this potential problem.

The Plainsboro Township Master Plan (2000) expresses support for Route 92 as currently proposed.

State Land Use Planning
The New Jersey State Development and Redevelopment Plan (State Plan) divides the state into the following planning categories:

- Metropolitan Planning Areas: PA1
- Suburban Planning Areas: PA2
- Fringe Planning Areas: PA3
- Rural Planning Areas: PA4
- Environmentally Sensitive Planning Areas: PA5

The State Plan "anticipates continued growth throughout New Jersey in all Planning Areas." Development is encouraged in PA1 and PA2 and is accommodated in PA3, PA4 and PA5. The State Plan specifies that development is expected to occur, within guidelines, in all planning areas. The State Plan directs that infrastructure investment decisions should encourage growth in areas that are already developed or are currently developing, and should discourage development sprawl into undeveloped areas.

Proposed Route 92 would begin and end in a Suburban Planning Area, PA2, and would pass through an Environmentally Sensitive Planning Area, PA5. From US Route 1 to the Amtrak rail lines in Plainsboro, proposed Route 92 would be in a Suburban Planning Area. From the Amtrak lines east to the US Route 130 corridor, Route 92 would pass through an Environmentally Sensitive Planning Area. From the western edge of the US Route 130 corridor to its eastern terminus at NJ Turnpike Interchange 8A, proposed Route 92 would again be in a Suburban Planning Area.

The South Brunswick portion of the US Route 1 corridor is in a Suburban Planning Area (PA2), while the North Brunswick portion is in a Metropolitan Planning Area (PA1).

On January 31, 2002, Governor McGreevey issued Executive Order #4 addressing "smart growth" in the state. The executive order states that "it is the law and policy of the State of New Jersey to promote smart growth and to reduce the negative effects of

sprawl and disinvestments in older communities." Among other things, Executive Order #4 did the following:

- Created in the Office of the Governor a Smart Growth Policy Council whose members include the commissioners of the New Jersey Department of Environmental Protection (NJDEP), the New Jersey Department of Transportation (NJDOT), and the New Jersey Department of Community Affairs (NJDCA).

- Made the Smart Growth Policy Council responsible for ensuring that state transportation and infrastructure spending and regulation are consistent with the principles of smart growth and the State Plan.

Later, an Office of Smart Growth was created in NJDCA. The web site of the Office of Smart Growth lists the following "smart growth principles":

- Mixed land uses
- Compact, clustered community design
- Range of housing choices and opportunity
- Walkable neighborhoods
- Distinct, attractive communities offering a sense of place
- Open space, farmland and scenic resource preservation
- Future development strengthened and directed to existing communities using existing infrastructure
- Transportation option variety
- Predictable, fair and cost-effective development decisions
- Community and stakeholder collaboration in development decision-making

3.14 Environmental Justice

The fundamental principle of environmental justice is that government actions should not impose disproportionate environmental impacts on minority groups or on low-income people. This section addresses the number and distribution of minority group members living in the area of proposed Route 92 and presents data related to the economic status of area residents.

Because the widening of US Route 1 would occur within the existing right-of-way, no significant impacts would be experienced by people living near sections of US Route 1 that would only be widened. Greater impacts would be experienced by people living near the new interchanges included in the US Route 1 Widening and Signal Removal Alternative. This environmental justice analysis is confined to people living in the vicinity of the potential new interchanges.

3.14.1 Minority Groups

Proposed Route 92 Corridor

Table 3-18 summarizes the racial composition of the 95 census blocks that have residents in the 1,000-foot corridor spanning proposed Route 92, based on the 2000 Census. The

Table 3-18
Racial Composition of Inhabited Census Blocks Overlapping the Proposed Route 92 Corridor

Municipality	Census tract and block group	Block	Popu-lation	Racial composition						Hispanic or Latino[1]	Total minority
				White only	Black only	Asian only	Mixed and other	Total	Total not white only		
So. Brunswick Twp.	85.02-1	1012	53	85%	0.0%	11%	3.8%	100%	15%	1.9%	17%
		1013	390	67%	7.9%	23%	2.3%	100%	33%	3.6%	37%
So. Brunswick Twp.	85.02-2	2000	52	98%	0.0%	1.9%	0.0%	100%	1.9%	0%	1.9%
		2001	72	89%	8.3%	0.0%	2.8%	100%	11%	0%	11%
So. Brunswick Twp.	85.04-1	1001	170	87%	2.4%	7.6%	2.9%	100%	13%	1.8%	15%
		1016	10	100%	0.0%	0.0%	0.0%	100%	0.0%	0%	0.0%
So. Brunswick Twp.	85.04-2	2002	265	65%	7.2%	27%	1.5%	100%	35%	6.8%	42%
		2013	50	34%	4.0%	56%	6.0%	100%	66%	6.0%	72%
		2014	6	100%	0.0%	0.0%	0.0%	100%	0.0%	0%	0.0%
Total for South Brunswick Township			1,068	72%	5.8%	19%	2.3%	100%	28%	3.7%	31%
Plainsboro Twp.	86.01-2	2004	183	68%	4.9%	25%	2.2%	100%	32%	4.4%	37%
		2005	87	64%	0.0%	36%	0.0%	100%	36%	0%	36%
		2011	5	100%	0.0%	0.0%	0.0%	100%	0.0%	100%	100%
Total for Plainsboro Township			275	67%	3.3%	28%	1.5%	100%	33%	4.7%	37%
Monroe Township	82.08-5	5003	363	98%	0.8%	1.7%	0.0%	100%	2.5%	0.8%	3.3%
Total for Monroe Township			363	98%	0.8%	1.7%	0.0%	100%	2.5%	0.8%	3.3%
Total for blocks overlapping the proposed Route 92 corridor			1,706	77%	4.3%	17%	1.7%	100%	23%	3.2%	26%

[1]"Hispanic or Latino" is a separate category whose members are also included in one of the racial categories.
Source: 2000 Census

table also shows the number of people who identified themselves as Hispanic or Latino. Hispanic/Latino is not a racial category; rather, it is a separate classification whose members are also included in one of the racial categories the Census uses.

Of the 1,706 residents of the census blocks in or partially in the proposed Route 92 corridor in 2000, 17 percent were Asian and 4.3 percent were Black or African American. No other racial groups are numerically significant in the study area. Approximately 3.2 percent of the 1,706 residents identified themselves as Hispanic or Latino.

Figure 3-25 shows the relative size of the total minority population in the census blocks in or near the Proposed Route 92 Corridor. The red line in the figure depicts the 1,000-foot primary impact corridor.

The guidance document for Federal Executive Order 12898, the original official statement of the principles of environmental justice, defines "minority" to include Hispanics and Latinos in addition to the minority racial groups used in the U.S. Census. The Executive Order states that affected areas in which the total minority population exceeds 50 percent should be identified (CEQ, 1997).

As shown in Figure 3-25, the primary impact corridor of proposed Route 92 includes one census block in which the total minority population is greater than 50 percent. This is block 2013 in census tract 85.04 in South Brunswick, south of Ridge Road and east of Schalks Crossing Road. At the time of the 2000 Census this block had 50 residents, of which 28 were Asian, two were Black or African American, two were multiracial, one was classified as "other," and three identified themselves as Hispanic. The other block was block 2011 in census tract 86.01 in Plainsboro, south of Research Way and west of Schalks Crossing Road in Plainsboro. This block had only five residents, all of whom identified themselves as Hispanic or Latino.

Route 1 Corridor

Table 3-19 shows the racial composition and the Hispanic/Latino population of inhabited census blocks within roughly 0.25 mile of the five new signal-free interchanges included in the US Route 1 Widening and Signal Removal Alternative. The table indicates that six census blocks in North Brunswick Township and four census blocks in South Brunswick Township have total minority populations greater than 50 percent. The total minority population of the four blocks in South Brunswick is 35, approximately 0.6 percent of the total number of South Brunswick residents in the vicinity of the potential interchanges. Of the 35, 7 live in the vicinity of the potential Finnegans Lane interchange and 28 live near the potential Route 522 interchange.

The total minority population of the six census blocks in North Brunswick is 388, approximately 20 percent of the total number of North Brunswick residents in the vicinity of the potential interchanges. Of the 388, 260 live in the vicinity of the potential Finnegans Lane interchange and 128 live near the potential Cozzens Lane-Adams Lane interchange.

Table 3-19
Racial Composition of Inhabited Census Blocks Near the Potential New US Route 1 Interchanges

Municipality	Census tract and block group	Block	Popu-lation	Racial composition						Hispanic or Latino[1]	Total minority[2]
				White only	Black only	Asian only	Other and mixed	Total	Total not white only		
No. Brunswick Twp.	61.04-3	3004	561	67%	2%	29%	2%	100%	33%	7%	39%
		3010	2	100%	0%	0%	0%	100%	0%	0%	0%
		3011	17	100%	0%	0%	0%	100%	0%	0%	0%
		3012	32	78%	22%	0%	0%	100%	22%	13%	34%
		3013	12	100%	0%	0%	0%	100%	0%	0%	0%
		3014	29	72%	0%	3%	24%	100%	28%	0%	28%
		3015	9	100%	0%	0%	0%	100%	0%	0%	0%
No. Brunswick Twp.	62.03-2	2000	5	100%	0%	0%	0%	100%	0%	0%	0%
		2002	35	91%	0%	0%	9%	100%	9%	9%	9%
		2003	32	88%	9%	0%	3%	100%	13%	0%	13%
		2004	10	100%	0%	0%	0%	100%	0%	0%	0%
		2005	40	43%	3%	23%	33%	100%	58%	25%	58%
No. Brunswick Twp.	62.04-1	1001	115	30%	7%	57%	6%	100%	70%	7%	77%
		1003	216	25%	20%	49%	6%	100%	75%	7%	80%
No. Brunswick Twp.	62.05-2	2000	1	0%	100%	0%	0%	100%	100%	0%	100%
		2001	58	83%	5%	7%	5%	100%	17%	14%	28%
		2002	27	81%	0%	19%	0%	100%	19%	11%	30%
		2003	171	63%	2%	30%	4%	100%	37%	5%	39%
		2004	73	51%	8%	29%	12%	100%	49%	11%	51%
No. Brunswick Twp.	62.07-2	2008	396	54%	30%	9%	8%	100%	46%	8%	48%
		2009	110	39%	29%	15%	17%	100%	61%	3%	61%
Total for North Brunswick Twp.			1,951	57%	12%	24%	6%	100%	43%	7%	47%
So. Brunswick Twp.	84.03-1	1000	840	62%	12%	21%	6%	100%	38%	6%	41%
		1010	116	77%	13%	10%	0%	100%	23%	7%	26%
		1011	31	61%	0%	39%	0%	100%	39%	19%	58%
		1012	10	0%	50%	50%	0%	100%	100%	0%	100%
So. Bruns. Twp.	84.03-3	3023	171	82%	12%	5%	1%	100%	18%	4%	22%
So. Bruns. Twp.	84.04-3	3000	882	84%	4%	9%	4%	100%	16%	5%	20%
		3002	135	88%	0%	10%	1%	100%	12%	2%	13%
		3003	60	87%	8%	0%	5%	100%	13%	12%	20%
		3004	45	93%	4%	0%	2%	100%	7%	4%	9%
		3005	58	97%	0%	3%	0%	100%	3%	0%	3%
		3006	58	98%	0%	2%	0%	100%	2%	2%	3%
		3007	45	100%	0%	0%	0%	100%	0%	0%	0%
		3008	12	100%	0%	0%	0%	100%	0%	0%	0%
		3009	14	100%	0%	0%	0%	100%	0%	0%	0%
		3010	19	100%	0%	0%	0%	100%	0%	0%	0%
		3011	16	100%	0%	0%	0%	100%	0%	6%	6%
		3012	11	100%	0%	0%	0%	100%	0%	0%	0%
So. Bruns. Twp.	84.05-1	1000	718	84%	3%	10%	3%	100%	16%	2%	18%
So. Bruns. Twp.	84.05-2	2000	232	72%	0%	24%	4%	100%	28%	3%	31%
		2023	41	95%	0%	2%	2%	100%	5%	0%	5%

[1]"Hispanic or Latino" is a separate category whose members are also included in one of the racial categories.
[2]Adjusted to eliminate double counting of people who are both "not white only" and Hispanic or Latino.
Source: 2000 Census

Table 3-19
Racial Composition of Inhabited Census Blocks Near the Potential New US Route 1 Interchanges

Municipality	Census tract and block group	Block	Popu-lation	Racial composition						Hispanic or Latino[1]	Total minority[2]
				White only	Black only	Asian only	Other and mixed	Total	Total not white only		
So. Brunswick Twp.	84.06-1	1000	357	83%	6%	5%	7%	100%	17%	4%	20%
		1009	4	100%	0%	0%	0%	100%	0%	0%	0%
		1010	3	100%	0%	0%	0%	100%	0%	0%	0%
		1011	5	100%	0%	0%	0%	100%	0%	0%	0%
		1014	2	0%	50%	0%	50%	100%	100%	0%	100%
		1016	9	100%	0%	0%	0%	100%	0%	56%	56%
So. Bruns. Twp.	84.06-2	2000	198	85%	7%	5%	3%	100%	15%	8%	23%
So. Bruns. Twp.	85.01-1	1000	216	84%	2%	0%	14%	100%	16%	17%	25%
		1001	1	100%	0%	0%	0%	100%	0%	0%	0%
		1009	551	64%	18%	10%	8%	100%	36%	9%	38%
So. Bruns. Twp.	85.01-2	2002	87	89%	0%	0%	11%	100%	11%	20%	20%
So. Bruns. Twp.	85.02-3	3000	33	100%	0%	0%	0%	100%	0%	0%	0%
So. Bruns. Twp.	85.04-3	3000	860	84%	7%	8%	1%	100%	16%	4%	20%
Total for South Brunswick Twp.			5,840	79%	7%	10%	4%	100%	21%	7%	24%
Total for blocks near the potential new Route 1 interchanges			7,791	73.4%	8.3%	13.7%	4.6%	100%	26.6%	6.1%	30.2%

[1]"Hispanic or Latino" is a separate category whose members are also included in one of the racial categories.
[2]Adjusted to eliminate double counting of people who are both "not white only" and Hispanic or Latino.
Source: 2000 Census

3.14.2 Economic Status

Proposed Route 92 Corridor

Economic block data are not available from the U.S. Census. Therefore, the analysis below is based on block-group data rather than block data. Because of this, the analysis extends beyond the 1,000-foot corridor around proposed Route 92, and the number of people included in the analysis is greater than the number included in the racial analysis above.

Table 3-20 shows financial data from the 2000 Census for residents and housing units in the nine census block groups that overlap the Proposed Route 92 Corridor. The table shows that per capita income in the Proposed Route 92 Corridor is higher than in Middlesex County as a whole, and the poverty rate is lower in the corridor than in the County. Both the median value of owner-occupied housing and the median contract rent are greater in the Proposed Route 92 Corridor than in Middlesex County as a whole.

One of the nine block groups that overlap the Proposed Route 92 Corridor, block group 82.06-1 in Monroe Township, has notably low housing values and rent. This block group is the Rossmoor retirement community. Rossmoor residents pay monthly maintenance fees that some report as rent on Census forms. Because the housing units are small, the individual owners of the housing units do not own the land the units are built on, and due to the monthly maintenance fees, the market value of the housing units is relatively small. The per-capita income of the residents of Rossmoor is relatively high.

Route 1 Corridor

Because economic block data are not available from the Census, the following analysis is based on block-group data. Because of this, the analysis extends farther from the potential new US Route 1 interchanges than the minority-group analysis above, and the number of people included in the analysis is much greater.

Table 3-21 shows financial data from the 2000 Census for residents and housing units in the 16 inhabited census block groups that overlap the five potential new US Route 1 interchanges. The table shows that per capita income in the areas around the potential interchanges is higher than in Middlesex County as a whole, and the poverty rate is lower than in the county. Both the median value of owner-occupied housing and the median contract rent are greater near the interchanges than in Middlesex County as a whole.

The census block group with the lowest per-capita income is block group 62.07-2 in North Brunswick Township, where per-capita income in 1999 was 20 percent below the Middlesex County average. This block group also has a poverty rate greater than the poverty rate for the county. This block group includes a census block at the intersection of Adams Lane and US Route 1 that has a total minority population of 61 percent.

Several of the block groups near the potential new interchanges have low median values for owner-occupied housing and/or low median contract rents. One factor contributing

Table 3-20
Financial Data for Persons and Housing Units In or Near the Proposed Route 92 Corridor

Municipality	Census tract and block group	Population	Estimated percent below poverty level	Per-capita income	Occupied housing units	Percent owner-occupied	Median value of owner occupied housing	Percent rented	Median monthly contract rent
South Brunswick Twp.	85.02-1	1,449	2.7%	$32,781	404	94.6%	$245,600	5.4%	Unknown
	85.02-2	240	0.0%	$27,893	82	90.2%	$246,400	9.8%	$1,625
	85.02-3	168	0.0%	$26,700	58	79.3%	$286,100	20.7%	$575
	85.04-1	657	0.8%	$35,918	220	93.2%	$290,300	6.8%	Unknown
	85.04-2	1,307	0.0%	$39,066	411	96.8%	$308,500	3.2%	$425
Plainsboro Township	86.01-2	2,194	0.6%	$37,976	647	96.1%	$279,100	3.9%	$1,406
	86.02-1	855	4.2%	$42,325	222	95.9%	$419,200	4.1%	$1,192
Monroe Township	82.06-1[1]	1,190	5.6%	$30,867	801	95.0%	$122,200	5.0%	$275
	82.08-5	1,062	0.8%	$51,353	453	83.2%	$285,400	16.8%	$950
		9,122	1.9%	$37,723	3,298	93.3%	$268,840	6.7%	$844
		750,162	6.6%	$26,535	265,815	66.7%	$164,400	33.3%	$770

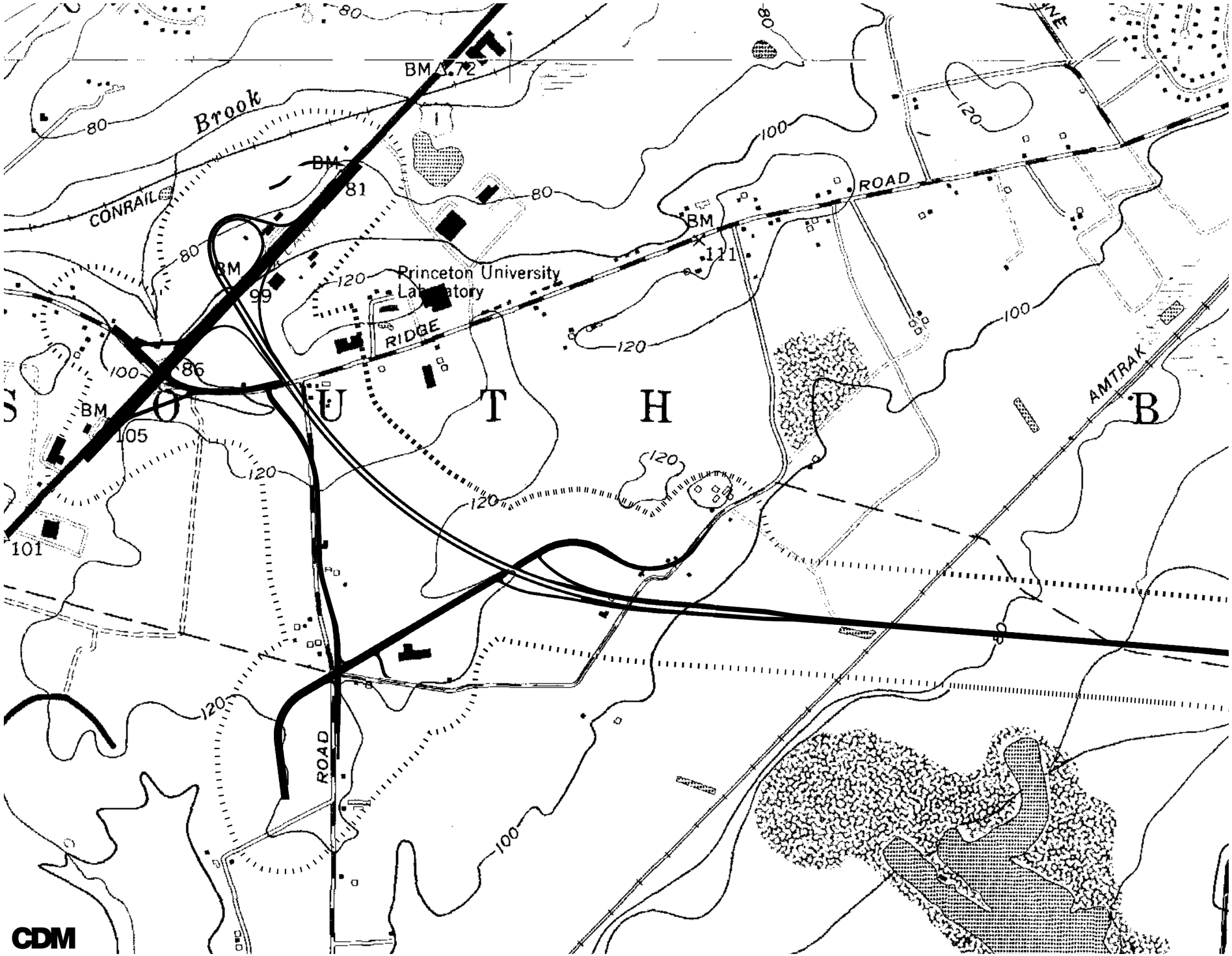
[1]This block group is the Rossmoor planned retirement community.

Table 3-21
Financial Data for Persons and Housing Units Near the Potential New US Route 1 Interchanges

Municipality	Census tract and block group	Population	Estimated percent below poverty level	Per-capita income	Occupied housing units	Percent owner-occupied	Median value of owner occupied housing	Percent rented	Median monthly contract rent
North Brunswick Township	61.04-3	1,187	1.1%	$41,491	370	94.3%	$240,500	5.7%	$1,125
	62.03-2[1]	1,131	2.7%	$26,429	519	92.7%	$65,500	7.3%	$425
	62.04-1	394	0.0%	$29,421	129	94.6%	$143,900	5.4%	---
	62.05-2	3,844	0.9%	$34,281	1,635	75.5%	$125,000	24.5%	$1,038
	62.07-2	1,500	8.1%	$21,204	490	81.6%	$174,000	18.4%	$984
South Brunswick Township	84.03-1	1,579	1.9%	$36,872	619	79.3%	$133,000	20.7%	$1,048
	84.03-3	2,777	3.0%	$25,856	836	95.9%	$191,300	4.1%	$1,197
	84.04-3	1,528	1.8%	$25,396	557	93.9%	$148,800	6.1%	$463
	84.05-1	2,356	3.6%	$31,286	698	97.4%	$232,900	2.6%	Unknown
	84.05-2	2,453	0.5%	$30,301	721	97.4%	$284,300	2.6%	$1,525
	84.06-1[2]	958	7.9%	$25,029	350	74.6%	$216,800	25.4%	$568
	84.06-2	1,267	0.0%	$39,790	407	95.6%	$217,100	4.4%	$1,375
	85.01-1	2,308	6.4%	$36,948	1,016	36.1%	$172,500	63.9%	$832
	85.01-2[3]	2,009	9.5%	$29,244	929	13.5%	$83,600	86.5%	$902
	85.02-3	168	0.0%	$26,700	58	79.3%	$286,100	20.7%	$575
	85.04-3	1,223	3.5%	$36,172	611	72.0%	$112,400	28.0%	$1,131
Overall values for block groups near the new interchanges included in the Route 1 Widening and Signal Removal Alternative		26,682	3.4%	$31,419	9,945	74.5%	$173,874	25.5%	$916
Overall values for Middlesex County		750,162	6.6%	$26,535	265,815	66.7%	$164,400	33.3%	$770

[1]This block group includes the Deer Brook Village mobile home park on the east side of the Amtrak rail lines. This may help explain the low median value of owner-occupied housing and the low median monthly contract rent.
[2]This block group includes the Oakdale mobile home park west of U.S. Route 1 and south of Finnegan's Lane. This may help explain the relatively low median contract rent.
[3]This block group includes the Brookside mobile home park immediately south of the intersection of U.S. Route 1 and Black Horse Lane. This is one reason for the low median value of owner-occupied housing.

to this is the presence of mobile home parks in several of the block groups, as noted in footnotes to Table 3-21.



N

0.2 0 0.2 Miles

1000 0 1000 Feet

Projection: Universal Transverse Mercator
Coordinate System: State Plane
Datum: NAD83

Legend

Route 92 Impact Corridor

Basemap:
USGS Hightstown & Monmouth Junction, NJ Quadrangles (Monochromatic Bitmap Images from NJDEP)

Figure 3-1, Sheet 1
(Section 3.2.1, Sheets 1 - 8)

Topography

US Army Corps of Engineers
Proposed Route 92
Environmental Impact Statement

CDM

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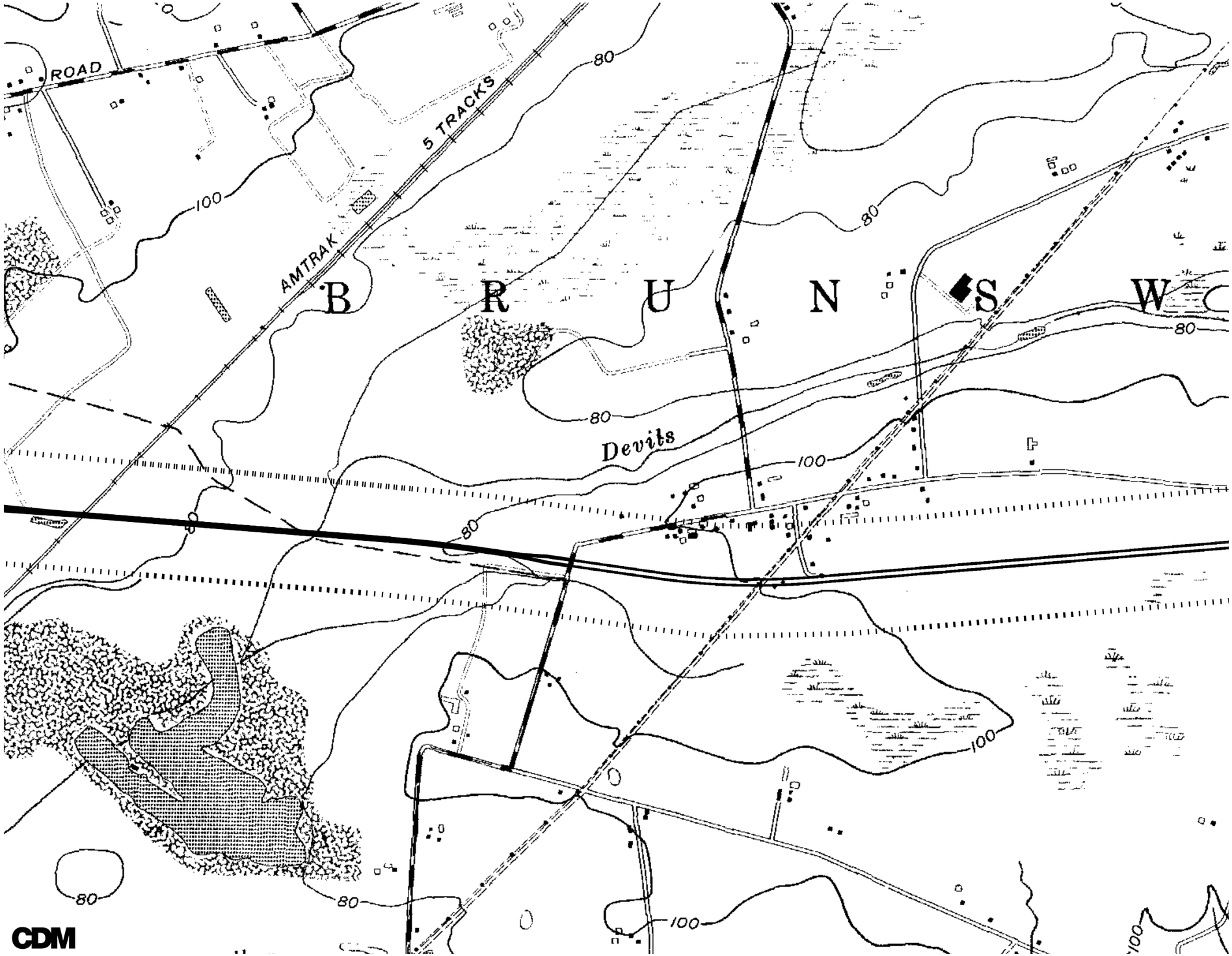

N

0.2 0 0.2 Miles

1000 0 1000 Feet

Projection: Universal Transverse Mercator
Coordinate System: State Plane
Datum: NAD83

Legend

Route 92 Impact Corridor

Basemap:
USGS Hightstown & Monmouth Junction, NJ Quadrangles (Monochromatic Bitmap Images from NJDEP)

Figure 3-1, Sheet 2
(Section 3.2.1, Sheets 1 - 8)

Topography

US Army Corps of Engineers
Proposed Route 92
Environmental Impact Statement

CDM

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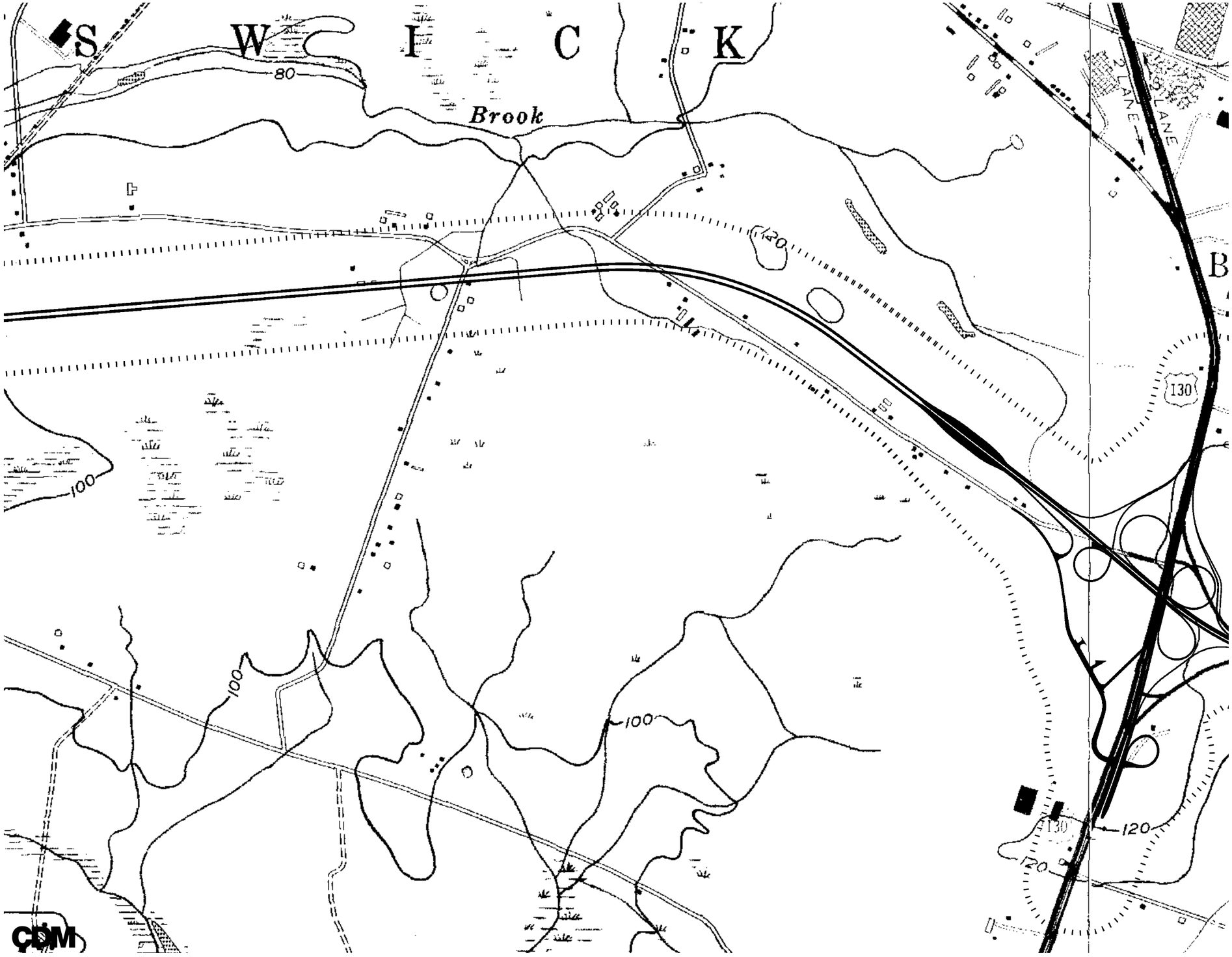

N

0.2 0 0.2 Miles

1000 0 1000 Feet

Projection: Universal Transverse Mercator
Coordinate System: State Plane
Datum: NAD83

Legend

Route 92 Impact Corridor

Basemap:
USGS Hightstown & Monmouth Junction, NJ Quadrangles (Monochromatic Bitmap Images from NJDEP)

Figure 3-1, Sheet 3
(Section 3.2.1, Sheets 1 - 8)

Topography

US Army Corps of Engineers
Proposed Route 92
Environmental Impact Statement

CDM

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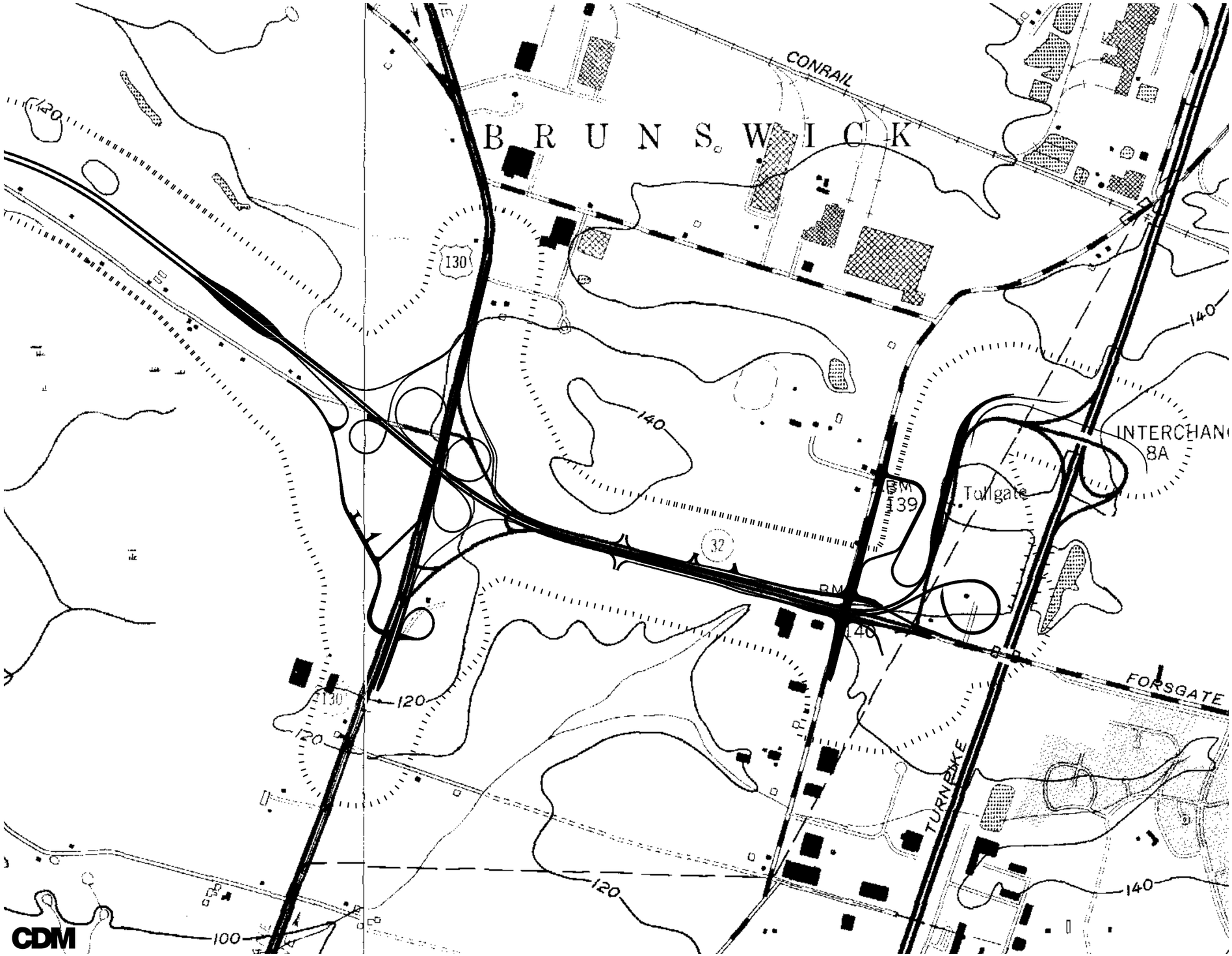

N

0.2 0 0.2 Miles

1000 0 1000 Feet

Projection: Universal Transverse Mercator
Coordinate System: State Plane
Datum: NAD83

Legend

Route 92 Impact Corridor

Basemap:
USGS Hightstown & Monmouth Junction, NJ Quadrangles
(Monochromatic Bitmap Images from NJDEP)

Figure 3-1, Sheet 4
(Section 3.2.1, Sheets 1 - 8)

Topography

US Army Corps of Engineers
Proposed Route 92
Environmental Impact Statement

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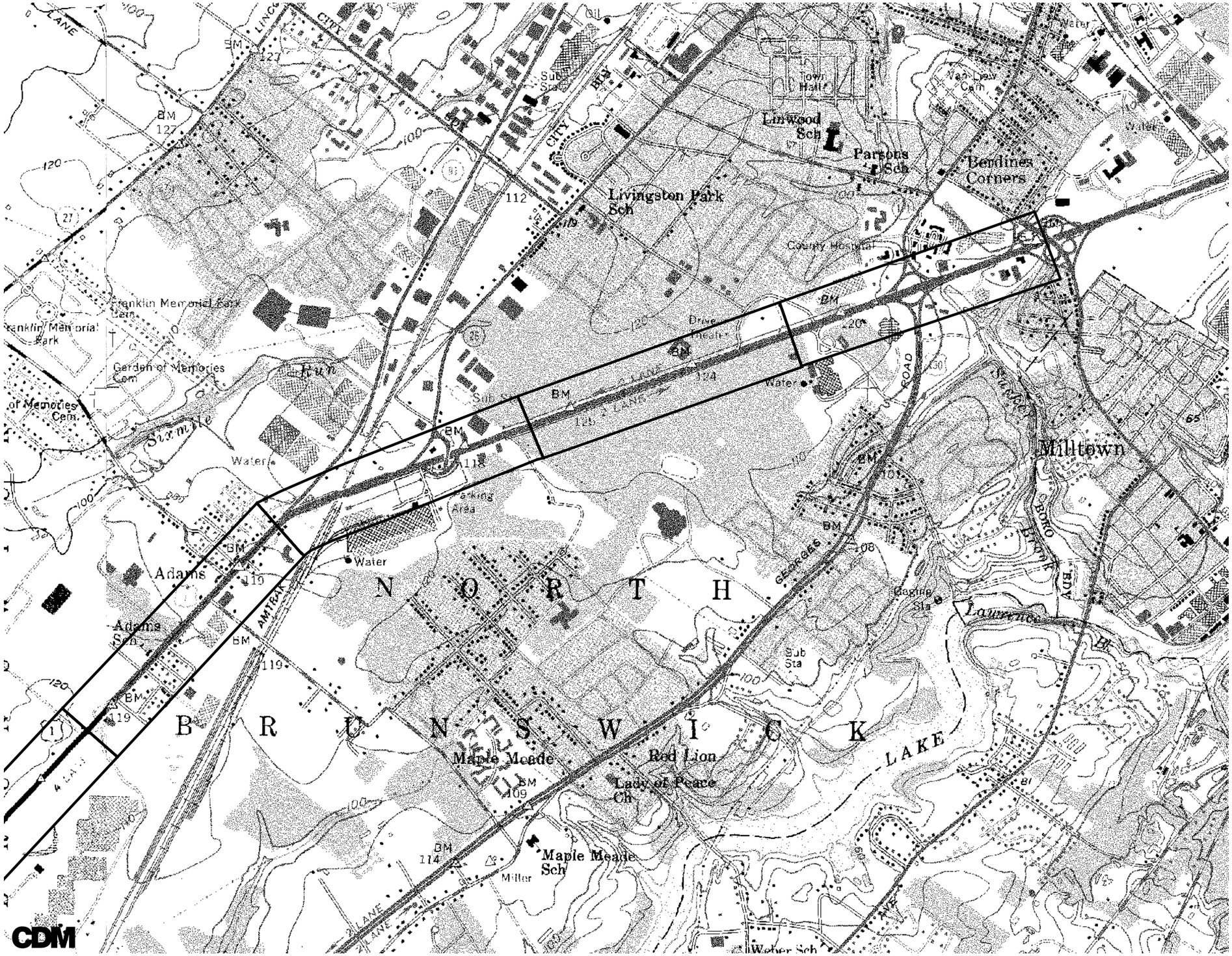

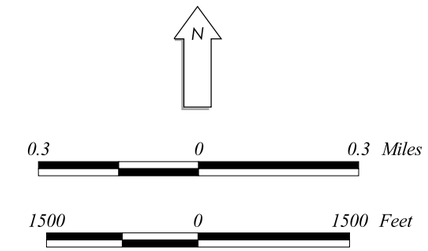

Projection: Universal Transverse Mercator
Coordinate System: State Plane
Datum: NAD83

Legend

Route 1 Impact Corridor

Basemap:
USGS Monmouth Junction and
New Brunswick, NJ Quadrangles
(Monochromatic Bitmap
Images from NJDEP)

Figure 3-1, Sheet 5
(Section 3.2.1, Sheets 1 - 8)

Topography

US Army Corps of Engineers
Proposed Route 92
Environmental Impact Statement

CDM

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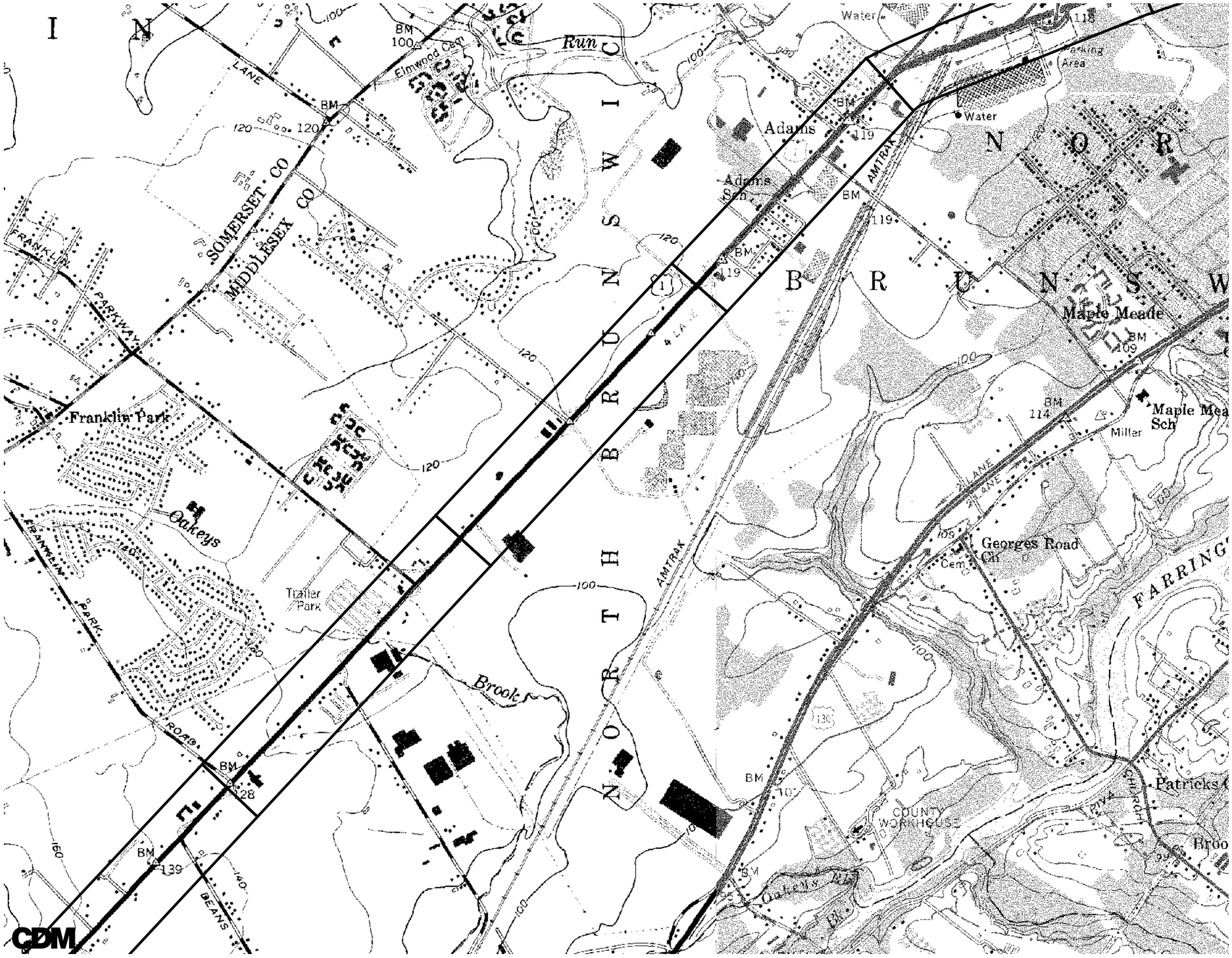

N

0.3 0 0.3 Miles

1500 0 1500 Feet

Projection: Universal Transverse Mercator
Coordinate System: State Plane
Datum: NAD83

Legend

Route 1 Impact Corridor

Basemap:
USGS Monmouth Junction and
New Brunswick, NJ Quadrangles
(Monochromatic Bitmap
Images from NJDEP)

Figure 3-1, Sheet 6
(Section 3.2.1, Sheets 1 - 8)

Topography

US Army Corps of Engineers
Proposed Route 92
Environmental Impact Statement

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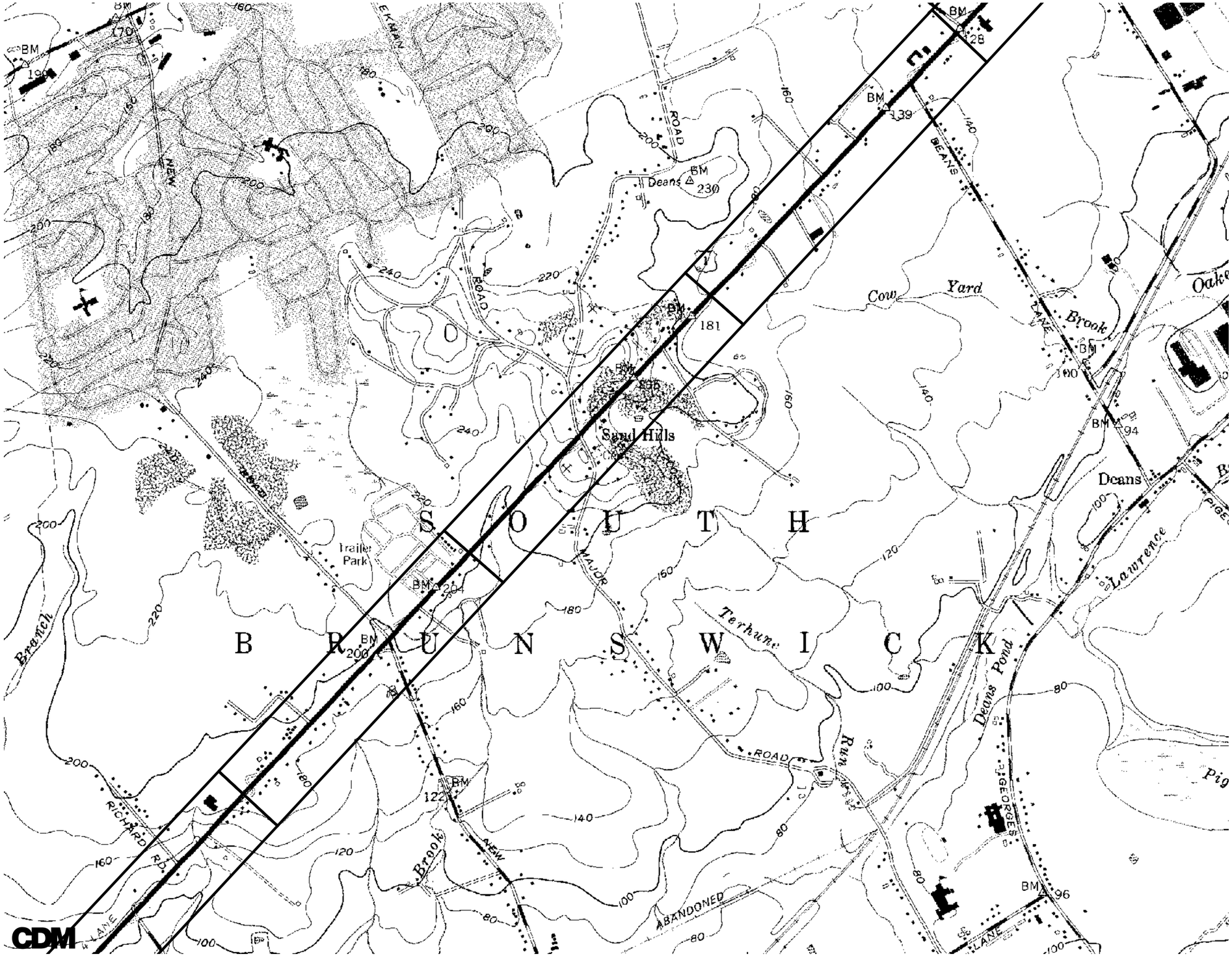

0.3 0 0.3 Miles

1500 0 1500 Feet

Projection: Universal Transverse Mercator
Coordinate System: State Plane
Datum: NAD83

Legend

Route 1 Impact Corridor

Basemap:
USGS Monmouth Junction and
New Brunswick, NJ Quadrangles
(Monochromatic Bitmap
Images from NJDEP)

Figure 3-1, Sheet 7
(Section 3.2.1, Sheets 1 - 8)

Topography

US Army Corps of Engineers
Proposed Route 92
Environmental Impact Statement

CDM

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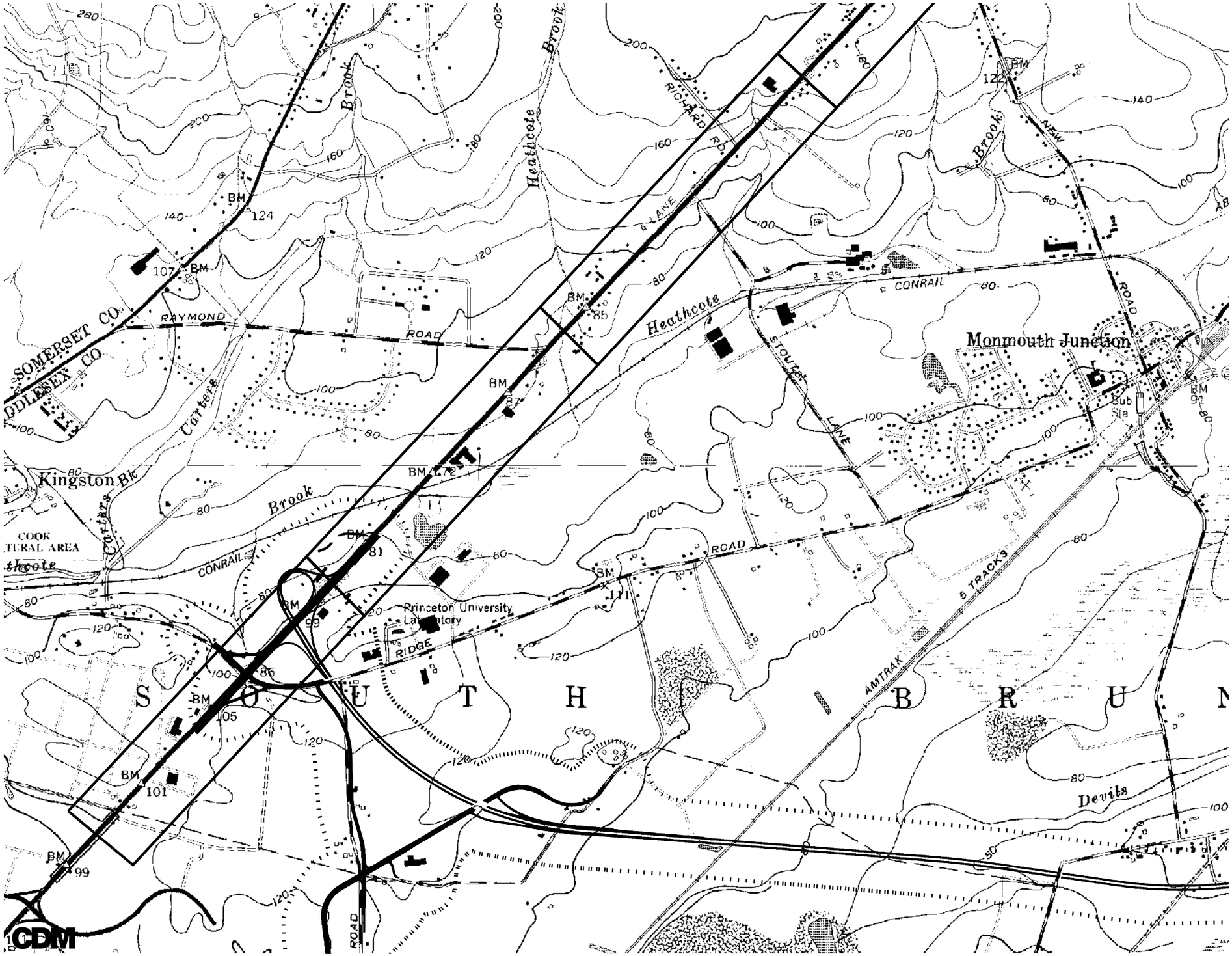

N

0.3 0 0.3 Miles

1500 0 1500 Feet

Projection: Universal Transverse Mercator
Coordinate System: State Plane
Datum: NAD83

Legend

Route 1 Impact Corridor

Basemap:
USGS Monmouth Junction and
New Brunswick, NJ Quadrangles
(Monochromatic Bitmap
Images from NJDEP)

Figure 3-1, Sheet 8
(Section 3.2.1, Sheets 1 - 8)

Topography

US Army Corps of Engineers
Proposed Route 92
Environmental Impact Statement

CDM

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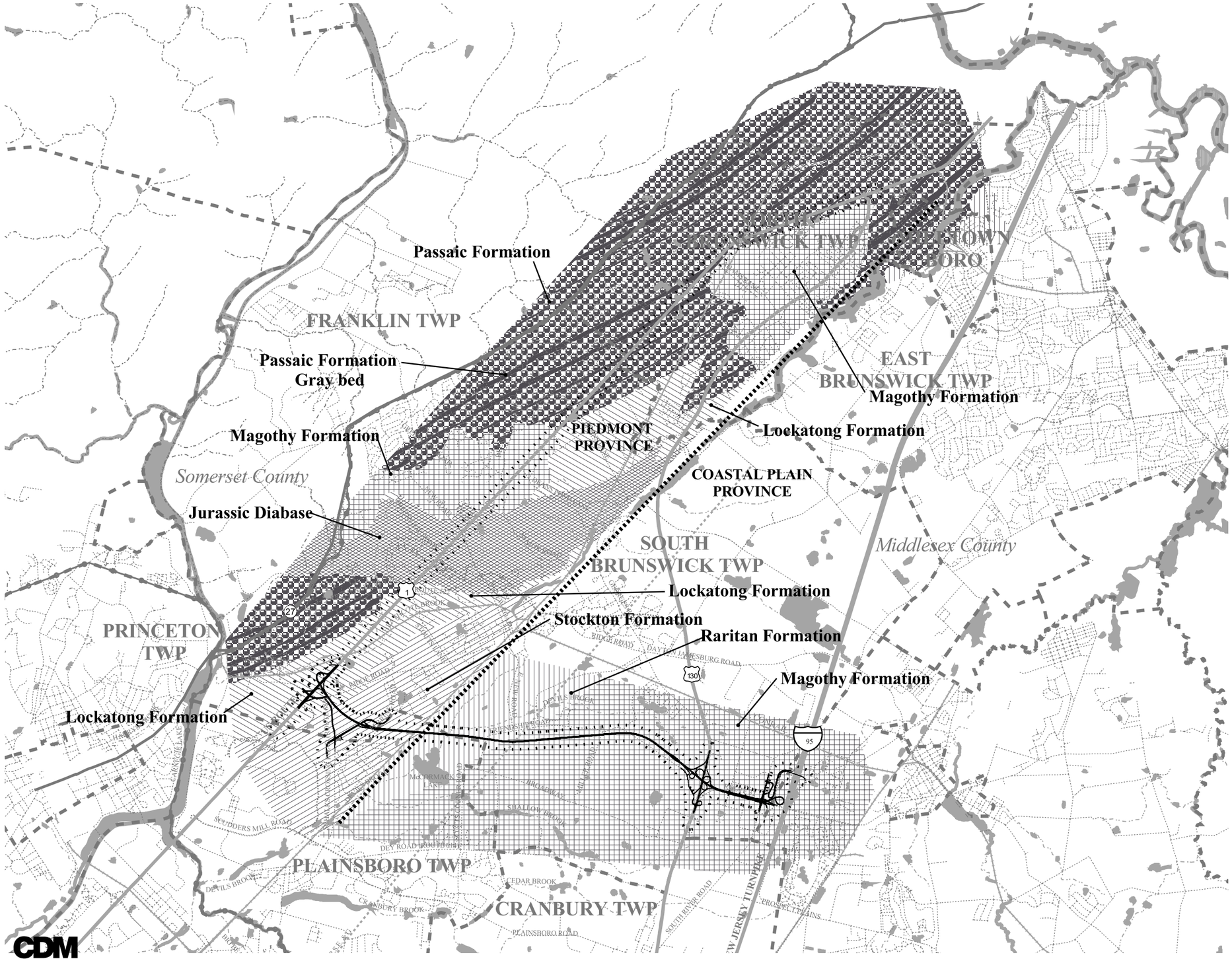

N

0.7 0 0.7 1.4 Miles

7000 0 7000 Feet

Projection: Universal Transverse Mercator
Coordinate System: State Plane
Datum: NAD83

Data Source:

Base map - Enhanced TIGER files, NJDEP GIS data.
Geologic formation - NJ Geologic Survey data on CD ROM.

Legend

- Fall Line
- Proposed Route 92
- Route 92/Route 1 Impact Corridor
- P.S.E. & G
- Major Highway
- Street
- Rail Road
- Municipal Boundary
- County Boundary
- Water
- Hydrologic Feature

Geologic Formations

- Jurassic Diabase
- Lockatong Formation
- Magothy Formation
- Passaic Formation
- Passaic Formation Gray bed
- Raritan Formation
- Stockton Formation

Figure 3-2 (Section 3.2.2)

Geologic Formations

US Army Corps of Engineers
Proposed Route 92
Environmental Impact Statement

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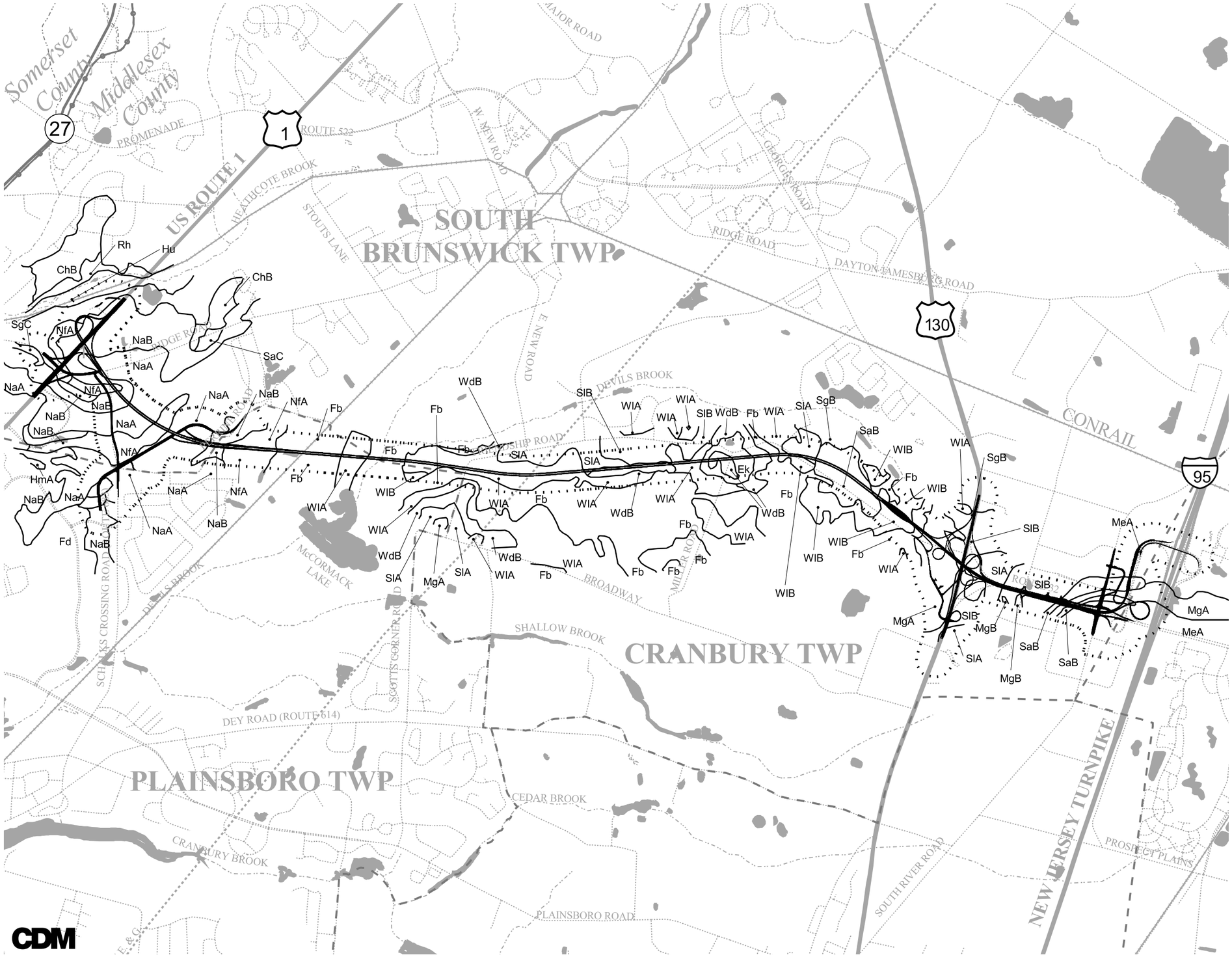

N

0.4 0 0.4 0.8 Miles

3000 0 3000 Feet

Projection: Universal Transverse Mercator
Coordinate System: State Plane
Datum: NAD83

Data Source:

Base map - Enhanced TIGER files, NJDEP GIS data.
Soils coverage - provided by Harris in digital format.

Symbol	Soil Phase	Percent Slope
ChB	Chalfont silt loam	2 to 5%
Ek	Elkton soil loam	Nearly level
Fb	Fallsington loam	Nearly level
Fd	Fallsington variant loam	Nearly level
HmA	Hammington sandy loam	0 to 2%
HU	Humaquept, frequently flooded	0 to 2%
MeA	Matapeake silt loam	0 to 2%
MgA	Mattapex silt loam	0 to 2%
MgB	Mattapex silt loam	2 to 5%
NaA	Nixon loam	0 to 2%
NaB	Nixon loam	2 to 5%
NfA	Nixon variant loam	0 to 2%
Rh	Reaville Variant silt loam	0 to 2%
SaB	Sassafras sandy loam	2 to 5%
SaC	Sassafras sandy loam	5 to 10%
SgB	Sassafras gravelly sandy loam	2 to 5%
SgC	Sassafras gravelly sandy loam	5 to 10%
SlA	Sassafras loam	0 to 2%
SlB	Sassafras loam	2 to 5%
WdB	Woodstown sandy loam	2 to 5%
WlA	Woodstown loam	0 to 2%
WlB	Woodstown loam	2 to 5%

Legend

- Proposed Route 92
- Route 92 Impact Corridor
- P.S.E. & G
- Major Highway
- Municipal Boundary
- Street
- Rail Road
- County Boundary
- Water
- Hydrologic Feature

Figure 3-3a (Section 3.2.3)

Soils (Route 92)

US Army Corps of Engineers
Proposed Route 92
Environmental Impact Statement

CDM

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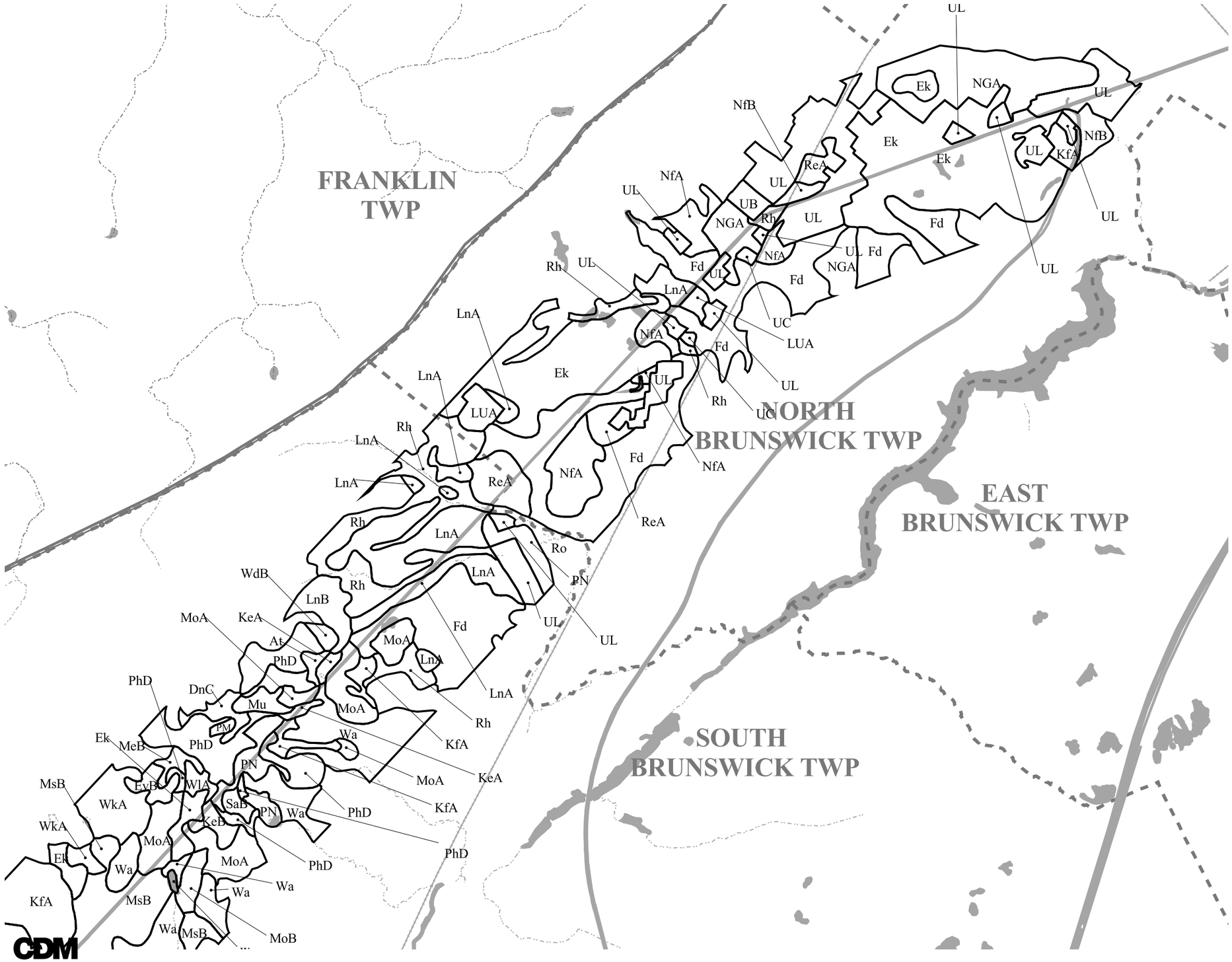

N

0.5 0 0.5 Miles

3000 0 3000 Feet

Projection: Universal Transverse Mercator
Coordinate System: State Plane
Datum: NAD83

Data Source:

Base map - Enhanced TIGER files, NJDEP GIS data,
Soils Coverage: NJDEP GIS data.

Symbol	Soil Phase and Percent Slope
At	Atsion sand
ChA	Chalfont silt loam, 0-2%
ChB	Chalfont silt loam, 2-5%
DnC	Downer loamy sand, 5-10%
Ek	Elkton loam
EvB	Evesboro sand, 0-5%
Fb	Fallington loam
Fd	Fallsington Variant loam
HeA	Hammonton loamy sand, 0-3%
HmA	Hammonton sandy loam, 0-2%
HU	Humaquepts, frequently flooded
KeA	Keyport sandy loam, 0-2%
KeB	Keyport sandy loam, 2-5%
KfA	Keyport loam, 0-2%
LnA	Lansdowne silt loam, 0-2%
LnB	Lansdowne silt loam, 2-5%
LUA	Lansdowne-Urban land complex, 0-5%
MeB	Matapeake silt loam, 2-5%
MoA	Mount Lucas silt loam, 0-2%
MsB	Mount Lucas very stony silt loam, 0-5%
Mu	Mullica sandy loam
NaA	Nixon loam, 0-2%
NaB	Nixon loam, 2-5%
NfA	Nixon Variant loam, 0-2%
NfB	Nixon Variant loam, 2-5%
NGA	Nixon Variant-Urban land complex, 0-5%
PhD	Phalanx loamy sand, 2-15%
PM	Pits, sand and gravel
PN	Psamments, nearly level
ReA	Reaville silt loam, 0-2%
Rh	Reaville Variant silt loam
Ro	Rowland silt loam
SaB	Sassafras sandy loam, 2-5%
SaC	Sassafras sandy loam, 5-10%
SgC	Sassafras gravelly sandy loam, 5-10%
UB	Udorthents, bedrock substratum
UC	Udorthents, clayey substratum
UL	Urban land
Wa	Watchung very stony silt loam, 0-2%
WdB	Woodstown sandy loam, 2-5 %
WkA	Woodstown sandy loam, clayey substratum, 0-2%
WlA	Woodstown loam, 0-2%

Legend

- Major Highway
- Rail Road
- Municipal Boundary
- County Boundary
- Water
- Hydrologic Feature

Figure 3-3b (Section 3.2.3)

Soils (Route 1)

US Army Corps of Engineers
Proposed Route 92
Environmental Impact Statement

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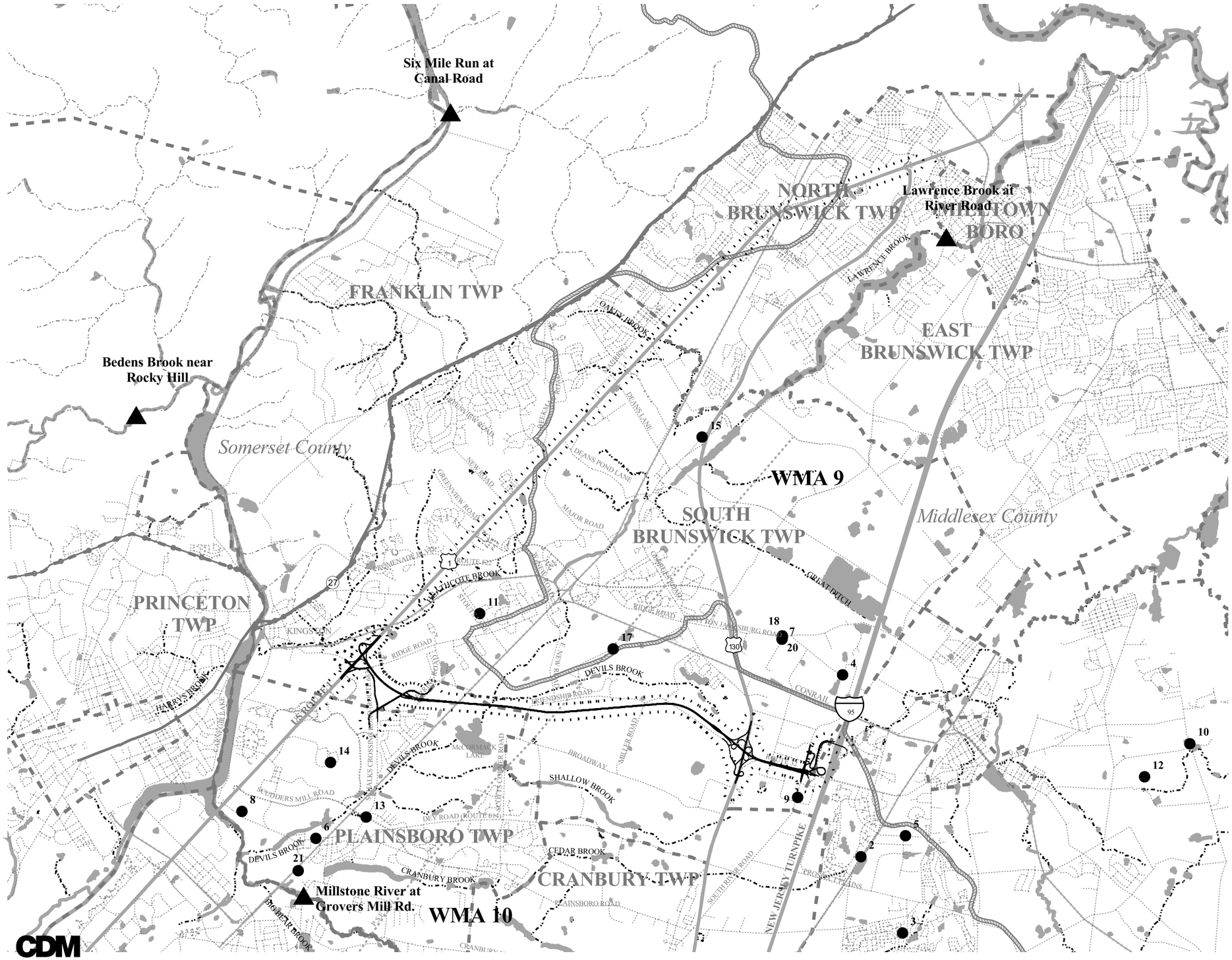

N

0.7 0 0.7 1.4 Miles

7000 0 7000 Feet

Projection: Universal Transverse Mercator
Coordinate System: State Plane
Datum: NAD83

Data Source:

Base map - Enhanced TIGER files, NJDEP GIS data.
Permit sites coverage - NJDEP GIS data.
Monitoring locations - USGS/NJDEP GIS data.

Legend

- NJPDES Permit Sites
- USGS/NJDEP Water Quality Monitoring Location
- Proposed Route 92
- Route 92/Route 1 Impact Corridor
- DEP Watershed Management Area Boundary
- P.S.E. & G
- Major Highway
- Street
- Rail Road
- Municipal Boundary
- County Boundary
- Water
- Hydrologic Feature

Figure 3-4 (Section 3.3.1.1)

Surface Water Features with Water Quality Monitoring Locations

US Army Corps of Engineers
Proposed Route 92
Environmental Impact Statement

CDM

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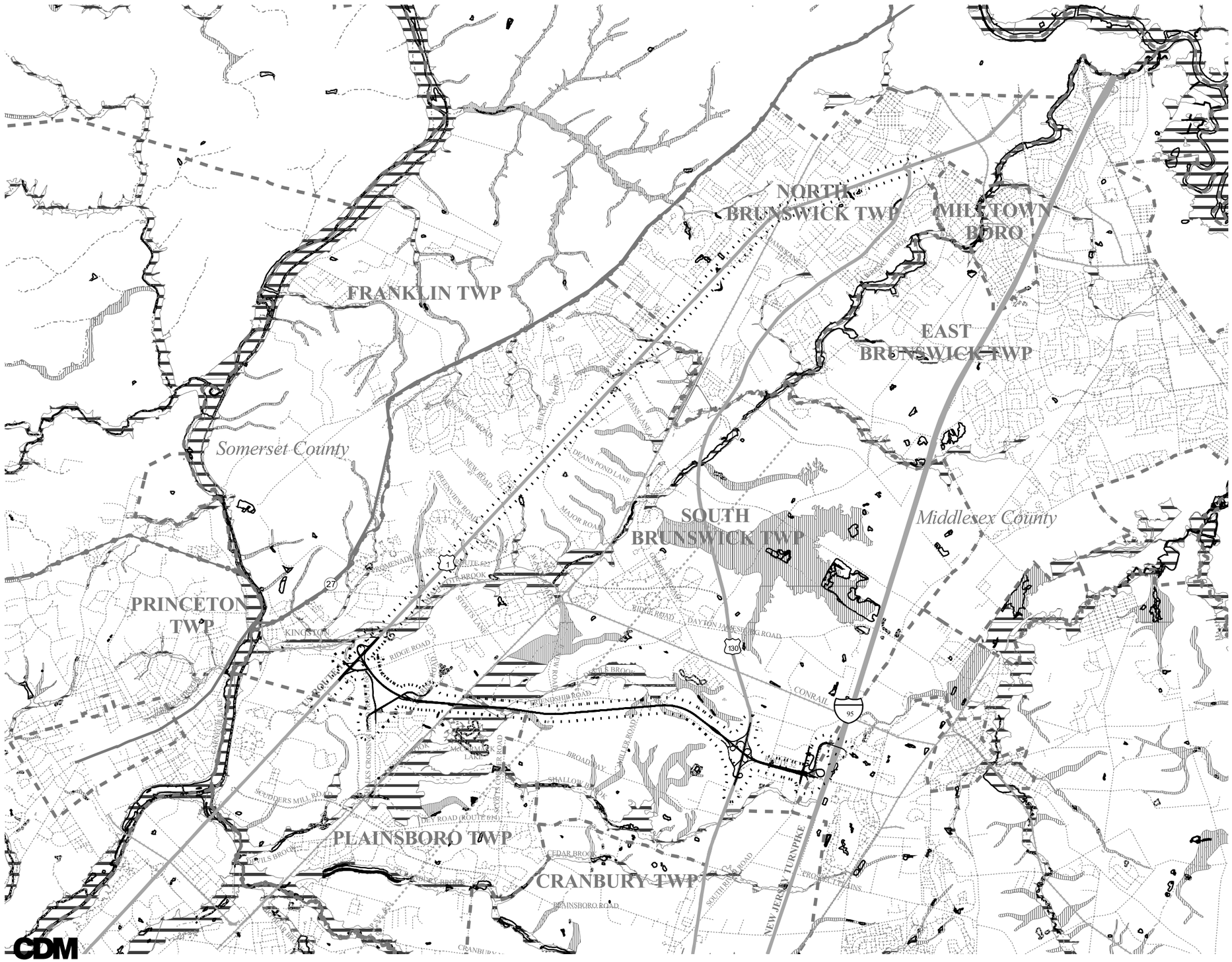

N

0.7 0 0.7 1.4 Miles

7000 0 7000 Feet

Projection: Universal Transverse Mercator
Coordinate System: State Plane
Datum: NAD83

Data Source:

Base map - Enhanced TIGER files, NJDEP GIS data.
Flood coverage - FEMA Q3 Flood Data on CD ROM.

Legend

- Proposed Route 92
- Route 92/Route 1 Impact Corridor
- P.S.E. & G
- Major Highway
- Street
- Rail Road
- Municipal Boundary
- County Boundary
- Hydrologic Feature
- Water

FEMA 100 Year Flood Zone

- Base Flood Elevation Not Determined
- Base Flood Elevation Determined

Figure 3-5 (Section 3.3.1.2)

FEMA Flood Hazard Areas

US Army Corps of Engineers
Proposed Route 92
Environmental Impact Statement

CDM

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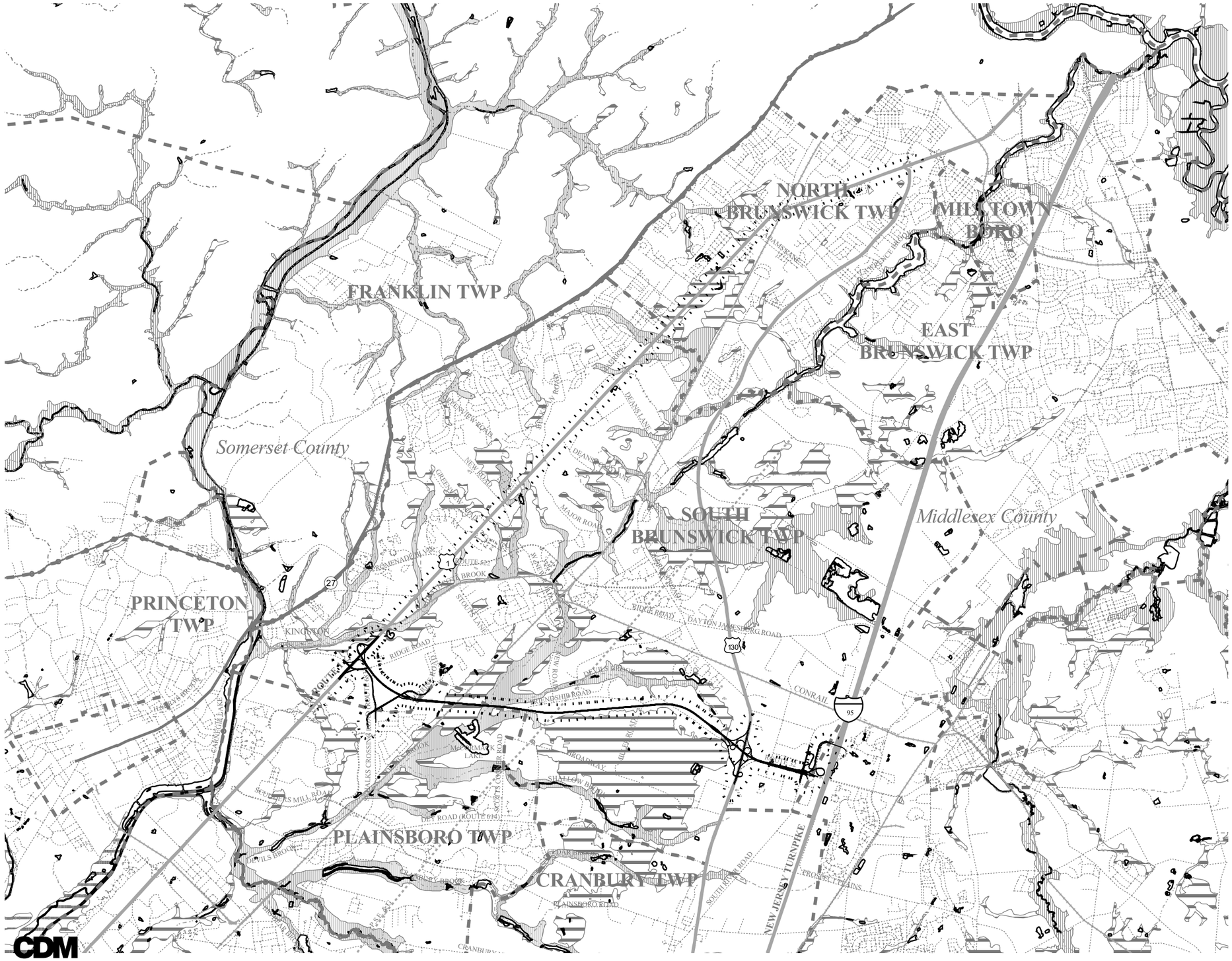

N

0.7 0 0.7 1.4 Miles

7000 0 7000 Feet

Projection: Universal Transverse Mercator
Coordinate System: State Plane
Datum: NAD83

Data Source:

Base map - Enhanced TIGER files, NJDEP GIS data.
Flood coverage - NJDEP Flood Data on CD ROM.

Legend

- Proposed Route 92
- Route 92/Route 1 Impact Corridor
- P.S.E. & G
- Major Highway
- Street
- Rail Road
- Municipal Boundary
- County Boundary
- Water
- Hydrologic Feature

NJDEP Flood Hazard Areas

- USGS Documented Flood prone Area
- Undocumented Flood prone Area

Disclaimer: This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized. Actual floodplain locations are subject to field investigation, survey and assessment.

Figure 3-6 (Section 3.3.1.2)

NJDEP Flood Hazard Areas

US Army Corps of Engineers
Proposed Route 92
Environmental Impact Statement

CDM

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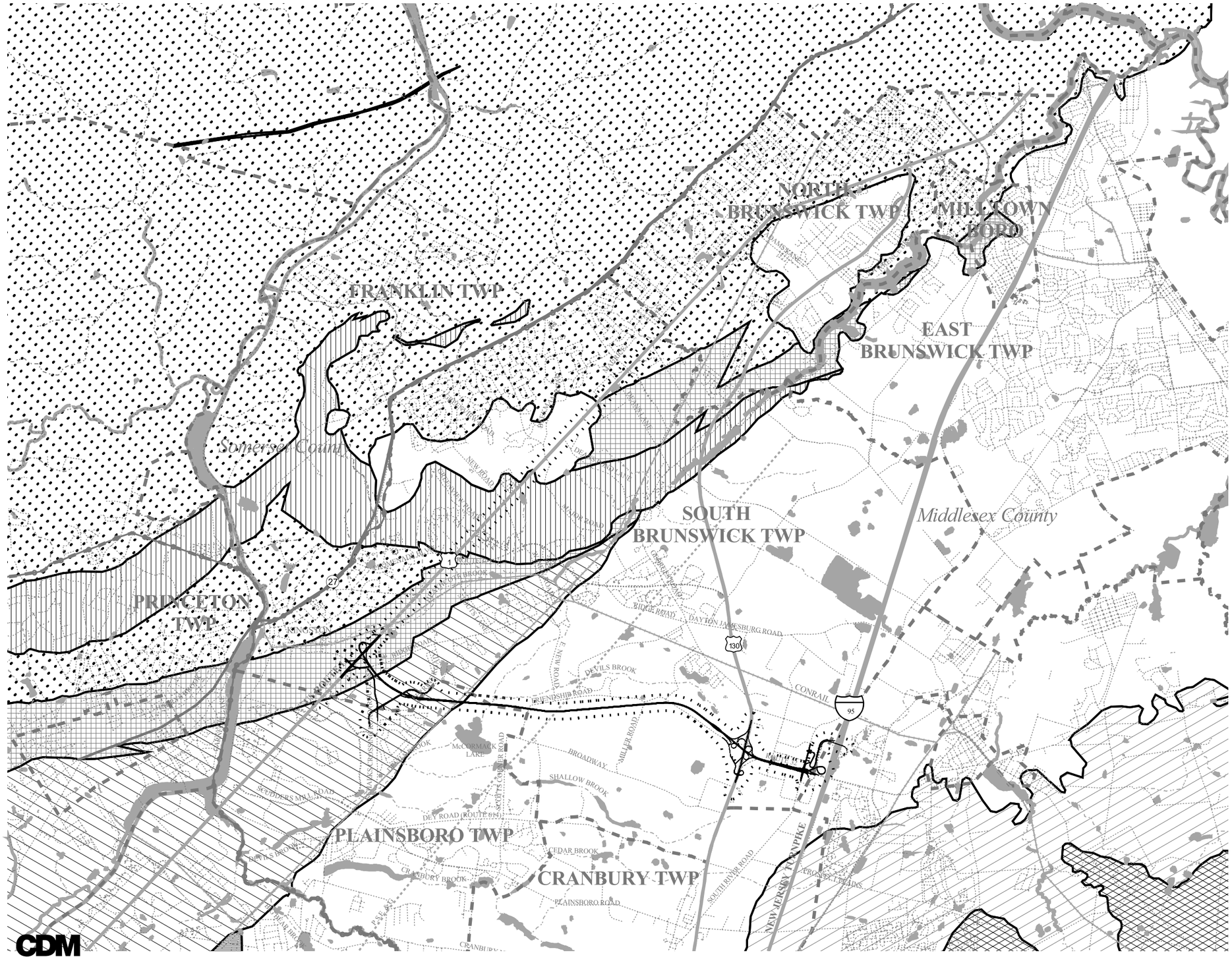

N

0.7 0 0.7 1.4 Miles

7000 0 7000 Feet

Projection: Universal Transverse Mercator
Coordinate System: State Plane
Datum: NAD83

Data Source:

Base map - Enhanced TIGER files, NJDEP GIS data.
Bedrock coverage: NJ Geologic Survey GIS data on CD ROM.

Legend

- Proposed Route 92
- Route 92/Route 1 Impact Corridor
- P.S.E. & G
- Major Highway
- Street
- Rail Road
- Municipal Boundary
- County Boundary
- Water
- Hydrologic Feature

Bedrock Aquifers

- Brunswick aquifer
- Diabase
- Englishtown aquifer system
- Igneous and metamorphic rocks
- Lockatong Formation
- Merchantville-Woodbury confining unit
- Mt. Laurel-Wenonah aquifer
- Potomac-Raritan-Magothy aquifer system
- Stockton Formation

Figure 3-7 (Section 3.3.2.1)

Bedrock Aquifers

US Army Corps of Engineers
Proposed Route 92
Environmental Impact Statement

CDM

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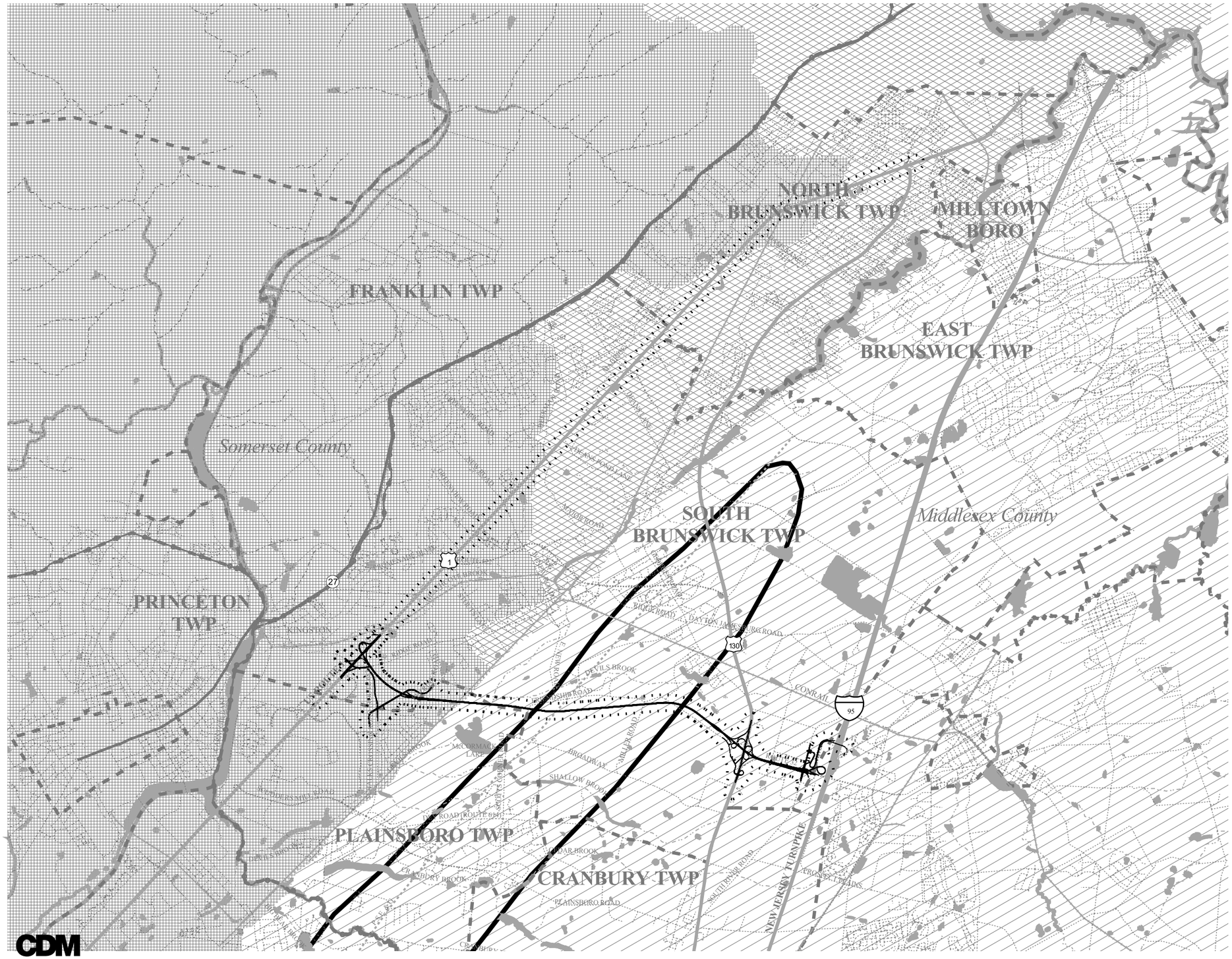

0.7 0 0.7 1.4 Miles

7000 0 7000 Feet

Projection: Universal Transverse Mercator
Coordinate System: State Plane
Datum: NAD83

Data Source:

Base map - Enhanced TIGER files, NJDEP GIS data.
Aquifer coverage: NJ Geologic Survey Data on CD ROM.

Legend

- Proposed Route 92
- Route 92/Route 1 Impact Corridor
- P.S.E. & G
- Major Highway
- Street
- Rail Road
- Municipal Boundary
- County Boundary
- Water
- Hydrologic Feature
- Surficial sediment of the Coastal Plain > 50 ft thick

Sole Source Aquifers

- Coastal Plain
- Northwest New Jersey
- Not a Sole Source Aquifer

Figure 3-8 (Section 3.3.2.2)

Surficial and Sole Source Aquifers

US Army Corps of Engineers
Proposed Route 92
Environmental Impact Statement

CDM

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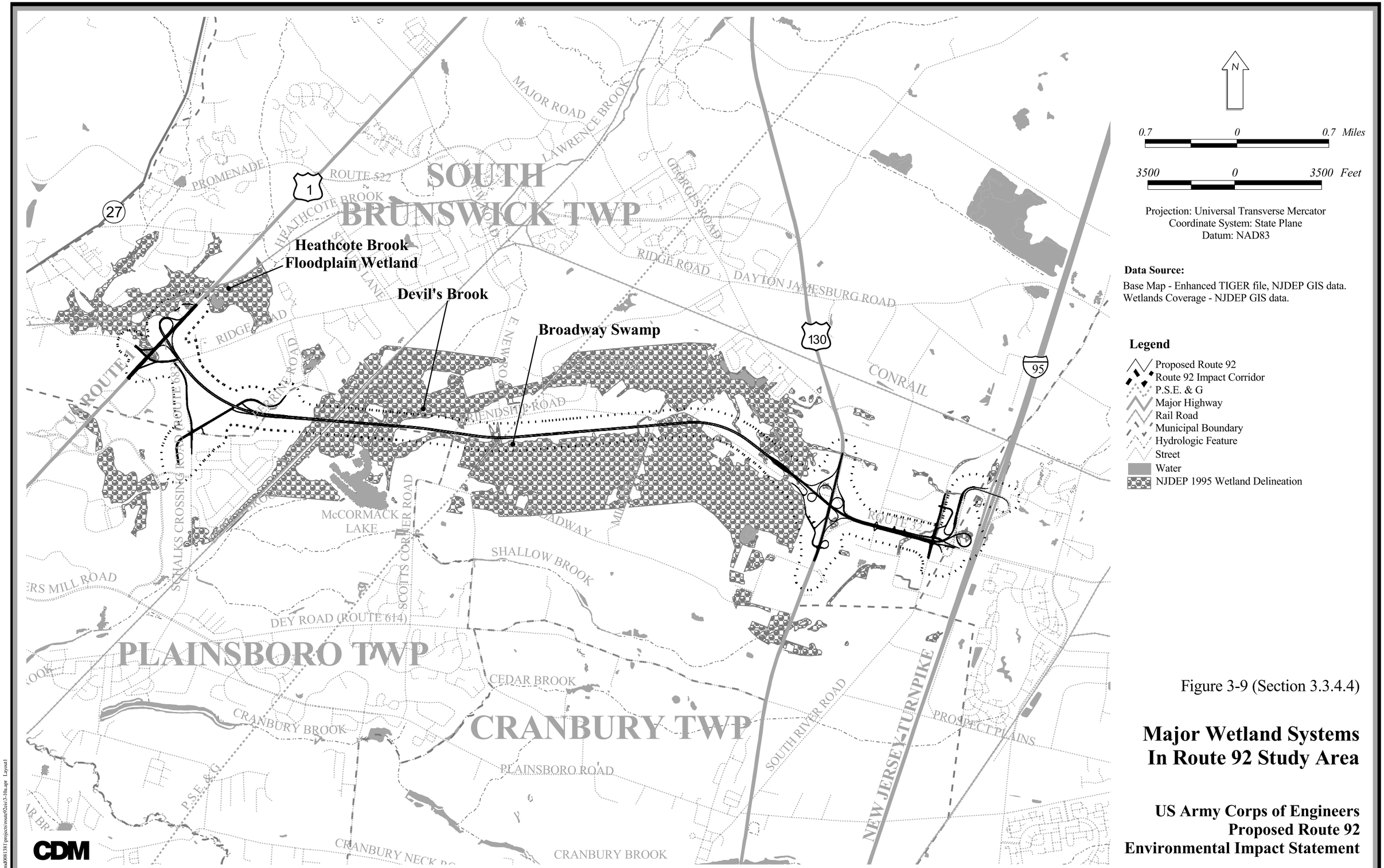

Figure 3-9 (Section 3.3.4.4)

Major Wetland Systems In Route 92 Study Area

US Army Corps of Engineers
Proposed Route 92
Environmental Impact Statement

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CDM

N

0.7 0 0.7 1.4 Miles

5000 0 5000 Feet

Projection: Universal Transverse Mercator
Coordinate System: State Plane
Datum: NAD83

Notes:

Base Map - Enhanced TIGER files, NJDEP GIS data.
Wetland Coverage - NJDEP GIS data.

Legend

- P.S.E. & G
- Major Highway
- Street
- Rail Road
- Municipal Boundary
- County Boundary
- Water
- Hydrologic Feature
- NJDEP 1995 Wetland Delineation

Figure 3-10 (Section 3.3.4.4)

Major Wetland Systems In Route 1 Study Area

US Army Corps of Engineers
Proposed Route 92
Environmental Impact Statement

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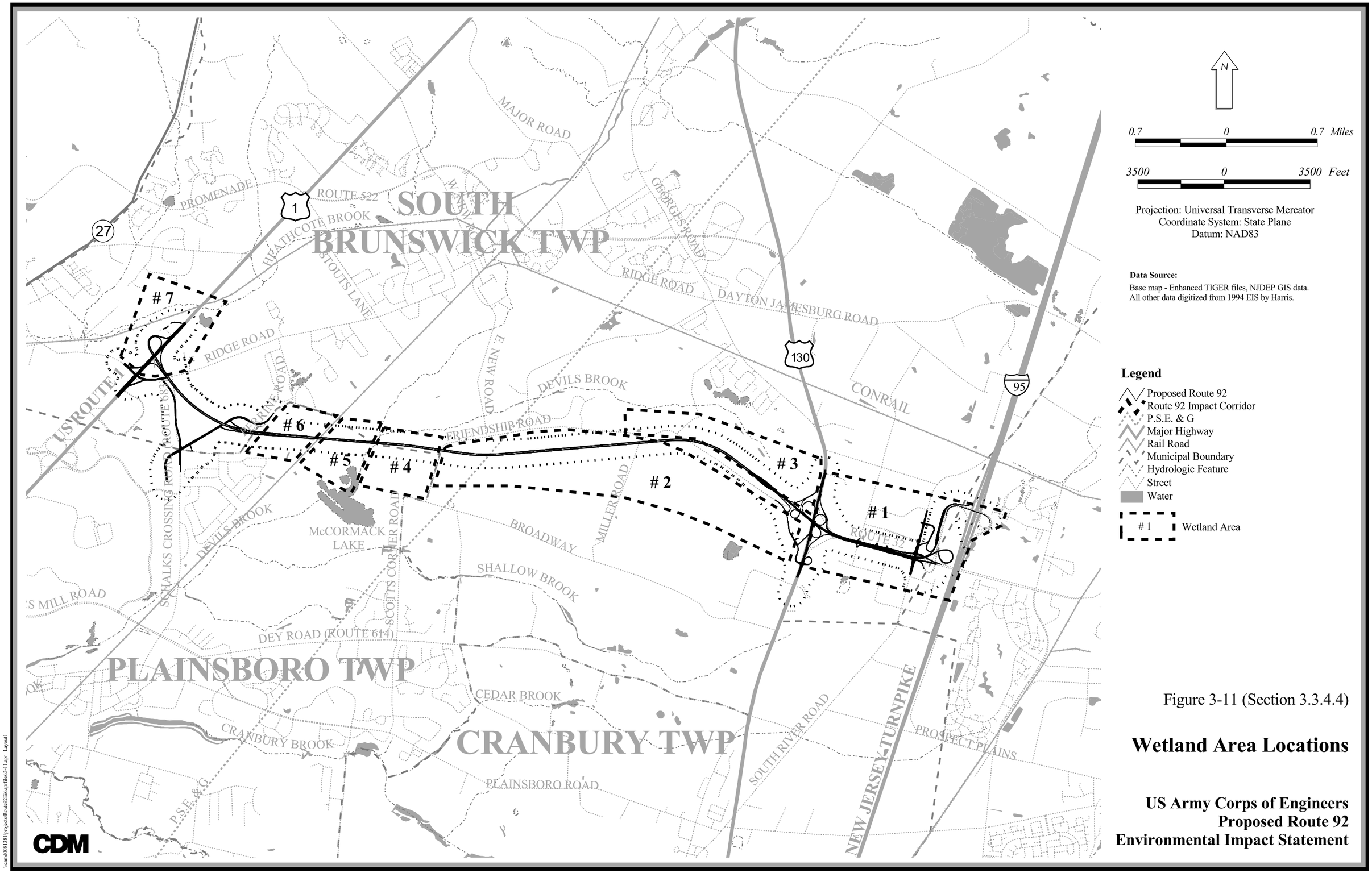

Figure 3-11 (Section 3.3.4.4)

Wetland Area Locations

US Army Corps of Engineers
Proposed Route 92
Environmental Impact Statement

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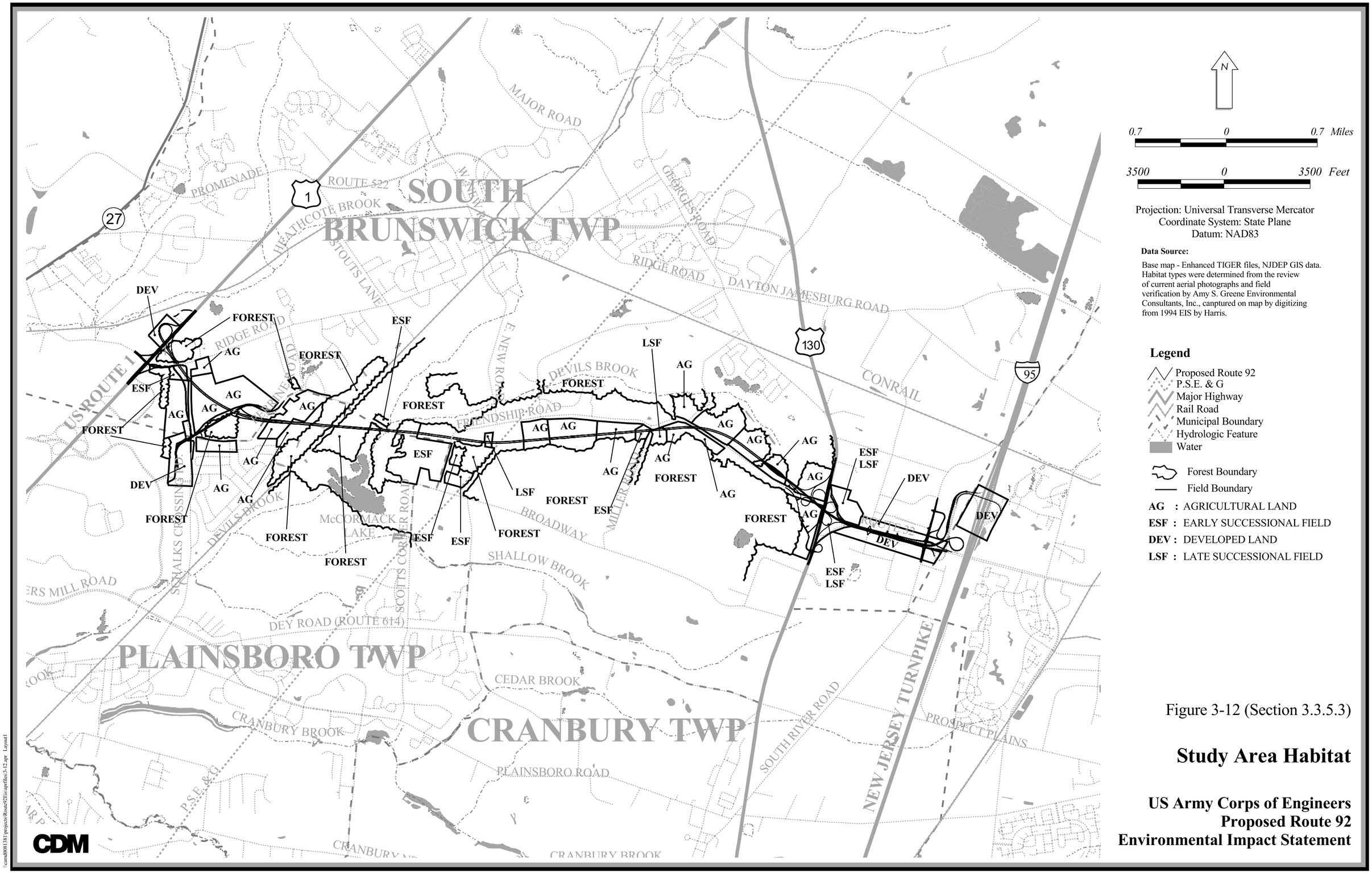

Figure 3-12 (Section 3.3.5.3)

Study Area Habitat

US Army Corps of Engineers
Proposed Route 92
Environmental Impact Statement

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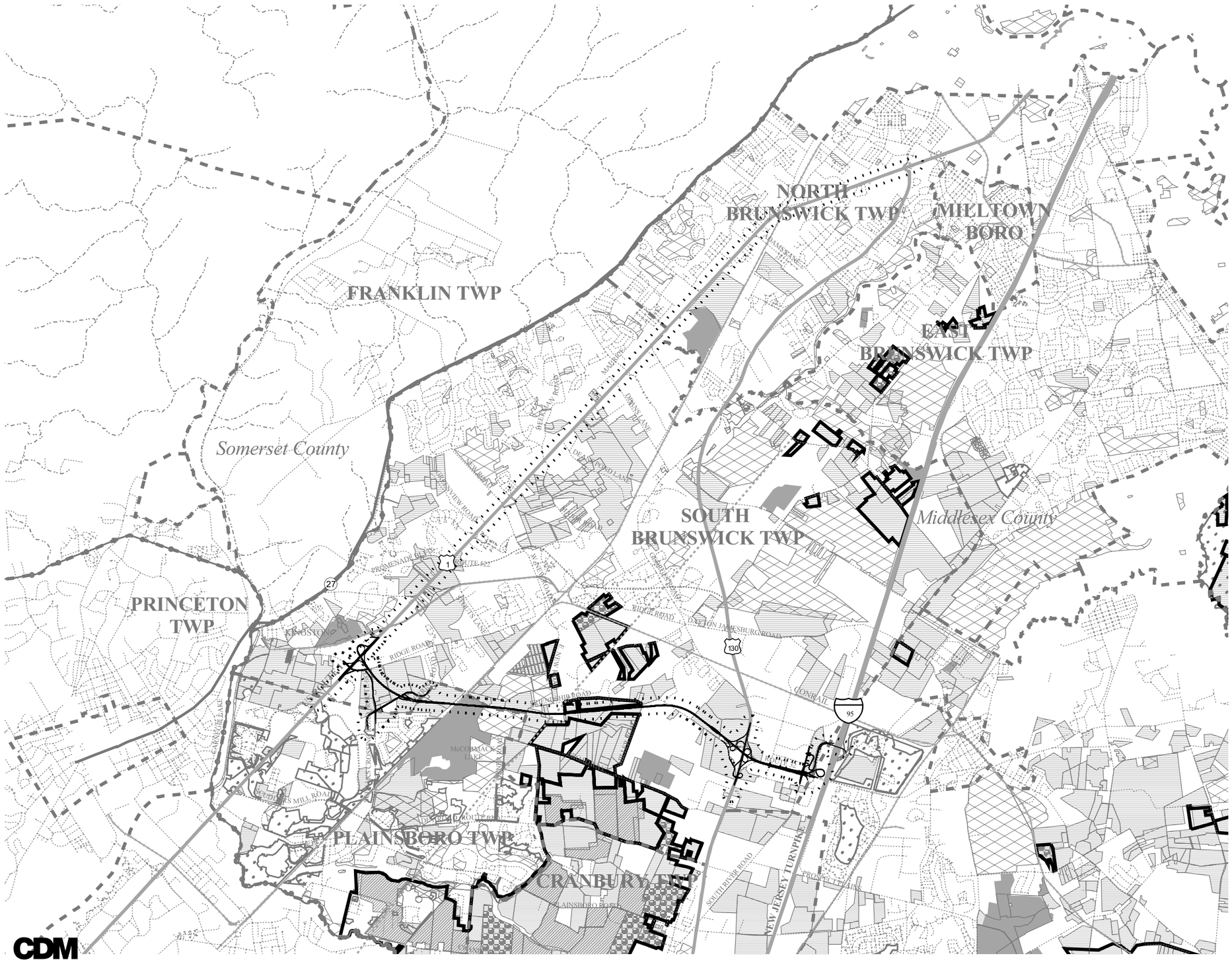

N

0.7 0 0.7 1.4 Miles

7000 0 7000 Feet

Projection: Universal Transverse Mercator
Coordinate System: State Plane
Datum: NAD83

Data Soruce:

Base map - Enhanced TIGER files, NJDEP GIS data.
All other data related to the farmland development program was provided by Middlesex County Planning Board in January 2002.

Legend

- Proposed Route 92
- Route 92/Route 1 Impact Corridor
- P.S.E. & G
- Major Highway
- Street
- Rail Road
- Municipal Boundary
- County Boundary

Middlesex County Farmland Preservation Program

- Agricultural Development Area
- Preserved Farmland since 1999
- Municipal/State/County Park
- Private Open Space
- Farmland Assessment Property
- County Trust Property
- Agricultural Easement Purchase Application

Figure 3-13 (Section 3.4)

Middlesex County Farmland Preservation Program

US Army Corps of Engineers
Proposed Route 92
Environmental Impact Statement

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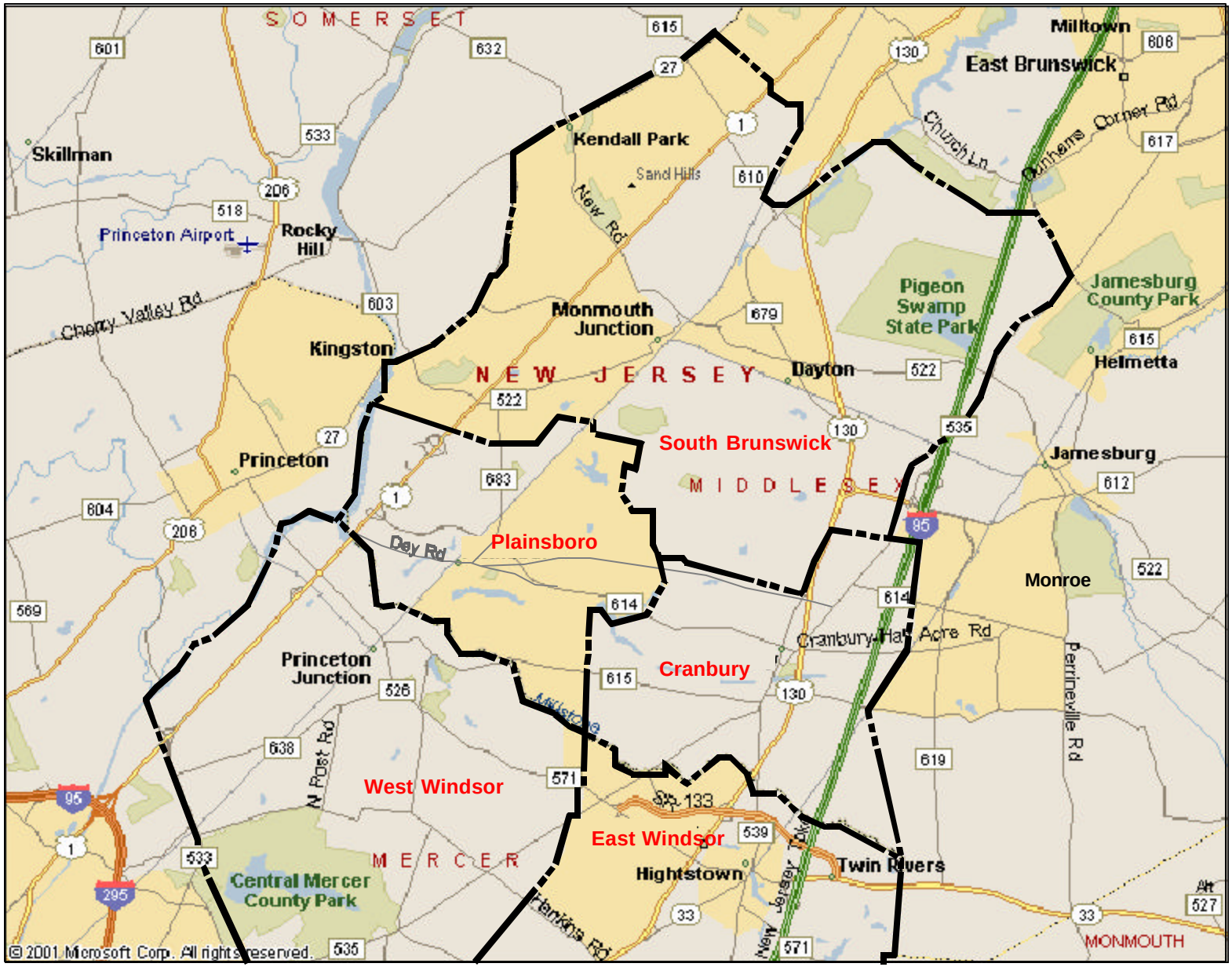


Legend:

Town Boundary

0 mi 2 mi 4 mi
Approximate Scale

Figure 3-14
Southwestern Middlesex County/Northeastern Mercer County

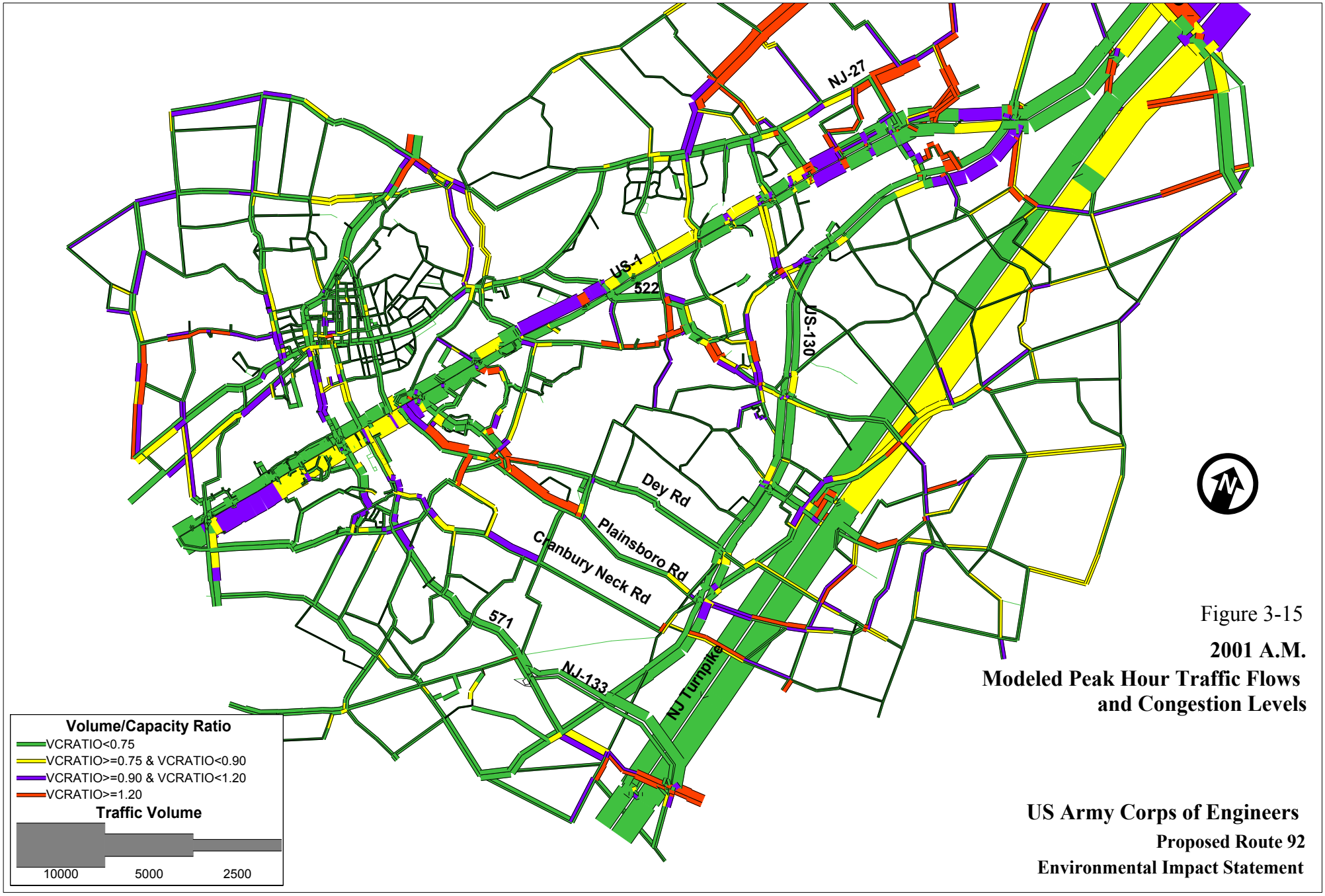


Figure 3-15

2001 A.M.
Modeled Peak Hour Traffic Flows and Congestion Levels

US Army Corps of Engineers
Proposed Route 92
Environmental Impact Statement

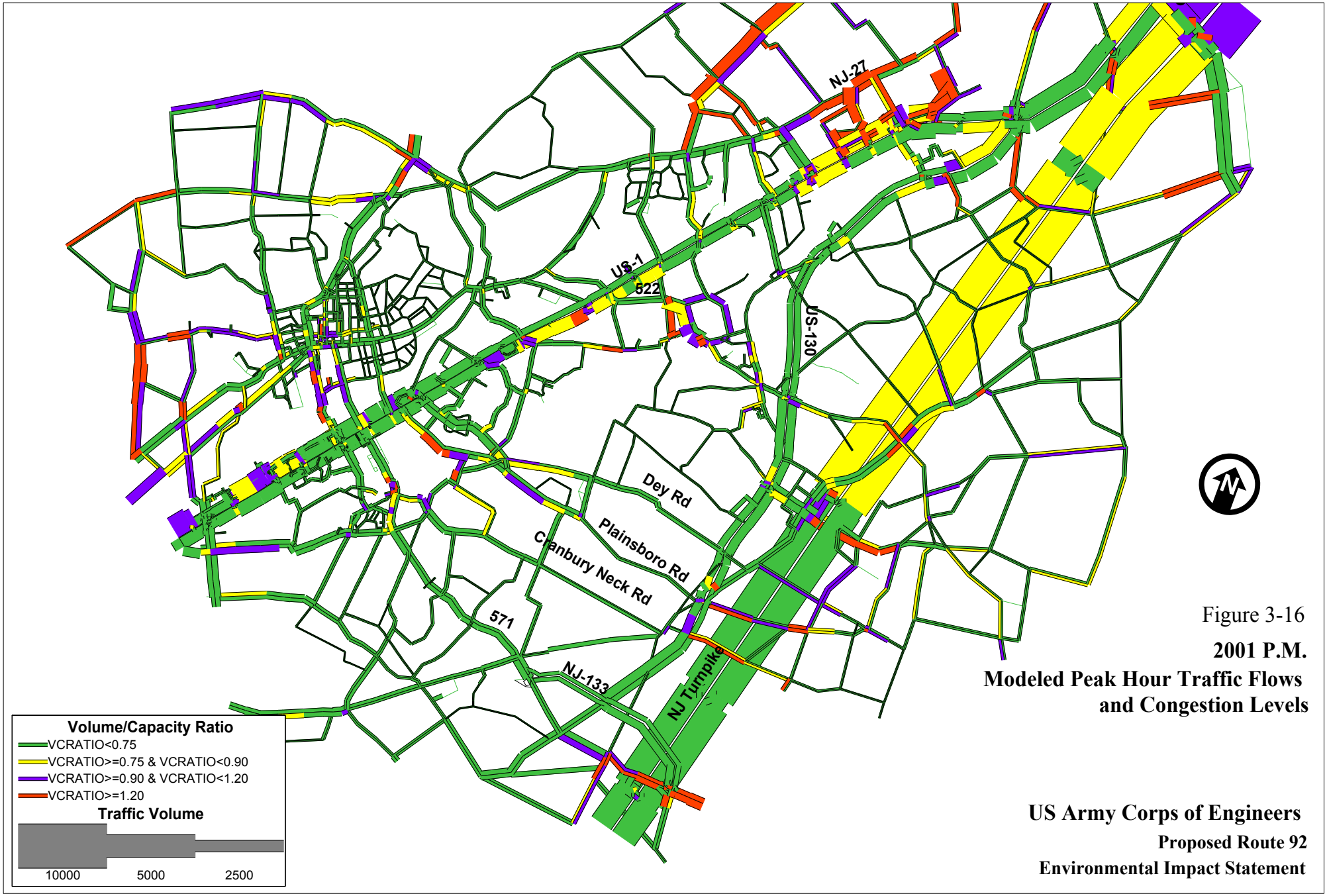


Figure 3-16

2001 P.M.
Modeled Peak Hour Traffic Flows and Congestion Levels

US Army Corps of Engineers
Proposed Route 92
Environmental Impact Statement

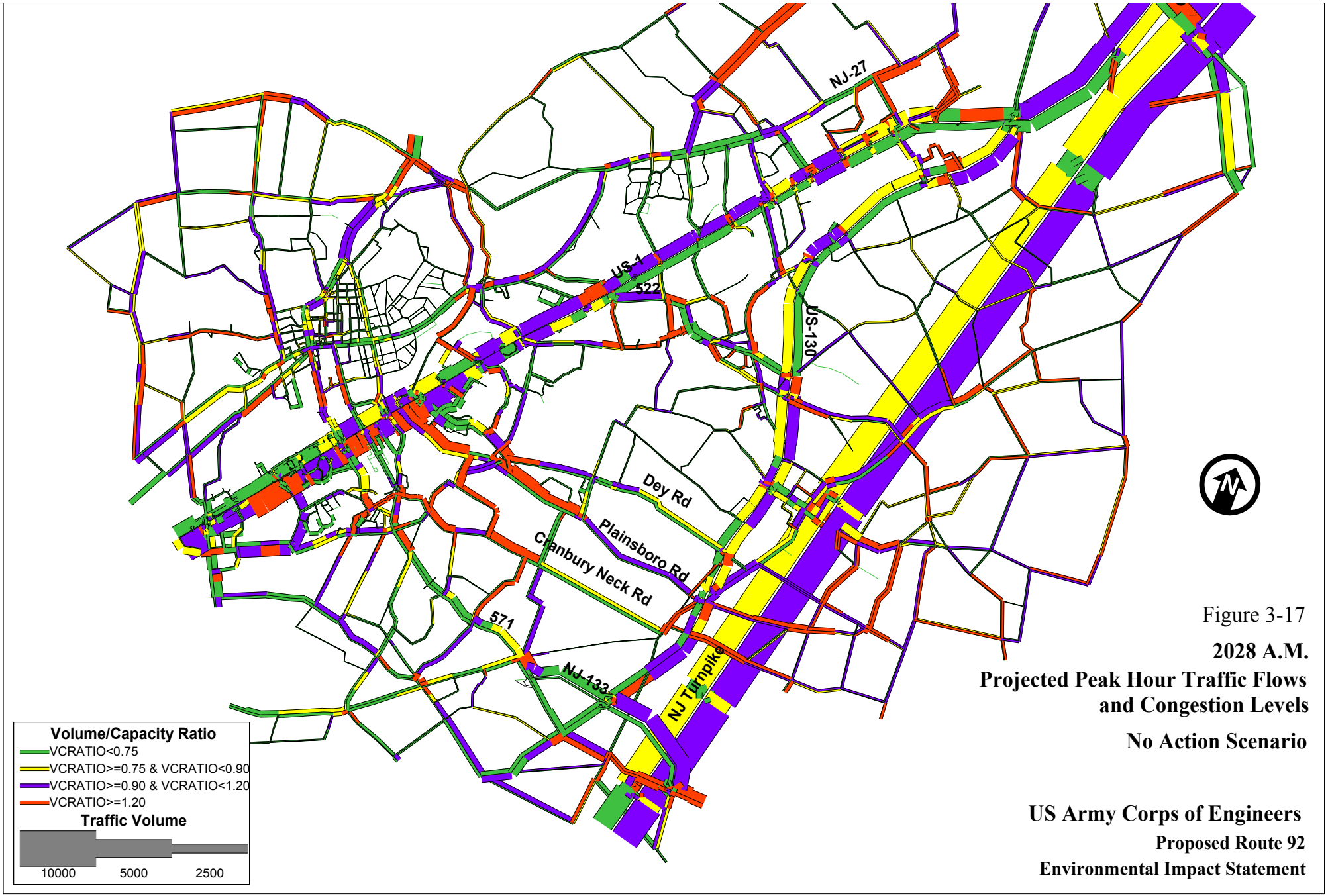


Figure 3-17

2028 A.M.
Projected Peak Hour Traffic Flows and Congestion Levels

No Action Scenario

US Army Corps of Engineers
Proposed Route 92
Environmental Impact Statement

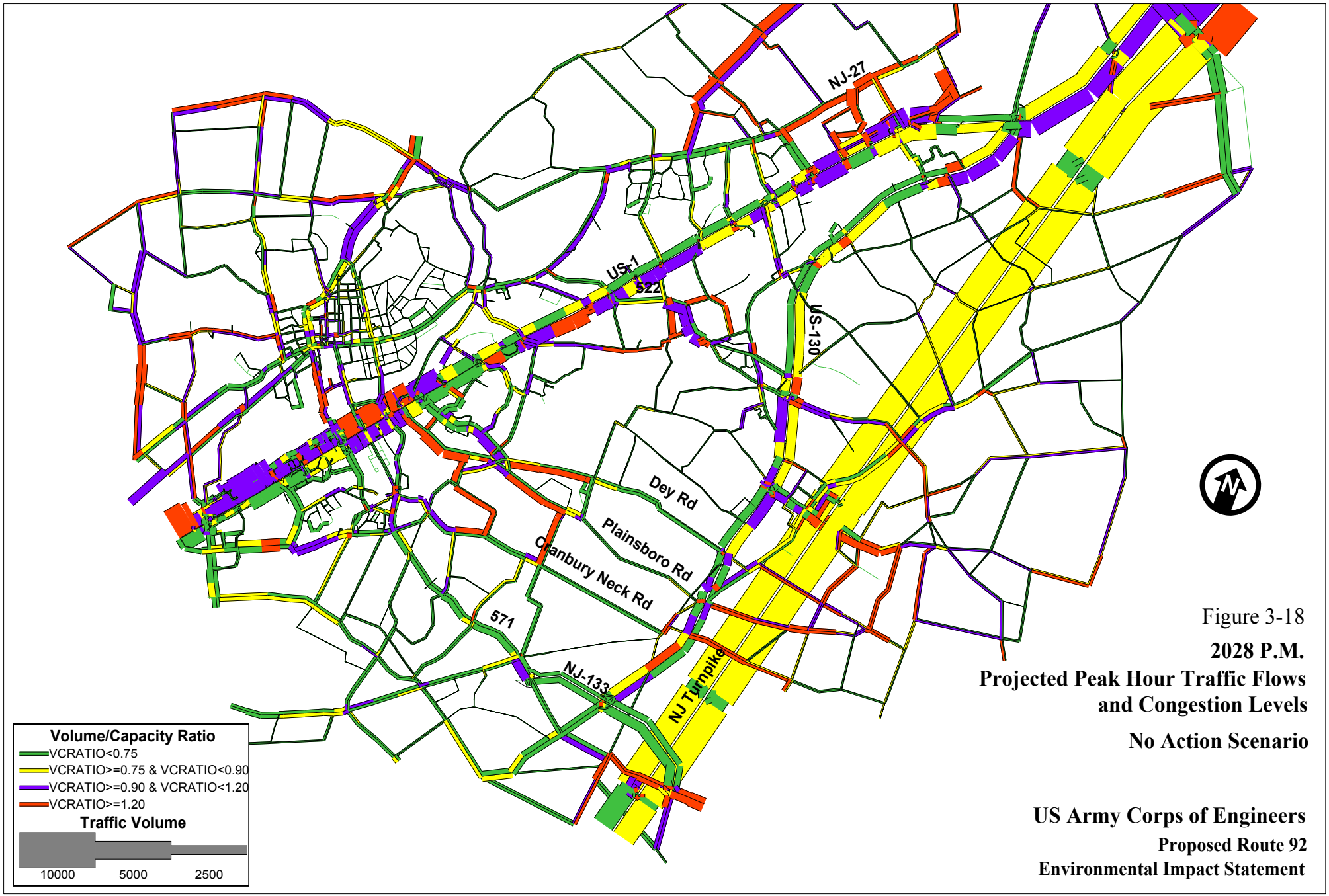


Figure 3-18

2028 P.M.

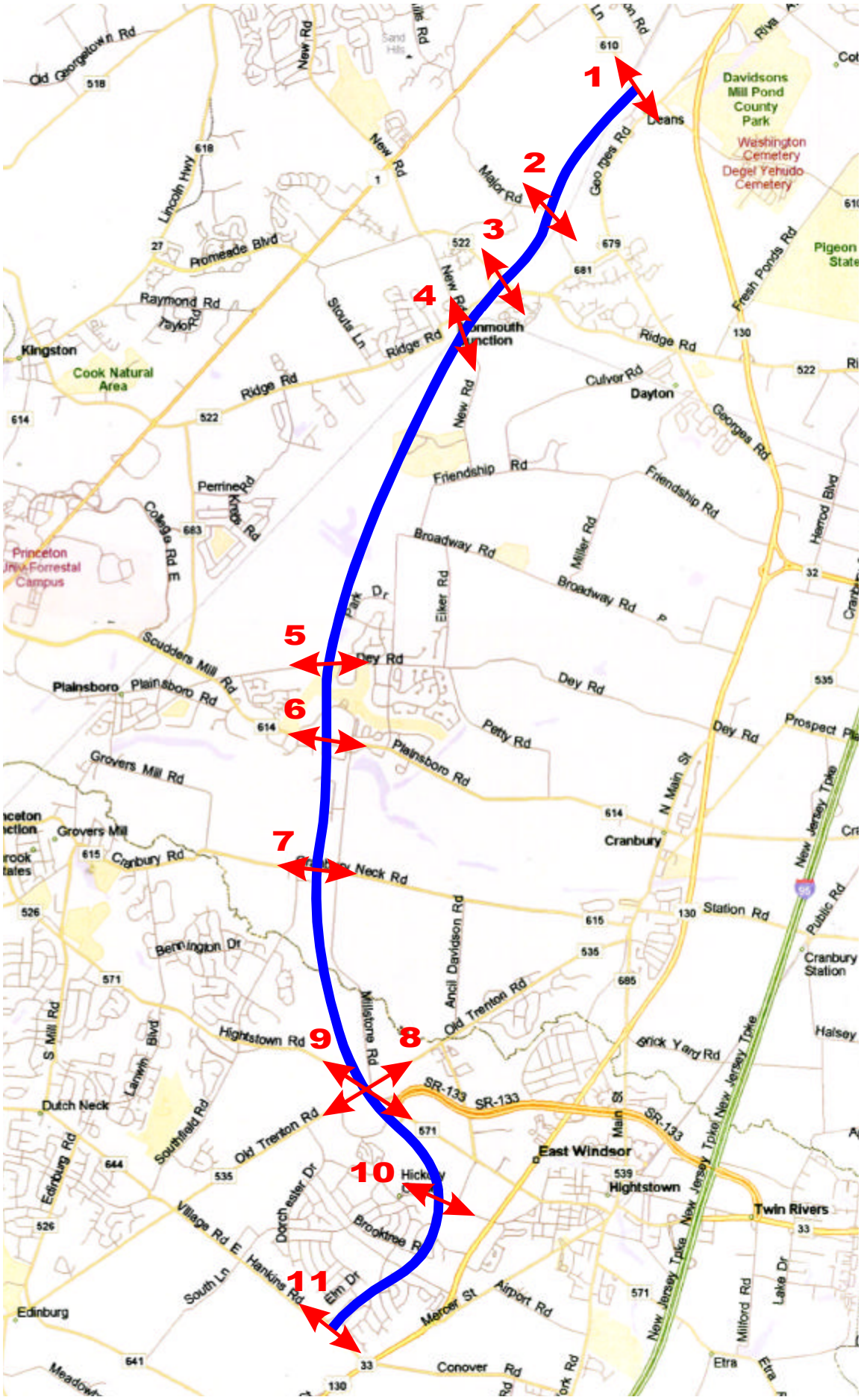
Projected Peak Hour Traffic Flows and Congestion Levels

No Action Scenario

US Army Corps of Engineers

Proposed Route 92

Environmental Impact Statement



N
W
E
S

1	CR-610 (Deans Lane)
2	Major Road
3	CR-522 (Ridge Road)
4	New Road
5	Dey Road
6	Plainsboro Road
7	Cranbury Neck Road
8	CR-535
9	CR-571
10	Dutch Neck Road
11	Hankins Road

Figure 3-19
Screenline Intercepting East - West Roads

N

0.1 0 0.1 0.2 Miles

1000 0 1000 Feet

Projection: Universal Transverse Mercator
Coordinate System: State Plane
Datum: NAD27

Data Source:

CAD files provided by DMJM - Harris.

Legend

▲ Noise Monitoring Locations

● Noise Modeling Locations

Figure 3-20, Sheet 1
(Section 3.8.2.1, Sheets 1 - 3)

Noise Monitoring and Modeling Locations

US Army Corps of Engineers
Proposed Route 92
Environmental Impact Statement

CDM

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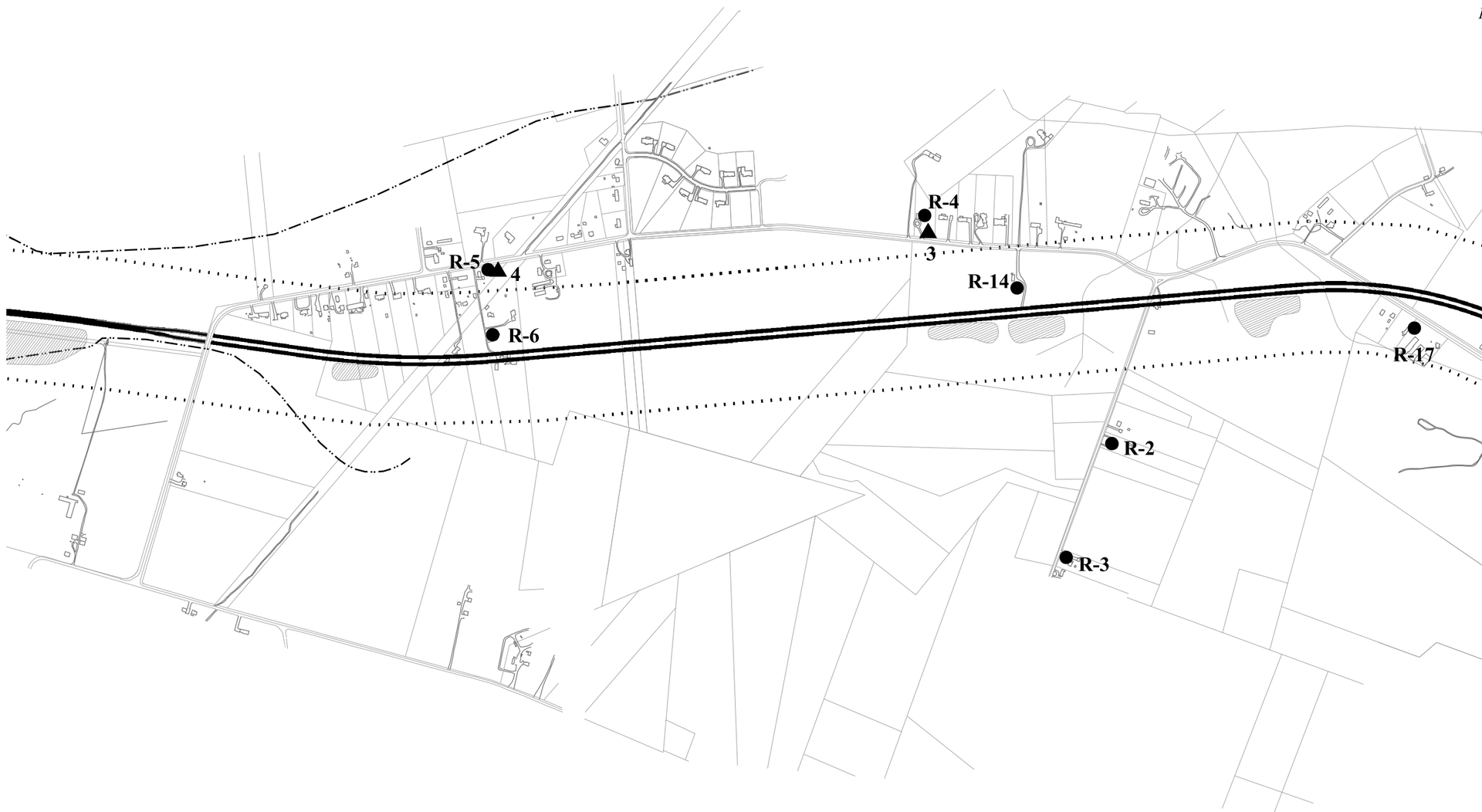

N

0.1 0 0.1 0.2 Miles

1000 0 1000 Feet

Projection: Universal Transverse Mercator
Coordinate System: State Plane
Datum: NAD27

Data Source:

CAD files provided by DMJM Harris.

Legend

▲ Noise Monitoring Locations

● Noise Modeling Locations

Figure 3-20, Sheet 2
(Section 3.8.2.1, Sheets 1 - 3)

Noise Monitoring and Modeling Locations

US Army Corps of Engineers
Proposed Route 92
Environmental Impact Statement

CDM

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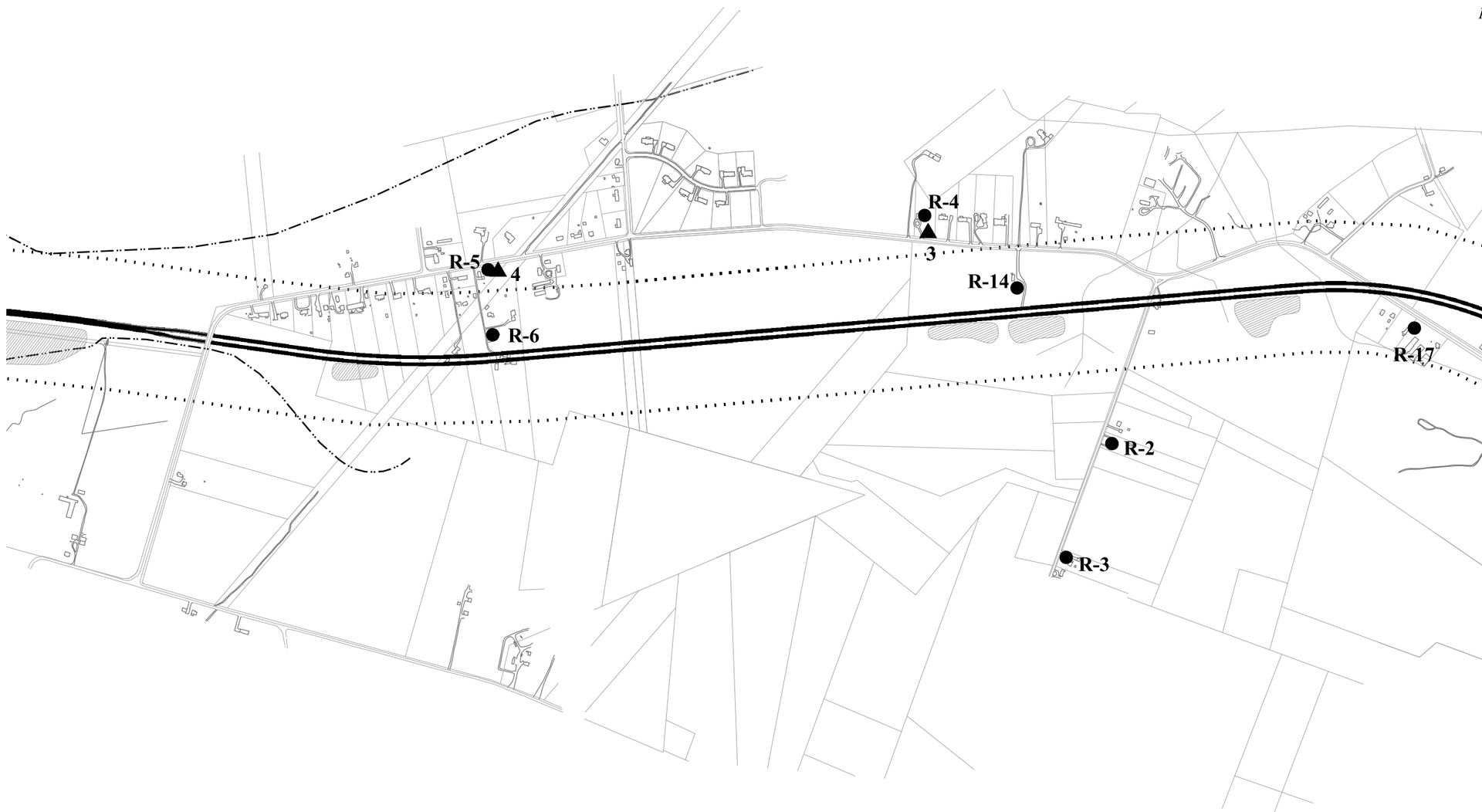

N

0.1 0 0.1 0.2 Miles

1000 0 1000 Feet

Projection: Universal Transverse Mercator
Coordinate System: State Plane
Datum: NAD27

Data Source:

CAD files provided by DMJM Harris.

Legend

▲ Noise Monitoring Locations

● Noise Modeling Locations

Figure 3-20, Sheet 2
(Section 3.8.2.1, Sheets 1 - 3)

Noise Monitoring and Modeling Locations

US Army Corps of Engineers
Proposed Route 92
Environmental Impact Statement

CDM

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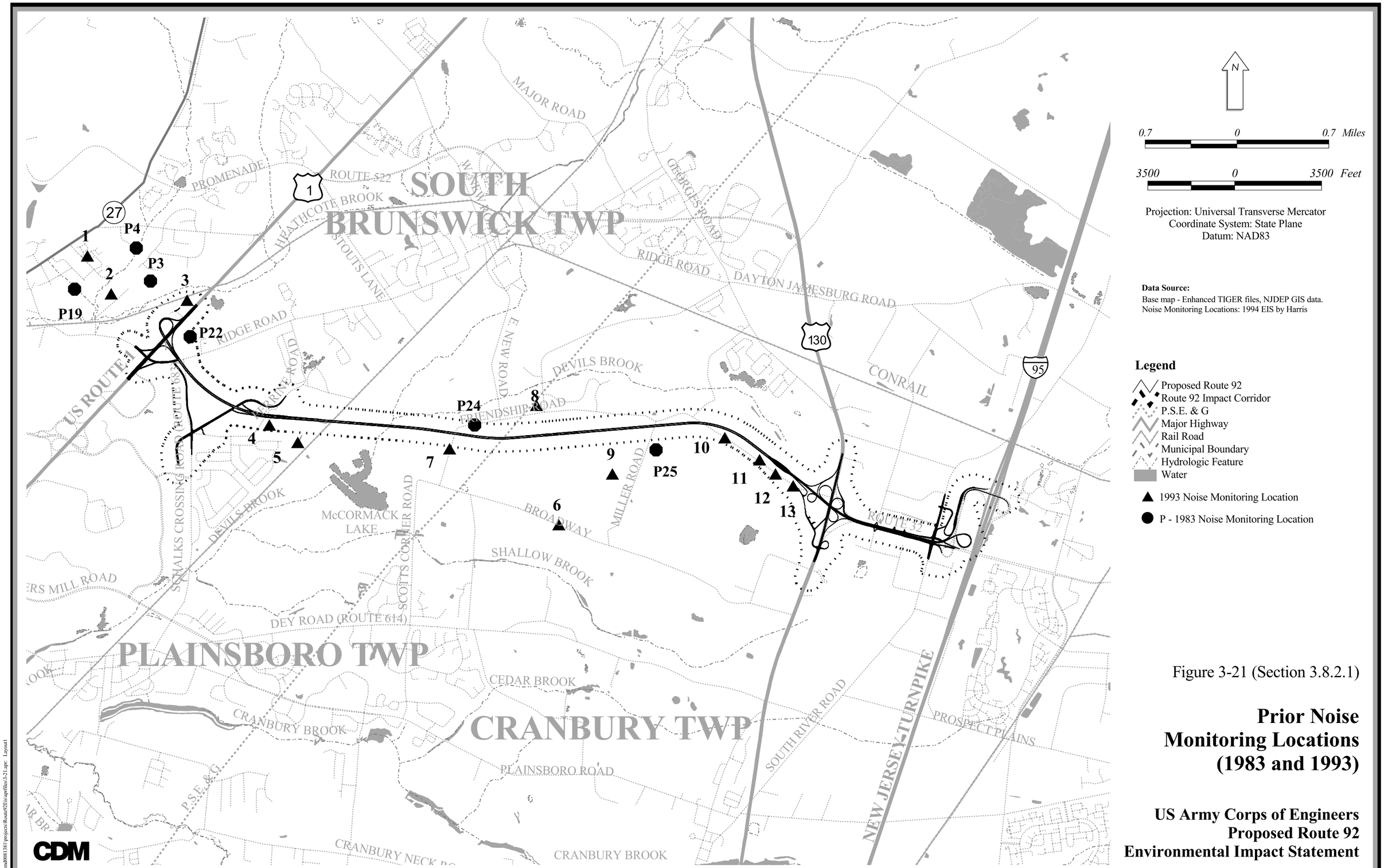

Figure 3-21 (Section 3.8.2.1)

Prior Noise Monitoring Locations (1983 and 1993)

US Army Corps of Engineers
Proposed Route 92
Environmental Impact Statement

\\cmd008181\projects\Route92Eis\aprfiles\3-21.apr: Layout1

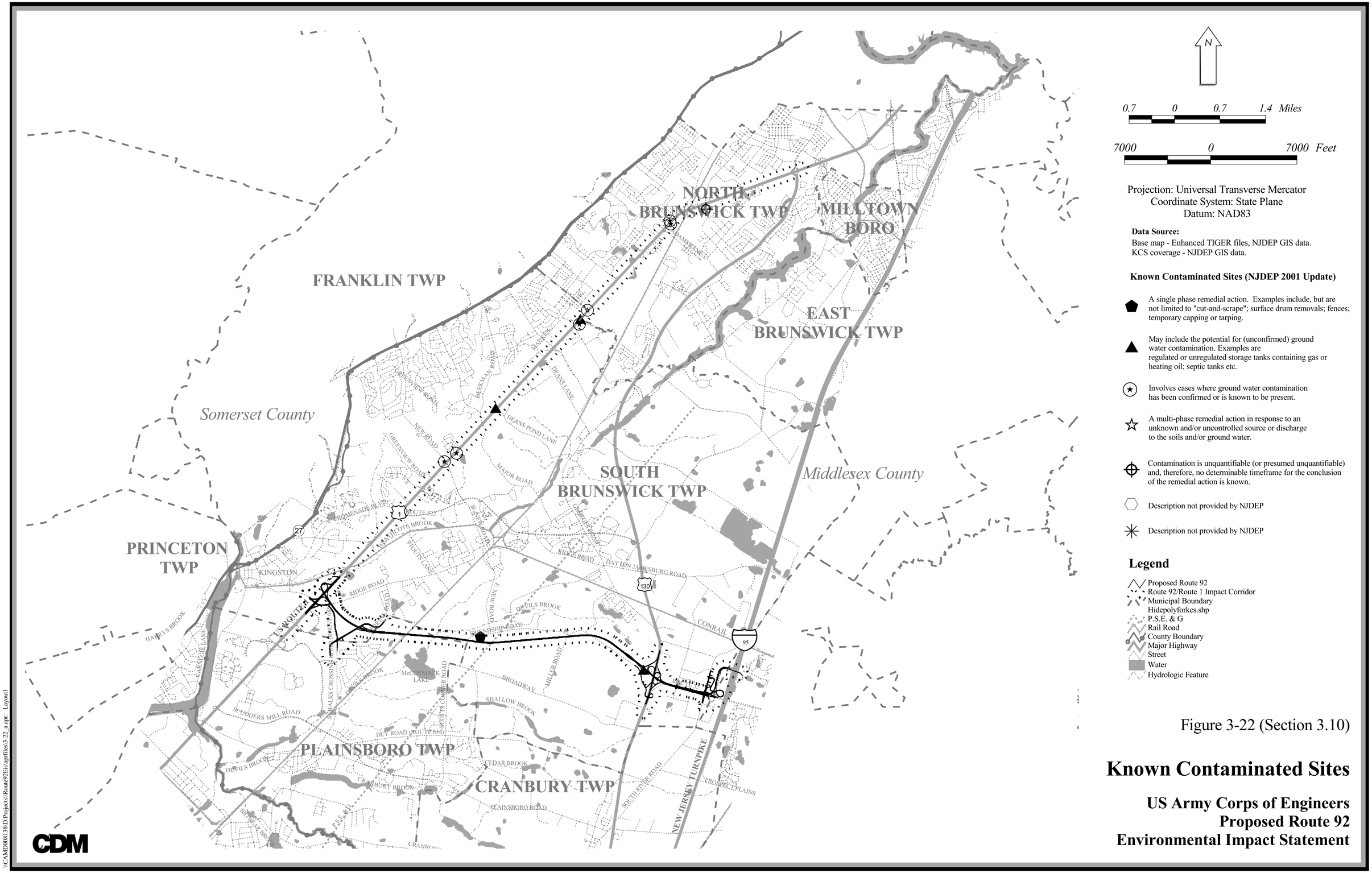

Figure 3-22 (Section 3.10)

Known Contaminated Sites

US Army Corps of Engineers
Proposed Route 92
Environmental Impact Statement

CDM

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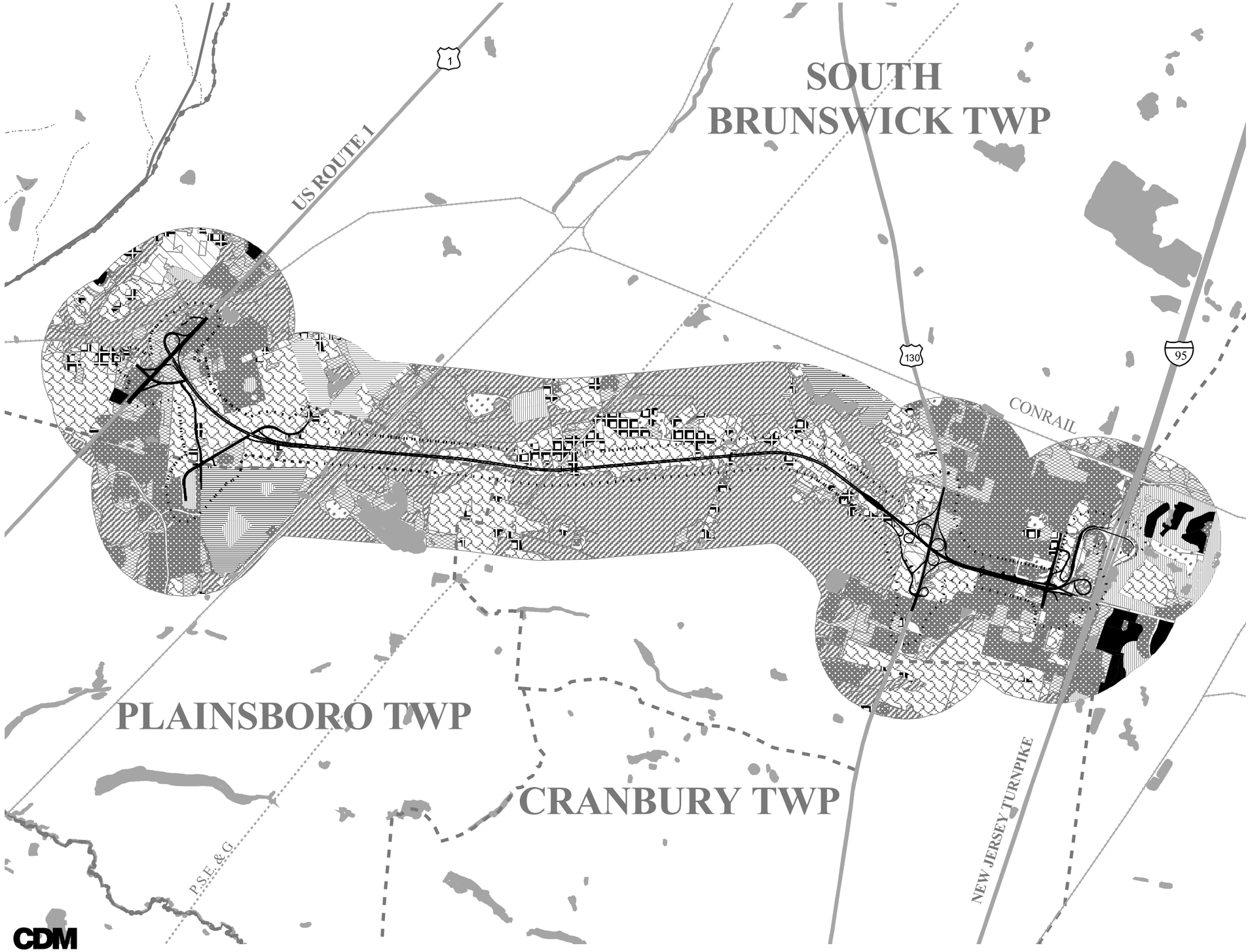

N

0.5 0 0.5 Miles

3500 0 3500 Feet

Projection: Universal Transverse Mercator
Coordinate System: State Plane
Datum: NAD83

Data Source:

Base map - Enhanced TIGER files, NJDEP GIS data.
Land Use coverage: NJDEP GIS data

Legend

- Proposed Route 92
- Route 92 Impact Corridor
- P.S.E. & G
- Major Highway
- Rail Road
- Municipal Boundary
- County Boundary
- Water

NJDEP 1995 LAND USE/LAND COVER

- AGRICULTURE
- BARREN LAND
- COMMERCIAL/INDUSTRIAL/OTHER URBAN
- FOREST
- RECREATIONAL LAND
- RESIDENTIAL, HIGH DENSITY, MULTIPLE DWELLING
- RESIDENTIAL, RURAL, SINGLE UNIT
- RESIDENTIAL, SINGLE UNIT, LOW DENSITY
- RESIDENTIAL, SINGLE UNIT, MEDIUM DENSITY
- URBAN
- WETLANDS

Figure 3-23a (Section 3.13)

Land Use
Route 92 Impact Corridor

US Army Corps of Engineers
Proposed Route 92
Environmental Impact Statement

CDM

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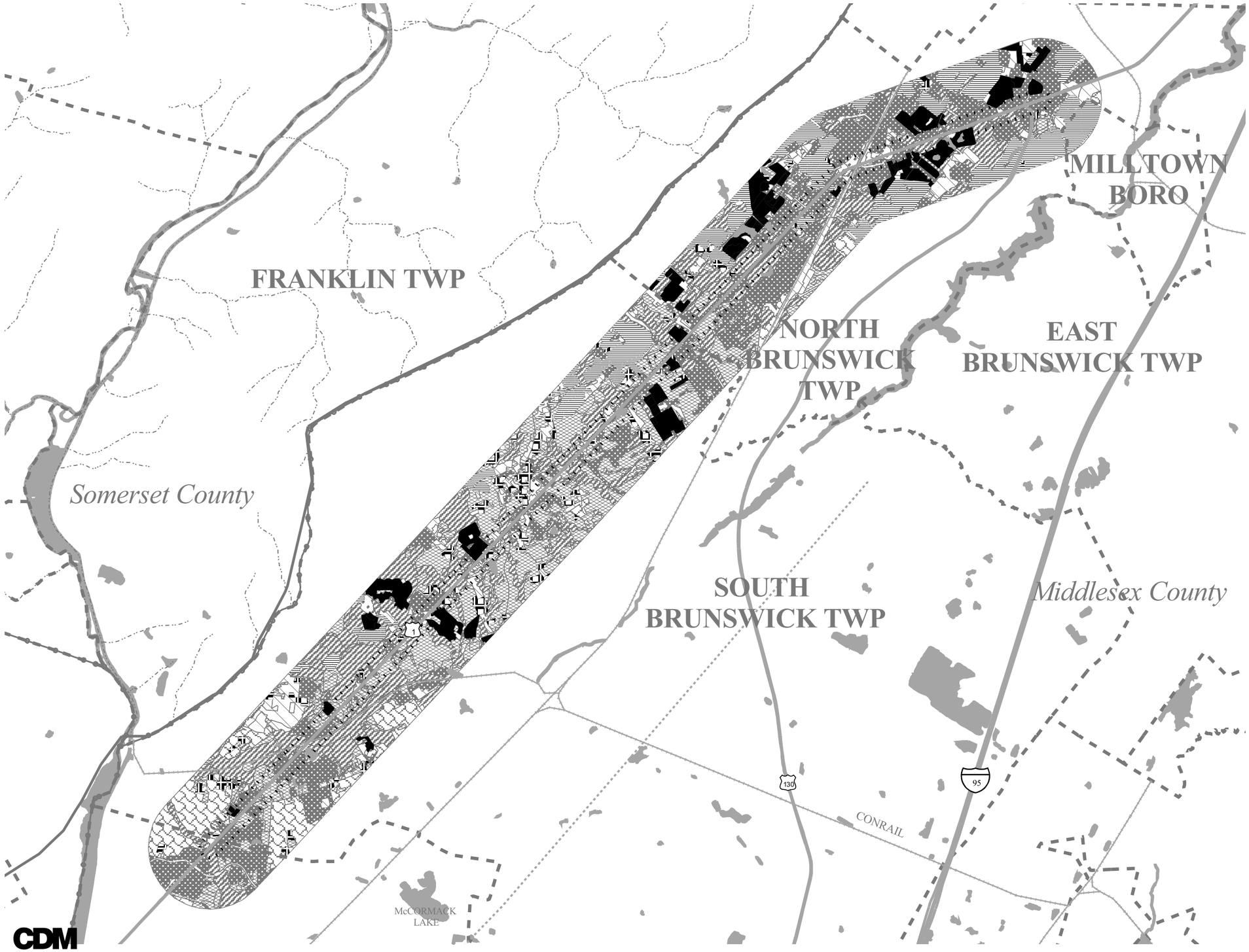

N

0.5 0 0.5 1 Miles

5000 0 5000 Feet

Projection: Universal Transverse Mercator
Coordinate System: State Plane
Datum: NAD83

Data Source:

Base map - Enhanced TIGER files, NJDEP GIS data.
Land Use coverage: NJDEP GIS data

Legend

- P.S.E. & G
- Major Highway
- Rail Road
- Municipal Boundary
- County Boundary
- Water

NJDEP 1995 LAND USE/LAND COVER

- AGRICULTURE
- BARREN LAND
- COMMERCIAL/INDUSTRIAL/OTHER URBAN
- FOREST
- RECREATIONAL LAND
- RESIDENTIAL, HIGH DENSITY, MULTIPLE DWELLING
- RESIDENTIAL, RURAL, SINGLE UNIT
- RESIDENTIAL, SINGLE UNIT, LOW DENSITY
- RESIDENTIAL, SINGLE UNIT, MEDIUM DENSITY
- URBAN
- WETLANDS

Figure 3-23b (Section 3.13)

Land Use
(Route 1 Impact Corridor)

US Army Corps of Engineers
Proposed Route 92
Environmental Impact Statement

CDM

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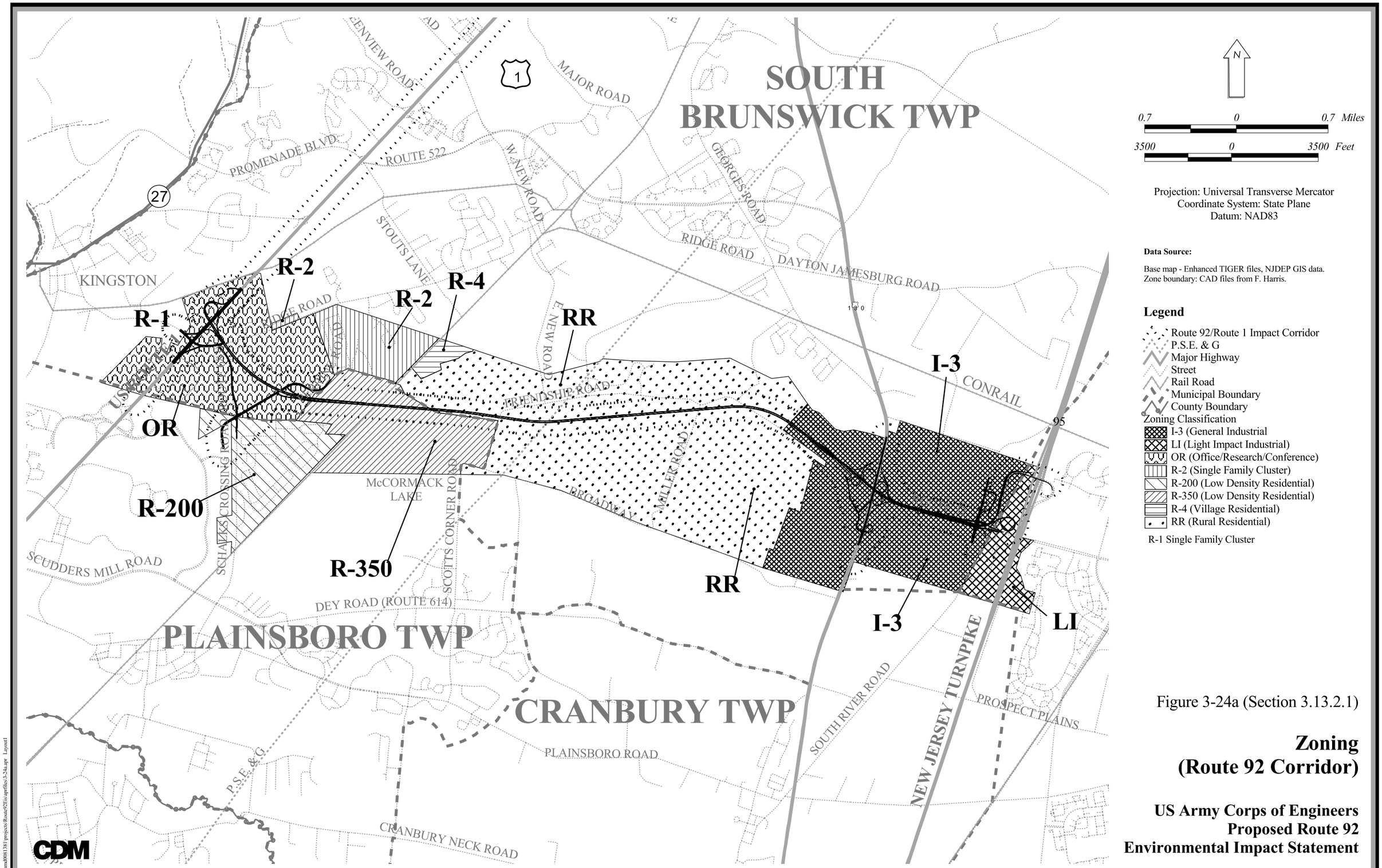

Figure 3-24a (Section 3.13.2.1)

Zoning (Route 92 Corridor)

US Army Corps of Engineers
Proposed Route 92
Environmental Impact Statement

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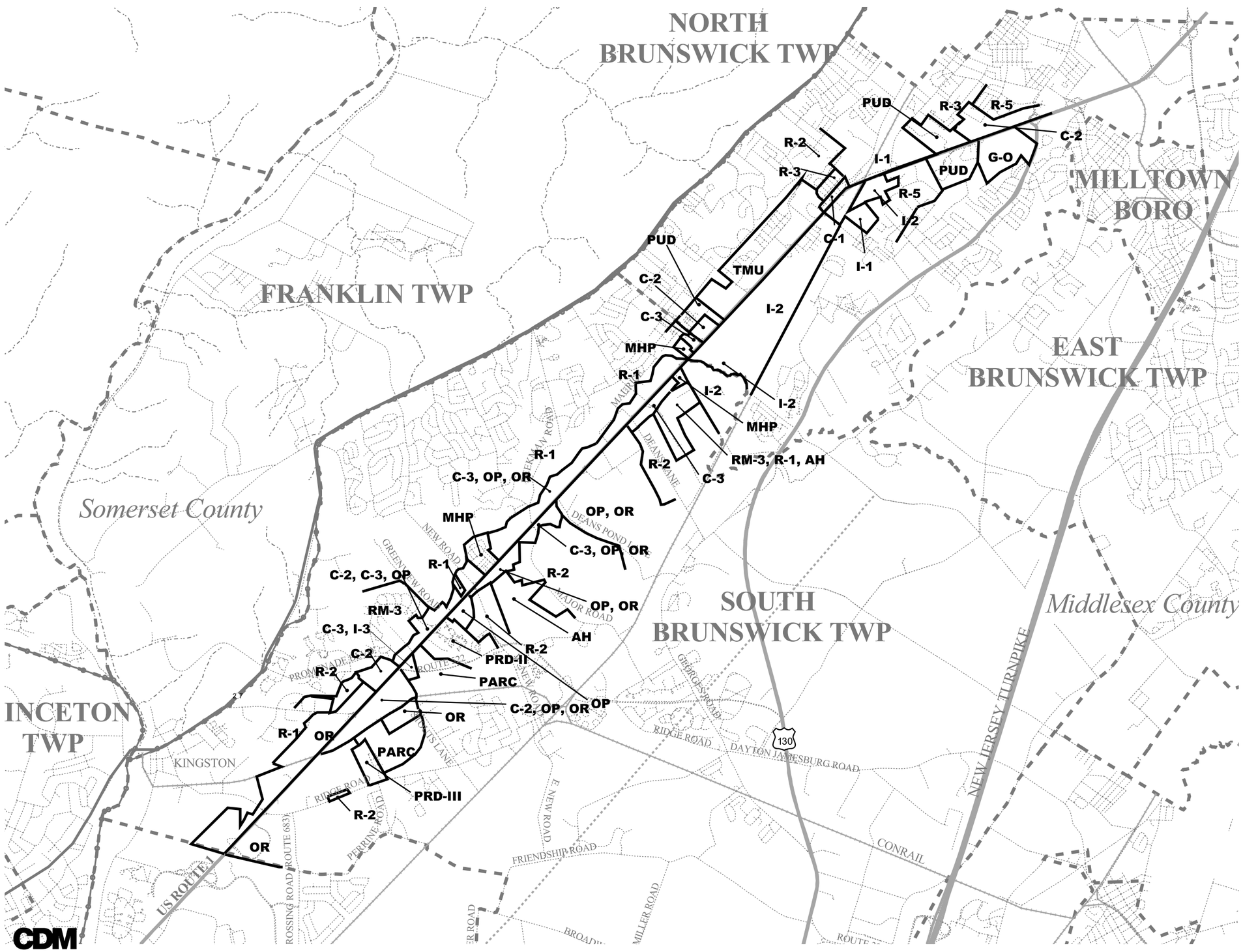


N

0.7 0 0.7 1.4 Miles

5000 0 5000 Feet

Projection: Universal Transverse Mercator
Coordinate System: State Plane
Datum: NAD83

Legend

South Brunswick Township

AH	Affordable Housing
C-2	General Retail Commercial Center
C-3	Highway Commercial
I-2	General Industrial
I-3	General Industrial
MHP	Mobile Home Park
OP	Office Park
OR	Office/Research/Conference
PARC	Planned Residential Adult Community
PRD-II	Planned Residential Development
PRD-III	Planned Residential Development
R-1	Single Family/Cluster
R-2	Single Family/Cluster
RM-3	Medium Density Residential

North Brunswick Township

C-1	Neighborhood Commercial
C-2	General Commercial
G-O	General Office
I-1	Industrial
I-2	Industrial
PUD	Planned Unit Development
R-2	Single Family Residential
R-3	Single Family Residential
R-5	Garden Apartment Residential
TMU	Transitional Mixed Use

Approximate Zone Boundary
P.S.E.& G
Major Highway
Street
Rail Road
Municipal Boundary
County Boundary

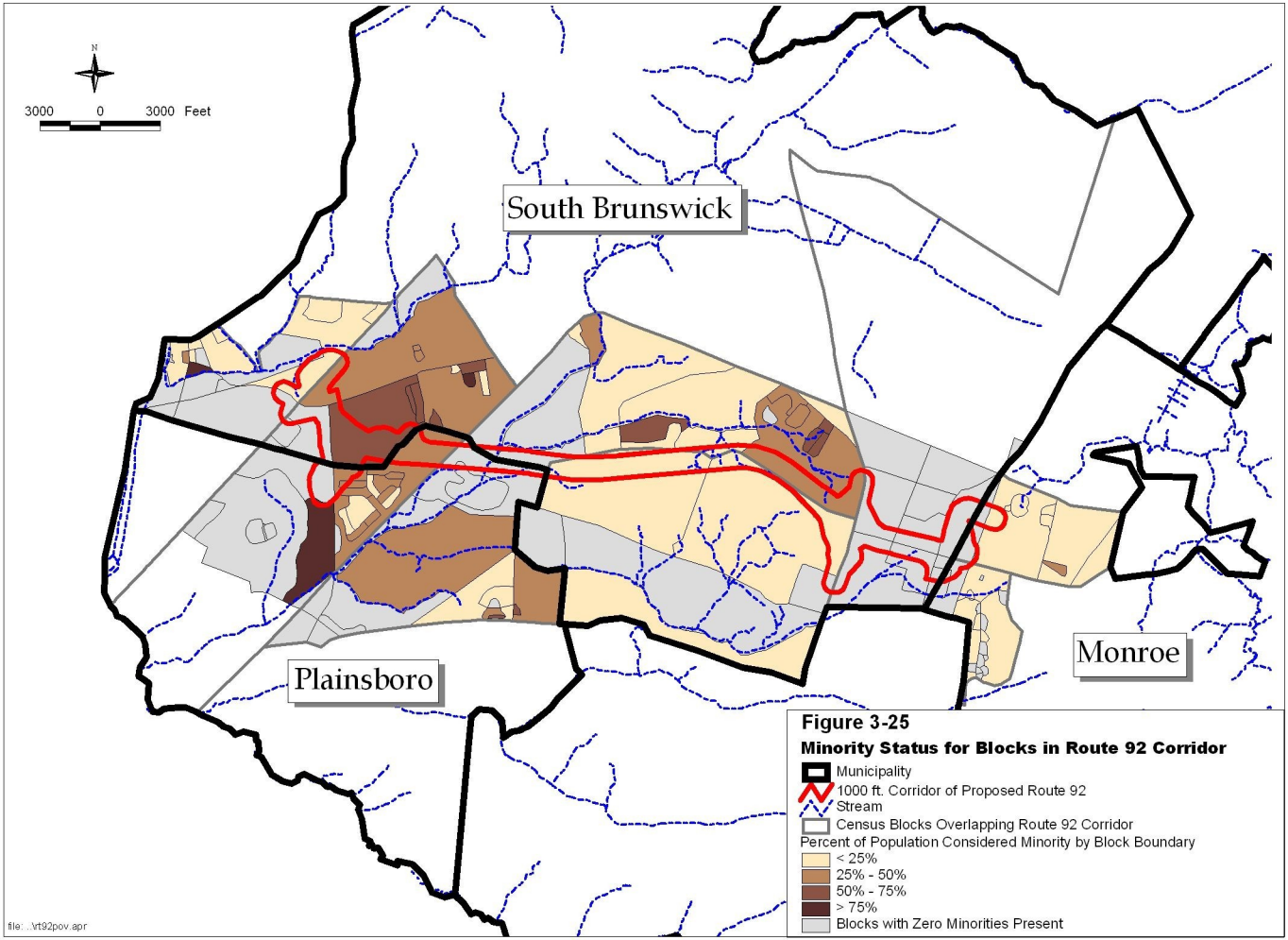
Figure 3-24b (Section 3.13.2.1)

Zoning
Route 1 Corridor

US Army Corps of Engineers
Proposed Route 92
Environmental Impact Statement

CDM

\\camd0081381\projects\Route92Eis\aprfiles\3-24b.apr Layout1


N
3000 0 3000 Feet
South Brunswick
Plainsboro
Monroe
Figure 3-25
Minority Status for Blocks in Route 92 Corridor
Municipality
1000 ft. Corridor of Proposed Route 92
Stream
Census Blocks Overlapping Route 92 Corridor
Percent of Population Considered Minority by Block Boundary
< 25%
25% - 50%
50% - 75%
> 75%
Blocks with Zero Minorities Present
file: ..\rt92pov.apr

Section 4
Direct, Indirect, and Cumulative Impacts of the Proposed Project and Alternatives

This section details the impacts of the New Jersey Turnpike Authority's (NJTA's) proposed Route 92 project, and the impacts of selected alternatives to the proposed project, to environmental and socioeconomic resources within the Proposed Route 92 Corridor and the Project Study Area. As discussed in Section 2, each of the alternatives proposed over the history of the Route 92 project was screened to ascertain how well it meets the project purpose and its comparative potential impact. The impact analyses for the No Action alternative, the Route 92 alternative, the phased Route 92 sub-alternative, and the US Route 1 Widening and Signal Removal alternative are presented in this section. Some of the US Route 1 alternative impacts discussion is divided into "widening only" and "widening with signal removal". This helps to segregate impacts by construction element, because a significant portion of the impacts of that alternative would be due to intersection alteration rather than the widening of US Route 1. Much of the discussion for the proposed Route 92 alternative and phased Route 92 sub-alternative was extracted from the 1994 DEIS (Harris, 1994), the 1996 Stream Encroachment Permit Application as revised in 1999 (Harris, 1999c), the US Army Corps of Engineers (USACE) Section 404 Permit Application, and other previously submitted documents, and was reviewed and updated as appropriate.

This section addresses regional and cumulative environmental impacts from the project alternatives, as well as site-specific issues. Impacts have been assessed for 18 different environmental and socioeconomic subject areas that are important in the Project Study Area. These subject areas include biological resources (e.g. wetlands and wildlife), other natural resources (e.g., water quality and hydrology), socioeconomic resources (e.g., community facilities and land use) and historic resources.

Several types of impacts are presented in Section 4. The Federal Council on Environmental Quality regulations (40 CFR 1508.8 and 1508.7) define the impacts that must be evaluated during the NEPA process. Direct impacts are those that are caused by a proposed project and occur at the same time and place. For example, the loss of wetland value and acreage from filling would be a direct impact. Indirect impacts are caused by a project, but occur later in time or are removed in distance. Induced development resulting from increased highway traffic is an example of an indirect impact. Cumulative impacts result from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions that may be undertaken by any party. Economic growth in a region after increased development could be considered a cumulative impact.

4.1 No Action

The No Action alternative would have no effect on many of the impact parameters identified in the proposed Route 92 and US Route 1 Widening and Signal Removal

sections (sections 4.2 and 4.3 below). Under this alternative, USACE would not issue a discharge authorization permit, proposed Route 92 would not be constructed, nor would any other regional traffic network improvement be implemented as part of this project. The environmental and socioeconomic impacts that would result from the No Action alternative are described in the following sections.

4.1.1 Air Quality

An air quality modeling analysis was conducted for all alternatives selected for more detailed evaluation in this section of the DEIS. The goal of the analysis was to estimate potential regional carbon monoxide (CO), nitrogen oxide (NO_x) and volatile organic compound (VOC) emissions for each alternative. The analysis was prepared based on the procedures set forth in the Federal Highway Administration (FHWA), USEPA, and New Jersey Department of Environmental Protection (NJDEP) regulations, guidelines, and guidance documents. A discussion of the modeling results follows (refer to Appendix B for a discussion of the methodology followed in completing the analysis).

4.1.1.1 Regional Emissions Modeling

A regional emissions model was performed for the Existing Year (2001) and Horizon Year (2028). The Horizon Year evaluated the following scenarios: No Action, proposed Route 92, and US Route 1 widening improvements. The modeling was conducted with the following goals:

- Estimate the potential regional CO, NO_x, and VOC emissions;
- Determine whether or not each of the project alternatives meets USEPA transportation conformity requirements.

The estimation of the potential regional CO, NO_x, and VOC emissions was based on predicted vehicle miles traveled (VMT) along with average speeds in the study area. These data, combined with emission factor data from USEPA's Mobile Source Emissions Factor Model, MOBILE6.2, were used to generate a tons-per-hour emission rate for each model scenario.

The Statewide Transportation Planning Model was used to supply the VMT and average speed data for all roadways included in the model. The data for each scenario are presented in Table 4-1.

Emission factor data were estimated for each scenario for CO, NO_x, and VOCs using MOBILE6.2. The MOBILE6.2 inputs for each scenario model run are presented in Appendix B, Table 2. Table 4-2 contains the emissions factors for the Traffic Study Region.

Table 4-1
VMTs and Average Speeds in the Traffic Study Area

Year	Scenario	VMT	Avg. Speed (mph)
2001	Existing	864,883	21.1
2028	No Action	1,163,744	17.7
2028	US Route 1 Six-Lane Widening	1,158,159	18.8
2028	US Route 1 Widening and Signal Removal	1,162,800	20.0
2028	Route 92	1,152,027	21.1

Table 4-2
Final Emission Factors

Year	Scenario	VOC (g/mile)	CO (g/mile)	NO_x (g/mile)
2001	Existing	1.24	23.83	1.93
2028	No Action	0.30	11.59	0.17
2028	US Route 1 Six-Lane Widening	0.29	11.53	0.17
2028	US Route 1 Widening and Signal Removal	0.29	11.48	0.17
2028	Route 92	0.28	11.43	0.17

The resultant VOC, CO, and NO_x pollutant loadings for the 2001 and 2028 build/no action scenarios were calculated using the VMT values from Table 4-1 and the emission factors from Table 4-2. This calculation was performed by multiplying the VMT for a specific scenario by the emission factor for each pollutant and scenario. The results of these calculations are displayed in Table 4-3.

Table 4-3
Total VOC, CO, and NO_x Loadings

Year	Scenario	VOC (tons)	CO (tons)	NO_X (tons)
2001	Existing	1.17	22.39	1.81
2028	No Action	0.38	14.71	0.22
2028	US Route 1 Six-Lane Widening	0.37	14.66	0.22
2028	US Route 1 Widening and Signal Removal	0.36	14.59	0.22
2028	Route 92	0.35	14.51	0.22

The emissions loading data in Table 4-3 reveal that VOC, CO, and NO_x loadings would decrease under all 2028 scenarios relative to the Existing Year scenario of 2001. This is because federally mandated reductions in motor vehicle emissions are expected to outweigh increases in traffic. With proposed Route 92, VOC emissions from vehicles would decrease by approximately 70 percent, compared to 67 percent in the No Action scenario. Reductions of CO emissions would also be slightly larger with Route 92 than without it. All of the 2028 alternatives produce an 88 percent reduction of NO_x loadings.

4.1.2 Transportation

Traffic congestion is currently experienced in significant portions of the existing local and regional roadway network in the study area. Under the No Action alternative, congestion would continue and would become worse in future years as population, employment, and vehicular use increase.

Under the No Action alternative vehicle hours of travel associated with trips in the region would increase, causing further delay in local and regional commutation, freight movement, and general travel. Compared to the Route 92 and US Route 1 Widening and Signal Removal alternatives, the No Action alternative exhibits the greatest increase in Vehicle Hours of Travel and Vehicle Miles Traveled in year 2028. It exhibits the lowest average network speed, attributable to extensive overloading of the capacity of the existing road system in the project area.

The No Action alternative would contribute to saturation of the existing roadway network, and significant declines in the level of service on existing roads. Increasing levels of regional through traffic, including heavy truck traffic, would be experienced on the local road system, making the affected neighborhoods less amenable to walking and bicycling and decreasing the quality of life in the area's neighborhoods.

4.2 Proposed Route 92 Project

4.2.1 Integrated Impacts Analysis

Through the course of preparing this EIS, several specific impact issues have been identified. These issues combine several environmental and/or socioeconomic parameters, and therefore are better addressed by an integrated discussion. Among these issues are impacts to the Devil's Brook watershed/wetland complex, impacts to the Plainsboro Preserve, impacts to the Village of Kingston, and the potential for induced development if proposed Route 92 is constructed. The following text addresses each of these impact issues.

4.2.1.1 Devil's Brook Watershed/Wetland Complex

Approximately 9.15 acres of wetland fill—76 percent of the wetland fill related to the proposed Route 92 project—would occur within the Devil's Brook wetland complex. All of the 1.16 acres of wetland shading impacts would also occur with the Devil's Brook complex.

The Devil's Brook watershed is flanked by a large tract of forested wetland and upland extending from just north of Dey Road in Plainsboro Township, northeast to where Conrail traverses east-west through Dayton. This entire forested system is approximately 1,650 acres. The proposed Route 92 project would traverse the southwestern portion of this forested tract, leaving 500 acres south of Route 92 and 1,150 acres north of Route 92. The width of the forested tract varies from approximately 1,000 feet at its narrowest point, located north of Friendship Road and east of Haypress Road, to 6,000 feet at its widest point, located north of Dey Road and south of McCormack Lake. Proposed Route 92 would cross the forested tract at the narrowest feasible point for the proposed alignment. The width of the forested tract at the proposed crossing is approximately 3,000 feet, although it is interrupted by a 700-foot-wide upland field such that the forested width is approximately 2,300 feet. Most of the forest and a portion of the field is wetland. Alignments crossing narrower portions of this tract would result in significant impacts to McCormack Lake or extensive disruption of developed residential communities, particularly those located north of Dey Road in Plainsboro Township.

As the proposed Route 92 project would cross the forested wetland tract, the issue of fragmentation of wildlife habitat must be addressed. The issue of fragmentation includes several concerns related to the wetlands system, including the connection of the hydrologic system, movement of wildlife throughout the system and the potential division of the larger system into distinct fragments.

In some sections of the wetland where the soil is not suitable to support the proposed highway bed, the soils would be excavated and replaced with structurally sound fill. Fill material has the potential to act as a dam, impeding the flow of subsurface water across the wetland complex. This could result in dehydration of the wetlands down gradient and ponding of the wetlands up gradient of the fill. These changes in subsurface hydrology could adversely affect wetland habitat. Hydrologic factors

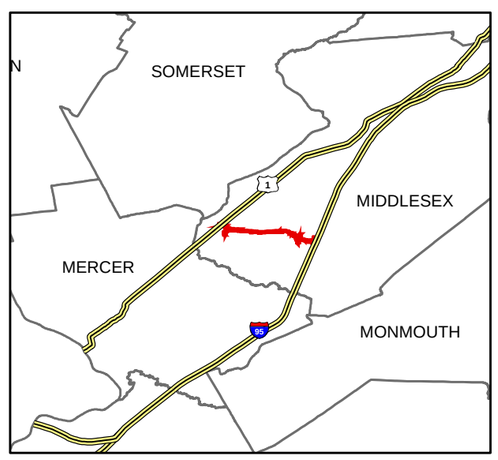
affecting wetland systems include precipitation, surface water, groundwater and evapotranspiration. The forested wetlands in the Devil's Brook watershed are surface water-driven wetland systems, with the underlying soils having relatively low permeability rates. The forested wetlands have been created in areas that receive surface water during flooding events and do not immediately drain afterwards due to flat topography and low soil permeability. The low permeability soil formations suggest that subsurface hydrology interaction with the surface hydrology in the forested wetlands is limited. These forested areas provide a slow release of surface and near-surface water to adjacent water bodies due to the relatively flat nature of the wetlands and low permeability of the underlying soils. The source of water for the Devil's Brook watershed is primarily surface water from flooding events (Harris, 1997). The placement of roadway fill would lead to localized, minor surface and subsurface changes to the wetlands immediately adjacent to the roadway.

The hydrology of the Devil's Brook wetlands complex was previously modified by diversion of flow to a drainage channel along the Plainsboro-South Brunswick border that discharges to the drainage channel that parallels the Amtrak Northeast Corridor rail line (see Section 3.3.1.1 or the description of Wetland Area 5 in Section 3.3.4.4). Potential impacts of proposed Route 92 to the hydrology of the Devil's Brook wetlands complex would be minimized by several features of the proposed roadway design. Proposed sections of elevated roadway would provide openings under the roadway to allow small and large surface flow to reach downstream wetland complexes. The roadway bed proposed in the Devil's Brook wetlands would modify the local subsurface hydrology by replacing the substrate with more permeable material, leading to additional seepage from the roadway embankment into the wetlands, rather than acting as a dam restricting subsurface water flow. Given the limited subsurface flow due to low permeability of the existing soils, the roadbed is not expected to have major impacts to the horizontal flow of subsurface water in the wetland complex. The potential impacts to surface water from the Route 92 project would be lessened by the proposed cross-culverts under the roadway where fill is proposed, and by two bridges: one where the Amtrak Northeast Corridor rail lines cross the proposed alignment, and a second where Devil's Brook flows through the proposed alignment. These bridges, 520 and 525 feet long, would preserve the surface and subsurface flow, thus minimizing fragmentation effects to the wetland complex. Locations of the bridges and culverts are shown on Figure 4-1.

These structures would also enable the passage of reptiles, amphibians, and larger animals. The wetland system does not contain documented large mammals that require a large habitat to maintain a stable population. Existing mammal populations (deer, raccoon, etc.) would be able to migrate to either side of proposed Route 92 by crossing beneath the spanned sections of the roadway at Devil's Brook and the Amtrak Northeast Corridor. In addition, sufficient habitat exists on either side of proposed Route 92 to support these animal populations.

0 0.5 1 Miles

Scale: 1:30,000



Legend

- Stormwater Management Basins and Segment Codes
- Rt 92 Footprint
- Segment Tributary Areas
- Bridges
- Culverts (24"-48")

Figure 4-1
Stormwater Management System

US Army Corps of Engineers
Proposed Route 92
Environmental Impact Statement

A

CAMD008321\c:\gisdata\NJ\MXD\EIS\Figure 4-1.mxd

The proposed Route 92 project would traverse the Devil's Brook watershed and has the potential to separate the southern section of the watershed's wetlands from the main stream corridor in the northern section, with respect to both animal movement and hydrologic circulation. However, Friendship Road and the adjoining properties, which run parallel to proposed Route 92, comprise a swath of upland along part of this watershed's wetlands (refer to Figure 3-9). USGS topographic maps do not provide enough detail to determine whether Friendship Road was built on a natural ridge or whether wetlands were drained to support it and the surrounding agricultural areas; either way, it exists as an upland that separates the two wetland areas. Construction of proposed Route 92 on this upland area would cause less additional hydrologic fragmentation than constructing it in a wetland area. As discussed above, several culverts under the highway would allow passage of surface water and some small animals such as raccoons and skunks. Larger animals (such as deer) that cannot utilize the culverts for passage have suitable habitat on either side of the proposed right-of-way.

The USFWS has expressed concern over the impacts of forest fragmentation on neotropical migrant birds. These are birds that migrate long distances from wintering grounds in the tropics of the Western Hemisphere (the New World Tropics or "Neotropics"). More than 130 neotropical migrant species breed in New Jersey, including many types of warblers and sparrows.

In part because of the presence of neotropical migrant birds, USFWS considers the wetlands in the vicinity of proposed Route 92 an Aquatic Resource of National Importance (USFWS, 1999). It has been documented that forested plots with a minimum of about 100 acres are required for the maintenance of stable populations of neotropical migrants (Galli et al., 1976). Fingers of forested land in the vicinity of McCormack Lake would be divided into smaller fragments (approximately 35 and 50 acres) by proposed Route 92; neotropical bird populations could be adversely affected in this localized area. However, the Devil's Brook forested wetland complex, consisting of about 1,150 acres north of proposed Route 92 and 500 acres south of proposed Route 92 would continue to support migratory birds. Therefore, suitable habitat for neotropical migratory birds would remain in the area. Because proposed Route 92 would not create a barrier to bird migration, species success or survival would not be affected.

During and after construction, NJTA's design for proposed Route 92 aims to preserve existing drainage patterns, with any temporarily disturbed areas restored to preexisting conditions as feasible.

Concern has been noted over the placement of fill within the floodplain of Devil's Brook and its tributaries, as this may negatively affect its flood-storage function unless properly mitigated. Fill in the floodplain would reduce the flood storage capacity and flood height of the stream, and could increase flood hazards in areas beyond the proposed Route 92 Corridor. The proposed Route 92 project, while requiring the

placement of fill, would also incorporate bridges and culverts to convey the flow of Devil's Brook and its tributaries across the filled areas (see Figure 4-1).

A 525-foot bridge is proposed to cross Devil's Brook and its floodplain. A second bridge, 520 feet long, is proposed to cross Amtrak's Northeast Corridor railroad tracks and a tributary to Devil's Brook. These bridges would require modification of the stream channels they cross. The proposed changes have been designed to closely resemble existing conditions, so that fish passage in these watercourses would not be significantly impacted. In addition, culverts would be installed to allow the flow of smaller tributaries and stormwater runoff courses to pass under Route 92. Because these smaller tributaries are intermittent and therefore not favorable for fish passage, design for fish passage is not required for these structures. Locations of the bridges and culverts are shown on Figure 4-1.

As part of NJTA's Stream Encroachment Permit Application (revised April 1999 and resubmitted December 2004), water surface elevations (WSEL) for the 100-year flood were computed for existing and proposed conditions at locations that would be impacted by proposed construction in each Design Section. The Federal Emergency Management Agency (FEMA) prohibits encroachment within the 100-year flood boundary that will cause an increase in flood heights of greater than 1.0 foot, and the State of New Jersey prohibits encroachment that will cause an increase greater than 0.2 feet. The model results indicate that the WSEL would not increase more than 0.2 feet at any of the upstream or downstream control points within the Devil's Brook floodplain or any tributary floodplains. The results of hydrologic modeling are discussed further in Section 4.2.3.1.2 and in the Engineer's Reports excerpts in Appendix E. In general, the hydraulic analyses show that the construction of proposed Route 92 would not have a major impact on the WSEL of the Devil's Brook or its tributaries.

NJDEP regulations (N.J.A.C. 7:13-2.14(a)(1)) limit the fill or reduction of floodplain volume below the 100-year flood to a maximum of 20 percent of the flood fringe area within the right-of-way. Two areas of proposed floodplain fill within the Devil's Brook watershed would exceed this 20 percent rule. These are located in the Devil's Brook floodplain in Design Section 2 and in the floodplain of a tributary to Devil's Brook in Design Section 3. NJTA requested exemptions from the requirement for these two areas in the Stream Encroachment Permit Application submitted to NJDEP in December 2004.

Impacts to surface and groundwater quality due to highway runoff are also a concern in the Devil's Brook watershed. NJTA has enhanced the stormwater management design in compliance with a regulatory requirement that the proposed project not increase flooding impacts and complies with the NJDEP's 2004 stormwater management rules (N.J.A.C. 7:8-5). Section 5.3.3 describes the revised stormwater management design.

4.2.1.2 Plainsboro Preserve

The proposed Route 92 project would pass through the northern end of the Plainsboro Preserve. The presence of a highway in the preserve would impact its value as a recreational and wildlife habitat area.

Approximately 12.5 acres of the preserve north of proposed Route 92 would be separated from the rest of the preserve. As with other parts of the Devil's Brook watershed, habitat and hydrologic fragmentation is a possible result. However, both the Devil's Brook bridge and the bridge over the Amtrak Northeast Corridor/Devil's Brook tributary would allow surface water to flow freely, maintaining some hydrologic connection between land on either side of the highway. Wildlife would also be able to travel beneath these bridges. Section 4.2.3 details the wetland, hydrology and floodplain impacts in the Devil's Brook watershed.

Approximately one-third of the portion of proposed Route 92 within the Plainsboro Preserve and most of the portion of proposed Route 92 just north of the Plainsboro Preserve would be constructed through open fields currently in agricultural use. This land is open because it is not being allowed to revert to its natural forested state. The marked trails are in the forested western half of the preserve, and signs warn "all persons" not to enter the mowed field north of McCormack Lake. Proposed Route 92 would pass through the field approximately 900 feet north of the lake, extending approximately 28 feet above the western edge of the field and approximately 12 feet above the eastern edge. Large tractor trailers on the highway would extend up to an additional 10 feet above the highway structure. The eastern side of the field, where the highway structure would be lower, is visible from one of the trails in the preserve. A line of vegetation is growing up between McCormack Lake and the field, partially obscuring the view of proposed Route 92 from the trail. Because of the configuration of the lake, the northern end of the lake is not visible from most of the rest of the lake.

Within the forest northwest of the lake and west of the field, vehicles passing on proposed Route 92 would be partially visible for approximately 500 feet through the trees. Within the part of the preserve accessible by marked trails, vehicles on proposed Route 92 would be visible over an area of approximately 24 acres.

The tallest section of proposed Route 92 would be the bridge over the Amtrak Northeast Corridor rail line, near the northern end of Plainsboro Preserve. The bridge structure would be approximately 40 feet tall, and large trailers would extend up to an additional 10 feet above the structure. Trees in the forest on both sides of the Amtrak line are 50 to 60 feet tall, and would therefore block views of the bridge and trucks on the bridge. Neither the bridge nor any other part of proposed Route 92 would be visible from the New Jersey Audubon Society Environmental Education Center at the southeastern end of McCormack Lake, approximately half a mile from the proposed Route 92 right-of-way.

The Amtrak Northeast Corridor is adjacent to the preserve, and trains currently using the tracks raise the background noise level in the preserve. Over 130 passenger trains plus freight trains are estimated to pass by the preserve every weekday. At noise receptor location R-9, which is representative of the preserve site, the addition of proposed Route 92 traffic would increase noise levels by 5.3 dBA during the peak traffic hour . Immediately adjacent to proposed Route 92, the increase would be 7-9 dBA. According to FHWA guidance, the noise impact from these increases would be perceptible, but not substantial. During non peak traffic hours, the impact would be minor (less than 5 dBA). A literature search of noise impacts on wildlife found that the effects of noise on wildlife are highly variable in different species and situations. The conclusions of the survey are that although traffic noise may affect some species, generally, wildlife are not adversely affected. Given that wildlife in the preserve are already affected by noise from the rail line and the suburban environment surrounding the preserve, the results of the literature search appear to apply to wildlife in the preserve. Therefore, overall potential Route 92 noise impacts to wildlife and human activity in the preserve are anticipated to be minor.

Because proposed Route 92 is at the northern edge of the Plainsboro Preserve, construction- and use-related impacts would be restricted to a relatively small portion of the preserve. The project would not significantly affect the wildlife and aesthetic value of the entire property.

Route 92 would include a bridge over the Amtrak rail line that passes along the northwestern boundary of the Plainsboro Preserve. An existing trail by which hikers currently access the northern portion of the preserve would pass under the bridge. The existing trail would be blocked at a point farther east where it currently crosses the proposed Route 92 right-of-way.

4.2.1.3 Village of Kingston

Residents and organizations in the Village of Kingston have expressed concerns regarding the volume of traffic using the local roads, particularly truck traffic, in this historic village. With respect to proposed Route 92, the concern of Kingston residents focuses on the additional traffic that would travel to and from Route 92 on Kingston's local roads, particularly Heathcote Road. Heathcote Road is a two-lane rural roadway without shoulders, bordered by residences constructed very close to the road. Together with Ridge Road, it provides an east-west connection between US Route 1 and NJ Route 27. The Heathcote Road intersection with NJ Route 27 is the major intersection in the Village.

The projected impact of proposed Route 92 on traffic volumes in the Kingston area is shown in Table 4-3a. The transportation network model used for this EIS projects that in 2028, proposed Route 92 would reduce overall traffic volumes in the Kingston area by approximately 6 percent relative to the no-action alternative. The model projects that on Route 27 and Mapleton Road, proposed Route 92 would reduce both car and truck traffic in the A.M. and P.M. peak hours and on an average weekday, relative to the no-

Table 4-3a
Projected Traffic Volumes in the Kingston Area in 2028--Proposed Route 92 vs. No Action

Road	Vehicle type[1]	Time period	No action	Route 92	Difference[2]	
					#	%
Ridge Road/Heathcote Road	Cars	A.M. peak hour	1,662	1,604	-58	-3.5%
		P.M. peak hour	1,493	1,525	32	2.1%
		Average weekday	16,721	16,584	-137	-0.8%
	Trucks	A.M. peak hour	44	59	15	34.1%
		P.M. peak hour	44	66	22	50.0%
		Average weekday	458	650	192	41.9%
	All	A.M. peak hour	1,706	1,663	-43	-2.5%
		P.M. peak hour	1,537	1,591	54	3.5%
		Average weekday	17,179	17,234	55	0.3%
Route 27	Cars	A.M. peak hour	2,216	2,026	-190	-8.6%
		P.M. peak hour	1,626	1,476	-150	-9.2%
		Average weekday	24,973	22,763	-2,210	-8.8%
	Trucks	A.M. peak hour	81	67	-14	-17.3%
		P.M. peak hour	54	39	-15	-27.8%
		Average weekday	905	710	-195	-21.5%
	All	A.M. peak hour	2,297	2,093	-204	-8.9%
		P.M. peak hour	1,680	1,515	-165	-9.8%
		Average weekday	25,878	23,473	-2,405	-9.3%
Mapleton Road	Cars	A.M. peak hour	1,538	1,358	-180	-11.7%
		P.M. peak hour	1,098	931	-167	-15.2%
		Average weekday	13,970	12,132	-1,838	-13.2%
	Trucks	A.M. peak hour	17	12	-5	-29.4%
		P.M. peak hour	19	17	-2	-10.5%
		Average weekday	188	150	-38	-20.2%
	All	A.M. peak hour	1,555	1,370	-185	-11.9%
		P.M. peak hour	1,117	948	-169	-15.1%
		Average weekday	14,158	12,282	-1,876	-13.3%
Laurel Avenue north of Church Street	Cars	A.M. peak hour	1,129	1,042	-87	-7.7%
		P.M. peak hour	822	882	60	7.3%
		Average weekday	10,145	10,005	-140	-1.4%
	Trucks	A.M. peak hour	8	10	2	25.0%
		P.M. peak hour	6	10	4	66.7%
		Average weekday	73	104	31	42.5%
	All	A.M. peak hour	1,137	1,052	-85	-7.5%
		P.M. peak hour	828	892	64	7.7%
		Average weekday	10,218	10,109	-109	-1.1%
River Road north of Herrontown Road	Cars	A.M. peak hour	1,145	1,086	-59	-5.2%
		P.M. peak hour	857	797	-60	-7.0%
		Average weekday	10,410	9,791	-619	-5.9%
	Trucks	A.M. peak hour	5	6	1	20.0%
		P.M. peak hour	23	23	0	0.0%
		Average weekday	146	151	5	3.4%
	All	A.M. peak hour	1,150	1,092	-58	-5.0%
		P.M. peak hour	880	820	-60	-6.8%
		Average weekday	10,556	9,942	-614	-5.8%
Total for these roads	Cars	A.M. peak hour	7,690	7,116	-574	-7.5%
		P.M. peak hour	5,896	5,611	-285	-4.8%
		Average weekday	76,219	71,275	-4,944	-6.5%
	Trucks	A.M. peak hour	155	154	-1	-0.6%
		P.M. peak hour	146	155	9	6.2%
		Average weekday	1,770	1,765	-5	-0.3%
	All	A.M. peak hour	7,845	7,270	-575	-7.3%
		P.M. peak hour	6,042	5,766	-276	-4.6%
		Average weekday	77,989	73,040	-4,949	-6.3%

[1]"Truck" is defined as a motor vehicle with more than two axles or more than four wheels. "Car" is defined as any motor vehicle that does not meet this definition of truck.
[2]This is the difference projected to be caused by implementation of proposed Route 92, relative to the no-action alternative.

action alternative. The model indicates that overall truck traffic on these roads would decrease by approximately 20 percent. In this EIS, "truck" means a motor vehicle with more than two axles or more than four wheels.

On Ridge Road/Heathcote Road between US Route 1 and Route 27, proposed Route 92 is projected to make a difference of less than 1 percent in car traffic and total traffic. With respect to truck traffic alone, however, Route 92 is projected to cause an increase of approximately 42 percent compared to the no-action alternative. If Route 92 is built, truck traffic is projected to account for approximately 4 percent of total traffic on this stretch of road in 2028.

Heathcote Road extends south from Route 27 at the center of Kingston, and Laurel Avenue extends north. Church Street also extends north from Route 27 and merges with Laurel Avenue just north of the center of Kingston. The results of traffic modeling for Laurel Avenue north of the merge with Church Street are more meaningful than results south of Church Street, because the traffic north of the merge is not divided among different streets. The modeling indicates that north of Church Street, the impact of proposed Route 92 would be similar to the impact on Heathcote Road, i.e., the impact on car traffic and overall traffic would be minimal, but truck traffic would increase by approximately 42 percent. Unlike on Heathcote Road, where projected truck traffic is approximately 4 percent of total projected traffic, truck traffic on Laurel Avenue is projected to account for approximately 1 percent of total traffic.

Kingston is on the east side of the Millstone River and the Delaware and Raritan Canal. River Road (Mercer County Route 605/Somerset County Route 533) runs north from Route 27 on the west side of the Millstone River and the canal. Traffic modeling indicates that in 2028, proposed Route 92 would reduce car traffic and total traffic on River Road by approximately 6 percent relative to the no-action alternative, and would increase truck traffic by approximately 3 percent. Projected truck traffic is approximately 1.5 percent of projected total traffic.

In the Kingston area as a whole, the transportation network model indicates that proposed Route 92 would decrease car traffic and total traffic by approximately 6 percent relative to the no-action alternative, and that overall truck traffic would be essentially the same with or without Route 92.

Increased truck traffic on Heathcote Road would be undesirable from safety and operation perspectives, due to tight geometry on this section of road as well as tight clearances at the intersection Route 27. If restrictions on truck traffic and traffic calming measures were implemented on this road, however, the traffic impact of proposed Route 92 on Heathcote Road would be reduced. Reduction of truck traffic on Heathcote Road would likely reduce truck traffic on Laurel Avenue, which functions as a continuation of Heathcote Road.

The Circulation Element of the Township of South Brunswick Master Plan anticipates restriction of truck traffic from Ridge Road west of US Route 1 after certain intersection improvements are complete (see Section 5.3.10).

The DEIS suggested speed humps as a traffic calming measure on Heathcote Road/Ridge Road, but the Kingston Volunteer Fire Department submitted a comment objecting to this. The objection of the Department to speed humps on Heathcote Road/Ridge Road will be given serious consideration. Traffic calming measures that would not disrupt emergency services would be recommended as permit conditions should a permit be issued. Refer to Section 5.3.10 for more discussion of possible traffic calming measures.

Because Kingston is outside the proposed Route 92 corridor, environmental impacts on Kingston would be indirect impacts resulting largely from traffic impacts. As discussed above, Route 92 would reduce total traffic in the Kingston area as compared to the no-action alternative. Mitigation has been proposed for the increase in truck traffic Route 92 would cause on Heathcote Road and Laurel Avenue.

New federal requirements are expected to reduce vehicular emissions whether or not proposed Route 92 is built. Traffic modeling indicates that at the intersection of Route 27 and Heathcote Road/Laurel Avenue in the center of Kingston, total traffic and delay per vehicle would be slightly lower with proposed Route 92 than under the no-action alternative. It is therefore unlikely that Route 92 would cause a localized increase in carbon monoxide emissions.

Proposed Route 92 would have no impact on efforts to establish a green belt or greenway around the Village of Kingston. Proposed Route 92 would end at US Route 1, outside the ring of open space around the Village.

The Cook National Trust natural area is at least 1/2 mile west of the terminus of Route 92 at US Route 1. A portion of the Cook natural area fronts on Ridge/Heathcote Road. As noted above, traffic modeling indicates that proposed Route 92 would make a difference of less than 1 percent in total traffic on Ridge/Heathcote Road, but that Route 92 would increase truck traffic. An increase in truck traffic would have an adverse noise impact. Mitigation for the projected increase in truck traffic is outlined above and in Section 5.3.10. Vehicular emissions are projected to decrease substantially in response to federal mandates with or without proposed Route 92 (see Section 4.2.6).

The Millstone River Valley Scenic Byway follows the Millstone River from Route 514 in Millstone to Route 27 in Kingston. The byway includes River Road/Mercer County Route 605/Somerset County Route 533 on the west side of the river and Canal Road/Laurel Avenue/Route 603 on the east side. At its closest point to proposed Route 92, its southern terminus in the center of Kingston, the byway would be approximately 1 mile from proposed Route 92. Route 92 would not be visible from the byway. As shown in Table 4-3a, Route 92 is projected to decrease total traffic on River Road and Laurel Avenue, but to increase truck traffic, especially on Laurel Avenue. It is likely that

the proposed mitigation for truck traffic on Heathcote Road would also reduce truck traffic on Laurel Avenue.

4.2.1.4 Induced Development

Much of the open land within the Proposed Route 92 Corridor is currently zoned for residential or commercial development. Planning officials have noted that growth and development pressures exist notwithstanding the development of proposed Route 92, and much of the development that is proposed or expected would likely occur with or without proposed Route 92, because of the commercial attractiveness of the Princeton region and the related demand for housing. The most significant direct land use impacts resulting directly from the proposed highway would be those related to conflicts with proposed or existing development within the right-of-way (Harris, 1994).

Indirect impacts are those effects that are not directly attributable to the development of the proposed Route 92 project, but occur as a secondary or spin-off effect. Indirect impacts include growth-induced impacts. In the case of Route 92, indirect land use impacts could include changes in area land use or land use trends that would not occur if the highway were not developed. Unlike direct impacts, indirect impacts occur over a period of time after a project is developed or occur in areas that are remote or removed from the site of the development. Induced development occurs when the project increases the function or attractiveness of previously undeveloped land for a particular use. In addition to a change in rate of development, a change in land use patterns might also occur.

Although proposed Route 92 would cross undeveloped lands, no direct access would be available to adjacent lands (either as frontage or via connecting local roads) because proposed Route 92 is designed as a limited access highway. For this reason, proposed Route 92 would not create opportunities for linear development along its route, and direct access to nearby undeveloped lands would only be possible in the interchange areas. There would be no interchanges along the road segment between Perrine Road and US Route 130, and thus it would not connect to local or cross streets that could provide access to new lands for development. Induced development impacts could potentially occur at the interchanges of proposed Route 92 with US Route 1, Perrine Road, US Route 130 and New Jersey Turnpike Interchange 8A. However, these interchange areas have either already been extensively developed, or are zoned for development. While the four interchanges may accelerate existing development trends for nearby parcels, proposed Route 92 is not expected to change the final amount of development anticipated in these areas. Development in these locations remains under the jurisdiction of the municipal development review process, and occurs under the guidance of municipal Master Plans.

While NJTA has no direct control over the land development review and approval process, which is principally the jurisdiction of municipalities and counties, it recognizes that new highway development can be a significant factor in the rate and shape of growth. State agencies have affirmed their interest in collaborating closely with local

communities to ensure that future development occurs in sustainable patterns. See, for example, the "smart growth principles" listed at the web site of the New Jersey Department of Community Affairs, Office of Smart Growth (also listed in Section 4.2.13.4 below).

The western end of proposed Route 92, including the US Route 1 and Perrine Road interchanges, would be constructed in an area of South Brunswick designated for office parks on the Land Use Plan Map in the 2001 South Brunswick Master Plan. The central portion of proposed Route 92, where there would be no interchanges, would pass through an area designated for rural residential use on the 2001 map. The eastern end of proposed Route 92, including the US Route 130 interchange and the South Brunswick portion of NJ Turnpike Interchange 8A, is in an area designated for general industrial development on the 2001 land use map.

The areas in South Brunswick where proposed Route 92 might potentially stimulate development—the interchange areas--are areas the Township has designated for commercial and industrial development because of the proximity of these lands to US Route 1 and the extensive office development that currently exists in this area (between US Route 1 and the Northeast Corridor railway). Thus, Proposed Route 92 could stimulate development in areas where South Brunswick has planned for commercial and industrial development to occur.

The area in South Brunswick where Route 92 would have no interchanges, and would therefore have little potential to stimulate development, is an area South Brunswick has designated for relatively sparse development. Although proposed Route 92 would cross undeveloped lands (in the central section), no direct access would be available to adjacent lands (either as frontage or via connecting local roads) because proposed Route 92 is designed as a limited access highway. For this reason, proposed Route 92 would not create opportunities for linear development along its route, and direct access to nearby undeveloped lands would only be possible in the interchange areas. There would be no interchanges along the road segment between Perrine Road and US Route 130, and thus it would not connect to local or cross streets that provide access to new lands for development.

East of Perrine Road, proposed Route 92 would pass through the northern portion of Plainsboro Township. In this part of Plainsboro, Route 92 would pass through the northern end of the Plainsboro Preserve, designated for open space and conservation on the Land Use Plan Map in the Plainsboro Master Plan, last revised in 2000. The remainder of the Plainsboro section of proposed Route 92 would pass through undeveloped property designated for low-density residential development. The Plainsboro Master Plan states that proposed Route 92 is "a priority for the Township," and that the Township supports Route 92 and "encourages [its] timely implementation."

In South Brunswick Township, the proposed Route 92 project may result in indirect impacts to farmland. Farmland areas adjacent to the Perrine Road interchange may be

removed from agricultural use and converted to more intensive industrial and office park uses. In Monroe Township, indirect impacts could be experienced in currently open areas in the Township. Monroe Township planning officials have indicated that areas are available for development; however, induced development might overstress local roads and infrastructure (Harris, 1994).

Plainsboro has fairly stringent land use controls that do not allow for development without adequate access to roadways and public facilities. Plainsboro officials have indicated that although the pace of new development could be accelerated if Route 92 were constructed, no new development or shift in development patterns is expected as a result of the proposed highway (Harris, 1994).

According to the 1994 DEIS, area township planners have indicated that factors other than proposed Route 92 will determine the region's future development potential. These factors include the national economy, the land supply suitable for development and the capacity of the housing and labor markets to absorb additional demand. In addition, the type and extent of development that will occur in each area is controlled to a great extent by each township's zoning ordinance. Much of the area that would be traversed by the proposed Route 92 project is low-density residential, which would preclude the development of commercial uses along Route 92, even if it were not a limited-access highway. In areas that are commercially zoned (generally near the interchanges), each township's zoning ordinance dictates the density and type of development that can occur. The proposed Route 92 corridor is experiencing substantial growth in the absence of Route 92, including commercial growth at both ends of the corridor, and this trend is expected to continue with or without proposed Route 92. While the four proposed interchanges may accelerate development of nearby parcels, proposed Route 92 is not expected to change the final amount of development in these areas. As a result, indirect land use impacts are expected to be minimal.

4.2.2 Topography, Geology and Soils

4.2.2.1 Topography

Because the topography of the area is generally flat, significant topographic constraints to construction do not exist. The absence of major bedrock outcrops, excessively steep hills, mountains and severe land depressions would reduce the cut and fill requirements for road construction. The cut and fill operations required for grading of proposed Route 92 should not result in harsh contrasts to the existing landscape. Construction would require substantially more fill than cut, especially between Perrine Road and US Route 130. Construction between US Route 130 and the New Jersey Turnpike would not be expected to require substantial amounts of cut and fill activities. Clean, usable material excavated for the proposed road would be utilized as fill where suitable. In addition, clean fill would have to be imported for grading. Impacts to geology and soils resulting from earth disturbances are addressed in Sections 4.2.2.2 and 4.2.2.3.

4.2.2.2 Geology

The Project Study Area contains no unique geologic features or economically significant geologic formations. Existing quarries in the region are outside the study area. Excavation for proposed Route 92 would be most extensive for the roadway section between Schalks Crossing Road and Perrine Road, within the Stockton Formation. The remainder of proposed Route 92 would require predominantly fill operations with minimal, isolated areas of excavation required. In areas within the study area where the depth to bedrock is shallow, blasting operations could be necessary.

Certain geologic formations may contain iron sulfide minerals known as "acid-producing deposits" that, when exposed to oxygen, oxidize and produce sulfuric acid. This acid increases the solubility of metals to the extent that these metals may represent a toxic source to aquatic life, vegetation, and potable water supplies. According to the *Technical Manual for Stream Encroachment*, the Magothy and Raritan geologic formations of the Coastal Plain physiographic province sometimes contain substantial acid-producing deposits. Construction of proposed Route 92 would require excavation within the Magothy and Raritan Formations; therefore, it is important to note the possibility of exposing acid-producing deposits to oxygen so that appropriate mitigation could be implemented if necessary.

As discussed in Section 3.2.2.1, 10 of 30 soil samples tested in the laboratory showed evidence of containing acid-producing minerals. One sample came from Design Section 1 (between the New Jersey Turnpike and the proposed toll plaza), while the remaining nine came from Design Section 2 (between the proposed toll plaza and the Amtrak Northeast Corridor). In Design Section 2, excavation would be relatively minor and fill operations would be more substantial. In that area, the risk of exposure of acid-producing deposits would not be as great.

4.2.2.3 Soils

The major anticipated impact to soils would be erosion of soil particles. One soil erosion problem occurs when downstream water features become laden with sediment, degrading water quality. Sediment from soil erosion also tends to obstruct natural and manmade drainage structures and channels.

Construction activities increase the amount of soil exposed to flowing water, increasing the extent of soil erosion leading to adverse impacts of nearby surface water features. To minimize impacts, soil erosion control guidelines and mitigation would be adhered to in accordance with New Jersey's *Standards for Soil Erosion and Sediment Control*.

The resistance of a soil to erosion depends upon the composition of the particles that make up the soil, the presence or absence of vegetative cover, and slope steepness. Sandy soils on steep slopes with minimal vegetative cover, such as a sand dune, are highly susceptible to erosion. Conversely, clayey silts with binding particles found on gentle to level slopes with significant vegetative cover, such as a forested wetland, are less susceptible to erosion. In accordance with the USDA Natural Resources

Conservation Service classifications, all soil types are designated an erosion factor, K, that predicts an area's annual rate of soil loss by sheet and rill erosion. These estimated factors are based on the percentage of silt, sand and organic matter and on soil structure and permeability. K-factor values between 0.17 and 0.24 indicate low erodibility, 0.28 to 0.37 indicate medium erodibility, and 0.43 to 0.49 indicate high erodibility.

Table 4-4 lists each soil anticipated to be disturbed for the construction of proposed Route 92 and its K-factor. A majority of the soils that would be impacted by construction of proposed Route 92 are characterized by a K of 0.28, representing soils of medium erodibility. The rest of the soils are characterized by K-factor values of 0.24, 0.37, 0.43 and 0.49. Only 10 of the 42 soil types have K values indicating they are highly erodible.

US Route 1 to Perrine Road – The Proposed Route 92 Corridor between US Route 1 and Perrine Road consists of Nixon and Nixon Variant soils, which have K-factor values of 0.28 (low erodibility). This area consists of active farmland, vegetated fields and scattered woodland, representing adequate vegetative cover for soil stabilization. Slopes in this area are for the most part level to gentle at zero to 2 percent.

Perrine Road to US Route 130 – The Proposed Route 92 Corridor between Perrine Road and US Route 130 consists largely of Fallsington and Woodstown soils and, to a lesser extent, of Nixon and Sassafras soils. The soils all have a K-factor of 0.28, representing soils with a low erodibility rating. The proposed alignment near Friendship Road would disturb some farmland, grassed fields and minimal forested lands. The alluvial deposits associated with many of the streams in the Devil's Brook watershed represent a source of erosion, as these deposits would be easily transported downstream during construction activities.

US Route 130 to the New Jersey Turnpike – The Proposed Route 92 Corridor between US Route 130 and the New Jersey Turnpike consists of Sassafras and Mattapex soils, characterized by slow to medium runoff and low to medium erodibility ratings. Soil erosion is not expected to represent a significant adverse impact for the construction of proposed Route 92 in the urbanized area between US Route 130 and the New Jersey Turnpike.

4.2.3 Natural Resources

4.2.3.1 Surface Water

4.2.3.1.1 Waterways, Streams, and Lakes

The impacts to existing surface water bodies for the proposed Route 92 project are expected to be minimal, as bridge crossings would be constructed for major stream crossings, and appropriately sized culverts constructed for minor crossings. In addition, stormwater Best Management Practices will be used to improve the quality of stormwater runoff before discharge to adjacent waterways and wetlands. Approximately 0.45 acres of open water would be permanently impacted by fill if the project were constructed.

Table 4-4
Soil K-Factor Listing

Soil	Erosion K-Factor	Soil	Erosion K-Factor
At	0.17	NaB	0.28
ChA	0.49	NfA	0.28
ChB	0.49	NfB	0.28
DnC	0.2	NGA	0.28
Ek	0.43	PhD	0.20
EvB	0.17	PM	-
Fb	0.28	PN	-
Fd	0.28	ReA	0.43
HeA	0.2	Rh	0.43
HmA	0.28	Ro	0.43
HU	Variable	SaB	0.28
KeA	0.37	SaC	0.28
KeB	0.37	SgB	0.24
KfA	0.43	SgC	0.24
LnA	0.43	SlA	0.28
LnB	0.43	SlB	0.28
LUA	0.43	UB	-
MeA	0.37	UC	-
MeB	0.37	UL	-
MgA	0.37	Wa	0.43
MgB	0.37	WdB	0.28
MoA	0.32	WkA	0.28
MsB	0.28	WlA	0.28
Mu	0.28	WlB	0.28
NaA	0.28		

Source: Soil Survey of Middlesex County, New Jersey, USDA, 1987.

The creation of seven linear miles of impervious surfaces would result in increased stormwater runoff rates compared to pre-development conditions. Approximately 147 acres of impervious surface would be created by this project. The 2004 NJDEP Stormwater Management Rules (N.J.A.C. 7:8-5.4) require a project design engineer to demonstrate that post-construction groundwater recharge is equal to pre-construction recharge, or that the increase in stormwater runoff volume of the two-year storm from pre-construction to post-construction is infiltrated.

If uncontrolled, the stormwater from proposed Route 92 could carry significant amounts of vehicle-related contaminants from the roadway into surface and groundwater resources. In addition, increased runoff could exacerbate flooding during rain events. Detention of stormwater runoff and subsequent controlled discharge into receiving

waters has been shown to reduce the rate of runoff into surrounding water bodies and to improve the quality of such runoff. The 2004 NJDEP Stormwater Management Rules (N.J.A.C. 7:8-5.4) require that stormwater management measures be designed to reduce the post-construction load of Total Suspended Solids (TSS) in stormwater runoff generated from the water quality design storm by 80 percent, expressed as an annual average. The stormwater quality design storm is a 1.25-inch/2-hour variable rate rainfall event. In addition, the stormwater management measures must reduce the average annual nutrient load in the post-construction runoff by the maximum extent feasible. Section 5.3.3 presents a discussion of the proposed stormwater management system.

4.2.3.1.2 Floodplains

Development within floodplains is regulated at the federal level by Floodplain Management Executive Order 11988 and at the state level by the Flood Hazard Area Control Act (N.J.S.A. 58:16A-50 et seq.) and Flood Hazard Area Control regulations (N.J.A.C. 7:13-1.1 et seq.). The placement of fill within a floodplain results in adverse impacts to the function of the floodplain including a reduction of the flood storage capacity of the stream, an increase in the flood height of the stream and an increase in flood hazards extending to areas beyond the disturbed area itself. The construction of the proposed Route 92 project would result in floodplain takings of Heathcote, Devil's and Shallow Brooks within the Millstone River watershed. Table 4-5 provides a summary of regulated activities within each floodplain.

An NJDEP Stream Encroachment Permit would be required for construction of the proposed Route 92 stream crossings of Heathcote Brook, Devil's Brook, Shallow Brook and/or various smaller tributaries associated with these brooks. The proposed Route 92 project would require widening of an existing culvert in Shallow Brook, construction of a new culvert in Shallow Brook, a bridge over Devil's Brook, cross culverts to convey flows of tributaries to Devil's Brook, a bridge over a tributary to Devil's Brook and the Amtrak Northeast Corridor, and replacement of culverts across a tributary to Heathcote Brook at US Route 1 and at Ridge Road. All bridges and culverts would have to be designed and sized to maintain the natural drainage patterns within the Proposed Route 92 Corridor. Details of each of the bridges and culverts listed above, as well as impacts to the floodplain hydraulics and hydrology, are discussed in the Engineer's Reports for each Design Section of Route 92, submitted as part of the Stream Encroachment Permit Application and reproduced in Appendix E of this EIS. Locations of new bridges and culverts are shown on Figure 4-1.

The Federal Emergency Management Agency (FEMA) prohibits encroachment within the 100-year flood boundary that will cause an increase in flood heights of greater than 1.0 foot. The State of New Jersey prohibits encroachment within the flood hazard area that will cause an increase in flood heights of greater than 0.2 feet. As part of the original Stream Encroachment Permit Application for proposed Route 92 (revised April 1999), NJTA modeled water surface elevations (WSEL) resulting from the 100-year flood for existing and proposed conditions at locations that would be impacted by proposed

Table 4-5
Regulated Activities in Design Sections 1, 2 and 3 of Proposed Route 92

Watercourse	**Section 1**	**Section 2**	**Section 3**
Devils Brook	-Non-regulated construction activities outside 100-year floodplain of non-delineated watercourse	-Bridge construction -Two channel realignments -Retaining walls	
Devils Brook Floodplain		-Stormwater outfalls/cross-culvert -Fill in floodplain	-Fill in floodplain -Stormwater outfalls
Tributaries to Devils Brook		-SMB-2A and 2E and outlet structures -Culvert crossing -Retaining walls	-Bridge crossing -Riprap placement -Retaining walls
Tributary to Shallow Brook	-SMB-1E and outlet structure -SMB-1F and outlet structure -140 linear foot pipe extension -Fill in floodplain		
Tributary 'A' to Shallow Brook	-Culvert placement -Fill in floodplain		
Heathcote Brook			-Fill in floodplain -Replacement of storm sewer (720' pipe placement)
Tributary to Heathcote Brook			-Replacement of pipe crossing under U.S. Route 1 -Outlet structures for SMB-3A, 3B and 3C -Replacement of pipe crossing under Ridge Road -Various utility crossings

construction in each design section. Hydraulic computations were performed using the USACE HEC-2 Water Surface Profiles software. For the December 2004 Stream Encroachment Permit Application, the hydraulic computations performed for the 1999 application were reviewed and found to be valid despite the changes in the stormwater management system required by the 2004 Stormwater Management Rules.

For Design Section 1, WSEL did not increase more than 0.2 feet at any of the upstream or downstream control points for the proposed culvert extension, proposed culvert replacement and proposed installation of stormwater management basins (SMBs) within the floodplain. For Design Section 2, WSEL did not increase more than 0.2 feet at any of the upstream or downstream control points for the proposed bridge crossing of Devil's Brook, the relocation of a tributary to Devil's Brook, a proposed culvert at Station 544+20, and SMB outfalls. For Design Section 3, WSEL did not increase more than 0.2 feet at any of the downstream control points for the proposed bridge crossing of Devil's Brook or the proposed US Route 1 stormwater runoff conveyance system. However, the higher roadway crown line at the barrier curb opening in the US Route 1/Ridge Road intersection yielded a higher WSEL for the proposed conditions that impacts the upstream water elevation. The results of hydrologic modeling are discussed in detail in the Engineer's Reports in Appendix E.

In general, the hydraulic analyses show that the construction of proposed Route 92 would not have a major impact on the WSEL of the affected brooks and tributaries, with the exception of the tributary to Heathcote Brook crossed by US Route 1. However, the modeling indicated that the excessive increase in WSEL for this tributary only occurred when the proposed conditions were modeled with the regulatory flood of 74 cfs (as prescribed in N.J.A.C. 7:13-2.3), and not when modeled with the 100-year flood of 50 cfs.

Proposed Route 92 would involve construction of bridges for major stream crossings and appropriately designed and sized culverts for minor stream crossings. NJDEP regulations require that any new or modified channel of a watercourse be designed and constructed so that during low flow conditions, the water depth is at least as deep as the existing channel (N.J.A.C. 7:13-3.6(c)1). The bridge crossings over Devil's Brook and one of its tributaries in Design Section 2 would require modification of the main channel of the brook as well as a diversion channel. The proposed modifications have been designed to closely resemble existing conditions, so fish passage in these watercourses would suffer minimal adverse impact. All other proposed culverts would be built in intermittent streams where conditions for fish passage are not favorable; therefore, design of fish passage is not required in these structures.

For major streams, bridge heights were established on the basis of preliminary hydraulic estimates, taking into account allowable increases in headwater depth caused by the bridge construction. The bridge lengths were based on spanning the entire floodway, allowing the natural stream cross-section to pass under the bridge.

NJDEP regulations (N.J.A.C. 7:13-2.14(a)(1)) limit the net fill or reduction of floodplain volume below the 100-year flood to a maximum of 20 percent of the storage volume of the flood fringe area within the right-of-way. Three of the proposed floodplain takings or net fills within the Proposed Route 92 Corridor exceed this 20-percent rule. In the Devil's Brook floodplain in Design Section 2, approximately 23,291 cubic yards of net fill would be placed in a flood fringe area with approximately 75,573 cubic yards of storage capacity, a fill rate of 30.8 percent. Also in Design Section 2, in the floodplain of the Devil's Brook tributary that crosses the north-south segment of Friendship Road, approximately 14,068 cubic yards of net fill would be placed in a flood fringe area with approximately 30,891 cubic yards of storage capacity, a fill rate of 45.5 percent. In Design Section 3, in the floodplain of a tributary of Devil's Brook that runs along the western side of the Amtrak Northeast Corridor rail line, approximately 538 cubic yards of fill would be placed in a flood fringe area with approximately 1,446 cubic yards of fill capacity, a fill rate of 37.2 percent. All three areas in which 20-percent fill would be exceeded are a combination of forested wetlands and agricultural fields. In the Stream Encroachment Permit Application submitted to NJDEP in December 2004, NJTA requested exemptions from the 20-percent rule for Design Sections 2 and 3.

NJSA 7:13-2.14(a)(7) provides for exemptions from the 20-percent net fill restriction for highway projects that cannot meet the restriction because of limited right-of-way, provided that the applicant demonstrates to NJDEP that there is a need for the project that can not be met by any other means, and that the project is designed to minimize the total volume of fill to the greatest extent possible.

4.2.3.1.3 Water Quality

As roadway construction would include a bridge over Devil's Brook, a bridge over a tributary to Devil's Brook, and culverts in several watercourses, the potential for adverse impacts to these water bodies was assessed. Impacts to the waterways in the region may originate from three distinct activities associated with the construction of the proposed roadway:

- Bridge and Roadway Construction – soil erosion and stream sedimentation.
- Vehicular Traffic – indirect impact from deposition of vehicular-related pollutants on highway surfaces
- Application of Deicing Material – indirect impact from deposition of salts and sand on highway surfaces.

The types of pollution that could result from these activities are further described below.

Sediment/Particulate Matter – Sediment is one of the most harmful pollutants transported by stormwater. Sediment is predominately soil particles that have eroded from uplands as a result of natural processes or deliberate land disturbance during development. Sediment washes off the land and can build up in lakes and clog drainage ditches, culverts, natural watercourses and man-made features. Increased sediment

loading can have impacts to the flora and fauna of water bodies including, but not limited to, the following:

- Sediment particles can accumulate on plants and fish, limiting respiration and leading to mortality.
- Increased sediment can limit sunlight penetration in lakes and ponds, decreasing photosynthetic capabilities of the macrophytic and algal communities.
- Excessive sediment build-up can lead to transformation of shallow water ponds to emergent wetlands, eliminating various aquatic organisms that require permanent standing water.
- Suffocation of benthic communities by sediment accumulation.
- Alteration of the benthic substrate.

Initial clearing and grading operations during construction would expose much of the surface soil, leaving it vulnerable to erosion by wind and water. As a result, pollutant export during construction is typically high. Adequate soil erosion controls would be required at the site, so that large quantities of sediment are not transported to receiving waters (see Section 5.2.1).

Petroleum Hydrocarbons – Oil and grease contain a diversity of hydrocarbon compounds that can be damaging to the environment. The major source of hydrocarbons is from the leakage of oil and other lubricating agents related to automobile and truck use. Hydrocarbon levels are generally highest in areas near parking lots, concentrated roadway networks and service stations. Once hydrocarbons are introduced to a water source, they are quickly adsorbed and absorbed by sediment and particulate matter and can accumulate at the bottom of lakes and streams, causing adverse impacts to the benthic community. Petroleum hydrocarbons biodegrade in an aerobic environment, but at a very slow rate.

Metals – Highway runoff is known to include metals such as lead, zinc, iron, copper, chromium, cadmium and nickel. Automobiles account for a significant portion of these metal contaminants. If metal levels exceed the acceptable standards for a water supply, the safety of public health and aquatic biota is at risk. Metals may naturally occur in the soil, but can be introduced into the environment by way of automobile use, industrial runoff or atmospheric deposition.

Solids/Floatables – Solids and floatable materials are defined as floating or suspended debris generally including bottles, cans, newspapers, plastic containers, and plastic and paper bags. As these pollutants are large, they are generally a surface water pollutant concern and are not capable of infiltrating the groundwater table. Solids and floatables are primarily an aesthetic concern because they litter the aquascape without posing

serious health threats to humans. These materials can pose a hazard to wildlife, however.

Nutrients – Phosphorus and nitrogen are two common nutrients found in highway runoff. Phosphorus occurs in various forms of phosphates, including orthophosphates (PO_4), polyphosphates (polymers of phosphoric acid), and organically bound phosphates. Likewise, nitrogen occurs in gaseous forms such as ammonia (NH_3), ammonium (NH_4^+), nitrite (NO_2^-) and nitrate (NO_3^-). Typically, undeveloped land generates few nutrients, agricultural and low to moderate density residential land generates more nutrients, and land uses consisting of commercial, industrial and high-density residential development generate significantly higher nutrient levels. The sources of these nutrients are extensive, including use of fertilizers high in nitrogen and phosphorus, manure from livestock and pet droppings, soaps and detergents, sewage effluent and septic system leachate from domestic and urban sources. The results of increased nutrient levels in the hydrologic system include eutrophication of surface water features. Eutrophication is defined as an over-enrichment of waters by nutrients resulting in a dominance of algal and plant growth.

Pathogens – Pathogens are common contaminants in stormwater. Bacterial and viral forms of pathogens are found in the intestinal tracts of humans and warm-blooded animals and are excreted with fecal wastes. The sources of pathogens include fecal wastes from livestock operations, domestic pets, concentrated wildlife populations, sewage effluent and septic system leachate.

Pesticides – Pesticides including insecticides, herbicides, rodenticides and fumigants are toxic substances deliberately introduced into the environment for agricultural purposes and maintenance of residential and commercial properties. Pesticides in stormwater runoff are carried from application sites by dissolution or binding to particulate matter carried by the runoff. These pesticides can enter surface water and percolate into the groundwater table. They can affect animals and humans either indirectly through the food chain or directly upon contact with the skin.

Road Salt – Road salts are typically used on roadways in the winter to minimize hazardous conditions on roads, as they are a low cost substance for melting snow and ice. Road salt is composed predominately of sodium chloride, which has the potential to degrade natural resources such as vegetation, surface and groundwater quality and aquatic ecosystems.

As areas become more urbanized, impervious pavement is placed on formerly natural lands. Much of this pavement is treated with road salt during the winter months, resulting in large amounts of sodium chloride entering streams, wetlands, ponds and lakes. During precipitation, much of the salt applied to proposed Route 92 would be transported by stormwater runoff into detention/retention basins, and eventually into streams and wetlands within the Millstone River watershed. The influx of sodium chloride into freshwater systems like the Millstone River watershed, if not controlled

and mitigated, can produce widespread damage to the aquatic environment. Plants and animals living in this environment cannot tolerate the elevated salt levels and eventually die off. Influx of stormwater runoff containing high concentrations of sodium chloride into a lake or pond can inhibit the natural mixing of a lake, vital to lake oxygenation and survival of organisms. These effects can be most intensive in the summer when evaporation rates are high and there is less water in the lake to dilute any sodium chloride that has not yet been flushed from the lake.

In addition to contaminating surface water resources, sodium chloride at high levels can kill roadside vegetation and tends to corrode bridges, roads, and stormwater management devices.

Pollutant Loads of Highway Generated Runoff
The CDM Watershed Management Model (WMM) was used to evaluate annual non-point source pollutant loads for existing and proposed conditions. Section 5.3.3 presents the reduced pollutant loads after implementation of the Best Management Practices (BMPs) for each Stormwater Management Basin (SMB). The WMM has been used on more than 30 EPA National Pollutant Discharge Elimination System (NPDES) stormwater permit projects and on more than 50 implemented stormwater projects nationwide.

The WMM model estimates annual pollutant loads for defined parameters using event mean concentrations (EMCs) for each parameter, annual average precipitation, land use and soil classifications (to determine impervious areas and runoff coefficients), average annual baseflow, and BMP sizes, types, and efficiencies (existing and proposed). Within a given watershed, multiple basins can be evaluated individually and collectively.

An EMC is defined as the average of individual measurements of storm-specific pollutant mass loading divided by that storm-specific runoff volume. One of the keys to effective transfer of published EMC values for non-point pollution loading factors to a particular study area is to make adjustments for actual runoff volumes in the watershed. Due to the lack of site-specific EMC data, published EMC data were collected from a variety of sources and evaluated for relevance to this specific study area. Table 4-6 presents the EMC values used.

The pollution loading factor (M_L) is computed for each land use (L) based on the EMCs presented in Table 4-6 using the following equation:

$$M_L = EMC_L * R_L * K$$

Where: M_L = loading factor for land use L (lb/ac/year)
EMC_L = event mean concentration of runoff from land use L (mg/l); EMC_L varies by land use and by pollutant
R_L = total average annual surface runoff from land use L (in/year)
K = 0.2266, a unit conversion constant (lb-l/mg-ac-in)

Table 4-6
EMC Values

Land Use Type	TSS	TN	TP
Agricultural/Pasture	145	3.2	1.7
Commercial	77	3	0.33
Forestland	51	1.8	0.1
Industrial	149	2.4	0.32
Open water	6	1.3	0.08
Other Urban or Built Up Land	97	3.3	0.24
Residential - Low Density	70	3.8	0.52
Residential - Medium Density	70	5.1	0.52
Transitional	145	2.6	0.37
Transportation	140	2.1	0.30
Wetlands	6	1.3	0.08

Sources: Pitt et al, 2004, The National Stormwater Quality Database (NSQD version 1.1); Kayhanian et al, 2003, Impact of Annual ADT on Highway Runoff Pollutant Concentrations ASCE Journal Env. Eng.; Kayhanian et al, 2003, Impact of Annual ADT on Highway Runoff Pollutant Concentrations ASCE Journal Env. Eng.; CDM, 1996 Watershed Management Model Manual Version 3.3 (Table 2-1, p. 2.3); and CDM, 1994, Selection of Stormwater Pollution Loading Factors RRNWWDP, RPO-MOD-TM34.00, FHWA, 1990.

By multiplying the pollutant loading factor by the area in each land use and summing for all land uses, the total annual pollution load from a watershed is computed. BMP efficiencies are then applied for each SMB based on methods allowed by NJDEP to determine load reduction and load discharged.

For the existing conditions scenario, tributary areas contributing runoff to each SMB location (as defined in Section 5.3.3) were delineated as follows. A GIS coverage of tributary areas to each SMB was not available; therefore, CDM used the topography and proposed Route 92 design drawings to conceptually estimate the contributing area of stormwater runoff to each of the stormwater management BMPs. This data-layer was hand-drawn and digitized. Figure 4-1 presents the layout of Route 92, tributary areas, and SMB locations. These project-related tributary areas were then superimposed upon the digitized land use map for the watershed (Watershed Management Area 10, WMA-10) to compute the land area associated with each existing land use category. The Anderson land use codes were then consolidated into a more manageable land use classification set as follows. A set of digitized maps were obtained from NJDEP describing the land use for:

- the Millstone Watershed (NJDEP Watershed Management Area 10, WMA-10), and,
- the Lower Raritan, South River and Lawrence Watershed Management Area (WMA-9)

Data represent land use/land cover for 1986 as well as 1995/97. NJDEP land use is mapped using two standard classification schemes: Anderson and Cowardin. The

Anderson land use scheme was developed in the 1970s as a uniform nationwide method for describing land use based on satellite imagery. It was originally described by USGS, in 1976. It is a "multi-level" classification scheme, and the assumption is that general results from high-level, coarse images can be further refined as more detailed information becomes available. Anderson land use is a consistent method for classifying land use over large geographic areas. For instance, the Level I code, "1 Urban or Built-Up Land", can be further broken down into several Level II codes, such as "11 Residential," "12 Commercial and Services", or "13 Industrial." Further, "11 Residential" can be further refined into a number of Level III codes, such as:

- 111. Single-family Unit
- 112. Multi-family Unit
- 113. Group Quarters
- 114. Residential Hotels
- 115. Mobile Home Parks
- 116. Transient Lodging
- 117. Other

Cowardin is a land use code specific to wetlands, described in Cowardin et. al. (1979). Its purpose was to "describe ecological taxa, arrange them in a system useful to resource managers, furnish units for mapping, and provide uniformity of concepts and terms". It is different from the Anderson system in that it only applies to wetland areas. At the highest classification level, there are 5 categories: Marine, Estuarine, Riverine, Lacustrine, and Palustrine. An example of a wetland found near the project area is "Forested Wetland". This can be further classified as:

- Broad-leaved Deciduous
- Needle-leaved Deciduous
- Broad-Leaved Evergreen
- Needle-leaved Evergreen
- Dead

Because each of the classification schemes can include 39 or more types of wetland areas, some simplification was required to make the data amenable to analysis. CDM combined the categories into groups as presented in Table 4-7. Table 4-8 presents the acreage of each SMB tributary area organized by the consolidated land use classification as it was used in the WMM analysis for existing conditions.

The estimated pollutant loads from proposed Route 92 must be reduced by a range of stormwater Best Management Practices that will be implemented adjacent to the roadway. Pollutants will be reduced in highway discharges to water bodies by stormwater management controls as presented in Section 5.3.3.

Table 4-7
Grouping of Land Use Codes from NJDEP Land Use/Land Cover Dataset

WMM Category	Anderson Land Use Code
Other Urban or Built-up Land	Other Urban Or Built-Up Land
Transportation	Transportation/Communications/Utilities
Commercial	Commercial/Services
Residential - Low Density	Residential, Rural, Single Unit
Residential – Medium Density	Residential, Single Unit, Medium Density
Residential - High Density	Residential, High Density, Multiple Dwelling
Wetlands	Managed Wetland In Maintained Lawn Greenspace Disturbed Wetlands (Modified) Deciduous Wooded Wetlands Deciduous Scrub/Shrub Wetlands Herbaceous Wetlands
Forestland	Mixed Deciduous/Coniferous Brush/Shrub-land Coniferous Brush/Shrub-land Deciduous Forest (10-50% Crown Closure) Coniferous Forest (>50% Crown Closure)
Industrial	Industrial
Open water	Artificial Lakes Natural Lakes
Agriculture/Pasture	Cropland And Pastureland Agricultural Wetlands (Modified) Other Agriculture Orchards/Vineyards/Nurseries/Horticultural Areas
Transitional	Transitional Areas

Table 4-8
Existing Conditions – SMB Tributary Area by Land Use Classification

Tributary Area	Agriculture/ Pasture (acres)	Commercial (acres)	Forestland (acres)	Industrial (acres)	Open Water (acres)	Other Urban or Built-up Land (acres)	Residential Low Density (acres)	Residential Medium Density (acres)	Transitional (acres)	Transpor-tation (acres)	Wetlands (acres)	Grand Total (acres)	Impervious Area (acres)	Existing Conditions Percent Impervious	Mean Annual Infiltration (in/yr)*
1A	0.08	0.00	2.66	0.00	0.00	4.54	0.00	0.00	0.00	6.18	0.00	13.46	5.41	40%	18.0
1B	0.00	0.00	2.85	0.00	0.00	1.86	0.00	0.00	0.00	4.26	3.19	12.17	6.15	51%	14.7
1C	0.00	0.00	0.00	0.00	0.00	5.23	0.00	0.00	0.00	0.84	0.00	6.07	3.03	50%	15.0
1D	3.47	0.00	0.00	0.00	0.00	1.04	0.00	0.00	0.16	0.73	0.39	5.79	1.33	23%	23.1
1E, 1F	2.43	0.00	0.00	1.12	0.00	2.26	0.00	0.00	0.83	5.64	1.12	13.39	5.66	42%	17.1
1G	4.46	0.00	7.23	0.00	0.00	0.00	0.00	0.00	2.38	2.36	1.40	17.82	2.86	16%	25.2
1H, 1I	13.06	0.00	0.00	0.00	0.00	0.00	1.34	0.00	3.07	11.50	0.95	29.92	7.25	24%	22.8
1J	4.96	0.00	0.56	0.00	0.00	0.24	0.00	0.00	3.50	3.57	0.00	12.83	2.19	17%	24.9
2A	14.57	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.89	15.46	1.14	7%	27.9
2B	10.11	0.00	0.50	0.00	0.00	0.00	1.22	0.00	0.00	0.00	0.80	12.63	1.13	9%	27.3
2C	6.93	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.28	7.21	0.41	6%	28.5
2D	5.48	0.00	0.00	0.00	0.00	0.00	0.35	0.00	0.00	0.00	0.24	6.07	0.38	6%	28.2
2E	6.24	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.79	7.06	0.88	12%	26.4
2F	9.78	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	10.11	0.51	5%	28.5
2G	5.36	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.02	6.38	1.08	17%	25.2
3A, 3B	0.00	0.00	12.11	0.00	0.00	0.43	0.00	0.00	0.00	1.81	2.00	16.35	3.26	20%	24.0
3C	0.00	0.72	1.71	0.00	0.00	2.84	0.30	0.00	0.00	3.83	0.66	10.06	4.47	44%	16.5
3D	9.49	0.00	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	9.60	0.19	2%	29.4
3E, 3F	0.00	2.10	9.76	0.00	0.00	2.39	0.00	0.00	0.00	3.49	0.08	17.81	4.47	25%	22.8
3G	16.51	0.00	2.32	0.00	0.00	0.00	0.53	0.00	0.00	0.00	0.00	19.37	0.45	2%	29.4
3H	15.62	0.00	0.00	0.00	0.18	0.00	0.00	0.00	0.00	0.00	0.09	15.89	0.57	4%	29.1
Section 1 (East of US 130)	0.56	0.00	0.21	0.00	0.00	1.15	0.00	0.00	0.00	1.88	0.00	3.80	1.53	40%	17.7
Section 1 (US 130 - NE ramp)	0.00	0.00	7.84	0.00	0.00	1.89	0.00	0.00	0.00	1.59	0.00	11.32	1.90	17%	24.9
Section 1 (US 130 - SE ramp)	0.00	0.00	6.04	0.00	0.00	0.12	0.00	0.00	0.00	1.50	1.10	8.75	1.97	23%	23.4
Section 3 (CR-683 and Perrine Rd.)	3.61	0.00	0.75	0.00	0.00	0.45	3.20	0.31	0.00	0.00	0.00	8.32	0.81	10%	27.3
Section 3 (Near Devil's Brook)	1.75	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.35	3.50	5.60	3.54	63%	11.1
Total	**134.48**	**2.82**	**54.66**	**1.12**	**0.18**	**24.45**	**6.96**	**0.31**	**9.94**	**49.51**	**18.84**	**303.27**			

* Calculated in NetSTORM using 56 years of climate data from Newark, NJ.

Summary
Construction, operation and maintenance of proposed Route 92 would result in the generation of stormwater runoff from the road surface into receiving surface waters. It is likely that this stormwater runoff would carry with it most or all of the pollution described above. Implementation of stormwater management practices will be required along the length of proposed Route 92 to mitigate potential water quality impacts, and as surface water flows downstream through wetlands, watercourses and floodplains, it would be further filtered by plants, and by microorganisms present in the soil and water that are capable of breaking down pollutants. In addition to pollution carried by stormwater runoff, pollution of surface and groundwater resources by other means is possible. During highway construction and operation, accidental spills of fuel products and toxic materials would be possible. Liquid hazardous material spilled on proposed Route 92 would flow to a stormwater detention basin, from which it could be pumped into a recovery truck.

Refer to Section 5.3.3 and the Engineer's Reports in Appendix E for details on the proposed stormwater best management practices.

4.2.3.2 Groundwater

4.2.3.2.1 Aquifers/Aquifer Recharge in Project Area
The construction of the proposed Route 92 project would generate stormwater runoff containing various pollutants as described in Section 4.2.3.1.3. These pollutants include nutrients, petroleum hydrocarbons, sediments, floatables, pathogens, pesticides, metals, and road salts. The likelihood of these pollutants entering the groundwater table is dependent upon the permeability and structure of the overlying soils. As described in Section 3.3.2.1, most of the Proposed Route 92 Corridor is characterized by a moderate vulnerability to groundwater contamination resulting from moderate transmissivity rates. No soils in the Proposed Route 92 Corridor are designated as hydrologic group A, defined as soils with a high rate of water transmission. All of the soils in the Proposed Route 92 Corridor are hydrologic group B, C or D, representing moderate, slow and very slow rates of water transmission, respectively. Due to the lack of soils with high transmission rates, infiltration of contaminated stormwater runoff generated by proposed Route 92 should not pose an adverse threat to groundwater quality. Many pollutants would be taken up by plants, adsorbed by sediments and soil, or broken down by microorganisms in the soil before they reach the groundwater table.

Aquifer recharge is also highly dependent upon the permeability of overlying geologic formations. The more permeable a geologic formation, the greater the recharge to the aquifer. Increased development leads to a decrease in pervious surfaces by the placement of impervious pavement. This results in a reduction of surface area through which aquifer recharge can be conducted. Construction of proposed Route 92 would result in a loss of approximately 147 acres of pervious land, reducing the surface area through which an aquifer can be recharged. The Proposed Route 92 Corridor is largely composed of geologic units characterized by fine sand and silt deposits of medium permeability. The uppermost geologic units in the remainder of the Proposed Route 92

Corridor are characterized by fractured bedrock of low permeability. The proposed Route 92 project could represent a minor impact to aquifer recharge, as there would be a loss of 147 acres of land characterized by medium and slow permeability, although no land characterized by high permeability. However, construction of the proposed stormwater management basins and bioretention swales is expected to mitigate this impact, as they will provide an opportunity for recharge of the stormwater. The 2004 Stormwater Management Rules (N.J.A.C. 7:8-5.4) require that the post-construction groundwater recharge is equal to pre-construction recharge, or that the increase in stormwater runoff volume of the 2-year storm from pre-construction to post-construction is infiltrated.

4.2.3.2.2 Sole Source Aquifers

Much of the project area lies above the Coastal Plain aquifer, which is a sole source aquifer. However, as discussed above, the soils overlying the aquifer have medium to slow permeability; therefore, impacts to the sole source aquifer would not be great. These soils would allow for adsorption and microbiological degradation of pollutants, preventing their infiltration into the aquifer. In addition, the SMBs would enhance percolation of the Route 92 runoff.

4.2.3.2.3 Wells

The proposed Route 92 project has the potential to affect up to 140 wells located within the Proposed Route 92 Corridor, as revealed by a well search completed in October 2002. Of these, 69 are owned by NJTA. The remaining 71 wells are private, industrial, and testing wells. Many of these would likely not be affected, since construction would not necessarily extend the entire width of the defined Proposed Route 92 Corridor. If any wells were displaced or otherwise affected by construction of proposed Route 92, relocation of these wells would be required as part of the applicant's mitigation measures.

4.2.3.3 Water Supply

4.2.3.3.1 Public Water Supply

As no active water supply wells are located within the Proposed Route 92 Corridor, construction of proposed Route 92 would not directly impact the public water supply. The sole public water supply well located within the Proposed Route 92 Corridor is neither in use nor expected to be used in the future (refer to Section 3.3.3).

4.2.3.3.2 Private Water Supply Wells

A total of 27 domestic wells were identified within the Proposed Route 92 Corridor during the well search completed in October 2002. It is likely that not all of these wells would suffer direct impact, as construction would not necessarily extend the entire width of the defined corridor. If any domestic wells were impacted by the construction of proposed Route 92, they would be relocated to ensure a safe and plentiful supply of drinking water.

4.2.3.4 Wetlands

The existing wetland conditions have been described in Section 3.3.4. The functions and values of the major wetland systems, as assessed in prior environmental studies for the project, are presented in the wetland conditions and summarized in Table 4-9. The wetlands assessment evaluated the functions/values of the three major wetland systems present in the project corridor. The major wetland systems in the study area are depicted in Figure 3-9. The wetland descriptions further divided those systems into seven wetland units along the project corridor, as shown in Figure 3-11. The correlation of the three major wetland systems to seven wetland units is presented in Table 4-9. The seven wetland units are used to report wetland impacts for the purposes of this assessment. The seven wetland units comprise many smaller wetland areas (Harris, 1999a; 1999b).

The proposed Route 92 project would result in permanent filling of 11.58 acres of wetlands and 0.45 acres of open water. The project would also create permanent shading impacts to 1.16 acres of wetlands. In addition, the project would result in temporary alteration of 2.87 acres of wetlands and 0.05 acres of open water. Impacts to wetlands outside the immediate construction area can be avoided by building temporary construction roads within the right-of-way, parallel to the road being constructed, rather than building perpendicular access roads from points outside the right-of-way. If proposed Route 92 is built, more than 1,600 acres of wetlands would remain in the vicinity of the highway.

Because none of the potential vernal pools identified in the study area are situated within the proposed Route 92 right-of-way, the identified vernal pools would not be impacted by the proposed project.

A summary of wetland impacts by wetland type is presented in Table 4-10. The majority of wetland fill would occur in the Devil's Brook wetland complex. This impact is approximately 9.15 acres (76.1 percent) of the total proposed fill area. In addition, vegetation removal for the construction of bridge spans would be required in areas where no fill is proposed. The area of forest that would have to be cleared is approximately equal to the sum of the 1.58-acre temporary impact to PFO1 forested wetlands and the 1.16-acre permanent shading impact to PFO1 forested wetlands shown in Table 4-10, a total of 2.74 acres.

Although the forested vegetation would be removed in some areas, existing hydrology would be maintained as a consequence of the two bridge structures (i.e., the 525-foot bridge over the Devil's Brook floodway and the 520-foot bridge over the Amtrak Northeast Corridor). Wetland hydrology and wetland soils should not be significantly disturbed in this area. However, the bridge structures would result in the shading of 1.16 acres beneath the structures. The existing forested vegetation would not be able to reestablish itself under the bridges. It is anticipated that shorter, more shade-tolerant wetland plant species would be able to grow under the bridges near the openings on each side.

Table 4-9
Summary of FHWA Wetland Functional Assessment

Wetland System	Ground Water Recharge	Ground Water Discharge	Flood Storage	Sediment Trapping	Shoreline Anchoring	Nutrient Retention	Basin Food Chain Support	Aquatic Diversity/ Abundance	Wildlife Diversity/ Abundance	Recreation
Rte 130 – NJT (Wetland Unit #1)	High	Low	Low	Moderate	Moderate	High	Low	Low	Low	Low
Perrine Rd. – Rte 130 (Units 2 – 6)	High	Moderate	High	Moderate	High	High (Long Term & Seasonal)	Moderate to Low	High (Warm Water Fishery) Low (Cold Water Fishery)	Moderate to Low	Moderate to Low
Rte 1 – Perrine Rd. (Unit 7)	High	Moderate	High	High	Moderate	High (Long Term & Seasonal)	Low	Low	Low	Moderate

Note: The previously reported assessments did not consistently follow FHWA terminology; therefore, this table presents reported criteria and assigns results to the criteria as appropriate.

Table 4-10
Summary of Wetland Impacts

Wetland Type	Temporary Wetland Impacts	Permanent Wetland Impacts	
		Impact by Filling (acres)	Impact by Shading (acres)
PFO1	1.58	7.42	1.16
PEM	0.63	1.54	0
PSS1	0.66	2.62	0
Open Water	0.05	0.45	0
Total Impacts	**2.92**	**12.03**	**1.16**

Table 4-9 shows that the Broadway Swamp (wetland units 2 through 6) is generally rated high for wetland functions associated with hydrology—groundwater recharge, flood storage, shoreline anchoring, and warm water fisheries. Broadway Swamp is rated as moderate for groundwater discharge and sediment trapping, and moderate to low for the remainder of the functions – in basin food chain support, wildlife diversity/abundance and recreation. The wetland to the east (wetland unit 1) is rated high for groundwater recharge and nutrient retention, but low for all other functions except sediment trapping and shoreline anchoring, which are rated as moderate. Similarly, wetlands at the western end of the corridor (wetland unit 7) are rated lower than the Broadway Swamp. The eastern and western ends are currently developed, thus diminishing the functional value of wetland in those areas. The central portion of the corridor supports mostly agricultural and low-density residential development, which have lower impact on the adjacent wetland resources and result in higher functional value.

Although soils in the project study area generally have medium to low permeability, the wetlands are rated high for groundwater recharge. Because the wetlands are low, flat and shaded, surface water remains in place for extended periods, potentially facilitating aquifer recharge despite low soil permeability. The actual rate of aquifer recharge has not been determined.

4.2.3.5 Fish and Wildlife

4.2.3.5.1 Endangered and Threatened Species

According to NJDEP, the New Jersey Landscape Project classifies McCormack Lake and an area up to 590-feet-wide around the lake as foraging habitat for a pair of bald eagles. The bald eagle is federally listed as a threatened species. The NJDEP Division of Fish and Wildlife reports that this pair of bald eagles has established a nest near Carnegie Lake. Carnegie Lake is on the border of Plainsboro and Princeton, approximately 3 miles southwest of the closest part of the proposed Route 92 right-of-way. McCormack Lake is approximately 900 feet south of the proposed right-of-way, on the same side of the right-of-way as Carnegie Lake.

The Landscape Project maps bald eagle foraging habitat using a model based on the location of all known bald eagle nests. To run the model, all water bodies from the NJDEP Land Use/Land Cover database having an area greater than 19.8 acres (8 hectares) are included. A radius around the nest is incrementally increased, one cell (16.4 feet or 5 meters) at a time, until an area of 2.6 square miles (660 hectares) of open water has been identified. All emergent wetland patches within 295 feet (90 meters) of the identified water body are selected. The emergent wetland patches are merged with the open water area. A 295-foot (90-meter) buffer is added to the combined water/emergent wetland area to protect perching sites. Therefore, the foraging habitat as modeled extends a maximum of 590 feet from a water body.

The eagle nest is in an area already subject to disturbance from nearby housing developments and traffic on US Route 1 and other roads. The closest point on Carnegie Lake is approximately 3 miles from McCormack Lake. McCormack Lake and its adjacent emergent wetlands are approximately 900 feet south of the proposed Route 92 right-of-way. This is approximately 310 feet beyond the maximum 590-foot foraging area delineated by the NJDEP model.

Proposed Route 92 would not impact any open water areas greater than 19.8 acres (8 hectares), nor would it impact any emergent wetlands adjacent to McCormack Lake. Based on the distance between the McCormack Lake foraging area and proposed Route 92 and the lack of impact to open water or emergent wetlands in the vicinity of McCormack Lake, it is not anticipated that proposed Route 92 would adversely affect this bald eagle nesting pair or its foraging habitat.

As stated in Section 3.3.5.2, according to the United States Fish and Wildlife Service (USFWS) the area near the Proposed Route 92 Corridor potentially contains habitat for the federally listed threatened bog turtle. Field surveys performed specifically for this species within the project corridor did not reveal any suitable habitat.

Several field surveys were previously conducted to confirm the presence or absence of individual threatened or rare plant species within the proposed right-of-way. The surveys revealed that the state-endangered plant, southern arrowhead, was present in seven locations along the ROW. However, only three stands were located within the expected limit of disturbance. The proposed Route 92 project would impact approximately 25 percent of the known southern arrowhead population situated within the Devil's Brook study area identified in the USACE Section 404 Permit Application (Harris, 1999). The estimate that 25 percent of the southern arrowhead plants would be impacted by proposed Route 92 is based on detailed mapping of existing southern arrowhead plants and the proposed highway.

The observed population of southern arrowhead extends from approximately 600 feet north of the proposed ROW at Devil's Brook, south to McCormack Lake. The spanning of the entire Devil's Brook floodway by a 525-foot bridge would reduce impacts to this population. Because southern arrowhead propagates by both seed and rhizome, both

present in the Devil's Brook floodplain, and there is significant acreage of suitable habitat for this plant outside of the proposed ROW, the construction of proposed Route 92 should not jeopardize the continuation of this population. Refer to Section 5.3.6 for proposed southern arrowhead mitigation.

Surveys were also conducted for Species of Concern (SOC) as identified by the New Jersey Division of Fish, Game and Wildlife (NJFGW). Although some of the SOC are not present within the project area due to lack of suitable habitat, some SOC might utilize habitat within the project area.

4.2.3.5.2 Critical Habitat

No critical habitats for threatened or endangered species have been designated within the Proposed Route 92 Corridor (refer to Section 3.3.5.2); therefore, the proposed Route 92 project would not result in impacts to designated critical habitats.

4.2.3.5.3 Other Wildlife Habitat

Evaluation of Impacts to Habitats Identified Along the Proposed Route 92 Corridor

Based on sizes of forest and grassland habitats, several areas have been identified as important natural habitats along the proposed Route 92 project (refer to Section 3.3.5.3). Two important forested habitats are located east of the Amtrak Northeast Corridor. Both areas are fairly wide forest corridors connecting larger forests found to the north and south of the Proposed Route 92 corridor. These tracts provide secluded travel corridor habitat as well as limited interior forest habitat. Two tracts of grasslands along the highway corridor are ranked as marginal and suitable. The marginal grassland habitat is an approximately 8.5-acre early successional field west of the railroad tracks. The complex of agricultural fields, ranked as suitable grassland habitat, between the power line easement and railroad tracks is greater than 25 acres within the Proposed Route 92 Corridor. Contiguous fields to the south increase the effective size of this grassland mosaic.

Target species used to assess anticipated habitat impacts resulting from the proposed construction of proposed Route 92 are a subset of the species of concern with habitat ratings of 3 (potential habitat) as identified in Table 3-8, as well as mammals anticipated to use the wetland forests along Devil's Brook. The subset of species selected from Table 3-8 includes only those species that are expected to be present based on the previous field efforts conducted by ASGECI and the ERI of the Turkey Island Corporation property (Fishback, 1994). The list of species, along with the range of territory/home range size for each (as reported in DeGraaf and Rudis (1986), except savannah sparrow and bobolink), includes:

Birds:
Cooper's Hawk (45–1300 ac)
Savannah Sparrow (20–40 ac)
Bobolink (5-10 ac)

Mammals:
Raccoon (180–1500 ac)
Eastern Cottontail (0.5–40 ac)
Red Fox (140–400 ac)
White-Tailed Deer (40–300 ac)

The mammals selected for this assessment are species that are common to the area as well as species that can utilize a variety of habitats, both upland and wetland. The study area includes forested wetlands and a variety of upland habitats. The mammals listed above have been documented to occur in red maple swamps, but are primarily facultative wetland species (Golet et al., 1993); they are primarily upland species that will utilize wetland habitats. Golet et al. (1993) report that red maple swamps have become important habitats for deer as these habitats provide refuge in developed areas and protection from predators and humans. Wetlands along watercourses offer travel corridor habitat to deer as well as other large mammals.

The approximate acreage of upland vegetation that lies within the proposed Route 92 right-of-way is as follows (Harris, 1999c):

Forest	100 acres
Agricultural	195 acres
Non-Farm Field	29 acres
Shrub-Scrub/Successional	36 acres
Total	**360 acres**

The proposed Route 92 project has the potential to disturb the sum of upland vegetation listed above, if the entire right-of-way is developed.

Forest Habitat Impacts
The upland and wetland forests associated with Broadway Swamp and the Devil's Brook watershed are currently split into two lobes by the upland that flanks Friendship Road. The central portion of proposed Route 92 would be constructed on this section of upland, most of which is not currently forested.

Proposed Route 92 is designed to avoid wetlands to the maximum extent possible. However, the bridges over Devil's Brook and the Amtrak Northeast Corridor would cause minor forest habitat impacts. The construction of proposed Route 92 in the Devil's Brook area would require clearing of forested land in the path of the highway. Therefore, birds may perceive the forests north and south of the bridge as two distinct woodlots instead of a single forested tract.

The forest remaining immediately south of the alignment and to the northeast of McCormack Lake would be approximately 50 acres and the forest to the northwest of McCormack Lake would be approximately 35 acres south of the proposed highway. The northerly parts of these finger-like forest tracts would remain contiguous to the 1150-acre forest complex to the north. Neotropical birds could be adversely affected by the fragmentation in this immediate area. However, an additional 500 acres of forest would remain further south, along Devil's Brook. If Broadway Swamp is included, a minimum of 2400 acres of forested land will remain south of proposed Route 92.

The southern portions of these woodlands, in their entirety, meet the minimum territory/home ranges for the majority of forest species identified above. Raccoon is

reported to have a large home range (DeGraaf and Rudis, 1986); however raccoon habitat includes a complex of woods, fields and watercourses, not usually dense woodland. In addition, they are adapted to living in close proximity to human development. Red fox also is reported to utilize extensive areas for its home range. Again, fox habitat includes a complex of forest and open areas, preferring field/forest edges. Fox typically avoid dense woods and open fields. Cooper's hawk may be present within the study area. Its habitat is described as mixed deciduous forest and scattered woodlots interspersed with open fields. Utilizing more agricultural land has broadened Cooper's hawk habitat. Sufficient habitat also would likely remain within the project vicinity should this species be present in the area.

Due to the existing edges to the east and west, and the proposed new edge to the north, the total interior forest habitat of the two forest tracts south of proposed Route 92 would be less than their total area of 85 acres. These tracts, however, would continue to provide their principal habitat function of secluded travel corridor habitat, connecting the forests to the north of the alignment to the forest, lake and grassland habitats to the south.

Grassland Habitat Impacts
The two tracts of grassland along the highway corridor that are ranked as marginal and suitable are the early successional field of approximately 8.5 acres west of the Amtrak Northeast Corridor (marginal), and the large complex of agricultural fields between the power line easement and Amtrak Northeast Corridor (greater than 25 acres) with additional contiguous fields to the south.

The early successional field west of the Amtrak Northeast Corridor may provide suitable habitat for bobolink but is too small for most other grassland birds. The proposed highway would follow along the south margin of this old field, with minimal effect to its size. Therefore, based on area this old field could continue to provide suitable bobolink habitat. The proposed highway alignment would cross the northern portion of the large complex of old fields and agricultural lands east of McCormack Lake. Approximately 20 acres of field habitat would remain north of the proposed highway alignment, while a large contiguous complex of fields (approximately 200 acres) would remain intact south of the highway alignment. The northern fragment of approximately 20 acres would be too small for species such as savannah sparrow, but could provide habitat for bobolink. The large expanse of fields south of the proposed alignment would continue to provide suitable habitat for a wide variety of grassland birds that require extensive grassland habitat.

In summary, implementation of the proposed Route 92 project would reduce the usable habitat within the Proposed Route 92 Corridor. Some interior forest habitat would be lost; however, connection of the forest to the north with the forest, lake and grassland in the south would continue to exist. The post-development grassland habitat should continue to provide suitable habitat for a variety of bird species.

4.2.4 Farmland

The proposed Route 92 roadway and associated interchanges would displace approximately 210 acres of active agricultural land. In addition, the proposed roadway would interfere with access to an additional 78 acres of agricultural land. None of the agricultural land that would be displaced or made inaccessible is in an agricultural development area (ADA), and none of the land is subject to preservation easement under the New Jersey Farmland Preservation Program.

4.2.5 Historic and Cultural Resources

4.2.5.1 Impacts to Historic Sites

Hunter Research, Inc. selected five sites in the Project Study Area for Phase I/Phase II cultural resources investigation (Hunter, 1996). These were the Major-Mount farmstead, the Van Pelt-Clark farmstead, the Boyko prehistoric site, the Ayres-Lane farmstead, and the Dey-Bayles farmstead. Architectural evaluations were performed at the four historic sites (farmsteads), and included all structures, including outbuildings. In addition, archeological field investigations were performed at the Boyko site, the Van Pelt-Clark farmstead, and the Ayres-Lane farmstead. The goal of this study was to offer an opinion as to which sites were eligible for listing on the National Register of Historic Places, and to determine the impacts of the proposed project to those sites.

With respect to the Ayres-Lane farmstead, Hunter stated that although the house retained some historic integrity, the building's extremely deteriorated condition greatly diminished its architectural significance. Hunter observed that the property has no outstanding historical associations and is an unexceptional example of traditional building practice in central New Jersey in the early-to-mid 19th century. Hunter also believed the archaeological research potential of the Ayres-Lane farmstead had been "suitably exhausted" by the Phase I and II surveys already completed. Hunter concluded that the property did not meet the criteria for inclusion in the National Register of Historic Places. Richard Grubb & Associates concurred with this conclusion in 2002.

The study concluded that the Major-Mount House, Van Pelt-Clark Farmstead, and the Dey-Bayles House were eligible for listing on the National Register on historic architectural grounds. Of these, proposed Route 92 was judged to have adverse impacts to the Van Pelt-Clark Farmstead and the Dey-Bayles House.

In 2002 Richard Grubb & Associates, Inc. conducted a cultural resources assessment for proposed Route 92. Grubb found that the Van Pelt-Clark House had been destroyed by fire in 2001 and that the Dey-Bayles House also no longer exists (Grubb, 2003).

Grubb concluded that an existing house not identified in previous cultural resources investigations, the Crespo House at 96 Perrine Road, is eligible for listing in the National Register of Historic Places. Grubb further concluded, however, that proposed Route 92 would have no impact on the Crespo House. Relocated Perrine Road would pass

approximately 800 feet south of the Crespo House, beyond the area of anticipated audible, visual or atmospheric effects. (Grubb, 2003)

The overall conclusion of the Richard Grubb & Associates cultural resources assessment is that no historic architectural properties would be affected by proposed Route 92, and that there is a low probability that proposed Route 92 would affect archaeological or historic properties (Grubb, 2003).

A draft *New Jersey Historic Roads Study* (Kise Straw & Kolodner 2001) has identified most of US Route 1 between Trenton and New Brunswick, known historically as the Trenton and New Brunswick Straight Line Turnpike, as potentially eligible for listing in the National Register of Historic Places. The interchange between US Route 1 and proposed Route 92 would fall along this stretch of US Route 1. Construction of the interchange would not change the historic alignment of the primary roadway of US Route 1, but would alter the character of the roadway at the new interchange. Grubb recommends that the existing integrity of the roadway be assessed to determine its eligibility for inclusion in the National Register.

4.2.5.2 Impacts to Historic Districts

Proposed Route 92 would not pass through any historic districts. Traffic modeling indicates that implementation of Route 92 would reduce traffic in the Cranbury Village Historic District relative to the no-action alternative, especially in the peak morning hour, and would have little impact on overall traffic in the Kingston Historic District, but would slightly increase truck traffic in the Kingston Historic District. Additional information regarding Kingston is provided in Section 4.2.1.3.

4.2.5.3 Section 106 Compliance

The proposed Route 92 project has been reviewed by the Historic Preservation Office of NJDEP pursuant to Section 106 of the National Historic Preservation Act (NHPA) of 1966, as amended. In a letter to NJTA dated December 11, 1996, NJDEP stated that no archaeological resources have been identified within the area of potential impacts, and that the proposed project could adversely impact two historic architectural properties, the Van Pelt-Clark House and the Dey-Bayles House. As noted above, the cultural resources assessment conducted by Richard Grubb & Associates in 2002 found that these two houses no longer exist.

4.2.6 Air Quality

The emissions loading data in Table 4-3 reveal that VOC, CO, and NO_x loadings would decrease under all 2028 scenarios relative to the Existing Year scenario of 2001. This is because federally mandated reductions in motor vehicle emissions are expected to outweigh increases in traffic. With proposed Route 92, VOC emissions from vehicles would decrease by approximately 70 percent, compared to 67 percent in the No Action scenario. Reductions of CO emissions would also be slightly larger with Route 92 than without it. All of the 2028 alternatives produce an 88 percent reduction of NO_x loadings.

Based on the above information, the Route 92 scenario would meet EPA's conformity regulations.

The proposed Route 92 project conforms to the New Jersey State Implementation Plan (SIP). As required under 40 CFR Part 93, a transportation conformity analysis was performed for this project. As part of the conformity analysis, a regional emission reduction test (40 CFR 93.119) was completed for the project. Carbon monoxide (CO), nitrogen oxide (NOx) and volatile organic compounds (VOCs) emissions were included in the emission reduction test. Although vehicle miles traveled (VMT) increase from 2001 to 2028, the proposed Route 92 in 2028 would have a one percent reduction in vehicle miles traveled (VMT) compared to the 2028 No-Action alternative. This reduction in VMT and improvement in travel speeds correlates to VOC and CO emissions reductions of 13.1 and 14.1, respectively, with no reduction in NOx emissions. However, the emissions reduction test procedures require comparing the alternatives to existing (2001) pollutant levels. This comparison shows a 70, 35 and 88 percent reduction of VOCs, CO and NOx emissions, respectively for proposed Route 92, when compared to 2001 conditions. Since air quality modeling shows that pollutant emissions would be reduced, the proposed roadway would conform to the State's SIP.

4.2.6.1 CAL3QHC Modeling

A CO "hot-spot" analysis was performed for the Horizon Year (2028) No Action and Build scenarios for the four worst-case intersections within the Proposed Route 92 traffic network area. The input parameters used in these analyses can be found in Appendix B. A surface roughness coefficient of 108 cm was used to represent the surrounding land use. In addition, the Project Study Area was determined to be more rural than urban; therefore, stability class E was used to represent atmospheric conditions in the area.

CAL3QHC predicted worst-case one-hour average CO concentrations for the Horizon Year No Action and Proposed Route 92 alternatives. The results were added to ambient CO levels and compared with the National Ambient Air Quality Standards (NAAQS). The one-hour analysis was multiplied by a persistence factor to determine the eight-hour result. A persistence factor of 0.7 is recommended as a conservative conversion from a 1-hour average concentration to an 8-hour average concentration (USEPA, 1992).

Table 4-11 presents the results of the CO microscale analysis for the Horizon Year No Action and Build for the four worst-case intersections. The maximum one-hour CO concentrations ranged from 3.4 ppm at the Kingston Lane/Route 522 intersection to 7.1 ppm at the Route 32/CR 535 intersection for the No Action alternative. The Route 92 alternative produced lesser one-hour CO concentrations at all four intersections with maximum concentrations ranging from 3.0 ppm at the Kingston Lane/Route 522 intersection to 5.1 ppm at the US 130 / Dey Road intersection. The one-hour CO concentrations for each alternative were less than the one-hour NAAQS of 35 ppm.

Maximum 8-hour CO concentrations ranged from 2.4 ppm at the Kingston Lane/Route 522 intersection to 5.0 ppm at the Route 32/CR 535 intersection for the No Action

Table 4-11
CAL3QHC Predicted Maximum CO Concentrations, in ppm

Intersections	1-Hour Average 2028		8-Hour Average 2028		NAAQS	
	No Action	Build	No Action	Build	1 hour	8 hour
Dey Road and CR 535	4.2	3.9	2.9	2.7	35	9
US 130 and Dey Road	5.4	5.1	3.8	3.6	35	9
Kingston Lane /Route 522	3.4	3.0	2.4	2.1	35	9
Route 32 and CR 535	7.1	4.7	5.0	3.3	35	9

alternative. Smaller maximum eight-hour CO concentrations were produced by the Route 92 alternative, ranging from 2.1 ppm at the Kingston Lane/Route 522 intersection to 3.6 ppm at the US 130 / Dey Road intersection for the Route 92 alternative. Both alternatives resulted in eight-hour CO concentrations that were below the NAAQS of 9 ppm.

CAL3QHC output files for each intersection are provided in Appendix B1.

4.2.6.2 Impacts During Construction

Potential air quality impacts from construction of proposed Route 92 include emissions from trucks and construction equipment, and fugitive dust on construction sites. Construction fugitive dust impacts are generally temporary.

USACE is the lead agency on the proposed project; therefore, the General Conformity rule applies to the proposed project. Since the preparation of the DEIS, EPA has designated the New Jersey Air Quality Control Region (AQCR 043), which includes Middlesex County, as an 8-hour moderate ozone nonattainment area and has rescinded the 1-hour severe ozone nonattainment designation. Therefore, under the General Conformity rule, the de-minimis threshold for nitrogen oxides (NO_x) for moderate ozone nonattainment areas is 100 tons per year rather than the 25 tons per year for severe ozone nonattainment areas stated in the DEIS. It is anticipated that the peak year NO_x emissions during construction will be kept below the 100 ton-per-year threshold by requiring NJTA to develop contractor specifications that will require the contractor to implement mitigation measures as described in Section 5.3.11, Air Quality.

Almost all trucks and equipment involved in construction will be diesel-powered. Diesel engines contribute a substantial portion of the NO_x, PM, and, to a lesser extent, hydrocarbon (HC) emissions from mobile sources.

Recently, USEPA promulgated new emissions standards for new on-road (highway) and non-road engine models. These new emissions standards will reduce NO_x, PM and HC emissions up to 90 percent from today's models. On-road emissions standards went

into effect with the 2004 model year, with more stringent standards to begin in 2007. Non-road emissions standards began with the Tier 1 (1994 model year), with Tier 2 emission standards established for 2001-2006 model years and Tier 3 emissions standards established for model year 2007 and beyond. Newer equipment used by contractors constructing proposed Route 92 would have to comply with the new emissions standards. Emission controls for older equipment are addressed in Section 5.3.11.

4.2.7 Transportation

4.2.7.1 Traffic Model

The changes in year 2028 peak-hour traffic flows that would result from the construction of proposed Route 92 were estimated using a detailed "Central Jersey" traffic model developed for this project. This model contains a detailed representation of the entire area from New Jersey Route 18 in the north to Mercer County Route 571 in the south, and from the New Jersey Turnpike and Middlesex County Route 535 on the east to New Jersey Route 27 on the west. It uses 985 zones to represent this area, and 53 "external stations" to represent entry and exit points to/from the area.

The detailed local traffic model is "nested" within the 22-county regional model recently developed for the Penns Neck Improvements EIS. The 22 counties include Bucks, Chester, Delaware, Montgomery and Philadelphia counties in Pennsylvania and all counties in New Jersey except Atlantic, Cape May, Cumberland and Salem. The 22-county regional model provides information relating to the orientation, mode choice, and route usage of relatively long trips. This regional model essentially provides the context within which travel in the Central Jersey study area is modeled.

The chief output of the local model is a set of detailed traffic assignments to the streets and highways of the study area. The local model also contains a comprehensive database of existing and future land use that drives the estimation of trip making in the local area. Both the local and regional models use this land use database.

In the road network, link free-flow speeds and per-lane hourly capacities are assigned based on link facility type. This approach is an efficient one that ensures consistency among links of the same type. For links with a control device (signal, stop or yield sign) at its end, the model adjusts the free-flow speed and per-lane capacity values using intersection delay and capacity calculations based on formulas in the Highway Capacity Manual of the Transportation Research Board. A.M. and P.M. peak-hour traffic counts for the 2000-2002 period were used to calibrate the model.

Peak-hour vehicular zone-to-zone matrices for the Central Jersey area were prepared based on data from the regional and local models. The regional 22-county model was executed to create a set of "subarea" vehicle trip matrices for the area covered by the Central Jersey traffic model. Four vehicle trip matrices (auto home-based work trips, auto home-based non-work trips, auto non-home-based trips, and truck trips) were

generated for each of two time periods: a 2.5-hour morning peak period, and a 3-hour evening peak period.

At the same time, standard ITE vehicle trip generation rates were applied to the detailed Central Jersey area land use inventory to estimate the number of vehicles entering and leaving each Central Jersey model zone during the A.M. and P.M. peak hours. This information was used to derive factors that were used to allocate the trips in the subarea matrices from the zones in the regional model to the much more detailed Central Jersey model zones. The resulting trip tables were then factored to ensure that the number of autos entering and leaving each zone agreed with the numbers obtained using the ITE rates, to convert from peak periods to peak hours, and to obtain the proper balance between internal and external trip-ends. The Central Jersey trip tables resulting from this factoring process were then further adjusted to achieve better agreement with the counted peak-hour traffic volumes.

An iterative process was used to "assign" peak-hour auto and truck trips to the road network. Each traffic assignment consisted of ten iterations of capacity restraint, starting with the free-flow link speeds on the first iteration. Ten percent of the trips were assigned for each iteration. The assignment process is explained further in part A.5 of Appendix C.

In the assignment process, the effect of Turnpike tolls was accounted for using the same method employed in the regional model. Representative auto and truck toll amounts were used for each Turnpike segment, and these amounts were translated into equivalent quantities of time, based on assumed representative time/cost trade-off rates (values of time) for autos and for trucks.

The effect of the toll on diversion of traffic from local roads to proposed Route 92 was accounted for in the traffic model by converting the toll into an equivalent time penalty, based on a value of time of $16/hour for cars and $42/hour for trucks. This is the same procedure that was used in the regional traffic model for the Penns Neck EIS, and has been validated against usage of the Turnpike by both autos and trucks.

The model was validated for year 2001 traffic conditions. For the 2001 base year, the total assigned traffic volumes on links with counts were very close to the counted volumes. In addition, "goodness of fit" statistics generated from the 2001 assignments are in general agreement (and in some cases substantially better) than FHWA standards.

For all future year (2028) model runs, all funded highway improvement projects in this area were added to the network. Displays of the model outputs are included in Appendix C.

For more detailed information regarding this traffic model, please refer to Appendix C of this EIS.

4.2.7.2 Projected Performance in Meeting Project Purpose

The model indicates that the construction of Route 92 would substantially meet the purpose of this project as stated in Section 1 (Project Purpose and Need):

Improve regional mobility, especially east-west mobility, for the central New Jersey area in and around southwestern Middlesex County and northeastern Mercer County.

The construction of proposed Route 92 is expected to reduce the amount of peak-hour through traffic on the local and secondary east-west roads crossing the screenline defined in Section 1 by 18 percent in 2028, as compared with the No Action alternative. As shown in Table 4-12, through traffic may decrease by more than 60 percent on several of these roads.

Table 4-12

Projected 2028 Total Daily Peak-Hour Through-Traffic Volumes (A.M. + P.M.)
Proposed Route 92 vs. No Action

Screenline Crossing	NO ACTION	NJTA ROUTE 92	PERCENT CHANGE
CR-610 (Deans Ln)	1,384	1,322	-5%
Major Road	265	101	-62%
CR-522	208	78	-63%
New Road	179	180	1%
Dey Road	890	317	-64%
Plainsboro Road	835	423	-49%
Cranbury Neck Road	886	646	-27%
CR-535	1,301	1,482	14%
CR-571	2,212	1,973	-11%
Dutch Neck Road	20	18	-9%
Hankins Road	1,938	1,793	-7%
Total	**10,117**	**8,334**	**-18%**

Figures 4-2 and 4-3 display the projected changes in 2028 peak-hour traffic volumes in the Traffic Study Area that would result from the construction of proposed Route 92. In these figures, red bars indicate roadways where peak-hour traffic volumes are expected to increase, and green bars indicate roadways where peak-hour traffic volumes are expected to decrease. The thickness of the bars indicates the magnitude of the peak-hour traffic volume change predicted by the model.

The traffic model indicates that construction of Route 92 would result in substantial reductions in peak-hour traffic volumes on the local and secondary east-west roads in the Traffic Study Area west of the New Jersey Turnpike, including roads in the sensitive

Figure 4-2

2028 A.M.

Peak Hour Traffic Changes

Route 92 vs. No Action

US Army Corps of Engineers

Proposed Route 92

Environmental Impact Statement

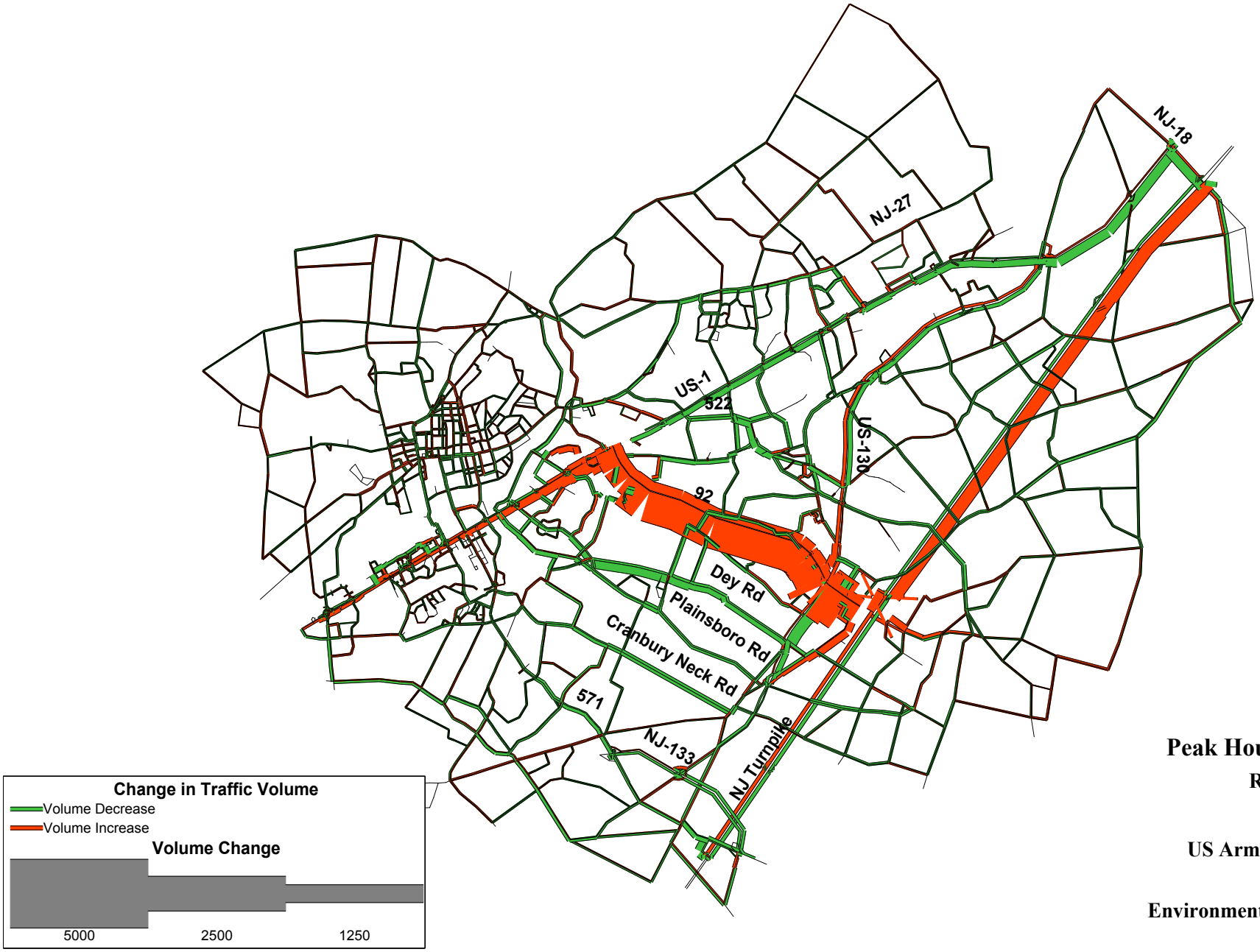


Figure 4-3

2028 P.M.

Peak Hour Traffic Changes

Route 92 vs. No Action

US Army Corps of Engineers

Proposed Route 92

Environmental Impact Statement

areas listed in Section 1 (Plainsboro Center, South Brunswick Center, and Princeton Junction Center), as well as along Route 27 in Kingston. East of the New Jersey Turnpike, traffic would generally be somewhat lighter with Route 92 than with the No Action alternative. As shown on figures 4-2 and 4-3, traffic is projected to increase significantly on a 1.5-mile section of Forsgate Drive between New Jersey Turnpike Interchange 8A and Half Acre Road in Jamesburg. Most of this section of Forsgate Drive is a four-lane divided arterial road that can handle additional traffic. A 0.5-mile section just west of Half Acre Road is a two-lane road. Traffic modeling indicates that without proposed Route 92, westbound traffic will back up on the two-lane section of Forsgate Drive in the peak morning hour, and that eastbound traffic will back up at the transition from the four-lane section to the two-lane section during the peak evening hour. The traffic model indicates that proposed Route 92 would exacerbate the morning backup on the two-lane section of Forsgate Drive but would have little effect on the evening backup at the transition point.

In addition to reducing peak-hour traffic levels on the existing east-west roads in the Traffic Study Area, the model indicates that proposed Route 92 would generally reduce peak-hour traffic volumes along the most constricted portion of US Route 1 in South Brunswick and North Brunswick. This would result from the rerouting of longer-distance north-south trips to US Route 130 and the New Jersey Turnpike, via Route 92.

Figures 4-4 and 4-5 display the projected changes in 2028 peak-hour truck volumes in the Traffic Study Area that would result from the construction of proposed Route 92. In these figures, red bars indicate roadways where peak-hour *truck* volumes are expected to increase, and green bars indicate roadways where peak-hour *truck* volumes are expected to decrease. The thickness of the bars indicates the magnitude of the model-projected changes in peak-hour *truck* volumes. The model indicates that the construction of Route 92 would result in substantial reductions in peak-hour truck volumes on the local and secondary east-west roads in the Traffic Study Area and along NJ Route 27 in Kingston, but would increase truck traffic on Ridge Road/Heathcote Road between US Route 1 and Route 27. Mitigation for Ridge Road/Heathcote Road is proposed in Section 5.3.10.

Peak-hour truck volumes on the local and secondary east-west roads are expected to drop by 17 percent, as compared with the No Action scenario, as shown in Table 4-13. On Dey Road and Plainsboro Road, truck volumes are expected to be reduced by about 85 percent and 50 percent, respectively. These reductions are predicted despite the expected imposition of tolls on trucks using proposed Route 92.

As discussed in Section 3.7, severe peak-hour congestion is expected to occur in the Traffic Study Area, due to the large amount of development expected over the next 25 years, particularly in Plainsboro and West Windsor. While it is not specifically the purpose of the proposed Route 92 project to accommodate this development, the construction of proposed Route 92 would help to ameliorate the traffic impacts of this development. This positive impact is described below in several ways.

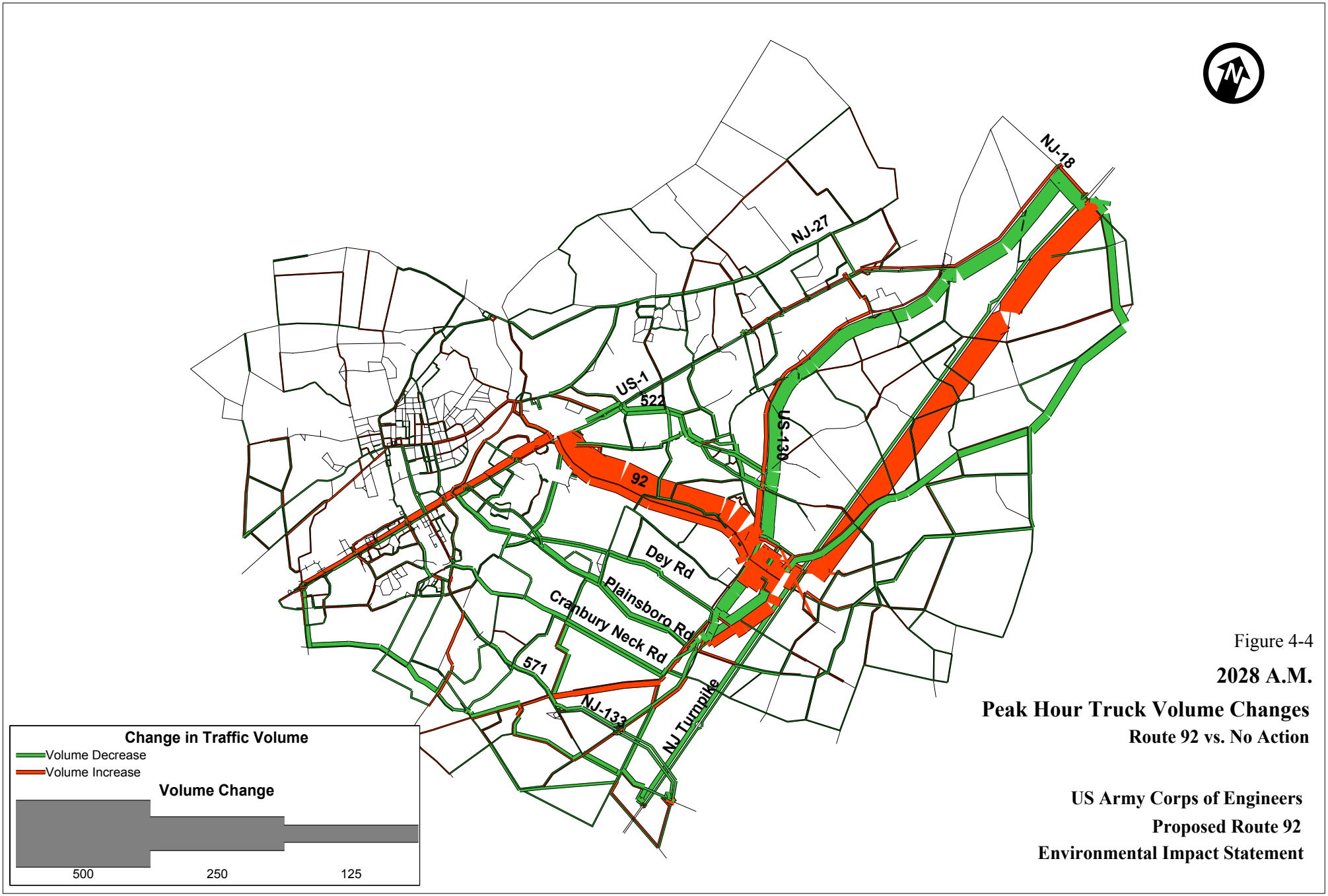


Figure 4-4

2028 A.M.

Peak Hour Truck Volume Changes

Route 92 vs. No Action

US Army Corps of Engineers

Proposed Route 92

Environmental Impact Statement

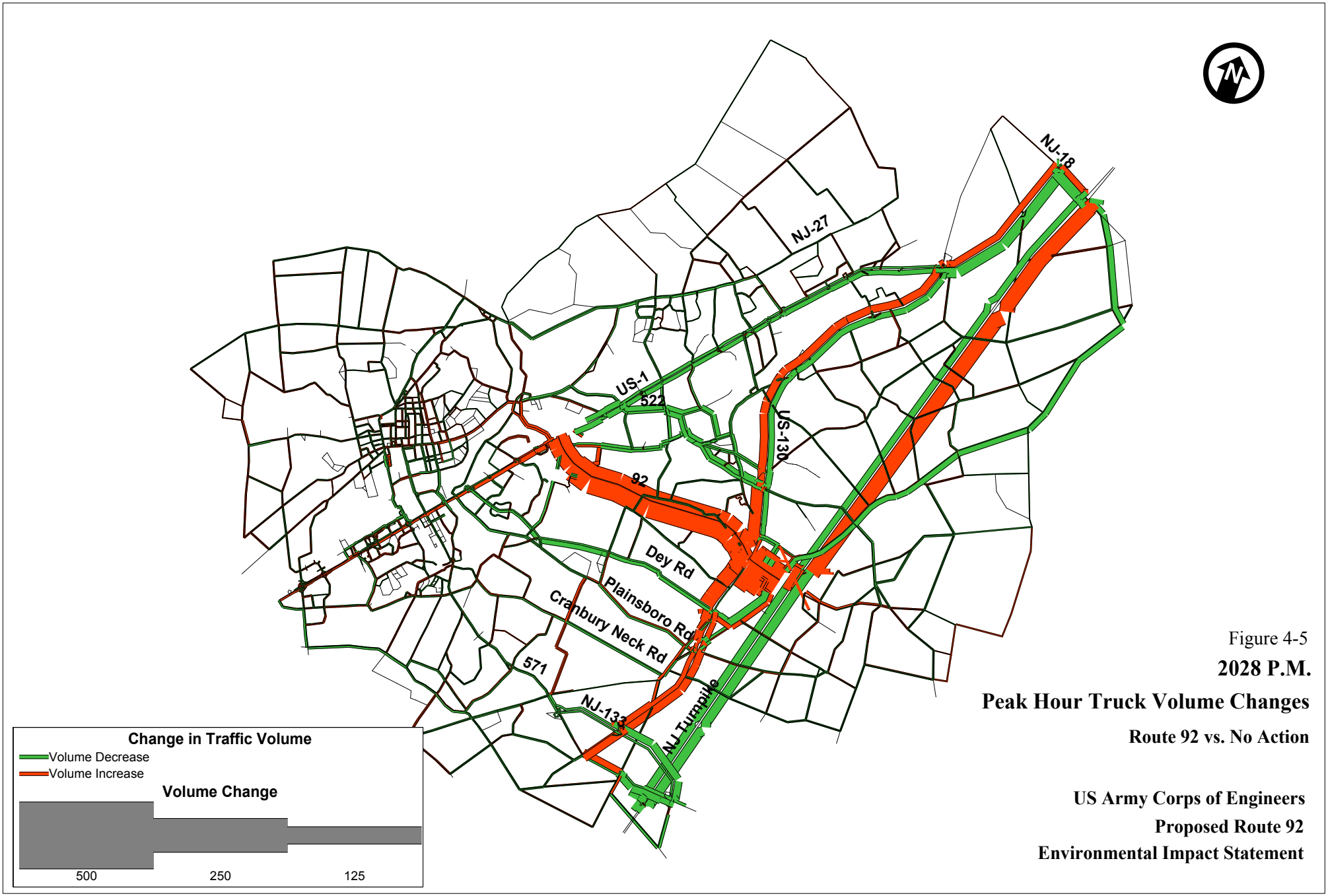


Figure 4-5

2028 P.M.

Peak Hour Truck Volume Changes

Route 92 vs. No Action

US Army Corps of Engineers
Proposed Route 92
Environmental Impact Statement

Table 4-13
Projected 2028 Total Daily Peak Hour Truck Volumes (A.M. + P.M.)
Proposed Route 92 vs. No Action

Screenline Crossing	**NO ACTION**	**NJTA ROUTE 92**	**PERCENT CHANGE**
CR-610 (Deans Ln)	101	48	-52%
Major Road	69	24	-66%
CR-522	203	92	-55%
New Road	13	6	-55%
Dey Road	79	14	-83%
Plainsboro Road	79	39	-51%
Cranbury Neck Road	131	98	-26%
CR-535	525	561	7%
CR-571	403	448	11%
Dutch Neck Road	449	436	-3%
Hankins Road	291	176	-40%
Total	**2,343**	**1,940**	**-17%**

Figures 4-6 and 4-7 depict the projected 2028 peak-hour traffic flows and congestion levels in the Traffic Study Area with the construction of proposed Route 92. In these figures, bars of different colors indicate projected levels of congestion, expressed as ranges of peak-hour volume to roadway capacity ratios. The thickness of the bars indicates the model-projected peak-hour traffic volume. By comparing these figures with the corresponding figures for the No Action alternative shown in Section 3.7, it can be seen that several roadway sections in the study area are predicted to be less congested if Route 92 is built.

Another way to present this information is shown in the following table:

Additional Lanes Needed	Miles of Roadway	
	No Action	With 92
1	413.8	380.5
2	60.3	48.9
3	1.3	0.4
4	0.3	0.3
TOTAL	475.7	430.2

Out of a total of 1,253 miles of roadways (counting each direction as a separate roadway) represented in the Traffic Study Area model, 476 miles are predicted to operate at sub-standard conditions (volume-to-capacity ratio of greater than 0.9) during at least one of

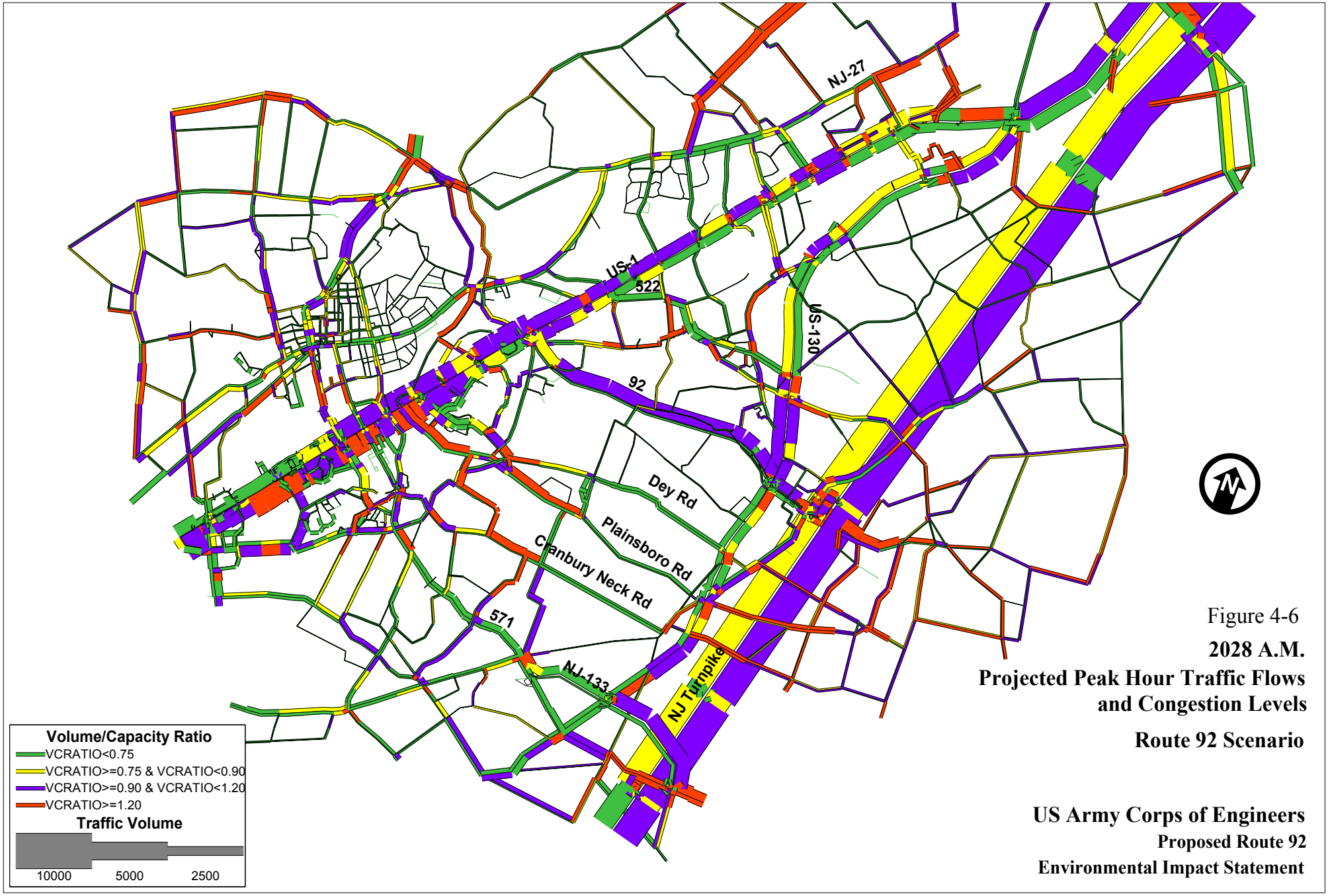


Figure 4-6

2028 A.M.

Projected Peak Hour Traffic Flows and Congestion Levels

Route 92 Scenario

US Army Corps of Engineers

Proposed Route 92

Environmental Impact Statement

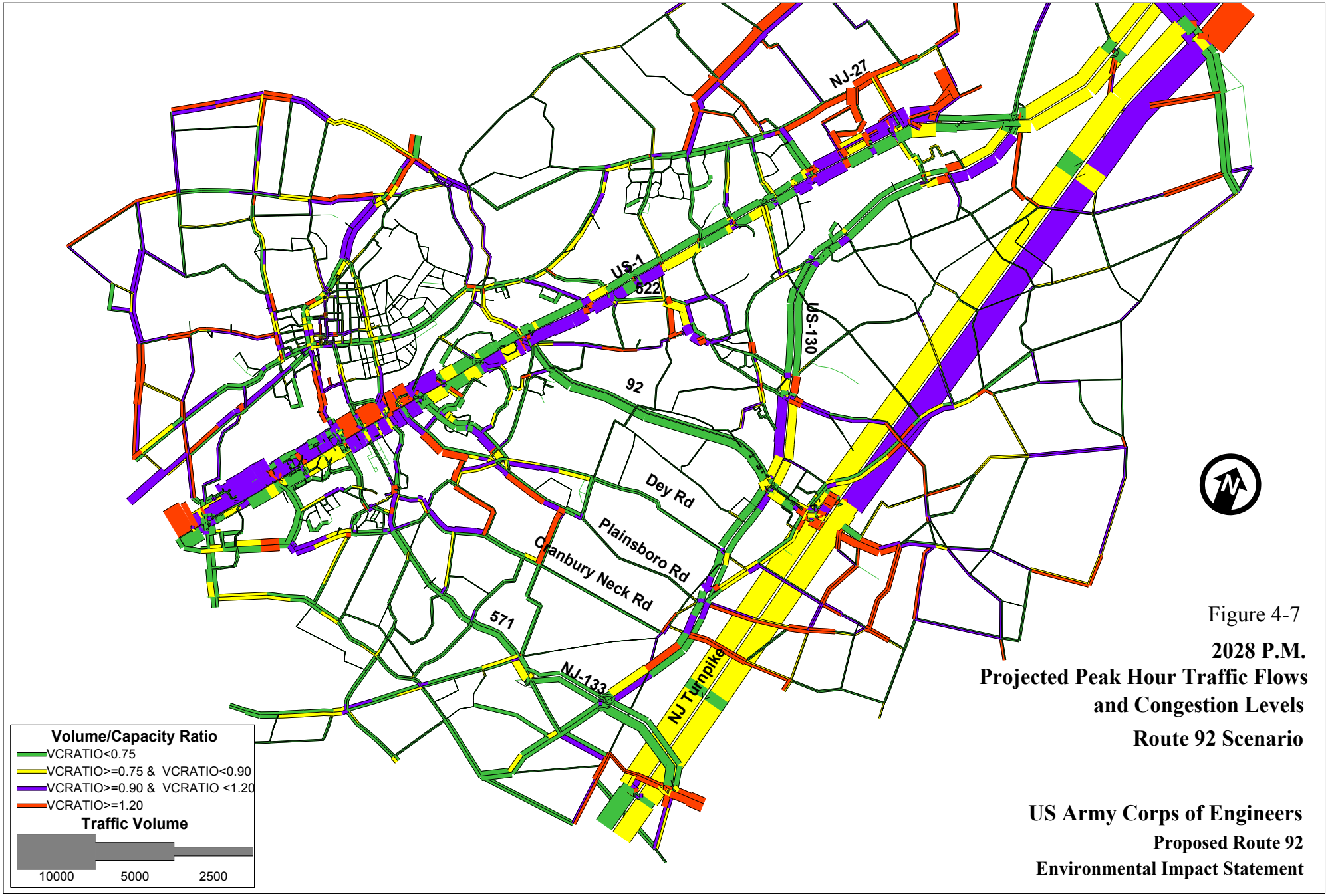


Figure 4-7

2028 P.M.
Projected Peak Hour Traffic Flows and Congestion Levels

Route 92 Scenario

US Army Corps of Engineers
Proposed Route 92
Environmental Impact Statement

the peak hours if Route 92 is not built. Of these 476 miles, 62 miles would require the addition of more than one lane to be brought up to standard. With the construction of proposed Route 92, 430 miles are predicted to operate at sub-standard conditions, with 50 of these miles requiring the addition of more than one lane to be brought up to standard. Thus, it is projected that construction of proposed Route 92 would eliminate the need for the widening of 46 miles of other roadways, including 12 miles that would need to be widened by more than one lane.

4.2.7.3 Travel Time Changes

One impact of the proposed construction of Route 92 and the resulting increase in highway capacity would be a change in travel times for trips made within the study area. This discussion summarizes travel time changes related to project implementation.

The year 2028 forecast of regional trips between origins and destinations (provided by the transportation model prepared for the EIS) assigned those trips using two separate networks: one containing proposed Route 92, and another without proposed Route 92. The model recorded a travel time for each trip for each network (with and without proposed Route 92). Any difference in projected trip time results from the construction of proposed Route 92.

The travel time for a particular trip may change for several reasons:

- The trip may use the new highway, and therefore benefit from the greater speeds allowed on a limited-access roadway.

- The trip may use the same roads as would be used without Route 92 being available, but other trips would be diverted to Route 92, and the trip now offers an improved Level of Service.

- Certain intersection movements may increase or decrease along a particular path due to shifting traffic flow patterns, causing a relatively small change in travel time for Route 92 users and also for those not using Route 92.

Since travel time changes are indicators of congestion changes, it is important to review in some detail the travel time effects of constructing the proposed roadway. The model travel time results can be organized so as to provide a clearer understanding of the results.

The following information, derived from the transportation model, summarizes the estimated travel time changes that would be caused by proposed Route 92 for all peak hour trips within the study area and for three subgroups of these trips. Summaries are provided for the following categories of travelers:

- Users of proposed Route 92

- Users of the parallel road network in the immediate vicinity of proposed Route 92. This includes CR 522, CR 571, Ridge Road, Dey Road, Plainsboro Road, and Cranbury Neck Road
- Users of Route 1 and Route 27
- All trips on the study area network

Users of Route 92

In the AM peak hour, it is estimated that a total of 3,905 drivers would use proposed Route 92. Overall AM peak hour travel time savings for these users are estimated to average about 15.2 minutes, totaling 988 hours per day in this time period.

In the PM peak hour, 2,659 drivers would save an average of about 11 minutes each, totaling 488 hours per day in this time period.

Users of the Parallel Road Network In the Immediate Vicinity of Route 92

In the AM peak hour, it is estimated that a total of 7,175 drivers would use the parallel roads in the immediate vicinity of the proposed Route 92 roadway. Overall AM peak hour travel time savings for these users are estimated to average about 5.5 minutes, totaling 652 hours per day in this time period. Users of the parallel roads make shorter trips, not involving proposed Rt. 92.

In the PM peak hour, 4,539 drivers would save an average of about 1.9 minutes each, totaling 147 hours per day in this time period.

Users of US Route 1 and Users of NJ Route 27

In the AM peak hour, it is estimated that a total of 6,260 drivers would use either US Route 1 or NJ Route 27 to travel northeast-southwest through the western end of the study area. Overall AM peak hour travel time savings for these users are estimated to average about 5.3 minutes, totaling 550 hours per day in this time period.

In the PM peak hour, 5,260 drivers would save an average of about 4 minutes each, totaling 353 hours per day in this time period.

The Total Study Area Network

In the AM peak hour, it is estimated that a total of 154,426 drivers would use roadways within the study area network. Because a large number of those drivers in the entire study area road network would not use the capacity provided by Route 92, the improved travel times are averaged out among them all, and the individual trip travel time improvement statistic loses meaning. That is because no driver actually experiences the average system trip time improvement; either a driver does not use the new capacity and no travel time benefit accrues, or the driver benefits either by using proposed Route 92, or parallel roads along proposed Route 92 and the travel time improvements described above accrue.

However, one average statistic for the system is useful: the combined AM peak hour travel time savings for these users is estimated to total 5,679 hours per day in this time period. In the PM peak hour, 157,044 drivers would save a total of 2,593 hours per day in this time period.

Summary

The road system modeling results indicate that proposed Route 92 would provide travel time savings and congestion relief to travelers within the region. Users of Route 92, users of parallel local roadways, and users of Route 1 and Route 27 all would be among those provided some degree of congestion relief. It is estimated that more than 2,000 drivers would each save more than 20 minutes during the morning peak hour each day; an additional 7,700 peak-hour drivers would each save more than 10 minutes each morning.

During the afternoon peak hour, about 2,400 drivers are projected to each save more than 10 minutes each day.

In all, projected peak hour travel time savings are more than 8,000 vehicle-hours per day.

Another way to describe the impact of proposed Route 92 on traffic conditions is through expected changes in travel times **between** various parts of the Traffic Study Area, as shown in Table 4-14.

The table shows that peak hour travel times between representative points are projected to decrease by an average of 10 percent as a result of the construction of proposed Route 92. The table shows that peak direction travel times between US Route 1 in Plainsboro and New Jersey Turnpike Interchange 8A are expected to improve by about 30 percent.

Table 4-14
Estimated 2028 Peak Hour Travel Times (minutes)

FROM	TO	NO ACTION		WITH 92		CHANGE (WITH 92 vs. NO ACTION)		PERCENT CHANGE (WITH 92 vs. NO ACTION)	
		AM	PM	AM	PM	AM	PM	AM	PM
Princeton Junction	Princeton University	22.9	15.1	19.7	14.2	-3.2	-0.9	-14%	-6%
Princeton Junction	Plainsboro Center	30.3	12.4	27.5	11.8	-2.8	-0.6	-9%	-5%
Princeton Junction	South Brunswick Ctr.	41.8	38.2	37.0	32.5	-4.8	-5.7	-12%	-15%
Princeton Junction	Interchange 8A	35.7	30.4	40.1	28.9	4.4	-1.6	12%	-5%
Princeton Junction	Hightstown	21.4	29.0	20.4	26.8	-1.0	-2.2	-5%	-8%
Princeton University	Princeton Junction	13.1	22.4	12.0	20.1	-1.1	-2.4	-8%	-11%
Princeton University	Plainsboro Center	22.6	14.1	19.0	12.3	-3.6	-1.9	-16%	-13%
Princeton University	South Brunswick Ctr.	30.6	34.8	27.4	27.7	-3.2	-7.2	-11%	-21%
Princeton University	Interchange 8A	36.8	39.6	30.5	27.8	-6.3	-11.9	-17%	-30%
Princeton University	Hightstown	30.9	48.8	29.6	44.8	-1.4	-4.0	-4%	-8%
Plainsboro Center	Princeton Junction	15.3	25.2	12.7	21.8	-2.7	-3.3	-17%	-13%
Plainsboro Center	Princeton University	12.8	18.3	12.9	16.9	0.2	-1.3	1%	-7%
Plainsboro Center	South Brunswick Ctr.	21.4	36.6	20.4	28.4	-1.0	-8.2	-5%	-22%
Plainsboro Center	Interchange 8A	19.0	31.1	20.0	23.0	1.0	-8.1	5%	-26%
Plainsboro Center	Hightstown	25.0	44.9	24.2	38.6	-0.8	-6.2	-3%	-14%
South Brunswick Ctr.	Princeton Junction	49.7	36.3	38.2	33.8	-11.5	-2.5	-23%	-7%
South Brunswick Ctr.	Princeton University	48.5	27.3	32.6	23.8	-15.9	-3.5	-33%	-13%
South Brunswick Ctr.	Plainsboro Center	52.5	22.1	37.7	21.0	-14.8	-1.0	-28%	-5%
South Brunswick Ctr.	Interchange 8A	14.6	15.5	15.5	13.5	1.0	-2.0	7%	-13%
South Brunswick Ctr.	Hightstown	38.0	45.6	33.0	43.6	-5.0	-2.0	-13%	-4%
Interchange 8A	Princeton Junction	42.1	30.1	33.0	30.9	-9.1	0.8	-22%	3%
Interchange 8A	Princeton University	52.4	35.1	34.4	25.9	-18.0	-9.2	-34%	-26%
Interchange 8A	Plainsboro Center	47.5	20.8	34.4	19.1	-13.1	-1.7	-28%	-8%
Interchange 8A	South Brunswick Ctr.	20.2	15.4	15.9	13.3	-4.2	-2.1	-21%	-13%
Interchange 8A	Hightstown	30.4	38.0	27.8	39.1	-2.6	1.1	-9%	3%
Hightstown	Princeton Junction	43.9	20.2	39.3	20.6	-4.6	0.4	-11%	2%
Hightstown	Princeton University	64.3	32.0	57.2	31.7	-7.2	-0.3	-11%	-1%
Hightstown	Plainsboro Center	68.2	25.4	60.7	25.7	-7.5	0.4	-11%	1%
Hightstown	South Brunswick Ctr.	66.5	35.4	63.9	35.4	-2.6	0.0	-4%	0%
Hightstown	Interchange 8A	51.7	27.6	56.7	30.0	4.9	2.4	10%	9%
					Average	-4.5	-2.8	-11%	-9%

4.2.7.4 Impacts at Specific Locations

Projected 2028 peak hour traffic conditions at 15 key intersections within the Traffic Study Area were evaluated for the No Action and Route 92 scenarios. The computed Level of Service (LOS) designations are shown in Table 4-15.

Table 4-15
Intersection Level of Service
Proposed Route 92 vs. No Action

	No Action		With 92	
Intersection	**A.M.**	**P.M.**	**A.M.**	**P.M.**
US-1 @ Cozzens Ln	F	F	F	F
US-1 @ Major Rd (Sandhill)	F	F	F	E
US-1 @ New Rd	F	F	F	F
NJ-27 @ Raymond Rd	F	B	F	E
NJ-27 @ CR-522	E	F	D	D
Scudders Mill Rd @ Schalk's Crossing Rd	F	F	F	F
Scudders Mill Rd & Dey Rd	F	F	F	F
Plainsboro Rd & CR-535	E	F	D	B
US-130 @ Dey Rd	F	F	F	F
Dey Rd & CR-535	F	F	F	F
NJ-32 @ CR-535	F	F	D*	D*
US-130 @ Friendship Rd	F	F	F	F
George's Rd & Kingston Ln	D	B	C	B
CR-522 & Kingston Ln	F	F	F	F
US-1 @ CR-522	F	F	F	F

* This intersection would be replaced with two intersections on either side of proposed Route 92. It is presumed that the new intersection would be planned such that the peak-hour level-of-service would be at least "D".

Four intersections exhibit improved LOS designations, as compared with the No Action scenario, and one exhibits a worse designation. Although most of these intersections are expected to remain at LOS "F," average delays at most of them would likely decline by at least 25 percent during the morning peak hour, and by more than 30 percent in the evening peak hour, as shown in Table 4-16.

Another expected impact of constructing Route 92 is that trucks traveling between the New Jersey Turnpike Interchange 8A and Princeton may find it attractive to use Ridge Road/Heathcote Road between NJ Route 27 and US Route 1 in combination with Route 92. The network model used for this project estimates that during each peak hour, an additional 20 trucks would use this portion of Ridge Road (as compared with the No Action alternative, both directions together). The model indicates that the number of cars, which is more than 20 times the number of trucks, would be essentially unchanged. The increase in the number of trucks would be undesirable from safety and operation perspectives, due to tight geometry on this section of Ridge Road as well as tight clearances at the intersections on Route 27. Section 5.3.10 of this document

presents possible measures for mitigating this impact. Beyond NJ Route 27, the network modeling shows that Route 92 traffic impact dissipates.

Table 4-16
Projected Intersection Delays--Proposed Route 92 vs. No Action

	Seconds of Delay per Vehicle				Percent Change (With 92 vs. No Action)	
	2028 No Action		2028 w/ 92			
Intersection	**A.M.**	**P.M.**	**A.M.**	**P.M.**	**A.M.**	**P.M.**
US-1 @ Cozzens Ln	290	336	233	225	-20%	-33%
US-1 @ Major Rd (Sandhill)	191	112	154	75	-19%	-33%
US-1 @ New Rd	172	168	160	119	-7%	-29%
NJ-27 @ Raymond Rd	170	18	115	63	-32%	250%
NJ-27 @ CR-522	77	202	54	54	-30%	-73%
Scudders Mill Rd @ Schalk's Crossing Rd	206	154	159	135	-23%	-12%
Scudders Mill Rd & Dey Rd	697	296	556	142	-20%	-52%
Plainsboro Rd & CR-535	67	167	50	16	-25%	-90%
US-130 @ Dey Rd	341	333	247	172	-28%	-48%
Dey Rd & CR-535	458	213	273	356	-40%	67%
NJ-32 @ CR-535	269	234	*	*	*	*
US-130 @ Friendship Rd	330	467	179	145	-46%	-69%
George's Rd & Kingston Ln	38	18	22	10	-42%	-44%
CR-522 & Kingston Ln	300	203	238	103	-21%	-49%
US-1 @ CR-522	230	179	147	128	-36%	-28%
US-1 @ Ridge Rd	362	264	290	234	-20%	-11%
				Median:	-26%	-39%

* This intersection would be replaced with two intersections on either side of proposed Route 92. It is presumed that the new intersection would be planned such that delays would be minimal.

4.2.7.5 Widening New Jersey Turnpike Mainline

The impact of the proposed widening of the NJ Turnpike mainline between Interchanges 6 and 8A from six to ten lanes – combined with the planned construction of a new interchange directly connecting the Pennsylvania Turnpike with Interstate 95 north of Philadelphia – was evaluated to see if it would affect the need for building Route 92 by providing transportation system improvements between the Philadelphia region and the New York region. An element of the evaluation was a determination whether the mainline widening and new Pennsylvania Turnpike interchange would remove truck traffic from US Route 1 in the Philadelphia-to-New York corridor, thereby lessening congestion there and reducing diversions of traffic to the local east-west roads in central New Jersey.

The widening of the six-lane section of the NJ Turnpike mainline south of Interchange 8A would remove a bottleneck for morning northbound traffic (as the 3 northbound lanes south of 8A do not provide enough northbound capacity for the vehicles desiring

to use them during peak travel periods, including during weekends) and evening southbound traffic, which are dominated by the increasing number of commuters who live in central New Jersey and work in the northeastern New Jersey/New York City area. The projected diversions from US Route 1 to the local east-west roads in central New Jersey (if Route 92 is not built) are unrelated to this problem. Rather, the east-west diversions to alternative north-south routes are caused by morning congestion on *southbound* US Route 1 and evening congestion on *northbound* US Route 1 (dominated by commuter traffic), which are largely unrelated to travel patterns on the NJ Turnpike mainline, and are totally unrelated to whether or not the Pennsylvania Turnpike has a direct connection with Interstate 95.

In addition, most of the traffic projected to use proposed Route 92 in the road network traffic model is traffic that would otherwise be using the local east-west roads in central New Jersey for sub-regional commutation trips (to commute to jobs in the Princeton area from areas along and east of US Route 130). These trips would likely not be affected by the proposed NJ Turnpike mainline widening or the planned new Pennsylvania Turnpike/Interstate 95 interchange, as these are not long-distance trips and their orientation is perpendicular to the NJ Turnpike mainline. (This assertion is supported by the results of recent central Jersey regional model runs performed for NJDOT as part of on-going planning activities. These runs show that the proposed NJ Turnpike mainline widening has no effect on east-west flows in this area.)

It is possible that the NJ Turnpike widening would increase the use of Route 92 by making it easier for Princeton area-bound commuters from the south and southeast to access Route 1 from the NJ Turnpike via Route 92. Likewise, the construction of Route 92 would enhance the ability of the NJ Turnpike widening project to divert truck traffic from US Route 1 by providing a new high-speed connection between southern New Jersey and the Princeton area.

Therefore, from a transportation impacts standpoint, the widening of the NJ Turnpike mainline and construction of a new Pennsylvania Turnpike interchange would either have no effect on the need for Route 92 or potentially increase the need for Route 92.

4.2.8 Noise

This section presents the results of the noise monitoring and modeling impact analysis performed for the proposed Route 92 EIS. Noise monitoring and modeling was conducted based on procedures presented in:

- New Jersey Turnpike Authority (NJTA), *Policy for Construction of Sound Barriers*, October 24, 1991;
- Federal Highway Administration (FHWA), *Highway Traffic Noise Analysis and Abatement Policy and Guidance*, June 1995; and
- New Jersey Department of Transportation (NJDOT), *Highway Traffic Noise Policy Technical Appendix*, December 2000.

The purpose of this noise impact analysis was to assess the potential for sensitive receivers to be adversely affected by the proposed Route 92 alignment, and if necessary, to evaluate the benefits of noise barriers. The STAMINA 2.0/OPTIMA model was used to characterize noise conditions along the Proposed Route 92 corridor. Refer to Appendix D for more detailed information regarding the modeling procedures used for noise analysis.

4.2.8.1 Noise Modeling Analysis

This section describes the noise modeling procedures used to evaluate the potential traffic noise impacts for the Horizon Year (2028) of the proposed Route 92 project. The results of the noise modeling and noise abatement measures evaluation are also included in this section.

4.2.8.1.1 STAMINA 2.0 Noise Modeling

The STAMINA 2.0 highway noise model was used to characterize noise conditions along segments of the Proposed Route 92 Corridor. Locations for which noise impacts were modeled are listed in Table 4-17. Model input parameters include:

- Length of road segments
- Receptor locations
- Grade adjustment
- Structure barrier effects
- Shielding factors
- Alpha factors (reflectivity of surface)
- Vehicle type
- Vehicles per hour
- Vehicle speed

The model calculates hourly L_{eq} noise levels for each receptor. Traffic data for the proposed Route 92 alternative, obtained from the traffic modeling analysis, were used in STAMINA 2.0. Each of these data requirements is described in detail in Appendix D.

4.2.8.2 Modeling Results

4.2.8.2.1 Route 92 Existing and Future Modeling Results

The noise modeling results are summarized in Table 4-18. This table presents a summary of the Existing, Horizon Year No Action and Route 92 alternative noise levels and compares them to the applicable FHWA noise abatement criteria (NAC). Under the Route 92 alternative, eight receivers would experience noise levels exceeding the applicable NAC. Two of the eight are commercial receivers at which the Activity Category C NAC of 72 dBA would be exceeded. Five of the eight receivers are residential receivers that would experience noise levels exceeding the applicable NAC of 67 dBA. One of the eight receivers is an institutional receiver (R-12 in Table 4-18) at which the 67 dBA NAC would be exceeded. This receiver is inside the proposed Route 92 right-of-way (ROW). Properties located within the ROW would be purchased

and, therefore, are not considered in evaluating noise impacts under the Route 92 alternative.

Table 4-17
Noise Modeling Receptors

Model Receptor Id.	Monitoring Station Id.	Location Description
C-1	**1**	East of Commerce Dr./South of Rt. 32
C-2	--	West of CR-535/South of Rt. 32
C-3	--	West of CR-535/South of Rt. 32
C-4	--	East of Commerce Dr./South of Rt. 32
C-5	--	West of Herrod Blvd/North of Rt. 32
C-6	--	East of Herrod Blvd/North of Rt. 32
C-7	13	30 Friendship Road
C-9	P22	Tile Institute
R-13	**2**	West of 84 Friendship Rd.
R-1	12	39 Friendship Road
R-2	P25	84 Miller Road
R-3	9	80 Miller Road
R-4	**3**	194 Friendship Rd.
R-5	**4**	273 Friendship Rd.
R-6	--	287Friendship Road
R-7	--	307 Friendship Road
R-8	7	343 Friendship Road
R-9	**5**, 5	Silvers Lane Dead End
R-10	**6**	100 Perrine Rd.
R-11	**--**	South of Perrine Rd./West of Major Rd.
R-12	**7**, 3	Rt. 1 Boy Scout Council
R-14	--	177 Friendship Road
R-15	--	111 Perrine Road
R-16	--	60-74 Perrine Road
R-17	--	107 Friendship Road

Note: Bold values indicate 2002 monitoring locations.

Table 4-18
Summary of Noise Modeling Results

Model Receiver Id.[1]	Monitoring Station Id.[2]	Location Description[3]	NAC	Peak Hour L_{eq} Noise Levels (dBA)[4]		
				Existing Year (2002) Measured	Horizon Year (2028) No Action Estimated	Horizon Year (2028) Route 92 Modeled
C-1	**1**	East of Commerce Dr. /South of Rt. 32	C	65.9	68.0	**72.5**
C-2	--	West of CR-535/South of Route 32	C	--	--	65.8
C-3	--	West of CR-535/South of Route 32	C	--	--	68.8
C-4	--	East of Commerce Dr. /South of Rt. 32	C	--	--	**73.7**
C-5	--	West of Herrod Blvd/North of Route 32	C	--	--	71.3
C-6	--	East of Herrod Blvd/North of Route 32	C	--	--	69.3
C-7	13	30 Friendship Road [ROW]	C	62.0	64.1	68.7
R-1	12	39 Friendship Road	B	**66.8**	**68.9**	59.3
R-13	**2**	West of 84 Friendship Road	B	63.2	65.3	**68.9**
R-2	P25	84 Miller Road	B	50.0	52.1	59.1
R-3	9	80 Miller Road	B	55.1	57.2	55.6
R-4	**3**	194 Friendship Road	B	61.1	63.2	61.7
R-5	**4**	273 Friendship Road	B	60.5	62.6	62.2
R-6	--	287 Friendship Road	B	--	--	**71.2**
R-7	--	307 Friendship Road	B	--	--	66.2
R-8	7	343 Friendship Road	B	65.2	**67.3**	59.3
R-9	**5**, 5	Silvers Ln. Dead End	B	49.7	51.8	55.3
R-10	**6**	100 Perrine Road	B	54.0	56.1	61.6
R-11	**--**	South of Perrine Rd./West of Major Rd.	B	--	--	59.5
R-12	**7**, 3	Route 1 Boy Scout Council [ROW]	B	**71.0**	**73.1**	**71.1**
R-14	**--**	177 Friendship Road	B	--	--	**68.6**
R-15	**--**	Perrine Road	B	--	--	66.5
R-16	**--**	Perrine Road	B	--	--	**68.8**
R-17	**--**	107 Friendship Road	B	--	--	**67.2**
C-9	P22	Tile Institute [ROW]	C	64.0	66.1	68.8
		No. of Receivers Impacted		2	3	8

[1]Receiver Id. represents both commercial (C) and residential (R) receivers based on the FHWA Noise Abatement Criteria description.
[2]Bold values indicate 2002 monitoring locations.
[3][ROW] indicates that the receiver would be located in the Route 92 right-of-way.
[4]Bold and shaded values indicate noise levels that exceed the 67 dBA and 72 dBA NAC.

The comparison of 2028 Route 92 Alternative projected traffic noise levels with existing and 2028 No Action noise levels indicates that projected noise levels do not exceed the existing noise levels by 10 dBA or greater. Proposed Route 92 would increase the Existing and 2028 No Action traffic noise levels by up to 9 and 7 dBA, respectively.

Under the No Action alternative, two residential receivers and one institutional receiver would be impacted by noise exceeding the applicable NAC in 2028. Under the Route 92 alternative, five residential receivers would be impacted in 2028. Under existing (2002) conditions, the applicable NAC is exceeded at one residential receiver and one institutional receiver.

Modeling outputs for the Route 92 alternative are included in Appendix D.

4.2.8.3 Construction Noise Impacts

Construction noise impacts were evaluated based on the steps specified in accordance with FHWA Technical Advisory Memorandum, *Analysis of Highway Construction Noise*, T6160.2, March 13, 1984.

Highway construction activities include use of mobile and stationary equipment. Mobile equipment such as dozers, scrapers, graders, and haul trucks operate in a cyclical manner in which a period of full power is followed by a period of reduced power. Stationary equipment falls into two categories: 1) equipment that operates at a fixed power, such as pumps, compressors and generators; and 2) impact equipment such as pile drivers, jack hammers and pavement breakers. The first group generates a constant background noise level, whereas the second group generates a much higher noise level, but over a very short time period (FHWA, *Special Report Highway Construction Noise: Measurement, Prediction and Mitigation*, 1987). Table 4-19 presents typical maximum noise levels (L_{max}) measured at 50 feet from construction equipment. Maximum noise levels range from 70 dBA for generators to 90 dBA for a mounted impact hammer at 50 feet away.

Table 4-19
Typical Construction Equipment Noise Levels

Equipment Category	**L_{max} Level (dBA)**
Backhoe	80
Chain Saw	85
Compactor	80
Compressors	80
Concrete Mix Truck	85
Concrete Pump	82
Concrete Saw	90
Crane (Mobile or Stationary)	85
Dozer	85
Front End Loader	80
Generator (25 kVA or less)	70
Generator (25 kVA or more)	82
Gradall	85
Grader	85
Jackhammer	85
Mounted Impact Hammer	90
Paver	85
Pneumatic Tools	85
Pumping Equipment	77
Scraper	85
Tractor	84
Vibrator (rollers)	80
All Other Equipment with Engines Larger than 5 HP	85

Source: Noise Control Engineering Journal, Construction Noise Control Program and Mitigation Strategy at the Central Artery Project, Sep-Oct 2000.

Highway construction is completed in the following phases:

- Mobilization
- Clearing and grubbing
- Earthwork
- Foundations
- Base preparation
- Paving and cleanup

Each construction phase would generate short-term noise impacts for noise sensitive land uses adjacent to the proposed Route 92 construction activity. In general construction noise impacts occur only during daytime working hours of 7:00 a.m. to 7:00 p.m., and would be highest during the clearing and earthwork phases of construction. The noisiest equipment would likely be earthmoving equipment, such as dozers, graders, scrapers and other heavy-duty diesel equipment. Noise levels decrease by 6 dBA for every doubling of distance. It is anticipated that the daytime L_{max} noise levels would not exceed 80 dBA at 150 feet away and the daytime L_{eq} noise level would not exceed 75 dBA at 150 feet away.

4.2.9 Aesthetics

Potential project-related visual impacts have been identified and determined based upon an examination of significant topological features as they would be seen from the highway and as the highway would be seen from nearby receptors. For the purpose of this study, valuable views are defined to include natural, historic and culturally significant landmarks; agricultural and natural open space; and natural and man-made water features. Less valuable views include paved transportation routes and parking areas and non-residential developments that do not serve as landmarks or congregation sites. The aesthetic benefits of proposed Route 92 would be enjoyed by its users, who would have new access to scenic vistas of South Brunswick and the other townships in the Project Study Area. Negative visual impacts would fall on those residents whose present enjoyment of these vistas would be permanently interrupted by the proposed highway.

Aesthetic features of the Project Study Area were studied using US Geological Survey (USGS) maps, aerial photographs, engineering plans and field reconnaissance. The 1994 DEIS and subsequent studies were consulted and updated to 2003. Both artificial and natural visual resources were identified and considered in terms of their users. Parks were given highest consideration because they have a significant volume of users and are specifically intended to serve as public open space for the enjoyment of scenic resources. Residences are also sensitive to visual and aesthetic impacts because residents are continually exposed to neighboring views.

Neighborhood character and community cohesion are sometimes affected by aesthetic surroundings. Agricultural and other uninhabited open spaces would be less affected because there might only be occasional viewers. In areas where zoning or plans restrict

land use to residential uses, effects on expected future use should also be addressed. In considering future residential or other view sensitive development, opportunities for mitigation at the site planning stage are addressed.

Lighting can have an adverse aesthetic impact. Because lighting to be installed as part of proposed Route 92 has not yet been designed, an evaluation of specific impacts is not possible at this time. It is anticipated that lighting will be required for safety reasons where vehicles change speeds, i.e., at the four interchanges and at the toll plazas. The potential for lighting impacts may be greatest at the proposed Perrine Road interchange and at the proposed toll plaza near Friendship Road, because the level of existing lighting in these areas is relatively low.

4.2.9.1 Residential Impacts

The most significant potential for aesthetic impacts occur at the boundaries of the residential subdivisions along the proposed Route 92 alignment. These neighborhoods include the Princeton Collection, Drinking Brook Estates, Heather Knolls of South Brunswick and Friendship Road and Perrine Road residences.

Princeton Collection
Residents of the Princeton Collection may experience adverse visual impacts. The Princeton Collection is a subdivision of single-family homes located approximately 400 feet south of the proposed Route 92 alignment. The subdivision is bounded on the north by Perrine Road and a hedgerow of deciduous trees. The most significant impacts may be those experienced by residents viewing Route 92 across Perrine Road.

Drinking Brook Estates
Drinking Brook Estates is a 46-lot development of single-family residences. Proposed Route 92 would be approximately 1,000 feet from the nearest houses in this development. Current views from Drinking Brook Estates to the south, in the direction of proposed Route 92, include agricultural fields and forested uplands and wetlands beyond. The western portion of the subdivision's frontage on Friendship Road would be buffered from views to the proposed Route 92 by a berm planted with evergreens. This vegetative buffer would function to partially obstruct some of the views from individual homes to the proposed Route 92, although this obstruction would not be complete, since the highway would be elevated above the existing grade. Therefore some residents of the Drinking Brook Estates would experience an adverse visual impact. This impact results from the removal of agricultural field views and replacement with views of proposed Route 92.

Heather Knolls of South Brunswick
The Heather Knolls Subdivision includes numerous single-family residences along Periwinkle Drive, Black Gum Drive and New Turkey Island Road. Several of the residences along Black Gum Drive have existing natural screening along the perimeter of the property lines. Because of the existing screening and greater than 1,000-foot distance, views of the proposed Route 92 from these homes would be limited. However,

several homes, primarily along Periwinkle Drive and Black Gum Drive, do not have a natural vegetative screen and would therefore likely experience some visual impacts, although these would be limited by the 1,500-2,000 foot distance to proposed Route 92. These homes currently have distant views of the Princeton Forrestal Center. Homes along New Turkey Island Road have moderately thick deciduous vegetation that would limit views of the proposed Route 92 during the warmer seasons.

Friendship Road Residences
Several single-family homes are located along the length of Friendship Road. People in these residences may experience varying degrees of visual impact. Several residences are located in the vicinity of the proposed western crossing of Friendship Road, designed as a single-span bridge. Residents here would experience visual impacts. The southern view from these homes would be of the bridge span and proposed Route 92. Those residents with no vegetative screening would experience the most significant impacts. Scattered residences to the east of the western bridge span of Friendship Road would also experience visual impacts.

Residents of Friendship Road homes in the vicinity of the proposed bridge crossing of Miller Road would experience adverse visual impacts. Existing scattered vegetation would provide a limited degree of screening, thus reducing the visual impact to these residences.

Residences are located in the vicinity of the span bridge, which constitutes the proposed eastern crossing of Friendship Road. The northern view from these residences could be subject to adverse visual impact, with the greatest impact for those residents without vegetative screening.

Favorable views from the highway for users would be similar to those that are favorable for residents and other viewers. These would include forested and agricultural landscapes. A majority of the proposed Route 92 alignment traverses wooded, open and agricultural areas, although in several cases residential subdivisions would be within view of roadway passengers. Portions of proposed Route 92 east of US Route 130 and within the vicinity of US Route 1 are more densely developed and the view from the proposed highway would include fewer open spaces and more urban activity.

Perrine Road
The existing environment surrounding Perrine Road is primarily open agricultural land with several single-family homes. These homes would likely experience adverse visual impact from proposed Route 92.

4.2.9.2 Impacts in the Plainsboro Preserve

Approximately one-third of the portion of proposed Route 92 within the Plainsboro Preserve and most of the portion of proposed Route 92 just north of the Plainsboro Preserve would be constructed through open fields currently in agricultural use. This land is open because it is not being allowed to revert to its natural forested state. The

marked trails are in the forested western half of the preserve, and signs warn "all persons" not to enter the mowed field north of McCormack Lake. Proposed Route 92 would pass through the field approximately 900 feet north of the lake, extending approximately 28 feet above the western edge of the field and approximately 12 feet above the eastern edge. Large tractor trailers on the highway would extend up to an additional 10 feet above the highway structure. The eastern side of the field, where the highway structure would be lower, is visible from one of the trails in the preserve. A line of vegetation is growing up between McCormack Lake and the field, partially obscuring the view of proposed Route 92 from the trail. Because of the configuration of the lake, the northern end of the lake is not visible from most of the rest of the lake.

Within the forest northwest of the lake and west of the field, vehicles passing on proposed Route 92 would be partially visible for approximately 500 feet through the trees. Within the part of the preserve accessible by marked trails, vehicles on proposed Route 92 would be visible over an area of approximately 24 acres.

The tallest section of proposed Route 92 would be the bridge over the Amtrak Northeast Corridor rail line, near the northern end of Plainsboro Preserve. The bridge structure would be approximately 40 feet tall, and large trailers would extend up to an additional 10 feet above the structure. Trees in the forest on both sides of the Amtrak line are 50 to 60 feet tall, and would therefore block views of the bridge and trucks on the bridge. Neither the bridge nor any other part of proposed Route 92 would be visible from the New Jersey Audubon Society Environmental Education Center at the southeastern end of McCormack Lake, approximately half a mile from the proposed Route 92 right-of-way.

4.2.10 Known Contaminated Sites

Two Known Contaminated Sites (KCS) listed by the NJDEP Site Remediation Program (SRP) could potentially be impacted by construction of the proposed Route 92 project. The sites are located at 298 Friendship Road and 24 Friendship Road in South Brunswick. The pesticide-contaminated soil at 298 Friendship Road might be disturbed, depending on its exact location and the grading requirements of the highway. If soil removal were required at that location, the contaminated soil would require special handling and disposal procedures, as it might not be suitable for use as fill. If fill were to be added to the site, the potential for disturbance would be decreased.

Because information is not available regarding the nature of the contamination at 24 Friendship Road, potential impacts cannot be assessed. Depending on the type and location of contamination (soil contamination, underground storage tanks, etc.), the degree of impact, if any, would vary.

Consultation with NJDEP SRP will be required to determine exactly how the construction of proposed Route 92 would affect the KCS within the Proposed Route 92 Corridor.

In addition, much of the Proposed Route 92 Corridor is, or in the recent past was, utilized as farmland. Historically, many farms have used pesticides and insecticides. Many of these substances are environmentally persistent and in some instances have been found to be toxic and/or hazardous to human, animal and environmental receptors. Use of many of these more hazardous substances has since been discontinued or less toxic compounds have been substituted; however, residues from past use may still remain in the soil or groundwater. Whether or not these compounds are confirmed onsite, their presence should not be expected to pose an imminent concern to the construction of the proposed roadway. As with the KCS at 298 Friendship Road, if soil removal were required, the use of the soil as fill might be restricted. If fill, rather than excavation, were required at these locations, the impact would be expected to be minimal.

In addition to the potential for contamination by pesticides, it is possible that farms, businesses, and residences in the Proposed Route 92 Corridor have utilized or currently utilize underground or aboveground storage tanks (USTs or ASTs) for storing heating oil or motor fuel. New Jersey does not require registration of ASTs, USTs up to 1,100 gallons used to store motor fuel at a farm residence, USTs up to 2,000 gallons used to store heating oil for onsite use in a nonresidential building, or USTs of any size used to store heating oil for onsite use in a residential building (N.J.A.C. 7:14B-1.4(b)). Information regarding such tanks may not be available in local or state files. However, should such tanks be discovered during construction of the roadway, the conduct of any necessary environmental actions would not be expected to pose significant delays in the construction process. USTs or ASTs would be decommissioned in accordance with the current environmental regulations.

4.2.11 Human Health

4.2.11.1 Air Quality

Air quality is a public health concern associated with the construction of proposed Route 92. An air quality analysis conducted for the project area indicates that the project would comply with federal transportation conformity guidelines. The project would not cause or contribute to any new localized carbon monoxide (CO) violations. By transferring through traffic from local roads to proposed Route 92, levels of service at many intersections in the region would improve. Consequently, a positive impact should occur to localized air quality.

The emissions loading data in Table 4-3 reveal that VOC, CO, and NO_x loadings would decrease with or without proposed Route 92. This is because federally mandated reductions in motor vehicle emissions are expected to outweigh increases in traffic. With proposed Route 92, VOC emissions from vehicles would decrease by approximately 70 percent, compared to 67 percent in the No Action scenario. Reductions of CO emissions would also be slightly larger with Route 92 than without it. All of the 2028 alternatives produce an 88 percent reduction of NO_x loadings.

4.2.11.2 Noise

Noise impacts can include annoying noises, which generally cause people to seek quieter environments and can affect the performance of work tasks, and high noise levels that can affect hearing, either temporarily or permanently. Sensitivity to noise depends on the individual, as well as on the frequency of the sound and the length of time a person is exposed. As demonstrated by the noise modeling discussed in Section 4.2.8, the project would not produce noise that exceeds levels that cause damage to hearing.

4.2.11.3 Water Quality

Increased highway stormwater runoff is a primary public health concern related to proposed Route 92, as runoff may contain harmful contaminants. An increase in runoff would be anticipated to result from the project, as an increase in impervious surface would be required for construction of the proposed roadway. Treatment measures would be provided to remove potential pollutants from runoff prior to discharge to surface and groundwater. Such treatment measures include the installation of stormwater management basins (SMBs) throughout the Proposed Route 92 Corridor. These SMBs would be used as the primary treatment mechanism along the proposed roadway. The SMBs were designed in accordance with the 2004 NJDEP Stormwater Management Rule (N.J.A.C. 7:8-5.4). Further information regarding these facilities is presented in the Engineer's Reports in Appendix E.

4.2.12 Socioeconomics

4.2.12.1 Construction Impacts

As a major construction project, proposed Route 92 would provide temporary employment, principally for people from outside the local area. The project would stimulate spending in the local area during the construction period.

Construction of proposed Route 92 could potentially complicate access to a small number of business establishments, primarily near the eastern and western ends of the alignment. These include approximately seven businesses on NJ Route 32 east of US Route 130. The affected businesses are not the types that draw their customers from among passing motorists. Therefore, the overall economic impact to the region would be relatively small.

4.2.12.2 Community Services

Proposed Route 92 is expected to draw traffic off local roads, and would be patrolled by the New Jersey State Police. Route 92 would not increase the burden on local police departments, and could reduce that burden by reducing traffic and traffic-related incidents on roads for which the local police are responsible.

Local fire companies and rescue squads would provide services on proposed Route 92. South Brunswick would provide services to approximately 6 miles of the main roadway and the interchanges, and Plainsboro Township would provide services to

approximately 0.8 miles of the main roadway. Monroe Township and South Brunswick would be expected to share responsibility for fire protection and emergency medical services around the interchange between proposed Route 92 and the existing Interchange 8A of the New Jersey Turnpike.

In South Brunswick, the proposed Route 92-US Route 1 interchange would be in the service area of the Kingston fire company and rescue squad. The Kingston and Monmouth Junction fire companies and rescue squads would share responsibility for the area of the proposed Perrine Road interchange. The remainder of proposed Route 92 in South Brunswick would be in the service area of the Monmouth Junction fire company and rescue squad.

Traffic analysis performed for the EIS indicates that east of US Route 1, peak-hour traffic would be lighter on most roads with Route 92 than without it. West of US Route 1, changes would be minor, with slightly lighter traffic on some roads and slightly heavier traffic on others. The only significant negative traffic impact west of US Route 1 would be an increase in truck traffic on Ridge Road/Heathcote Road and on Laurel Avenue, which functions as a continuation of Heathcote Road west of Route 27. This impact could be mitigated through truck restrictions and traffic calming (see Section 5.3.10). On US Route 1 itself, construction of Route 92 would increase peak-hour traffic south of the western terminus of Route 92. As part of the Route 92 project, US Route 1 would be widened to six lanes from just north of Ridge Road to the Plainsboro border, providing additional capacity to accommodate the increased traffic. Therefore, proposed Route 92 should improve peak-hour emergency response times east of US Route 1 and have little overall impact west of US Route 1 and on US Route 1 itself. Because Route 92 would be a new road with few interchanges, most construction activity would take place away from existing roads, and traffic impacts on existing roads during construction would be relatively minor. Efforts would be made to minimize disruption of emergency services during construction of interchanges.

Because proposed Route 92 would be a limited-access highway with few interchanges, emergency response vehicles would have to travel relatively long distances to reach people in need of help on Route 92. Proposed Route 92 would not have an interchange along the 4.7-mile stretch between the Perrine Road interchange and US Route 130. This could be mitigated by provision of emergency-only access to proposed Route 92 where it crosses Friendship Road. The limited access to Route 92 would be further mitigated by the higher speeds at which emergency vehicles could travel on Route 92.

4.2.12.3 Fiscal and Economic Impacts

Bond proceeds are being held in reserve for construction of Route 92. The bonds will be redeemed using toll proceeds from the New Jersey Turnpike and the Garden State Parkway. No tax funds would be required for construction of Route 92.

The farmland that would be used as right-of-way for proposed Route 92 is in generally non-intensive agricultural use. Agricultural production on New Jersey farmland in non-

intensive use generally has a value of up to $500 per acre per year. At $500 per acre per year, the value of the 210 acres of agricultural production displaced by Route 92 would be approximately $105,000 per year. Route 92 would interfere with access to an additional 78 acres of farmland. At $500 per acre per year, the value of agricultural production on this land would be approximately $39,000 per year. Therefore, the approximate value of agricultural production displaced by proposed Route 92 would be approximately $144,000 per year.

Because land in agricultural use is assessed at its agricultural value rather than its market value, use of agricultural land for Route 92 would reduce property tax revenue in South Brunswick Township by no more than $12,000 per year. Proposed Route 92 would not cause Plainsboro Township to lose any property tax revenue, because the proposed Route 92 right-of-way in Plainsboro is public property.

Proposed Route 92 would tend to reduce the value of homes that would have a view of the highway but would not have access to it. However, external aesthetics are a relatively weak factor in determining the value of moderately priced housing such as that found in the proposed Route 92 corridor.

4.2.13 Land Use

4.2.13.1 Direct Impacts

Proposed Route 92 would be visible from a small number of existing residences, and traffic noise from proposed Route 92 would cause the applicable FHWA noise abatement criterion to be exceeded at five residences and two business establishments. In addition, Route 92 would be visible from the southern portion of Friendship Park in South Brunswick and could be heard from a larger portion of the park and from a portion of the Plainsboro Preserve. See Sections 4.2.8 and 4.2.9 on noise and visual impacts.

Acquisition of the right-of-way for proposed Route 92 and associated interchanges would displace four residential properties, all in South Brunswick Township:

- Block 5, Lot 2.01, near the power line easement at the end of a private drive off the south side of Friendship Road across from New Road
- Block 5, Lot 4.04, at the end of another private drive off the south side of Friendship Road, immediately east of Lot 2.01
- Block 6, Lot 2.02, on the south side of Friendship Road southeast of Haypress Road
- Block 11, Lot 16, off the north side of Friendship Road just west of US Route 130

Acquisition of the right-of-way for proposed Route 92 and associated interchanges would displace one business, the Solar Motel at the intersection of US Route 1 and Ridge Road, west of US Route 1 and north of Ridge Road. The motel is directly in the path of

the proposed ramp from southbound US Route 1 to Ridge Road. A building owned by NJTA at US Route 1 and Campus Drive would also be displaced. The building is currently leased by the Central New Jersey Council of the Boy Scouts of America and by an accounting business, but the leases provide for termination by NJTA.

Two vacant commercial/industrial buildings would be displaced because they are at the point where the ramp connecting proposed eastbound Route 92 would merge with northbound US Route 1.

Realignment of Research Way at the proposed Perrine Road-Route 92 interchange would displace three ball fields on a 20-acre recreational facility owned by Princeton University.

The eastbound service road for proposed Route 92 would pass through the northern end of four developed commercial properties on the south side of NJ Route 32 between Cranbury-South River Road and Herrod Boulevard in South Brunswick. The two properties closer to Herrod Boulevard are not currently accessed off NJ Route 32. The two properties closer to Cranbury-South River Road are currently accessed from NJ Route 32, and this access would be eliminated. Substitute access for one of the two properties would be provided off the northern end of Abeel Avenue. Access to the other property, an office/warehouse building, could be provided off Cranbury-South River Road. Construction of the service road would require displacement of the parking area in front of the office/warehouse building.

The proposed Route 92 roadway and associated interchanges would displace approximately 210 acres of active agricultural land. In addition, the proposed roadway would interfere with access to an additional 78 acres of agricultural land. None of the agricultural land that would be displaced or made inaccessible is in an agricultural development area (ADA), and none of the land is subject to preservation easement under the New Jersey Farmland Preservation Program.

The proposed Route 92 project would pass through the northern end of the Plainsboro Preserve, displacing 14 acres of the 630-acre preserve and separating approximately 12.5 acres north of proposed Route 92 from the rest of the preserve. Route 92 would pass approximately 900 feet north of McCormack Lake, the focal point of the preserve, and approximately one half mile north of the New Jersey Audubon Society Environmental Education Center at the southeastern end of McCormack Lake.

Route 92 would include a bridge over the Amtrak rail line that passes along the northwestern boundary of the Plainsboro Preserve. An existing trail by which hikers currently access the northern portion of the preserve would pass under the bridge. The existing trail would be blocked at a point farther east where it currently crosses the proposed Route 92 right-of-way.

4.2.13.2 Consistency with Planning Principles and the NJ State Development & Redevelopment Plan

Proposed Route 92 would draw regional through-traffic away from local roads. This would make local driving more amenable and efficient and facilitate use of alternative forms of transportation, such as walking and bicycle riding. Removal of through traffic from neighborhood centers would improve quality of life and would tend to strengthen the identification of residents with their communities while allowing more efficient development designs (such as interconnected developments, which are not locally desirable because the connections tend to become routes for through traffic).

Construction of proposed Route 92 would contradict the policy of South Brunswick Township as reflected in its current planning documents. Proposed Route 92 and related improvements were included in the Circulation Element of the 1988 South Brunswick Master Plan, but were deleted from the Circulation Element when the Master Plan was revised in 1994. The 1994 Master Plan Reexamination Report presented no reasons for deleting Route 92 from the Circulation Element.

South Brunswick's 2000 Master Plan Reexamination Report asserted, "with the completion of Route 522, the Township will have adequately contributed a much needed arterial road, significantly meeting the east/west circulation goal of many decades." The 2000 Master Plan report stated that the Planning Board, Township Council and Environmental Commission strongly opposed the construction of proposed Route 92. The report endorsed the USEPA Modified No-Build Alternative (see Section 2.3.1), stating that it would achieve "essentially the same goal as Route 92" with less damage to the environment and at lower cost.

Traffic modeling performed for this EIS indicates that under the USEPA Modified No-Build Alternative, morning non-local trips on local roads would *increase* by 4 percent, and there would be no reduction in the number of evening non-local trips using local roads. Because this alternative would not reduce regional through traffic on the local east-west road system, local driving would be more difficult as a result of congestion. Walking and bicycling would be less safe. Congestion, caused by regional traffic attempting to use local roads to reach their destinations more quickly, tends to decrease the quality of life in neighborhoods and decrease the identification of local residents with their community. Consequently, this alternative would not fulfill the purpose of the proposed project, nor would it address the region's needs for improved mobility.

The 2001 South Brunswick Master Plan and the 2001 Circulation Element state that proposed Route 92 is inconsistent with the Master Plan and is not endorsed by the Township, but neither document explains how Route 92 is inconsistent with the plan. Proposed Route 92 would promote the principle, consistently stated in South Brunswick planning documents, that "local traffic should be separated, as much as possible, from through traffic".

The western end of proposed Route 92, including the US Route 1 and Perrine Road interchanges, would be constructed in an area of South Brunswick designated for office parks on the Land Use Plan Map in the 2001 South Brunswick Master Plan. The central portion of proposed Route 92, where there would be no interchanges, would pass through an area designated for rural residential use on the 2001 map. The eastern end of proposed Route 92, including the US Route 130 interchange and the South Brunswick portion of NJ Turnpike interchange 8A, is in an area designated for general industrial development on the 2001 land use map. Therefore, the areas in South Brunswick where proposed Route 92 might potentially stimulate development—the interchange areas--are areas the Township has designated for commercial and industrial development. The area in South Brunswick where Route 92 would have no interchanges, and would therefore have little potential to stimulate development, is an area South Brunswick has designated for relatively sparse development. Proposed Route 92 could stimulate development in areas where South Brunswick has planned for commercial and industrial development to occur.

East of Perrine Road, proposed Route 92 would pass through the northern portion of Plainsboro Township. In this part of Plainsboro, Route 92 would pass through the northern end of the Plainsboro Preserve, designated for open space and conservation on the Land Use Plan Map in the Plainsboro Master Plan, last revised in 2000. The remainder of the Plainsboro section of proposed Route 92 would pass through agricultural land recently acquired by the Township for preservation as open space. The Township refers to this property as the Perrine Tract. Plainsboro has reserved a right-of-way for proposed Route 92 through the Perrine Tract. Both Plainsboro, the primary creator of the preserve, and Middlesex County, the owner of the northern portion of the preserve (through the Middlesex County Improvement Authority) intended that proposed Route 92 pass through the preserve. The Plainsboro Master Plan states that proposed Route 92 is "a priority for the Township," and that the Township supports Route 92 and "encourages [its] timely implementation."

The 1998 Monroe Township Master Plan expresses concern that proposed Route 92 could cause significant increases in through traffic in the Township, but notes that changes have been made in the design of Route 92 to address this potential problem.

The 2001 New Jersey State Development and Redevelopment Plan (State Plan) divides the state into the following planning categories:

- Metropolitan Planning Areas: PA1
- Suburban Planning Areas: PA2
- Fringe Planning Areas: PA3
- Rural Planning Areas: PA4
- Environmentally Sensitive Planning Areas: PA5

The State Plan "anticipates continued growth throughout New Jersey in all Planning Areas." Development is encouraged in PA1 and PA2 and is accommodated in PA3, PA4

and PA5. The State Plan specifies that development is expected to occur, within guidelines, in all planning areas. The State Plan directs that infrastructure investment decisions should encourage growth in areas that are already developed or are currently developing, and should discourage development sprawl into undeveloped areas.

Proposed Route 92 would begin and end in a Suburban Planning Area, PA2, and would pass through an Environmentally Sensitive Planning Area, PA5. From US Route 1 to the Amtrak rail lines in Plainsboro, proposed Route 92 would be in a Suburban Planning Area. From the Amtrak lines east to the US Route 130 corridor, Route 92 would pass through an Environmentally Sensitive Planning Area. From the western edge of the US Route 130 corridor to its eastern terminus at NJ Turnpike Interchange 8A, proposed Route 92 would again be in a Suburban Planning Area.

The State Plan anticipates that the Suburban Planning Area will provide for much of the state's future development, promote compact development in "centers" and "nodes," and protect the character of existing stable communities. Proposed Route 92 would link a linear development center, US Route 1, with a development node, Interchange 8A of the New Jersey Turnpike. Route 92 would have only two other interchanges: at Perrine Road, less than 1 mile east of US Route 1, and at US Route 130, approximately 1 mile west of the NJ Turnpike. The areas around the proposed US Route 1 interchange and around Interchange 8A are currently developed, and the areas around the proposed Perrine Road and US Route 130 interchanges are planned for development and are currently developing. To the extent that proposed Route 92 promotes development, it will be compact development in the interchange areas, consistent with the State Plan's vision for the Suburban Planning Area.

Traffic modeling indicates that proposed Route 92 would reduce traffic on local roads. This would help protect the character of existing stable communities, thus advancing another element of the State Plan's vision for the Suburban Planning Area.

The alignment of proposed Route 92, specifically the portion that would pass through an Environmentally Sensitive Planning Area, has been modified to minimize impact to wetlands and other environmental resources. The design of proposed Route 92 includes no interchanges in the Environmentally Sensitive Planning Area, and would therefore preclude construction of connecting roads that would promote development in that area.

4.2.13.3 Effect of Proposed Route 92 on Growth Patterns

Proposed Route 92 is designed to maintain mobility on the local and regional road networks. Maintaining mobility in the road network would have the potential to make undeveloped properties in the area more attractive for development, because their accessibility would remain stable. New development creates the ability to accommodate increased population and economic activity. Transportation modeling conducted for this EIS indicates that Route 92 would not provide transportation capacity beyond what is currently needed (i.e., no excess capacity is proposed). Rather, traffic modeling indicates

that Route 92 would provide only the transportation capacity needed to accommodate growth that has already occurred or is already in the process of occurring. Without improvements such as Route 92, traffic growth would continue and the gap between the volume of traffic and the capacity to accommodate traffic would become steadily larger. The effect of the widening gap would be to decrease the quality of life for residents as a result of significant congestion.

A key to managing growth is effective land use regulation. Without effective land use controls, any road system in an area with strong development pressure will become congested. If land use regulators and other public officials accept current traffic conditions as the standard, and allow traffic-generating development to continue unchecked, construction of new roads or highways would likely increase the total traffic volume that could be accommodated in the local area and the region. If construction of Proposed Route 92 were combined with effective control of development, however, traffic conditions would be maintained, and perhaps improved. The NJTA has no direct control over the land development review and approval process, which is principally the jurisdiction of municipalities and counties, but it notes that new highway development can be a significant factor in the rate and shape of growth. State agencies have affirmed their interest in collaborating closely with local communities to ensure that future development occurs in sustainable patterns.

Much local traffic (see Section 4.2.7) is traveling on local roads as a substitute for the congested regional highway system. Route 92, if built, is predicted to draw traffic away from local roads. This would discourage growth of business activity on local roads generally, but could accelerate growth at the new interchanges. Proposed Route 92 would be a limited-access highway with four interchanges: US Route 1, Perrine Road, US Route 130, and a tie-in to Interchange 8A of the New Jersey Turnpike. All of these locations are in areas where commercial development has been strong in the past, and growth in these locations is encouraged by local zoning ordinances and land use planning documents. The interchange areas in South Brunswick are zoned for development because of the proximity of these lands to US Route 1 and the extensive office development that currently exists in this area (between US Route 1 and the Northeast Corridor railway). The interchange areas in Monroe Township host a major warehouse distribution center serving the region.

Proposed Route 92 would provide a needed connection between the New Jersey Turnpike corridor and the US Route 1 corridor, and the limited access design precludes it from creating a new development corridor of its own.

For a distance of approximately 4.4 miles along the middle two-thirds of proposed Route 92, vehicles would not be able to enter or exit the highway. Although proposed Route 92 would cross currently undeveloped lands (in this central section), no direct access would be available to adjacent lands (either as frontage or via connecting local roads) because proposed Route 92 is designed as a limited access highway. For this reason, proposed Route 92 would not create opportunities for linear development along

its route, and direct access to nearby undeveloped lands would only be possible through the interchange areas. There would be no interchanges along the road segment between Perrine Road and US Route 130, and thus it would not connect to local or cross streets that could provide access to new lands for development. Route 92 would therefore not enhance access to the area between the development corridors that are present at its eastern and western ends.

While Proposed Route 92 might accelerate zoned development near its interchanges, it would also divert traffic away from local roads to the major highways. This would discourage traffic-dependent commercial development along the local roads, consistent with anti-sprawl initiatives.

Because proposed Route 92 would be a limited access highway, it would not enable linear development along its route. With no interchanges between Perrine Road and US Route 130, it would not connect to cross streets that would make available new lands for development. Secondary development impacts could occur at the interchanges of proposed Route 92 with US Route 1, Perrine Road, US Route 130 and New Jersey Turnpike Interchange 8A. These interchange areas are already well developed or approved for development; further development in these locations would remain under the jurisdiction of the municipal development review process and the guidance of municipal Master Plans.

Proposed Route 92 would not induce development of the area east of Perrine Road that Plainsboro Township has designated for low-density residential development. This area currently has direct access to Perrine Road, but after realignment of Perrine Road during construction of the Perrine Road interchange of Route 92, the area would have to be accessed by a circuitous route.

4.2.13.4 "Smart Growth" Initiative

On January 31, 2002, New Jersey Governor James McGreevey issued Executive Order #4 addressing "smart growth" in the state. The executive order states, "it is the law and policy of the State of New Jersey to promote smart growth and to reduce the negative effects of sprawl and disinvestments in older communities." Among other things, Executive Order #4 did the following:

- Created in the Office of the Governor a Smart Growth Policy Council whose members include the commissioners of the New Jersey Department of Environmental Protection (NJDEP), the New Jersey Department of Transportation (NJDOT), and the New Jersey Department of Community Affairs (NJDCA).

- Made the Smart Growth Policy Council responsible for ensuring that state transportation and infrastructure spending and regulation are consistent with the principles of smart growth and the State Development and Redevelopment Plan (the State Plan).

Later, an Office of Smart Growth was created in NJDCA. The web site of the Office of Smart Growth lists the following "smart growth principles":

- Mixed land uses
- Compact, clustered community design
- Range of housing choices and opportunity
- Walkable neighborhoods
- Distinct, attractive communities offering a sense of place
- Open space, farmland and scenic resource preservation
- Future development strengthened and directed to existing communities using existing infrastructure
- Transportation option variety
- Predictable, fair and cost-effective development decisions
- Community and stakeholder collaboration in development decision-making

These principles of land use planning are reflected in the land use analysis in this EIS.

4.2.14 Environmental Justice

4.2.14.1 Minority Groups in the Proposed Route 92 Corridor

The percentage of people of Asian descent in the Proposed Route 92 Corridor is essentially the same as in South Brunswick as a whole and is substantially less than in Plainsboro as a whole (see Table 3-16 in Section 3.12 and Table 3-18 in Section 3.14). In addition, the percentage of Asians in the Proposed Route 92 Corridor is only moderately higher than the percentage in Middlesex County as a whole, which is 14 percent. Because they are not disproportionately concentrated in the corridor that would be affected by Route 92, the proposed project would not be anticipated to have disproportionate environmental impact on people of Asian descent.

The percentage of Blacks and African Americans in the Proposed Route 92 Corridor is less than half the percentage in South Brunswick and Plainsboro as a whole, and is less than one third the percentage in Middlesex County as a whole (see Table 3-18). Therefore, Route 92 would not be anticipated to have disproportionate environmental impacts on Blacks or African Americans.

Similarly, the percentage of Hispanics in the Proposed Route 92 Corridor, 2.9 percent, is less than the percentage in South Brunswick and Plainsboro as a whole, and is less than one quarter the percentage in Middlesex County as a whole. Therefore, proposed Route 92 would not be anticipated to have disproportionate environmental impacts on Hispanics.

4.2.14.2 Economic Groups in the Proposed Route 92 Corridor

Census data indicate that the overall financial status of the residents of the Proposed Route 92 Corridor is higher than the financial status of Middlesex County residents taken as a whole (see Section 3.14.2). Therefore, construction of proposed Route 92

would not be anticipated to have disproportionate environmental impacts on low-income people.

4.2.15 Cumulative Impacts

Federal regulations define "cumulative impact" as the impact on the environment that results from the impact of a proposed action combined with other past, present and reasonably foreseeable future actions (40 CFR 1508.7). The regulations further state that cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. This section examines potential cumulative impacts of proposed Route 92.

4.2.15.1 Natural Resources

4.2.15.1.1 Wetlands

As discussed in Section 4.2.3.4, approximately 12.03 acres of wetlands and open water would be permanently filled during construction of proposed Route 92, and an additional 1.16 acres would be permanently affected by shading from elevated sections of the roadway. To mitigate the impact of this construction, NJTA proposes to construct approximately 57 acres of wetlands and open water on land extending north and south from the proposed Route 92 alignment east of Haypress Road (see Section 5.3.4).

The constructed wetland would be hydrologically connected to the wetland bordering Devil's Brook, the same wetland that would experience most of the wetland filling associated with proposed Route 92. The replacement wetland would be designed as a wetland complex composed of 12.24 acres of emergent marsh and wet meadow, 8.2 acres of scrub-shrub wetland, and 36.7 acres of forested wetland. The mitigation plan also includes 0.85 acres of open water.

Because proposed Route 92 would not cause a net loss of wetlands after construction of replacement wetlands, it would not contribute to a cumulative loss of wetlands.

4.2.15.1.2 Wildlife

The middle section of proposed Route 92 passes between two wetland complexes that provide important wildlife habitat: the Devil's Brook wetland complex to the north of the proposed alignment, and the wetland complex that includes Broadway Swamp to the south. East of the Amtrak rail lines, Devil's Brook turns southwest through the Plainsboro Preserve and the two wetland complexes merge in the southwestern section of the preserve. Route 92 would pass through the Devil's Brook wetlands in the northern end of the Plainsboro Preserve. To maintain existing wetland hydrology and to allow terrestrial and aquatic wildlife to move between the two wetland complexes, Route 92 would include two 500-foot bridges in the wetland area. Proposed Route 92 would therefore not contribute significantly to cumulative fragmentation of the wildlife habitat provided by the wetlands.

4.2.15.2 Farmland

The proposed Route 92 roadway and associated interchanges would displace approximately 210 acres of active agricultural land and would interfere with access to an additional 78 acres. Proposed Route 92 would not contribute to cumulative loss of farmland beyond this direct impact, however. The agricultural land in the Route 92 study area is already undergoing a rapid process of division into three categories:

- Agricultural land in the process of being developed for residential and commercial use, such as the agricultural land near US Route 1 and US Route 130.
- Agricultural land subject to legal restrictions designed to preserve its agricultural nature, including farmland north and south of the proposed Route 92 alignment in south-central South Brunswick Township.
- Agricultural land being preserved as recreational and natural open space, such as Friendship Park and the Boyko property in South Brunswick near the eastern end of the Plainsboro Preserve.

The process of dividing agricultural land among these three categories is proceeding, and will continue whether or not Route 92 is built. Construction of proposed Route 92 would not contribute to the process. Therefore, proposed Route 92 would not contribute to cumulative impacts to farmland.

4.2.15.3 Air Quality and Transportation

The air quality and transportation analyses performed for this EIS are cumulative impact analyses. The air quality and transportation analyses include the effects of recently completed transportation improvements in the area potentially affected by implementation of proposed Route 92. These improvements include addition of a right-hand turning lane from southwest-bound Dey Road to northwest-bound Scudders Mill Road; widening of US Route 1 from four to six lanes from Adams Lane in North Brunswick Township to US Route 130; addition of a 500-space NJTA park-and-ride lot adjacent to the intersection of US Route 130 and Route 32; and widening the New Jersey Turnpike to seven lanes per direction north of Interchange 11. The air quality and transportation analyses also include the projected effects of the proposed Penns Neck improvements, for which funds have been committed by the New Jersey Department of Transportation.

The air quality and transportation analyses address the combined impacts of proposed Route 92, past actions, and foreseeable future actions, and therefore meet requirements for cumulative impact analyses as defined in federal regulations. As shown in sections 4.2 6 and 4.2.7, the air quality and transportation analyses indicate that proposed Route 92 would provide a cumulative environmental benefit as compared to the no-action alternative and the other action alternatives considered in the EIS. Because proposed Route 92 would have positive air quality and transportation impacts, it would not contribute to cumulative negative impacts to air quality and transportation.

4.2.15.4 Noise and Aesthetics

Proposed Route 92 would have localized noise and aesthetic impacts, as discussed in Sections 4.2.8 and 4.2.9. These impacts could combine with noise and aesthetic impacts of other development projects to create more significant cumulative impacts. The potential of proposed Route 92 to contribute to cumulative noise and aesthetic impacts is limited, however, by the absence of interchanges from proposed Route 92 between US Route 130 and Perrine Road. This section of proposed Route 92 is largely undeveloped and therefore more susceptible to noise and aesthetic impacts caused by new development. Because proposed Route 92 would have no interchanges in this section, it would not facilitate additional development that could combine with Route 92 to cause cumulative impacts.

4.2.15.5 Land Use

4.2.15.5.1 Displacement

Proposed Route 92 would displace four residences, one business, and three ball fields (see Section 4.2.13). Construction of new highways and interchanges displaces existing land uses, and this impact may be cumulative. Highway projects are difficult to implement in central New Jersey, however, and this limits the potential for cumulative displacement impacts. No highway projects are currently foreseen that could combine with proposed Route 92 to cause significant cumulative displacement impacts. Proposed Route 92 would be a limited-access toll road, and construction of intersecting roads that could combine with Route 92 to cause cumulative impacts would be restricted.

4.2.15.5.2 Parkland

Proposed Route 92 would pass through the northern end of the Plainsboro Preserve, displacing approximately 14 acres of the 630-acre preserve and separating another 12.5 acres of the preserve from the rest. If additional through-roads were built through the preserve, a significant cumulative impact could result. Because the preserve is encumbered under New Jersey's Green Acres Program, promoters of an additional through-road would have to show that construction of the road would have a significant public benefit and that there was no feasible alternative to routing the road through the preserve (see Section 3.13.1). In addition, replacement land would have to be provided. These requirements are a strong deterrent to construction of additional through-roads in the Plainsboro Preserve, and therefore a strong barrier to the development of cumulative road-related impacts to the preserve.

4.2.16 Phased Route 92 Sub-alternative

The phased Route 92 alternative would involve two phases of construction. The first phase of construction would involve building one travel lane in each direction along the proposed Route 92 alignment. In the second phase of construction a second lane would be added when travel demand requires it. Under this alternative, key elements of the roadway structure, such as bridges and embankments, would be built out to the full four-lane highway specifications, but only one travel lane (in each direction) would be paved and marked.

Most of the physical environmental impacts of the sub-alternative would be the same as for the proposed Route 92 project. Other impacts, such as traffic and potential induced development near the interchanges, would be reduced in the short-term. However, the impacts of the full implementation of the phased Route 92 alternative are the same as the proposed Route 92 alternative, namely a four-lane highway between US Route 1 and New Jersey Turnpike interchange 8A. As a result, by the end of the project, the ultimate impacts would be the same as those described for Route 92 as proposed by NJTA.

4.3 US Route 1 Widening and Signal Removal

This section addresses potential impacts of the US Route 1 Widening and Signal Removal alternative. Because the potential new US Route 1 interchanges are now only preliminary concepts, rather than preliminary engineered designs as in the case of proposed Route 92, many of the impacts discussed below should be regarded as potential impacts rather than impacts that are expected to occur if the alternative is implemented.

4.3.1 Topography, Geology and Soils

4.3.1.1 Topography

Since US Route 1 has already been graded, the effects to topography as a result of US Route 1 Widening and Signal Removal would be minimal. In the Sand Hills area, where US Route 1 currently is bounded by steep embankments, some excavation would likely be required to accommodate the widening. In addition, some excavation and/or fill would likely be required to construct the grade-separated intersections.

4.3.1.2 Geology

Unique or economically significant geologic features do not occur within the Project Study Area, and existing quarries are outside the project area limits. Excavation associated with US Route 1 Widening and Signal Removal would be minimal. Fill would be required to construct the grade-separated interchanges and an overpass at Major Road in the Sand Hills area.

Certain geologic formations may contain iron sulfide minerals known as "acid-producing deposits" that, when exposed to oxygen, oxidize and produce sulfuric acid. This acid increases the solubility of metals to the extent that these metals may represent a toxic source to aquatic life, vegetation, and potable water supplies. According to the *Technical Manual for Stream Encroachment*, the Magothy and Raritan geologic formations of the Coastal Plain physiographic province sometimes contain substantial acid-producing deposits. Construction of the US Route 1 Widening and Signal Removal alternative could require excavation within the Magothy Formation; therefore, it is important to note the possibility of exposing acid-producing deposits to oxygen so that appropriate mitigation could be implemented if necessary.

4.3.1.3 Soils

The major anticipated impact to soils would be erosion of soil particles. Soil erosion causes problems when downstream water features become laden with sediment, thus degrading water quality. Sediment from soil erosion also tends to obstruct natural and manmade drainage structures and channels.

Construction activities increase the amount of soil exposed to flowing water, thus increasing the extent of soil erosion leading to adverse impacts to nearby surface water features. Soil erosion control guidelines and mitigation would be adhered to in accordance with New Jersey's *Standards for Soil Erosion and Sediment Control*.

The resistance of a soil to erosion depends upon the composition of particles that make up the soil, as well as the presence of vegetative cover and steepness of the slope. Sandy soils on steep slopes with minimal vegetative cover, such as a sand dune, are highly susceptible to erosion. Conversely, clayey silts with binding particles found on gentle to level slopes with significant vegetative cover, such as a forested wetland, are less susceptible to erosion. The USDA Natural Resources Conservation Service assigns to all soil types an erosion factor, K, which predicts an area's annual rate of soil loss by sheet and rill erosion. These estimated erosion factors are based on the percentage of silt, sand and organic matter and on soil structure and permeability. K-factor values from 0.17 to 0.24 indicate low erodibility, 0.28 to 0.37 indicate medium erodibility, and 0.43 to 0.49 indicate high erodibility.

Table 4-4 lists the soils anticipated to be disturbed for the construction of the US Route 1 Widening and Signal Removal and its K-factor. Most of the soils that would be impacted for construction of this alternative are characterized by K-factor values of 0.28 to 0.49, representing soils of medium to high erodibility.

4.3.2 Natural Resources

4.3.2.1 Surface Water

4.3.2.1.1 Waterways, Streams, and Lakes

The impacts to existing surface water bodies from the US Route 1 Widening and Signal Removal would be expected to be minimal, as the water bodies that cross the Route 1 Corridor are already bridged or culverted. Some bridges or culverts would be altered by the project.

The creation of additional impervious surface would result in increased stormwater runoff rates compared to current conditions. If uncontrolled, the additional stormwater from US Route 1 could carry significant amounts of vehicle-related contaminants from the roadway into surface and groundwater resources. In addition, increased runoff can exacerbate flooding during rain events. The current stormwater system in place along US Route 1 would have to be updated to convey and treat the additional stormwater created by this alternative. Various state, county and regional agencies have set forth stormwater management regulations with which this alternative would have to comply.

4.3.2.1.2 Floodplains

Development within floodplains is regulated at the federal level by Floodplain Management Executive Order 11988 and at the state level by the Flood Hazard Area Control Act (N.J.S.A. 58:16A-50 et seq.) and Rules and Regulations Governing Flood Hazard Area for Stream Encroachment Permits (N.J.A.C. 7:13-1.1 et seq.). The placement of fill within a floodplain results in adverse impacts to the function of the floodplain including a reduction of the flood storage capacity of the stream, an increase in the flood height of the stream and an increase in flood hazards extending to areas beyond the disturbed area itself. Implementation of the US Route 1 Widening and Signal Removal alternative could require construction in the floodplains of Heathcote Brook and Oakey Brook. NJDEP Stream Encroachment permits would be required for

construction of the stream crossings of Heathcote Brook, Oakey Brook, and various smaller tributaries associated with these brooks.

FEMA prohibits encroachment within the 100-year flood boundary that will cause an increase in flood heights of greater than 1.0 foot. The State of New Jersey prohibits encroachment within the flood hazard area that will cause an increase in flood heights of greater than 0.2 feet. NJDEP's Flood Hazard Area Control regulations require that any new or modified channel of a watercourse be designed and constructed so that during low-flow conditions the water is at least as deep as in the existing channel (N.J.A.C. 7:13-3.6(c)). This preserves the ability of fish to pass through the watercourse during low flow conditions. NJDEP regulations limit the fill or reduction of floodplain volume below the 100-year flood to a maximum of 20 percent of the flood storage volume in the flood fringe area within the right-of-way (N.J.A.C. 7:13-2.14(a)(1)). Highway projects that cannot meet this requirement because of limited right-of-way may be granted an exemption if a need for the project has been demonstrated and the project is designed to minimize fill (N.J.A.C. 7:13-2.14(a)(7)).

4.3.2.1.3 Water Quality

Because construction of the US Route 1 Widening and Signal Removal alternative would not require any additional water crossings, no new impacts to water quality would occur as a result of this alternative. However, the generation of additional stormwater runoff could increase the degree of impact that already occurs along US Route 1. Section 4.3.2.1.3 contains a discussion of the types of impacts that could occur to water quality. In addition, temporary impacts to water quality could occur during construction (namely, erosion and accidental spills).

4.3.2.2 Groundwater

4.3.2.2.1 Aquifers/Aquifer Recharge in Project Area

Implementation of the US Route 1 Widening and Signal Removal alternative would generate stormwater runoff containing various pollutants as described in Section 4.3.2.1.3. These pollutants include nutrients, petroleum hydrocarbons, sediments, floatables, pathogens, pesticides, metals, and road salts. The likelihood of these pollutants entering the groundwater table is dependent upon the permeability and structure of the overlying soils. As described in Section 3.3.2.1, most of the Route 1 Corridor is characterized by a moderate vulnerability to groundwater contamination resulting from moderate transmissivity rates. No soils in the Route 1 Corridor are designated as hydrologic group A, defined as soils with a high rate of water transmission. Nearly all of the soils in the Route 1 Corridor are hydrologic group B, C or D, representing moderate, slow and very slow rates of water transmission, respectively. The only soil phase in hydrologic group A is Evesboro sand, which is found in one relatively small area and is not under the US Route 1 right of way. Due to these generally moderate transmissivity rates, increased infiltration of contaminated stormwater runoff generated by this alternative would not be expected to pose an adverse threat to groundwater quality. Many of these pollutants would be taken up by

plants, adsorbed by sediments and soil, or broken down by microorganisms in the soil before they reached the groundwater table.

Aquifer recharge is also highly dependent upon the permeability of overlying geologic formations. The more permeable a geologic formation, the greater the recharge to the aquifer. Increased development leads to a decrease in pervious surfaces by the placement of impervious pavement. This results in a reduction of surface area by which aquifer recharge can be conducted. Construction of this alternative would result in a loss of pervious lands, reducing the surface area through which an aquifer can be recharged. The Route 1 Corridor is largely composed of geologic units characterized by fine sand and silt deposits of medium permeability. The remainder of the Route 1 Corridor comprises uppermost geologic units characterized by fractured bedrock of low permeability. The US Route 1 Widening and Signal Removal alternative would represent a minor impact to aquifer recharge, as there would be a small loss of land characterized by medium and slow permeability, although no loss of land characterized by high permeability.

4.3.2.2.2 Sole Source Aquifers

The construction of additional impermeable land would reduce the area of recharge by the same amount. Approximately half of the Route 1 Corridor lies above the Northwest New Jersey aquifer, which is a sole source aquifer. However, as discussed above, the soils overlying the aquifer have medium to slow permeability; therefore, impacts to the sole source aquifer would not be great. In addition, these soils would also allow for the absorption and adsorption of pollutants and prevent their infiltration into the aquifer. The central portion of the Route 1 Corridor is over formations that are not sole source aquifers.

4.3.2.2.3 Wells

A well search was not performed for the US Route 1 Widening and Signal Removal alternative; however, it is known that there are no active public water supply wells in either South Brunswick or North Brunswick along the corridor (see Section 3.3.3). Any wells within the footprint of the project would be affected by construction of this alternative.

4.3.2.3 Water Supply

4.3.2.3.1 Public Water Supply

As no active water supply wells are located within the Route 1 Corridor, the construction of this alternative would not directly impact the public water supply.

4.3.2.3.2 Private Water Supply Wells

It is unlikely that any private water supply wells are located within the footprint of the US Route 1 Widening and Signal Removal alternative, since the corridor is mainly commercial and the water source for North Brunswick is the Delaware and Raritan Canal.

4.3.2.4 Wetlands

Widening Only

US Route 1 is approximately 80 feet wide as it travels through this corridor. This accounts for two lanes traveling north, two lanes traveling south, a center divider and an 8 to 10 foot shoulder on either side. Widening US Route 1 by two lanes (one northbound and one southbound lane) would impact approximately 4 acres of palustrine forested wetlands. Construction easements associated with temporary disturbance would increase this impact.

Widening and Signal Removal

The following text addresses the additional wetland loss expected as a result of construction activities at each of the five intersections targeted for grade-separated interchanges.

Cozzens Lane/Adams Lane

This intersection contains a dense development of both residential and commercial uses. Based on the available mapping, no known wetlands exist at this intersection; therefore, no wetland impacts would be anticipated.

Finnegan's Lane

Wetlands are located to the south and east of US Route 1, as well as to the northwest at this intersection. Based on available wetland mapping, approximately 1.5 acres of forested wetlands would be filled during grade-separation of this intersection. Reconstruction at this intersection could result in sediment and runoff entering the wetland areas that surround this intersection.

Beekman Road/Northumberland Way

Open water wetlands and forested wetland areas are present on the northwest side of US Route 1. A small wetland area (about 0.2 acres) is also present in the southwestern intersection quadrant. This small wetland area could be lost due to construction activities at this intersection required to grade-separate this intersection.

New Road

Approximately 1 acre of wetlands would be lost as a result of intersection improvements required to grade-separate this intersection. The wetland area is located in the southwestern quadrant of the intersection.

Promenade/Route 522

Although a relatively new intersection, modifications required to grade-separate the intersection would impact areas not previously affected by the recent improvements. Approximately 1 acre of wetland would be lost in the southwestern quadrant of the intersection as a result of construction activities needed to grade-separate this intersection.

Summary
Approximately 3.7 acres of wetlands would be lost as a result of roadway improvements needed to grade-separate the five targeted intersections for the US Route 1 Widening and Signal Removal alternative.

4.3.2.5 Fish and Wildlife

4.3.2.5.1 Endangered and Threatened Species

Widening Only
Since the vegetated area affected would consist of relatively narrow bands on both sides of developed US Route 1, no threatened or endangered species habitat is anticipated to be affected by this action.

Widening and Signal Removal
As noted in Section 3.3.5.1, records of occurrence of both federal and state endangered species are documented for the Proposed Route 92 Corridor. As the study area for the proposed Route 92 project and the US Route 1 Widening and Signal Removal overlap and contain similar habitats, it is possible that the range of these species could extend within the Route 1 Corridor. Construction impact at the five intersection reconstruction locations could impact these species' habitat. Additional studies would be required to determine if these species inhabit this area, but the long history of US Route 1 as a major travel route and the habitat fragmentation caused by existing development indicate a low potential for suitable habitat, especially at the roadway fringe.

4.3.2.5.2 Vegetation and Wildlife

Widening Only
US Route 1 widening would result in the loss of vegetation and associated wildlife habitat along the new roadway right-of-way. Assuming the US Route 1 widening requires an additional 8 to 10 feet of roadway to accommodate the proposed third north- and southbound lanes, approximately two acres of vegetated habitat would be taken for roadway construction. Additional vegetation would be disturbed during construction as staging areas would be required along the approximate 7-mile length of affected roadway. Although revegetation is usually required at the end of a construction period, it takes several decades to recreate forest habitat lost during construction.

Widening and Signal Removal
The impacts discussed below are in addition to those described above for just the widening of US Route 1 from a four-lane road to a six-lane road. The following is an estimate of the additional vegetation and associated habitat that could be disturbed and lost as a result of roadway improvements required to grade-separate the five targeted intersections.

Cozzens Lane/Adams Lane (CR 608)**:** Natural vegetation at this intersection is very limited as a result of residential and commercial development. To limit the impacts to the existing residences and businesses, the intersection would need to be designed to use undeveloped lands. Therefore, an estimated 0.5 acres of vegetated land would need to

be taken to accommodate the roadway modifications required to grade-separate this intersection.

Finnegan's Lane: Natural vegetation is predominantly located in the southeastern and southwestern quadrants of this intersection. To make the modifications necessary to remove the signal at this intersection, it is estimated that 4 acres of vegetation would be lost on the southeastern side of US Route 1.

Beekman Road/Northumberland Way: Natural vegetation is predominantly located in the southeastern and southwestern quadrants of this intersection. It is estimated that approximately 2 acres of vegetation and habitat would be lost as a result of removing the signal at this intersection.
New Road: Improvements at this intersection associated with grade-separation and the removal of the signal would result in the loss of approximately one acre of natural vegetation and associated habitat in the southwest quadrant of this intersection.

Promenade/Route 522: Natural vegetation predominantly occurs to the south of this intersection. Roadway improvements required to remove the signal at this intersection would remove approximately one acre of vegetation.

Summary: Approximately 8.5 acres of vegetation and associated habitat would be lost as a result of roadway improvements needed to reconstruct the five targeted intersections.

4.3.3 Farmland

Widening Only
Because the widening of US Route 1 from four lanes to six would take place within the existing right-of-way, no significant impacts to farmland along US Route 1 would occur.

Widening with Signal Removal
As described in Section 2, the US Route 1 Widening and Signal Removal Alternative would create five new signal-free interchanges along US Route 1. It is likely that portions of three of the five interchanges would have to be constructed on land assessed as farmland. Construction of a new interchange at Beekman Road and Northumberland Way could require acquisition of several acres of farmland east of US Route 1 and south of Northumberland Way. Construction of a new interchange at New Road could require acquisition of two narrow lots apparently used to access a large area of agricultural land east of US Route 1 and New Road. It is likely that a new interchange at Route 522 would be built primarily in farmland-assessed woodland south of Route 522 on both sides of US Route 1. A surface-level ramp from southbound US Route 1 to eastbound Route 522 was completed recently in the southwest quadrant of the intersection. Therefore, a portion of the farmland impact associated with a signal-free interchange has already occurred.

4.3.4 Historic and Cultural Resources

4.3.4.1 Impacts to Historic Sites

A cultural resources assessment conducted by Richard Grubb & Associates, Inc. (Grubb) in 2002 identified five small areas near the potential new US Route 1 interchanges that have a moderate to high probability for the presence of prehistoric and historic archaeological resources (Grubb, 2003). The locations of the five areas are as follows:

- The south quadrant of the potential Beekman Road/Northumberland Road interchange
- The east quadrant of the potential New Road interchange
- The east, west and south quadrants of the potential Route 522/Promenade Boulevard interchange

Nineteenth century maps indicate the presence of structures in these areas prior to the Civil War. Grubb recommends that these five areas be investigated further through background research, site assessment and subsurface testing to evaluate the potential impacts of interchange construction on prehistoric and historic archaeological resources (Grubb, 2003).

Grubb concluded through background research and field reconnaissance that no structures exist in the vicinity of the five potential new US Route 1 interchanges that appear to be eligible for listing in the National Register of Historic Places (Grubb, 2003). It is therefore unlikely that construction of the interchanges would affect historic architectural resources.

A draft *New Jersey Historic Roads Study* (Kise Straw & Kolodner 2001) has identified most of US Route 1 between Trenton and New Brunswick, known historically as the Trenton and New Brunswick Straight Line Turnpike, as potentially eligible for listing in the National Register of Historic Places. All of the potential new interchanges would fall along this stretch of US Route 1. The US Route 1 Widening and Signal Removal alternative would not change the historic alignment of the primary roadway of US Route 1, but would alter the character of the roadway at the new interchanges. Grubb recommends that the existing integrity of the roadway be assessed to determine its eligibility for inclusion in the National Register.

4.3.4.2 Impacts to Historic Districts

There are no historic districts along US Route 1 between Ridge Road in South Brunswick and US Route 130 in North Brunswick. There are also no historic districts in the vicinity of any of the five potential new US Route 1 interchanges. The Kingston historic district is approximately 1 mile from US Route 1. Therefore, the US Route 1 Widening and Signal Removal Alternative would not have significant impacts on any historic district.

4.3.4.3 Section 106 Compliance

Section 106 of the National Historic Preservation Act of 1966 (16 USC 470f) applies to the effects of proposed federal actions (such as a permit) on districts, sites, buildings, structures, and objects included in or eligible for inclusion in the National Register of Historic Places. The cultural resources assessment conducted by Grubb in 2002 concluded that no structures exist in the vicinity of the five potential new US Route 1 interchanges that appear to be eligible for listing in the National Register of Historic Places (Grubb, 2003). However, a draft *New Jersey Historic Roads Study* (Kise Straw & Kolodner 2001) states that the stretch of US Route 1 along which the new interchanges would be constructed may itself be eligible for listing in the National Register of Historic Places. Grubb recommends that the eligibility of this stretch of US Route 1 for inclusion in the National Register be assessed.

4.3.5 Air Quality

There are two scenarios for Route 1: six lanes with signalization and six lanes with signal removal. The first scenario involves widening the road to six lanes and keeping existing signalization. The second removes five traffic signals and replaces them with overpasses and ramps in addition to widening the road.

NO_x emissions from vehicles are projected to decrease by 88 percent under either option. Vehicular CO and VOC emissions are projected to decrease substantially under either option, with a slightly greater increase if signals are removed. From an air quality standpoint, removing signals, which increases network speeds, makes the Route 1 Widening with Signal Removal the next best alternative after Route 92.

Hotspot analyses were not performed for either Route 1 widening scenario. Both alternatives, when compared to No Action, provide higher network speeds and lower vehicle miles, which would result in reduced congestion. It is expected that these conditions would reduce CO emissions, eliminating the need for hotspot analysis.

4.3.6 Transportation

The changes in year 2028 peak-hour traffic flows that would result from US Route 1 Widening and Signal Removal were estimated using the detailed network model developed for this project. This model demonstrates that US Route 1 Widening and Signal Removal would partially meet the purpose of this project as stated in Section 1 (Project Purpose and Need):

Improve regional mobility, especially east-west mobility, for the central New Jersey area in and around southwestern Middlesex County and northeastern Mercer County.

The US Route 1 Widening and Signal Removal would be expected to reduce the amount of through traffic on the local and secondary east-west roads crossing the screenline defined in Section 1 by 10 percent, as compared with the No Action Alternative (see Table 4-20).

Table 4-20
Projected 2028 Total Daily Peak-Hour Through-Traffic Volumes (A.M. + P.M.)
US Route 1 Widening and Signal Removal vs. No Action

	PROJECTED 2028 PEAK-HOUR (A.M. + P.M.) THROUGH-TRAFFIC VOLUMES		
Screenline Crossing	**NO ACTION**	**US ROUTE 1 WIDENING AND SIGNAL REMOVAL**	**PERCENT CHANGE**
CR-610 (Deans Ln)	1,384	920	-34%
Major Road	265	535	102%
CR-522	208	253	22%
New Road	179	40	-78%
Dey Road	890	732	-18%
Plainsboro Road	835	764	-8%
Cranbury Neck Road	886	747	-16%
CR-535	1,301	1,393	7%
CR-571	2,212	2,000	-10%
Dutch Neck Road	20	3	-87%
Hankins Road	1,938	1,770	-9%
Total	**10,117**	**9,156**	**-10%**

Figures 4-8 and 4-9 display the projected changes in 2028 peak-hour traffic volumes in the Traffic Study Area that would result from the US Route 1 Widening and Signal Removal alternative. In these figures, red bars indicate roadways where peak-hour traffic volumes are expected to increase, and green bars indicate roadways where peak-hour traffic volumes are expected to decrease. The thickness of the bars indicates the magnitude of the peak-hour traffic volume change predicted by the model.

As indicated by the figures, the US Route 1 Widening and Signal Removal alternative would be expected to reduce peak-hour traffic volumes on the local and secondary east-west roads in the Traffic Study Area, including in the sensitive areas listed in Section 1 (Plainsboro Center, South Brunswick Center, and Princeton Junction Center). More significant reductions in peak-hour traffic volumes would be expected along NJ Route 27 in Kingston.

While the US Route 1 Widening and Signal Removal would substantially increase the traffic-carrying capacity of US Route 1, this capacity increase would attract to US Route 1 a large number of vehicles that would otherwise use alternate routes to avoid congestion on US Route 1. As a result, US Route 1 would be expected to remain heavily congested in the peak hour in the peak direction.

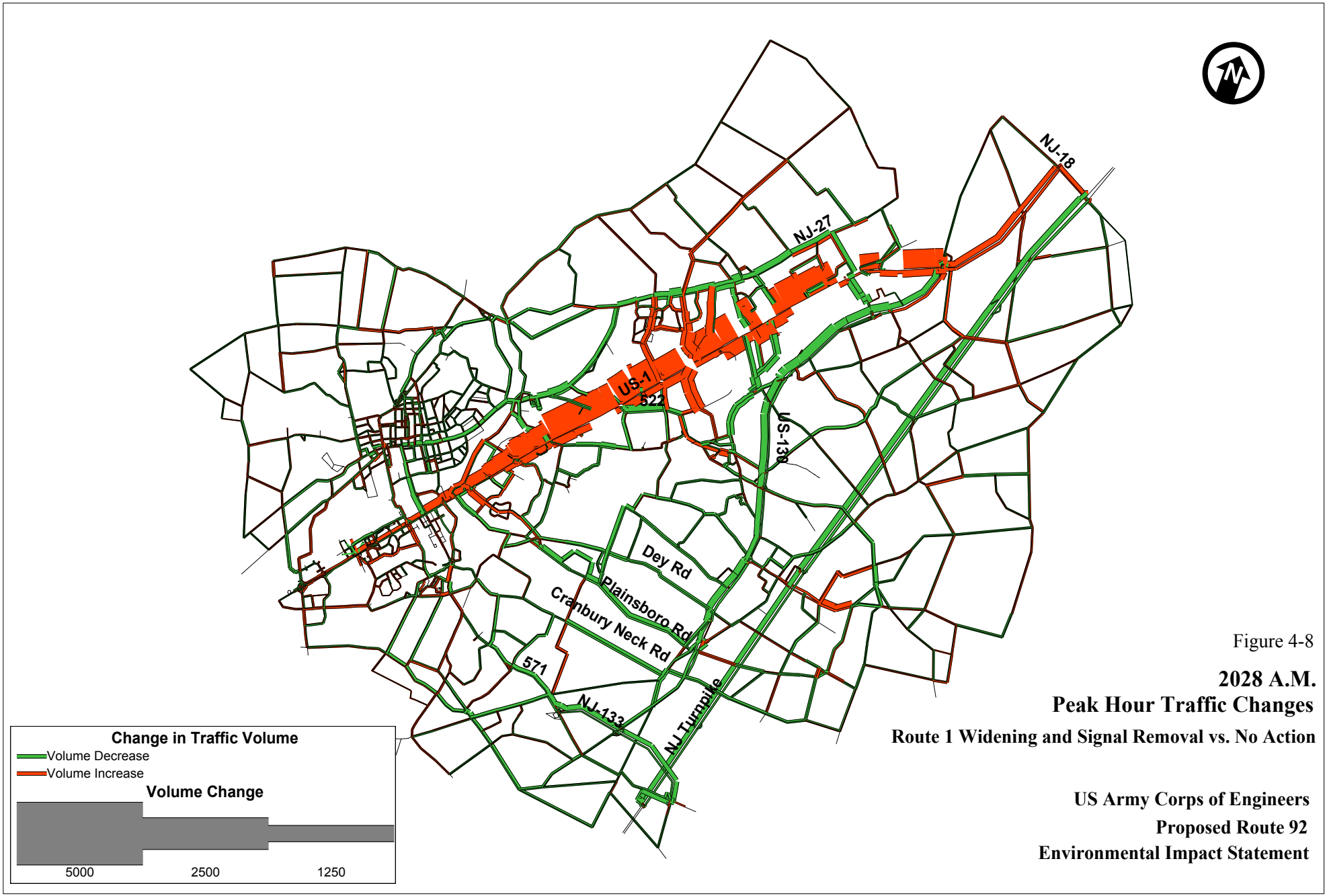


Figure 4-8

2028 A.M.
Peak Hour Traffic Changes
Route 1 Widening and Signal Removal vs. No Action

US Army Corps of Engineers
Proposed Route 92
Environmental Impact Statement

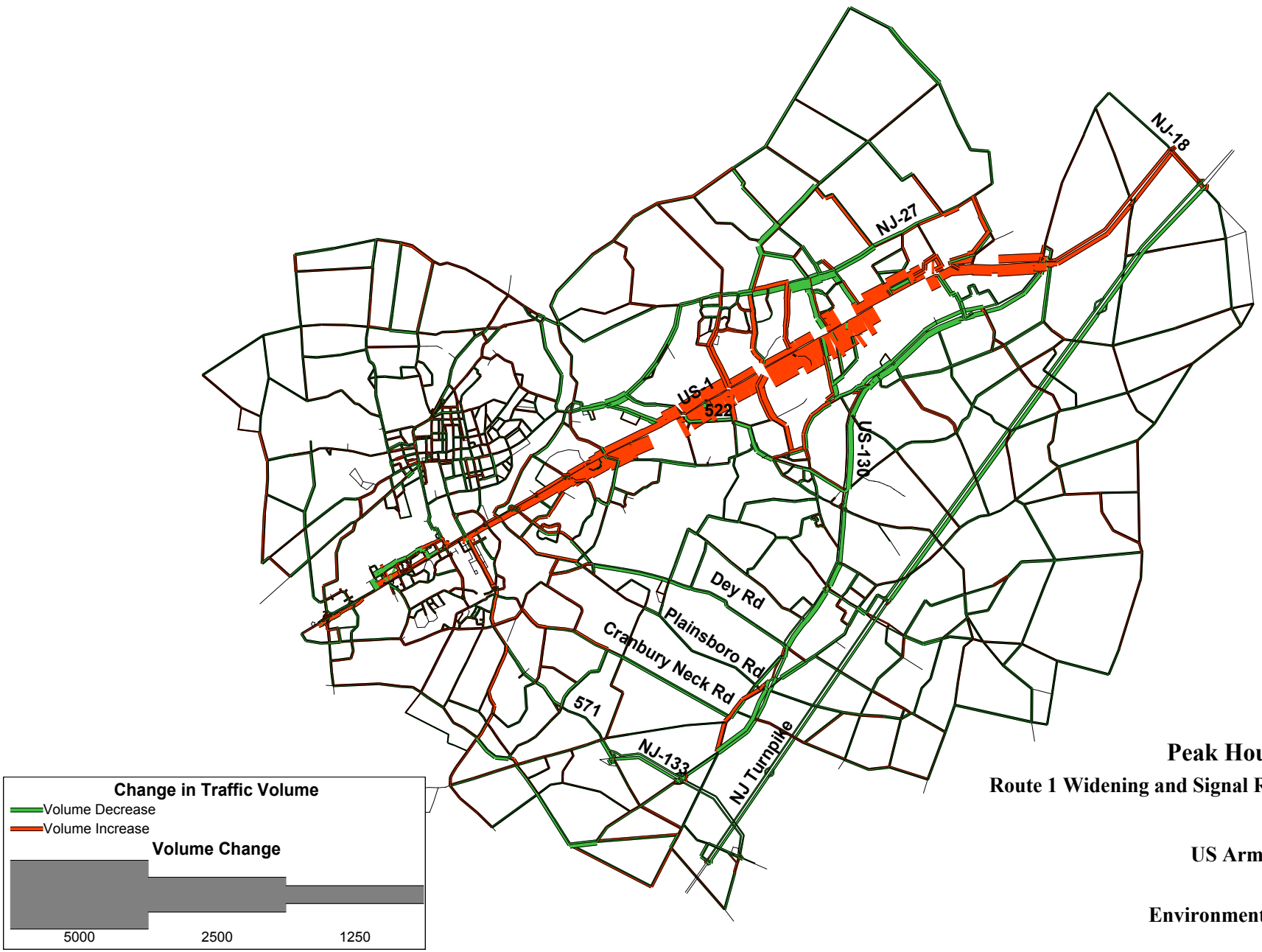


Figure 4-9

2028 P.M.

Peak Hour Traffic Changes

Route 1 Widening and Signal Removal vs. No Action

US Army Corps of Engineers

Proposed Route 92
Environmental Impact Statement

Most of the new traffic attracted to US Route 1 would be rerouted away from US Route 130 and the New Jersey Turnpike, which would likely be left with spare capacity.

Figures 4-10 and 4-11 display the projected changes in 2028 peak-hour truck volumes in the Traffic Study Area that would result from the US Route 1 Widening and Signal Removal. In these figures, red bars indicate roadways where peak-hour *truck* volumes are expected to increase, and green bars indicate roadways where peak-hour *truck* volumes are expected to decrease. The thickness of the bars indicates the magnitude of the model-projected changes in peak-hour *truck* volumes. As can be seen, this alternative would be expected to result in modest changes in peak-hour truck volumes on the local and secondary east-west roads in the Traffic Study Area, and along NJ Route 27 in Kingston.

Peak-hour truck volumes on the local and secondary east-west roads are projected to be 8-percent lower with proposed Route 92 than under the No Action scenario, as shown in Table 4-21.

Table 4-21

Projected 2028 Total Daily Peak-Hour Truck Volumes (A.M. + P.M.)
US Route 1 Widening and Signal Removal vs. No Action

	PROJECTED 2028 PEAK HOUR (A.M. + P.M.) TRUCK VOLUMES		
Screenline Crossing	**NO ACTION**	**US ROUTE 1 WIDENING AND SIGNAL REMOVAL**	**PERCENT CHANGE**
CR-610 (Deans Ln)	101	72	-29%
Major Road	69	68	-2%
CR-522	203	174	-14%
New Road	13	20	54%
Dey Road	79	64	-20%
Plainsboro Road	79	69	-13%
Cranbury Neck Road	131	125	-5%
CR-535	525	540	3%
CR-571	403	329	-18%
Dutch Neck Road	449	438	-2%
Hankins Road	291	264	-9%
Total	**2,343**	**2,162**	-8%

Figure 4-10

2028 A.M.

Peak Hour Truck Volume Changes

Route 1 Widening and Signal Removal vs. No Action

US Army Corps of Engineers
Proposed Route 92
Environmental Impact Statement

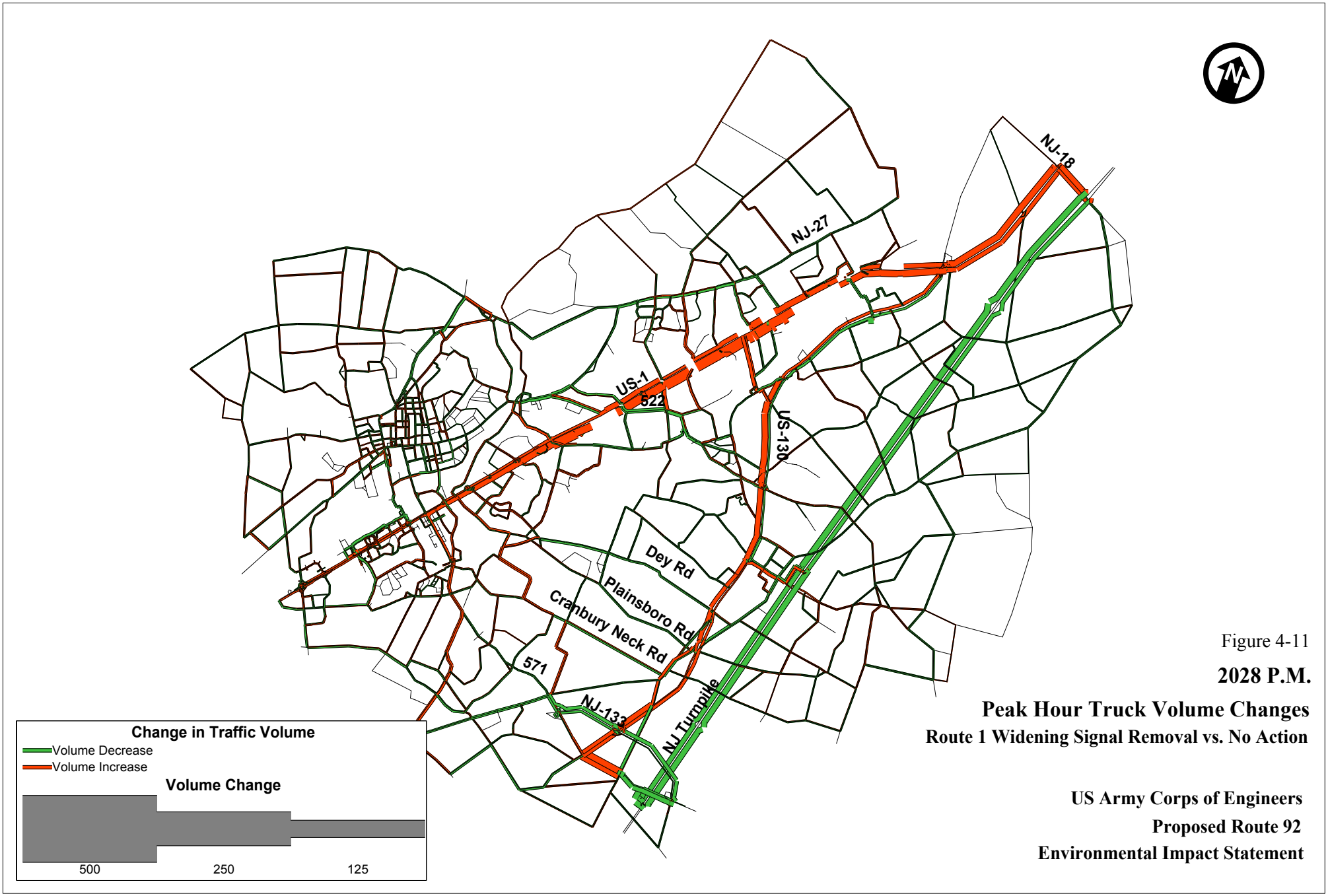


Figure 4-11

2028 P.M.

Peak Hour Truck Volume Changes

Route 1 Widening Signal Removal vs. No Action

US Army Corps of Engineers

Proposed Route 92

Environmental Impact Statement

The US Route 1 Widening and Signal Removal would not be expected to relieve the severe peak-hour congestion that is expected to occur in the Traffic Study Area due to the large amount of development expected over the next 25 years, particularly in Plainsboro and West Windsor. As discussed above, most of the trips that would be diverted to US Route 1 would come from other north-south routes that are relatively uncongested. The result is depicted in figures 4-12 and 4-13. In these figures, bars of different colors indicate projected levels of congestion, expressed as ranges of peak-hour volume to roadway capacity ratios. The thickness of the bars indicates the model-projected peak-hour traffic volume.

As shown in the following table, this alternative would be expected to eliminate 14 out of 476 miles of roadway projected to operate at sub-standard conditions (volume-to-capacity ratio of greater than 0.9) during at least one of the peak hours if no action is taken:

Additional Lanes Needed	Miles of Roadway	
	No Action	US Route 1 Widening and Signal Removal
1	413.8	401.0
2	60.3	59.9
3	1.3	0.8
4	0.3	0.3
Total	475.7	462.0

In addition, 61 out of 62 roadway miles would still require the addition of more than one lane to be brought up to standard.

Table 4-22 shows the changes in travel times between various parts of the Traffic Study Area expected to result if US Route 1 Widening and Signal Removal were implemented.

As can be seen, peak hour travel times between these representative points are projected to decrease by an average of 5-to-6 percent as a result of this alternative. Peak direction travel times between US Route 1 in Plainsboro and New Jersey Turnpike Interchange 8A would be expected to improve by 10-15 percent.

Projected 2028 peak hour traffic conditions at 15 key intersections within the Traffic Study Area were evaluated for the No Action and US Route 1 Widening and Signal Removal scenarios. The computed Level of Service (LOS) designations are shown in Table 4-23.

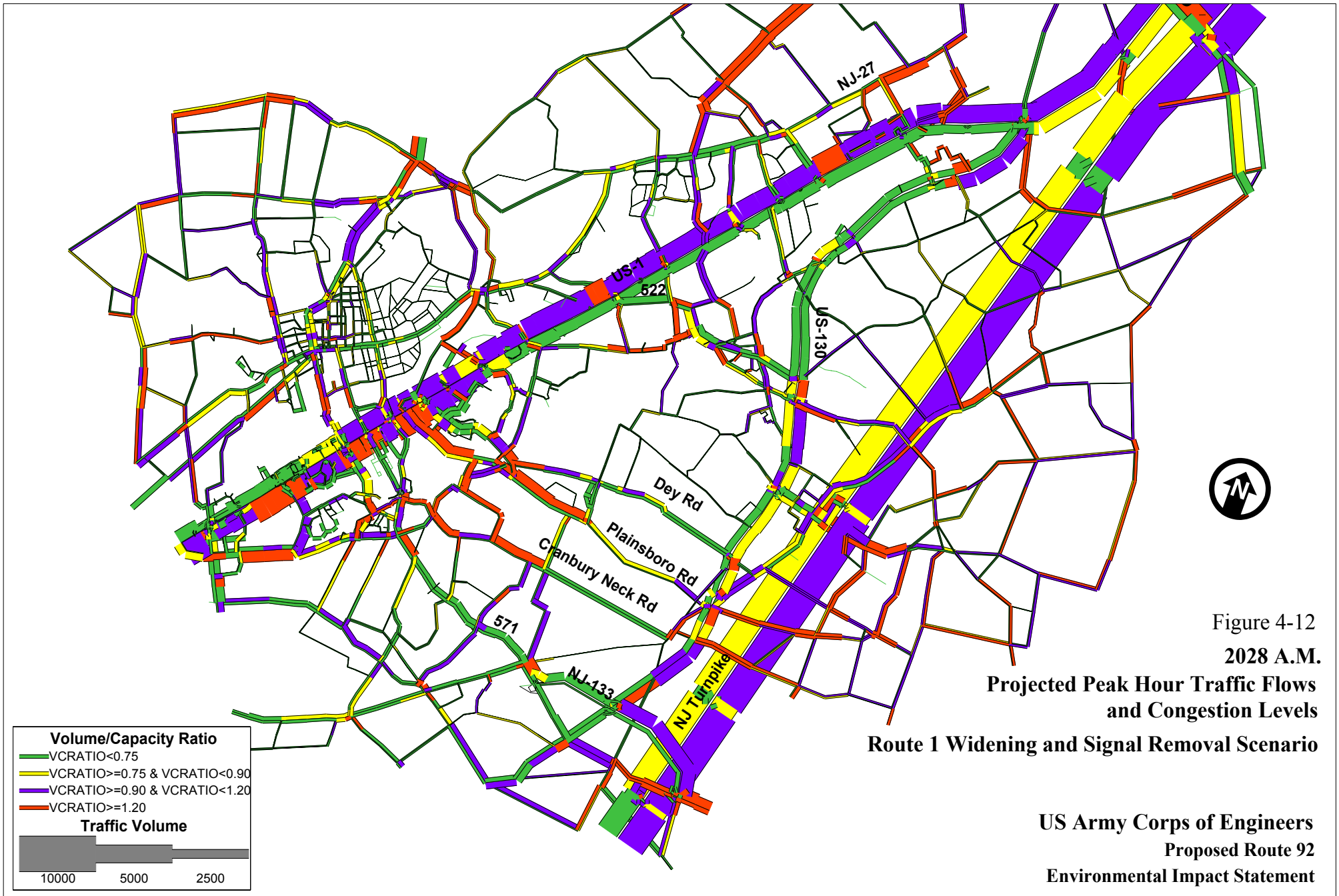


Figure 4-12

2028 A.M.

Projected Peak Hour Traffic Flows and Congestion Levels

Route 1 Widening and Signal Removal Scenario

US Army Corps of Engineers

Proposed Route 92

Environmental Impact Statement

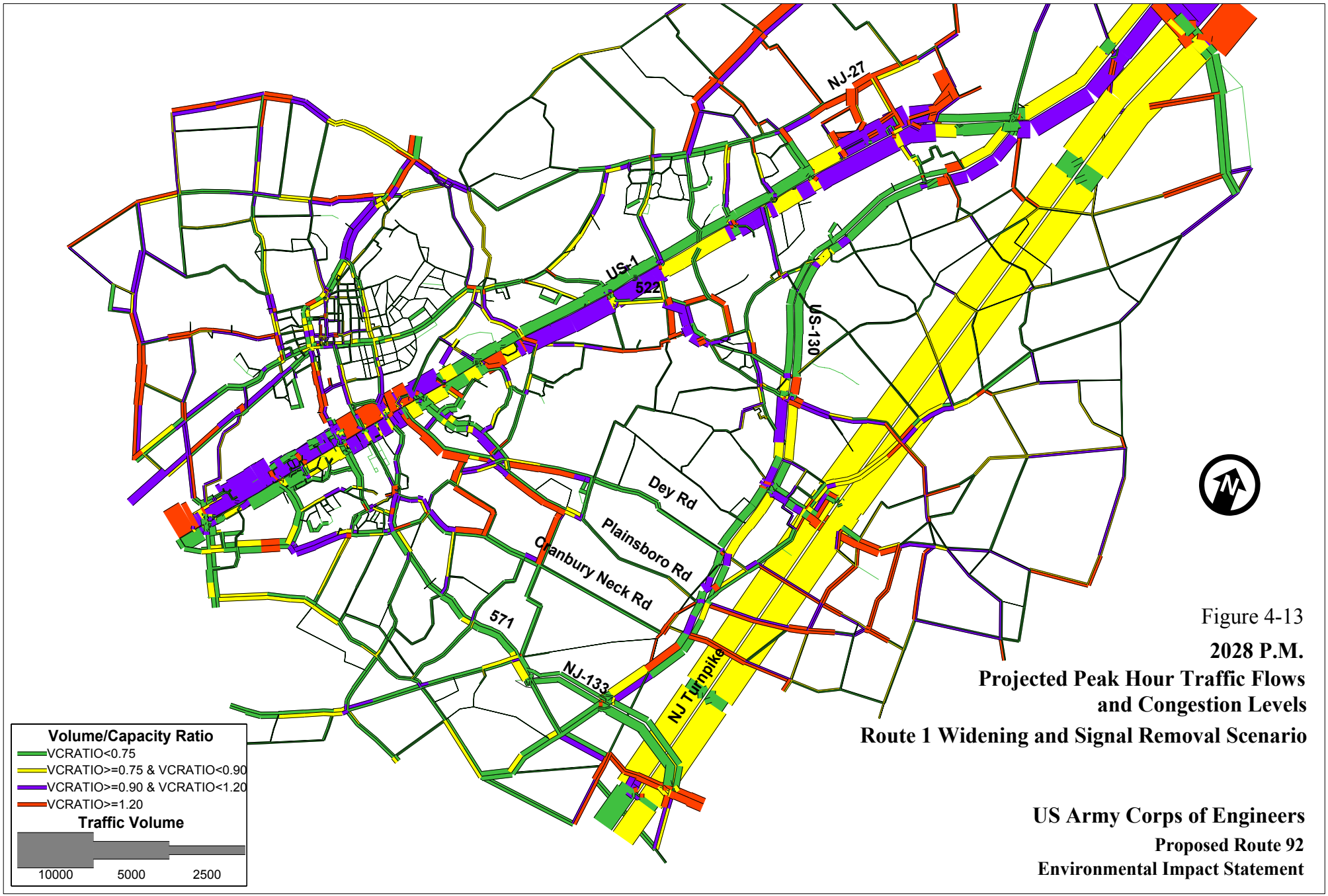


Figure 4-13

2028 P.M.

Projected Peak Hour Traffic Flows and Congestion Levels

Route 1 Widening and Signal Removal Scenario

US Army Corps of Engineers

Proposed Route 92

Environmental Impact Statement

Table 4-22
Estimated Changes in Travel Times - US Route 1 Widening and Signal Removal vs. No Action

FROM	TO	ESTIMATED 2028 PEAK HOUR TRAVEL TIMES (minutes)				CHANGE (US ROUTE 1 WIDENING AND SIGNAL REMOVAL vs. NO ACTION)		PERCENT CHANGE (US ROUTE 1 WIDENING AND SIGNAL REMOVAL vs. NO ACTION)	
		NO ACTION		US ROUTE 1 WIDENING AND SIGNAL REMOVAL					
		AM	PM	AM	PM	AM	PM	AM	PM
Princeton Junction	Princeton University	22.9	15.1	20.8	15.0	-2.0	-0.1	-9%	-1%
Princeton Junction	Plainsboro Center	30.3	12.4	27.7	13.1	-2.6	0.7	-9%	6%
Princeton Junction	South Brunswick Ctr.	41.8	38.2	38.5	35.6	-3.3	-2.7	-8%	-7%
Princeton Junction	Interchange 8A	35.7	30.4	33.9	29.2	-1.8	-1.2	-5%	-4%
Princeton Junction	Hightstown	21.4	29.0	21.3	29.0	-0.2	-0.1	-1%	0%
Princeton University	Princeton Junction	13.1	22.4	12.4	21.5	-0.7	-0.9	-5%	-4%
Princeton University	Plainsboro Center	22.6	14.1	21.8	12.7	-0.8	-1.5	-4%	-10%
Princeton University	South Brunswick Ctr.	30.6	34.8	28.1	31.7	-2.6	-3.1	-8%	-9%
Princeton University	Interchange 8A	36.8	39.6	33.0	35.6	-3.8	-4.0	-10%	-10%
Princeton University	Hightstown	30.9	48.8	30.1	48.2	-0.8	-0.6	-3%	-1%
Plainsboro Center	Princeton Junction	15.3	25.2	14.4	24.9	-1.0	-0.2	-6%	-1%
Plainsboro Center	Princeton University	12.8	18.3	13.3	18.4	0.5	0.2	4%	1%
Plainsboro Center	South Brunswick Ctr.	21.4	36.6	19.9	31.6	-1.5	-5.0	-7%	-14%
Plainsboro Center	Interchange 8A	19.0	31.1	18.0	26.8	-1.0	-4.3	-5%	-14%
Plainsboro Center	Hightstown	25.0	44.9	24.7	42.6	-0.2	-2.3	-1%	-5%
South Brunswick Ctr.	Princeton Junction	49.7	36.3	41.9	36.1	-7.8	-0.2	-16%	-1%
South Brunswick Ctr.	Princeton University	48.5	27.3	37.8	26.7	-10.8	-0.6	-22%	-2%
South Brunswick Ctr.	Plainsboro Center	52.5	22.1	43.4	21.8	-9.0	-0.3	-17%	-1%
South Brunswick Ctr.	Interchange 8A	14.6	15.5	13.4	14.7	-1.2	-0.8	-8%	-5%
South Brunswick Ctr.	Hightstown	38.0	45.6	34.0	44.5	-4.0	-1.1	-10%	-2%
Interchange 8A	Princeton Junction	42.1	30.1	35.9	30.6	-6.2	0.5	-15%	2%
Interchange 8A	Princeton University	52.4	35.1	49.8	35.4	-2.6	0.3	-5%	1%
Interchange 8A	Plainsboro Center	47.5	20.8	40.6	20.8	-6.9	0.0	-14%	0%
Interchange 8A	South Brunswick Ctr.	20.2	15.4	18.9	14.3	-1.2	-1.1	-6%	-7%
Interchange 8A	Hightstown	30.4	38.0	28.1	37.5	-2.4	-0.4	-8%	-1%
Hightstown	Princeton Junction	43.9	20.2	41.0	20.7	-3.0	0.5	-7%	3%
Hightstown	Princeton University	64.3	32.0	60.7	32.5	-3.6	0.5	-6%	2%
Hightstown	Plainsboro Center	68.2	25.4	63.5	25.9	-4.8	0.5	-7%	2%
Hightstown	South Brunswick Ctr.	66.5	35.4	62.3	33.1	-4.3	-2.3	-6%	-7%
Hightstown	Interchange 8A	51.7	27.6	48.8	26.7	-2.9	-0.9	-6%	-3%
					Average:	-3.1	-1.0	-7.7%	-3.1%

Table 4-23
Intersection Level of Service
US Route 1 Widening and Signal Removal vs. No Action

	Intersection LOS			
	No Action		US Route 1 Widening and Signal Removal	
Intersection	**A.M.**	**P.M.**	**A.M.**	**P.M.**
US-1 @ Cozzens Ln	F	F	*	*
US-1 @ Major Rd (Sandhill)	F	F	*	*
US-1 @ New Rd	F	F	*	*
NJ-27 @ Raymond Rd	F	B	D	B
NJ-27 @ CR-522	E	F	D	E
Scudders Mill Rd @ Schalk's Crossing Rd	F	F	F	F
Scudders Mill Rd & Dey Rd	F	F	F	F
Plainsboro Rd & CR-535	E	F	E	F
US-130 @ Dey Rd	F	F	F	F
Dey Rd & CR-535	F	F	F	F
NJ-32 @ CR-535	F	F	F	F
US-130 @ Friendship Rd	F	F	F	F
George's Rd & Kingston Ln	D	B	B	A
CR-522 & Kingston Ln	F	F	F	F
US-1 @ CR-522	F	F	*	*
US-1 @ Ridge Rd	F	F	F	F
* These intersections will be replaced with either grade-separated interchanges, or overpasses.				

Of the 12 key intersections that would remain signalized, only three exhibit improved LOS designations, as compared with the No Action scenario. Most of these intersections would be expected to remain at LOS "F".

Table 4-24 shows the projected changes in average peak hour delays at these intersections that would result from US Route 1 Widening and Signal Removal.

During the morning peak hour, 7 of the 12 intersections are projected to have lower average delays, while 4 are projected to have longer average delays. In the evening peak hour, 6 of the intersections are projected to have delay reductions of at least 20 percent.

Table 4-24
Projected Intersection Delays
US Route 1 Widening and Signal Removal vs. No Action

Intersection	Seconds of Delay per Vehicle				Percent Change (US Route 1 Widening and Signal Removal vs. No Action)	
	2028 No Action		2028 w/ US Route 1 Widening and Signal Removal			
	A.M.	P.M.	A.M.	P.M.	A.M.	P.M.
US-1 @ Cozzens Ln	290	336	*	*	*	*
US-1 @ Major Rd (Sandhill)	191	112	*	*	*	*
US-1 @ New Rd	172	168	*	*	*	*
NJ-27 @ Raymond Rd	170	18	41	12	-76%	-33%
NJ-27 @ CR-522	77	202	51	78	-34%	-61%
Scudders Mill Rd @ Schalk's Crossing Rd	206	154	151	122	-27%	-21%
Scudders Mill Rd & Dey Rd	697	296	595	231	-15%	-22%
Plainsboro Rd & CR-535	67	167	60	164	-10%	-2%
US-130 @ Dey Rd	341	333	348	255	2%	-23%
Dey Rd & CR-535	458	213	477	177	4%	-17%
NJ-32 @ CR-535	269	234	275	221	2%	-6%
US-130 @ Friendship Rd	330	467	330	483	0%	3%
George's Rd & Kingston Ln	38	18	17	10	-55%	-44%
CR-522 & Kingston Ln	300	203	283	190	-6%	-6%
US-1 @ CR-522	230	179	*	*	*	*
US-1 @ Ridge Rd	362	264	384	294	6%	11%
				Median:	-8%	-19%

* These intersections will be replaced with either grade-separated interchanges or overpasses.

4.3.7 Noise

This section presents the results of the noise monitoring and modeling impact analysis completed for this EIS. For comparison purposes, a screening-level noise modeling analysis was conducted for two US Route 1 improvement alternatives. Both alternatives include widening US Route 1 from four to six lanes; however, one alternative assumes no changes to the existing intersections while the other alternative reduces the number of signalized intersections and constructs five grade-separated interchanges at five of the intersections.

4.3.7.1 Noise Modeling Analysis

This section will describe the noise modeling procedures for evaluating potential noise impacts for sensitive receivers that may be impacted by the widening US Route 1 to six lanes as part of the US Route 1 Widening alternatives (with and without signalization).

4.3.7.1.1 STAMINA 2.0 Noise Modeling

STAMINA 2.0 was used to estimate potential noise impacts for the five redesigned interchanges. The traffic engineer provided the necessary peak hour traffic volumes, vehicle speeds and interchange design information to be used in STAMINA 2.0. The purpose of this modeling analysis was to determine the distance of the 67-dBA-noise contour from the interchange center. Residential receivers near each interchange within the 67-dBA-noise contour were identified as potential impacted receivers.

4.3.7.1.2 FHWA Nomograph Modeling

The FHWA Nomograph Model is based on the FHWA, *Highway Traffic Noise Prediction Model FHWA-RD-77-108, December 1978*. The purpose of the nomograph modeling was to predict Horizon Year 2028 No Action and Build noise levels for the US Route 1 Widening alternatives with and without signalization. Sixteen residential receivers were identified adjacent to the existing US Route 1 alignment. The nomograph modeling was based on peak hour traffic modeling results for 2028 No Action and the two US Route 1 Widening alternatives. Distances from the center of US Route 1 were entered into the model along with: 1) the speed of the vehicles for each vehicle category (automobile, medium truck, and heavy truck); 2) roadway grade; 3) shielding factors; 4) ground attenuation (soft or hard); and 5) barrier height, receptor height and barrier to receptor distance (refer to Appendix D for more detail).

4.3.7.2 Modeling Results

4.3.7.2.1 US Route 1 Signalized Intersection Alternative STAMINA Modeling Results

The STAMINA 2.0 modeling results for the five redesigned intersections indicated that for the US Route 1/Adams Lane/Cozzens Lane interchange and the US Route 1/Finnegans Lane interchange that the 67-dBA noise contour would extend approximately 300 feet from the center of the interchange on either side of US Route 1. For the other redesigned interchanges (US Route 1/Beekman Road/Northumberland Road, US Route 1/New Road and US Route 1/Promenade Boulevard/Route 522) the 67-dBA-noise contour would extend approximately 200 feet from the center of each interchange on either side of US Route 1. Table 4-25 presents the number of potential residential receivers that would be within the 67-dBA-noise contour for each interchange based on aerial photography. One residential receiver would be impacted for three of these interchanges and none would be impacted at the other two interchanges. Since these are not new interchanges, but are only redesigned, the number of potential receivers that would be impacted compared to not redesigning these interchanges should be similar.

Table 4-25
Summary of Noise Modeling Results for Residences
Near the Potential New US Route 1 Interchanges

US Route 1 Redesigned Interchange	Number of Residential Receivers within the 67-dBA Noise Contour (2028)
Cozzens Lane/Adams Lane	0
Finnegans Lane	1
Beekman Road/Northumberland Road	1
New Road	1
Promenade Boulevard/Route 522	0

4.3.7.2.2 US Route 1 Widening Alternatives Nomograph Modeling Results

The nomograph modeling results indicated that during peak AM traffic conditions the No Action alternative traffic volumes and speeds would generate noise levels of 66 dBA or greater within approximately 150 feet from the center of US Route 1 or approximately 150 feet from the edge of US Route 1. There are 16 residential receivers within or close to 150 feet from the edge of US Route 1. Therefore, these residences would most likely experience noise levels that would approach or exceed the 67 dBA NAC. Adding a lane of traffic to both sides of US Route 1 would increase noise levels at 150 feet from the edge of US Route 1 by approximately 2 dBA. This increase in noise level is considered barely perceptible. Both US Route 1 Improvement alternatives would generate a 67-dBA-noise level approximately 200 feet away. Table 4-26 presents the modeling results for the US Route 1 improvement alternatives.

Table 4-26
Summary of Noise Modeling Results
US Route 1 Improvements vs. No Action

	One Hour L_{eq} Noise Levels (dBA)			
Scenario	100 ft	150 ft	200 ft	300 ft
2028 No Action	69	66	65	62
2028 Build (Signalized)	71	68	67	64
2028 Build (Unsignalized)	71	68	67	64

4.3.7.3 Construction Noise Impacts

Construction noise impacts were evaluated based on the steps specified in accordance with FHWA Technical Advisory Memorandum, *Analysis of Highway Construction Noise*, T6160.2, March 13, 1984.

Highway construction activities include use of both mobile and stationary equipment. Mobile equipment such as dozers, scrapers, graders, and haul trucks operate in cyclical manner in which a period of full power is followed by a period of reduced power. Stationary equipment falls into two categories: 1) equipment that operates at a fixed power, such as pumps, compressors and generators; and 2) impact equipment such as pile drivers, jack hammers and pavement breakers. The first group generates a constant background noise level where as the second group generators a much higher noise level, but over a short time period (FHWA, *Special Report Highway Construction Noise: Measurement, Prediction and Mitigation*, 1987). Table 4-19 in Section 4.2.8.3 presents typical maximum noise levels (L_{max}) measured at 50 feet from construction equipment. Maximum noise levels range from 70 dBA for generators to 90 dBA for a mounted impact hammer at 50 feet away.

Highway construction is completed in the following phases:

- Mobilization
- Clearing and grubbing
- Earthwork
- Foundations
- Base Preparation
- Paving and Cleanup

Each construction phase would generate short-term noise impacts for noise sensitive land uses adjacent to construction activity associated with the US Route 1 Widening and Signal Removal alternative. In general, construction noise impacts occur only during daytime working hours of 7:00 a.m. to 7:00 p.m., and should be highest during the clearing and earthwork phases of construction. The noisiest equipment would likely be earthmoving equipment, such as dozers, graders, scrapers and other heavy-duty diesel equipment. Noise levels decrease by 6 dBA for every doubling of distance. It is anticipated that the daytime L_{max} noise levels would not exceed 80 dBA at 150 feet away and the daytime L_{eq} noise level would not exceed 75 dBA at 150 feet away.

4.3.8 Aesthetics

Widening Only

Widening of US Route 1 would not significantly impact the aesthetics of the area or the views currently seen in the area. Widening of the roadway would not make it more visible to receptors, nor would it impede views. From residential locations along US Route 1, views would be relatively unchanged. However, the buffer between a few residences and US Route 1 would be reduced by approximately 10 feet.

Widening and Signal Removal

At Cozzens Lane/Adams lane the residential communities could have views of the grade-separated roadway.

There are no significant views from the Finnegan's Lane intersection that would be impacted by the addition of a grade-separated intersection. The same is true at the Beekman Road/Northumberland Way intersection. There are currently no receptors whose views would be impacted by the grade-separated roadway.

Residential development exists on the east side of US Route 1 and New Road. These receptors would have full view of the grade-separated roadway. This would be a negative impact on their current view of the roadway at-grade.

At the intersection of Promenade Boulevard/Route 522 and US Route 1, a grade-separated intersection would be visible to users of the Islamic Society facilities immediately north of the existing intersection. Although this can be considered a negative impact, a view of the roadway from an establishment along US Route 1 is a common and expected sight.

4.3.9 Known Contaminated Sites

Eleven Known Contaminated Sites (KCS) listed by the NJDEP Site Remediation Program (SRP) could potentially be impacted by construction of the US Route 1 Widening and Signal Removal alternative. The location of these sites is shown on Figure 3-22 and listed in Table 3-15. The extent of impact to these sites would depend on whether fill or excavation was required. If soil removal were required at a location, the contaminated soil would require special handling and disposal procedures, as it would probably not be suitable for use as fill. If fill were to be added to the site, the potential for disturbance would be decreased.

Consultation with NJDEP SRP would be required to determine exactly how the construction of this alternative would affect KCS within the Route 1 Corridor.

4.3.10 Human Health

4.3.10.1 Air Quality

Air quality is a public health concern associated with the US Route 1 Widening and Signal Removal alternative. Air quality modeling conducted for the project area indicates that this alternative would comply with federal transportation conformity guidelines. The project would not cause or contribute to any new localized carbon monoxide (CO) violations. By adding more capacity to US Route 1 and eliminating signals vehicle speeds and idling times would improve. Consequently, a positive impact would be expected to occur to localized air quality. If the US Route 1 Widening and Signal Removal were implemented, NO_x emissions from vehicles are projected to decrease by 88 percent, and vehicular CO and VOC emissions are also projected to decrease substantially.

4.3.10.2 Noise

Noise impacts can include annoying noises, which generally cause people to seek quieter environments and can affect the performance of work tasks, and high noise

levels that can affect hearing, either temporarily or permanently. Sensitivity to noise depends on the individual, as well as on the frequency of the sound and the length of time a person is exposed. As demonstrated by the noise modeling discussed in Section 4.3.7, the US Route 1 Widening and Signal Removal alternative would not produce noise levels that cause damage to hearing.

4.3.10.3 Water Quality

Increased highway runoff is a primary public health concern related to the US Route 1 Widening and Signal Removal alternative, as runoff may contain harmful contaminants. An increase in runoff would be anticipated to result from the project as an increase in impervious surface would be required for construction of the proposed roadway. The current stormwater system would have to be upgraded to allow for the additional runoff created by the improvements to US Route 1.

4.3.11 Socioeconomics

4.3.11.1 Growth-Inducing Effects

Implementation of the US Route 1 Widening and Signal Removal Alternative would increase the capacity of the local and regional road networks. This would increase the population and the level of economic activity that could be accommodated in the local area and the region. If land use regulators and other public officials accept current traffic conditions as the standard, and allow traffic-generating development to continue unchecked, increasing the capacity of the road system would merely increase the total traffic volume that could be accommodated in the local area and the region. If improved capacity were combined with effective control of development, however, traffic conditions could be improved.

A widened and signal-free US Route 1 would draw traffic from local roads. This would discourage growth of traffic-related business activity on local roads to some degree, and encourage growth on US Route 1. Because US Route 1 would not be a limited access highway, the tendency for growth to concentrate at the new interchanges would be relatively weak.

4.3.11.2 Construction Impacts

Implementation of the US Route 1 Widening and Signal Removal alternative would provide temporary employment, principally for people from outside the local area. The project would stimulate spending in the local area during the construction period.

Construction activity during implementation of either alternative would temporarily interfere with access to businesses along US Route 1.

4.3.11.3 Community Services

Local police, fire companies and rescue squads would provide services on a widened and signal-free US Route 1, as they do on existing US Route 1. Because a widened,

signal-free US Route 1 would draw traffic off local roads, it would reduce the time required to respond to emergencies on local roads.

Because implementation of the US Route 1 Widening and Signal Removal Alternative would eliminate left turns onto US Route 1, emergency response vehicles would have to travel farther to reach many points on the highway. Under peak traffic conditions, when congestion on the widened, signal-free US Route 1 is projected to be comparable to current congestion, the time required to respond to emergencies at many points on US Route 1 would be longer than under current conditions.

4.3.12 Land Use

4.3.12.1 Direct Impacts

US Route 1 is a long-established, major at-grade highway with linear, principally commercial development along most of its length. Communities and neighborhoods generally do not cross US Route 1. Widening US Route 1 to six lanes and removing traffic signals would not fundamentally alter the character of the highway, nor the character of the adjoining land uses and residential neighborhoods, where they are present. Widening and signal removal would reinforce the character of US Route 1 as a regional business-oriented highway.

Widening and signal removal on US Route 1 would draw regional through-traffic away from local roads to a modest degree. This would make local driving somewhat more amenable and efficient and facilitate alternate forms of transportation, such as walking and bicycle riding. Removal of through traffic from neighborhood centers would improve the quality of life and would tend to strengthen the identification of residents with their communities, while allowing more efficient development designs.

Widening US Route 1 would potentially impact approximately seven existing businesses whose properties are developed to the edge of the existing roadway. Three of these businesses may not be able to function on a smaller lot. Of the approximately 25 single-family homes along this length of US Route 1, approximately three occupied homes would likely be displaced because they are located close to the current edge of the roadway.

The following paragraphs describe potential land use impacts of the five new interchanges included in the US Route 1 Widening and Signal Removal Alternative.

Cozzens Lane-Adams Lane Interchange
It is likely that a new ramp from westbound Adams Lane to northbound US Route 1 would have to cut through the eastern end of the vehicle storage area at Malouf Buick-Pontiac. The ramp would probably pass through the current location of Coppa's Towing and Service Center, and could also impact the BP gas station on US Route 1 north of the existing intersection.

A ramp connecting southbound US Route 1 to Cozzens Lane could pass along the western edge of the parking lot of the Italian-American Social Club of North Brunswick, connecting with Cozzens Lane next to an existing single-family house.

Finnegans Lane Interchange
A new signal-free interchange at Finnegans Lane would probably include a ramp connecting eastbound Finnegans Lane to southbound US Route 1, and the new ramp would probably displace the Exxon gas station in the southwest quadrant of the existing intersection. The same ramp could displace one or two single-family residences on the south side of Finnegans Lane. Construction of ramps connecting northbound US Route 1 with Finnegans Lane could displace one of the catenary towers along the power line easement extending southeast from the existing intersection. A new ramp from southbound US Route 1 to westbound Finnegans Lane would probably pass close to an office building, the Bnai Tikvah temple, and the eastern end of the Indian Head townhouse development, but would not directly interfere with any of these uses.

Beekman Road-Northumberland Way Interchange
Construction of a new signal-free interchange at Beekman Road and Northumberland Way would not interfere with any developed land use, but could remove approximately 6 acres of open land from agricultural use.

New Road Interchange
Construction of a ramp connecting northbound US Route 1 with New Road could have a substantial impact on the Lazy Boy furniture store that opened in 2001 on the east side of US Route 1 north of the existing intersection. The ramp would potentially pass between the store and US Route 1, and could complicate access to the store's parking lot. A ramp connecting northwest-bound New Road with northbound US Route 1 could also displace two single-family homes on the northeast side of New Road.

Construction of ramps connecting southbound US Route 1 with New Road could displace the Exxon gas station in the southwest quadrant of the existing intersection. These ramps could also displace a single-family home on the west side of US Route 1 southwest of the Exxon Station.

Route 522 Interchange
It is likely that the ramps required for a new US Route 1-Route 522 interchange would be concentrated in the undeveloped southwest and southeast quadrants of the existing intersection. This would have minimal impact on existing developed land uses, but would remove up to 8 acres of land from agricultural use. A surface-level ramp from southbound US Route 1 to eastbound Route 522 was completed recently in the southwest quadrant.

4.3.12.2 Consistency with NJ State Development & Redevelopment Plan

The 2001 New Jersey State Development and Redevelopment Plan (State Plan) divides the state into the following planning categories:

- Metropolitan Planning Areas: PA1
- Suburban Planning Areas: PA2
- Fringe Planning Areas: PA3
- Rural Planning Areas: PA4
- Environmentally Sensitive Planning Areas: PA5

The State Plan "anticipates continued growth throughout New Jersey in all Planning Areas." Development is encouraged in PA1 and PA2 and is accommodated in PA3, PA4 and PA5. The State Plan specifies that development is expected to occur, within guidelines, in all planning areas. The State Plan directs that infrastructure investment decisions should encourage growth in areas that are already developed or are currently developing, and should discourage development sprawl into undeveloped areas.

On the State Plan Policy Map, the South Brunswick portion of the US Route 1 corridor is in a Suburban Planning Area (PA2), while the North Brunswick portion is in a Metropolitan Planning Area (PA1). Development is encouraged in both of these planning areas, especially in development centers such as the US Route 1 corridor. Because implementation of the US Route 1 Widening and Signal Removal alternative would do little to facilitate access to undeveloped areas, it would have little impact on "sprawl" development.

4.3.13 Environmental Justice

Potential impacts of the US Route 1 Widening and Signal Removal alternative to residential communities would be largely confined to the areas around the new signal-free interchanges. The analysis below is confined to residential communities near the five potential new interchanges described elsewhere in this document.

4.3.13.1 Minority Residents Near the US Route 1 Interchanges

The percentage of people of Asian descent near the potential new US Route 1 interchanges is essentially the same as in North Brunswick and Middlesex County as a whole and is lower than in South Brunswick as a whole (see Table 3-16 in Section 3.12 and Table 3-19 in Section 3.14). Because they are not disproportionately concentrated in the areas that would be affected by the US Route 1 Widening and Signal Removal Alternative, this alternative would not be anticipated to have disproportionate environmental impact on people of Asian descent.

The percentage of Blacks and African Americans near the potential new US Route 1 interchanges is similar to the percentage in South Brunswick and Middlesex County as a whole, and substantially lower than the percentage in North Brunswick as a whole. Therefore, implementation of the US Route 1 Widening and Signal Removal Alternative would not be anticipated to have disproportionate environmental impacts on Blacks or African Americans.

The percentage of Hispanics near the potential new US Route 1 interchanges is slightly lower than the percentage in South Brunswick as a whole, and is significantly less than

the percentages in North Brunswick and Middlesex County as a whole. Therefore, the US Route 1 Widening and Signal Removal Alternative would not be anticipated to have disproportionate environmental impacts on Hispanics.

It is likely that a ramp connecting westbound Adams Lane to northbound US Route 1 would pass through census block 2009 in block group 62.07-2 in North Brunswick. This block has 125 residents of whom 61 percent belong to minority groups. However, the portion of block 2009 through which the ramp would pass is occupied by commercial operations rather than residences. Impact to the residents of the block would be minimal.

A ramp from eastbound Finnegans Lane to southbound US Route 1 could have a direct impact on the only residence in census block 1014 in block group 84.06-1, North Brunswick. This residence has two occupants, both of whom belong to minority groups.

It is possible that a ramp from southbound US Route 1 to Finnegans Lane would pass through census block 1003 in block group 62.04-1 in North Brunswick. This block has 216 residents of whom 80 percent are members of minority groups. It is likely that the ramp would pass near the residences in this block but would not require displacement of any residences.

It is likely that a ramp from eastbound Route 522 to southbound US Route 1 would pass through census block 1012 in block group 84.03-1, South Brunswick. This census block has 10 residents of which 5 are Black or African American and 5 are Asian. The ramp would pass through an undeveloped section of this block and would not impact any residences.

4.3.13.2 Low-Income Residents Near the US Route 1 Interchanges

Census data indicate that the overall financial status of people living near the potential new US Route 1 interchanges is higher than the financial status of Middlesex County residents taken as a whole (see Section 3.14.2). Therefore, implementation of the US Route 1 Widening and Signal Removal would not be anticipated to have disproportionate environmental impacts on low-income people.

Section 5
Mitigation Actions

5.1 Goals of Mitigation Actions

Mitigation includes steps taken to avoid environmental impacts of an action; to minimize impacts by limiting the degree or magnitude of an action; to rectify impact by repairing, rehabilitating or restoring the affected environment; to reduce or eliminate impact over time by preservation and maintenance operations over the life of the action; and to compensate for impacts by replacing or providing substitute resources or environments.

If the US Department of the Army (DA) issued a permit for a project as proposed by the New Jersey Turnpike Authority (NJTA), mitigation of adverse environmental impacts from the project would be required. This section sets forth generally an NJTA draft proposal to meet its obligation to mitigate. At this time, the US Army Corps of Engineers (USACE) does not express an opinion whether the NJTA proposal sets forth sufficient mitigation for the proposed project. Mitigation measures such as those discussed in this section will be considered for inclusion in a Department of the Army (DA) permit for the project, if issued. USACE judgment as to the sufficiency of mitigation would be made as part of a Record of Decision prepared to document a decision on the NJTA permit application.

The goals of the mitigation for either of the proposed construction alternatives include:

- Limiting the impact of project construction and operation on environmental, socioeconomic, and human health receptors.
- Meeting regulatory requirements and guidelines to compensate for unavoidable impacts, such as filling of wetlands or construction in floodplains.

Section 5.2 discusses construction-related mitigation that would be similar if either alternative were implemented. Section 5.3 details the mitigation measures proposed by the applicant for the Route 92 project. Section 5.4 discusses the mitigation that would be expected to be required if the US Route 1 Widening and Signal Removal alternative were built.

5.2 Construction-Related Impacts

5.2.1 Soils

In accordance with New Jersey State Law (NJSA 4:24-39 et seq.), a certified erosion and sedimentation control plan, in compliance with practices established in *Standards for Soil Erosion and Sediment Control in New Jersey*, would have to be filed with the appropriate Soil Conservation District.

Mitigation measures in accordance with standards set forth in the above-referenced document would need to be implemented during and after construction. The most efficient method by which to minimize soil erosion is to stabilize the soil immediately after disturbance has occurred. This could be accomplished by the following:

- Seeding immediately after the slope is graded with an appropriate groundcover.
- Placement of mulch or wood chips immediately after soil disturbance has occurred.
- Seeding of slopes simultaneously with road construction.
- Placement of temporary and permanent vegetative covers for soil stabilization.
- Placement of temporary stabilization of exposed soil on banks.
- Construction of temporary sediment basins.
- Installation of sediment barriers.
- Installation of drainage diversions.
- Placement of riprap for conduit outlet protection.
- Ensuring that the cut face of earth excavations and fills is no steeper than the safe angle of repose for the materials encountered and flat enough for proper maintenance.
- Ensuring that the permanently exposed faces of earth cuts and fills are vegetated or otherwise protected from erosion.
- Making provisions to safely conduct surface water to storm drains or suitable watercourses and to prevent surface runoff from damaging cut faces and fill slopes.
- Providing subsurface drainage in areas having a high water table, to intercept seepage that would adversely affect slope stability or building foundations, or create undesirable wetness.
- Ensuring that adjoining property is protected from excavation and filling operations.
- Ensuring that fill is not placed adjacent to the bank of a stream or channel unless provisions are made to protect the hydraulic, biological, aesthetic and other environmental functions of the stream.

Soils in portions of the Proposed Route 92 Corridor are acidic, having pH values that range from 4.0 to 6.0. Soils in the Route 1 Corridor may also be acidic. The construction specifications in the *Standards for Soil Erosion and Sediment Control in New Jersey* state, "exposed soils with a pH of less than 4.0 should be covered with a minimum of 12

inches of soil material no coarser than a sandy loam or soil material that can be corrected to a minimum pH of 6.5." Certain areas within both project corridors may contain acid-producing deposits, as discussed in Section 3.

5.2.2 Fugitive Dust

Some of the measures that would be expected to mitigate the impacts of fugitive dust include:

- Spraying water or on exposed areas
- Covering trucks hauling dust generating materials to and from the site
- Washing wheels and underbodies of construction vehicles prior to departure from the site
- Reducing vehicle flow over non-paved areas
- Routinely cleaning paved areas to lessen the amount of dust available for re-suspension

5.2.3 Noise

Proposed Route 92 would be located in both residential and commercial areas, while the US Route 1 Widening and Signal Removal alternative would mainly affect commercial receptors. Appropriate construction noise mitigation measures would be required for either alternative. These measures may include:

- Implement a Community Relations Program to inform the public of potential noise impact and measures that would be employed to reduce these impacts.
- Coordinate early with the roadway designers to reduce construction noise levels by sequencing construction activities and locating noisier activities away from sensitive receivers.
- Ensure that all construction equipment would be equipped with exhaust mufflers and maintained to minimize engine noise.
- Limit construction activities to Monday through Friday from 7 a.m. to 5 p.m.

5.3 Route 92 Mitigation Actions

5.3.1 Acid-Producing Deposits

During construction of proposed Route 92 between Perrine Road and US Route 130, where excavation of the Magothy and Raritan formations may take place, NJTA proposes to implement mitigation measures to reduce exposure of acid-producing deposits. In accordance with NJDEP's *Technical Manual for Stream Encroachment*, acid-producing deposits would be handled as follows:

Acid-producing deposits exposed in the course of construction activities but intended to remain in their original locations would be promptly buried under 1 foot of soil in an effort to reduce oxygen availability and minimize the rate at which acid is produced.

Exposed acid-producing deposits, including earth contaminated with such deposits, that are not promptly backfilled and covered would be removed and disposed of on or off the construction site in a suitable manner and location. Acid-producing deposits moved from their original locations would not be discharged into streams, spread over uncontaminated soil, or sold or distributed as topsoil or topsoil amendments suitable for plant growth. Instead, the deposits would be buried at least 2 feet beneath the land surface, in such a manner that the cover material would not be subject to accelerated erosion.

Stockpiles of acid-producing deposits awaiting burial would be covered with pulverized limestone at the rate of 30 tons per acre (1375 pounds per 1000 square feet) and then covered with a minimum of 1 foot of compacted soil free of acid-producing-deposits within one week after exposure, or before the pH of a well-mixed sample from the uppermost two inches of the deposit drops to 3.0, whichever occurs first. Whenever practicable, deposits would be buried the same day they are excavated.

5.3.2 Streams and Floodplains

Federal Executive Order 11988, Flood Plain Management (May 24, 1977), requires agencies to reduce the risk of flood loss, minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by floodplains. Floodplain concerns were considered in the design of the proposed Route 92 project, and NJTA indicates that construction in floodplains, particularly the placement of fill material, has been minimized to the greatest amount feasible.

Three of the floodplain fills proposed for Route 92 would exceed NJDEP's 20% net fill rule (N.J.A.C. 7:13-2.14(a)1, discussed in Section 4.2.3). NJTA requested exemptions for these floodplain fills in its Stream Encroachment Permit Application submitted in December 2004.

Various forms of mitigation may be implemented to maintain the function and quality of the affected streams and floodplains during construction of proposed Route 92. These measures include the following:

- Bridges should be designed and constructed so that the natural streambed is maintained and not replaced by an artificial floor.
- Culverts should be designed with the capacity to pass the 100-year flood.
- Culverts should be designed to allow for the passage of fish during periods of low flow, where passage existed before project construction.

- Any proposed swales or channels discharging into an existing stream should incorporate the following: 1) settling basins to filter sediment prior to discharge into stream; 2) swales and channels stabilized with riprap, sod or appropriate vegetative cover prior to receiving stream flow; and 3) swales and channels designed to discharge in the direction of the existing stream flow and of a velocity so as not to cause erosion or interfere with the stream's natural flow pattern.

- Construction within streams and floodplains should take place during the anticipated low-flow period of July-August. This reduces the volume of water available to erode streambed soils, minimizing sediment transport downstream.

- Once construction within a stream is complete, disturbed areas should be stabilized and revegetated. Vegetation selected should be a ground cover species indigenous to the site.

- Construction materials should not be stockpiled in floodplain areas.

- Utilization of detention and/or retention basins that function to settle out sediment and some pollutants, thus improving the quality of water discharged downstream.

- Vegetative buffers, natural or manmade, should function to absorb sediment and pollutants from overhead runoff, provide food and cover for wildlife, stabilize soil to minimize erosion, and when present along a stream provide shade and suitable temperature regimes for aquatic life. At all stream encroachments, vegetative buffers should be restored if disturbed during construction. Trees, shrubs and herbaceous matter native to the existing stream should be planted and non-native species should be discouraged.

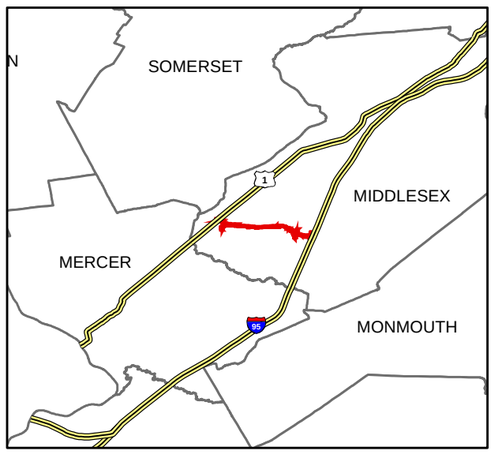
5.3.3 Water Quality

5.3.3.1 Stormwater Management

The New Jersey Pollutant Discharge Elimination System (NJPDES) permit for the New Jersey Turnpike system would require that NJTA control runoff and treat stormwater from proposed Route 92 prior to discharge into the receiving water bodies. The NJTA's proposed stormwater management system consists of a series of detention/water quality basins and/or grassed swales dependent upon various features affecting stormwater management design. Thirty stormwater management basins (SMBs) are proposed throughout the project corridor. NJTA advises that the proposed Route 92 project was designed to comply with the water quality requirements of the Flood Hazard Area stormwater management regulations, N.J.A.C. 7:13-2.8. The proposed stormwater management system was reviewed to assess its compliance with the Stormwater Management rules, N.J.A.C. 7:8-5, adopted in February 2004. Figure 5-1 presents the locations of the proposed stormwater management basins.

0 0.5 1 Miles

Scale: 1:30,000



Legend

- Stormwater Management Basins and Segment Codes
- Rt 92 Footprint
- Segment Tributary Areas
- Bridges
- Culverts (24"-48")

Figure 5-1
Stormwater Management System

US Army Corps of Engineers
Proposed Route 92
Environmental Impact Statement

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CAMD008321\c:\gisdata\NJ\MXD\EIS\Figure 4-1.mxd

CDM's Water Quality BMP Decision Matrix (WQ Matrix) was used to evaluate and select stormwater BMPs. The WQ Matrix was updated to specifically evaluate BMPs based on current New Jersey stormwater regulations. The WQ matrix was also updated to include New Jersey-specific stormwater BMP design criteria, as presented in the New Jersey Stormwater BMP manual. In evaluating a stormwater BMP, the WQ Matrix considers nineteen criteria grouped into four main categories:

1. Target Pollutant Reduction Goal,
2. Physical Characteristics,
3. Cost (Capital and O&M), and
4. Multipurpose Goals (Groundwater Recharge)

The four criteria categories were each assigned a weighting factor. This provides the ability to determine the desired influence each criterion will have on the score of a BMP. The weighting factors for this evaluation were set to 35 percent each for Target Pollutant Reduction Goal and Multi-purpose Goals (Groundwater Recharge), and 15 percent each for Physical Characteristics and Cost. This weighting factor distribution appropriately biases the matrix results to identify those stormwater BMPs that best meet the New Jersey removal efficiency requirements for total suspended solids (TSS) and provide groundwater recharge.

Table 5-1 presents the BMP selections from the WQ Matrix. These selections were then used in the water management model (WMM, as described in Section 4.2.3.1.3) to assess the TSS loads. The results of the WMM model are presented in Table 5-2. The table shows the expected TSS loads for the existing conditions, Route 92 with no BMPs, and Route 92 with the WQ Matrix recommended BMPs. The table shows an overall reduction in TSS of 80 percent from the Route 92 with no BMPs condition to the Route 92 with BMPs condition – the amount required by the 2004 NJDEP Stormwater Management Rules (N.J.S.A. 7:8-5.5).

The 2004 Stormwater Management rules (N.J.A.C. 7:8-5.4) require that the post-construction groundwater recharge is equal to pre-construction recharge, or that the increase in stormwater runoff volume of the two-year storm from pre-construction to post-construction is infiltrated. Recharge was calculated using the methods described in Chapter 6 of the NJ Stormwater Manual, based on the New Jersey Groundwater Recharge Spreadsheet (NJGRS). The spreadsheet is based on the 1993 NJ Geologic Survey *Report GSR-32: A Method for Evaluating Groundwater Recharge Areas in New Jersey, developed by NJGS*.

The spreadsheet is designed to estimate average annual groundwater recharge volume under both pre- and post-development conditions. Inputs to the spreadsheet include data on land use, soils, and impervious area. Extensive precipitation data has been compiled by the creators of the NJGRS to synthesize a series of typical storms

Table 5-1
Proposed Conditions in Tributary Areas and Proposed BMPs[1]

Tributary Area ID	Watershed	Impervious Area (Acres)	Imp. Area (%)	Pervious Area (Acres)	Pervious Area (%)	Total (Acres)	Proposed Best Management Practices (BMPs)
1A	Devil's Brook	7.5	56%	5.9	44%	13.5	Retention Basin
1B	Shallow Brook	7.6	63%	4.5	37%	12.2	Retention Basin
1C	Shallow Brook	3.9	64%	2.2	36%	6.1	Retention Basin
1D	Shallow Brook	3.1	54%	2.7	46%	5.8	Retention Basin
1E, 1F	Shallow Brook	11.0	82%	2.4	18%	13.4	Bioretention Swale & Manufactured Treatment Devices to Dry Detention Basin
1G	Devil's Brook	7.9	44%	9.9	56%	17.8	Retention Basin
1I, 1H	Shallow Brook	13.2	44%	16.7	56%	29.9	Bioretention Swale to Retention Basin; Vegetative Filter
1J	Shallow Brook	6.5	50%	6.4	50%	12.8	Bioretention Swale to Retention Basin; Vegetative Filter, Manufactured Treatment Devices
2A	Devil's Brook	5.3	34%	10.2	66%	15.5	Bioretention Swale to Dry Detention Basin; Manufactured Treatment Devices
2B	Devil's Brook	9.2	73%	3.4	27%	12.6	Bioretention Swale to Dry Detention Basin
2C	Devil's Brook	3.9	55%	3.3	45%	7.2	Bioretention Swale to Dry Detention Basin
2D	Devil's Brook	2.8	47%	3.2	53%	6.1	Bioretention Swale to Dry Detention Basin
2E	Devil's Brook	3.1	43%	4.0	57%	7.1	Manufactured Treatment Devices to Dry Detention Basin
2F	Devil's Brook	6.1	60%	4.0	40%	10.1	Retention Basin
2G	Devil's Brook	5.2	81%	1.2	19%	6.4	Bioretention Swale to Dry Detention Basin
3A, 3B	Heathcote Brook	7.7	47%	8.7	53%	16.4	Retention Basin; Vegetative Filter
3C	Heathcote Brook	8.9	89%	1.2	11%	10.1	Bioretention Swale to Retention Basin; Vegetative Filter; Manufactured Treatment Devices, Isolated Bioretention Swale
3D	Heathcote Brook	5.9	61%	3.7	39%	9.6	Retention Basin
3E, 3F	Heathcote Brook	11.7	66%	6.1	34%	17.8	Bioretention Basin; Isolated Bioretention Swale
3G	Devil's Brook	10.8	56%	8.6	44%	19.4	Retention Basin
3H	Devil's Brook	6.3	39%	9.6	61%	15.9	Bioretention Swale to Dry Detention Basin
Sec 3 (CR-683 and Perrine Rd.)	Devil's Brook	8.2	98%	0.2	2%	8.3	Retention Basins (C1 and DH1)
Sec 3 (Near Devil's Brook)	Devil's Brook	5.2	93%	0.4	7%	5.6	Bioretention Swale
Sec 1 (East of US 130)	Shallow Brook	3.7	98%	0.1	2%	3.8	Retention Basin
Sec 1 (US 130 - NE ramp)	Devil's Brook	5.9	52%	5.4	48%	11.3	Retention Basin
Sec 1 (US 130 - SE ramp)	Shallow Brook	4.4	51%	4.3	49%	8.8	Retention Basin
Subtotal	Devil's Brook	87.4	56%	69.3	44%	156.7	
Subtotal	Heathcote Brook	34.2	63%	19.7	37%	53.8	
Subtotal	Shallow Brook	53.6	58%	39.1	42%	92.7	
Total		**175.1**		**128.2**		**303.3**	

[1]Proposed conditions for recharge are with BMPs in place.

Table 5-2
Annual Loading of Total Suspended Solids and Projected Removal Efficiency

SMB Name		Tributary Area (acres)	Existing Loads (lb/yr)	Route 92 Loads w/o BMPs (lb/yr)	Route 92 Loads w/ Proposed BMPs (lb/yr)	Percent Reduction
SMB - 1A	Devil's Brook	13.5	8,171	7,522	1,504	80%
SMB - 1B	Shallow Brook	12.2	5,146	7,540	1,508	80%
SMB- 1C	Shallow Brook	6.1	3,203	3,863	773	80%
SMB - 1D	Shallow Brook	5.8	1,734	3,124	625	80%
SMB - 1E, 1F	Shallow Brook	13.4	7,635	10,683	2,137	83%
SMB - 1G	Devil's Brook	17.8	3,397	8,130	1,626	80%
SMB - 1I, 1H	Shallow Brook	29.9	13,303	13,593	2,719	80%
SMB - 1J	Shallow Brook	12.8	4,353	6,591	1,318	80%
SMB - 2A	Devil's Brook	15.5	2,332	5,653	1,131	73%
SMB - 2B	Devil's Brook	12.6	1,813	9,012	1,802	96%
SMB - 2C	Devil's Brook	7.2	1,107	3,925	785	96%
SMB - 2D	Devil's Brook	6.1	923	2,864	573	96%
SMB - 2E	Devil's Brook	7.1	1,008	3,197	639	86%
SMB - 2F	Devil's Brook	10.1	1,562	6,073	1,215	80%
SMB - 2G	Devil's Brook	6.4	868	5,054	1,011	68%
SMB - 3A, 3B	Heathcote Brook	16.4	2,644	7,871	1,574	80%
SMB - 3C	Heathcote Brook	10.1	5,429	8,602	1,720	81%
SMB - 3D	Heathcote Brook	9.6	1,516	5,865	1,173	80%
SMB 3E, 3F	Heathcote Brook	17.8	5,875	11,561	2,312	86%
SMB - 3G	Devil's Brook	19.4	2,830	10,838	2,168	80%
SMB- 3H	Devil's Brook	15.9	2,495	6,579	1,316	96%
Section 3 (CR-683 & Perrine Rd.)	Devil's Brook	8.3	1,317	7,874	711	80%
Section 3 (Near Devil's Brook)	Devil's Brook	5.6	664	5,009	1,192	61%
Section 1 (East of US 130)	Shallow Brook	3.8	2,430	3,554	892	80%
Section 1 (US 130 - NE ramp)	Devil's Brook	11.3	2,828	5,960	1,575	80%
Section 1 (US 130 - SE ramp)	Shallow Brook	8.8	1,843	4,460	501	80%
Subtotal	Devil's Brook	156.7	31,315	87,690	17,248	82%
Subtotal	Heathcote Brook	53.8	13,948	33,899	6,779	83%
Subtotal	Shallow Brook	92.7	39,647	53,408	10,473	81%
Total		303.3	84,910	174,997	34,500	82%

representing an average year for each region. In order to meet the NJ Stormwater Regulations, BMPs or other engineering controls must be installed to maintain 100 percent of the pre-construction average annual recharge. The NJGRS calculates the volume of water that is recharged in an average year under both existing and proposed conditions. The difference is the "recharge deficit", or the volume of water that must be infiltrated by one or more BMPs. Table 5-3 presents a summary of the average annual groundwater recharge values as calculated by the spreadsheet. The calculations show that the project would increase recharge which will provide cleaner sustained base-flow.

5.3.3.2 Roadway Deicing

NJTA will be required to consider, where necessary, options to reduce the impact of deicing salt in highway runoff from proposed Route 92, depending on the degree of actual impact and sensitivity of specific areas to salt in the runoff. These options include, but may not be limited to, alternative deicing materials, modified application rates and procedures, and minimizing or prohibiting the use of deicing salt in sensitive areas with warning provided to motorists of potentially hazardous driving conditions.

5.3.3.3 Spills of Hazardous Materials

NJTA would be required to employ spill mitigation measures immediately upon the spilling of any fuel or other hazardous materials on Route 92. Spilled materials could be recovered from the road surface, the shoulder, the drainage channels, and if necessary, the surface of the stormwater management basins. Should a substantial quantity of liquid spill on proposed Route 92, it would flow to a stormwater detention basin, from which it would be pumped into a recovery truck.

5.3.4 Wetlands and Open Space

NJTA states that the design of proposed Route 92 was developed and refined to comply with the federal government's"no net loss" wetland policy, which seeks to avoid and minimize wetland impacts to the greatest extent practicable. USEPA's 404(b)(1) guidelines, intended to implement this policy, involve the evaluation of project alternatives to first avoid wetland impacts. The second step involves evaluation of project modifications to minimize unavoidable wetland impacts. The third step involves development of a mitigation program to mitigate for the unavoidable wetland impacts.

The proposed Route 92 alignment was selected to avoid wetlands to the extent practicable by proposing the highway in open field areas that are generally parallel with and south of Friendship Road. Alteration to Wetland Units 1, 2, 3 and 7 (see Figure 3-11 in Section 3) mostly involves filling along the margins of the wetlands to avoid further fragmentation of the forested wetlands to the north and south of the proposed alignment. This design also looks to limit adverse effects to the wildlife habitat in these forested wetlands, as described in Section 4.2.3.4. Wetland Units 4, 5 and 6 are oriented in a north to south direction along Devil's Brook and the Amtrak tracks in the west central portion of the alignment. Due to their orientation, these wetland units could not

Table 5-3
Average Annual Groundwater Recharge Summary*

BMP Tributary Area	Tributary Area (acres)	New Impervious Area Created by Rt 92 (acres)	Existing Conditions Recharge (in/yr)	Proposed Conditions Recharge (in/yr)	Recharge Deficit (ft^3)	Calculated BMP Recharge (ft^3)
1A	13.46	4.17	5.72	5.09	31,000	730,000
1B	12.17	3.19	5.57	4.35	54,000	970,000
1C	6.07	1.74	1.73	0.87	19,000	440,000
1D	5.79	2.74	7.68	4.86	59,000	370,000
1E, 1F	13.39	9.71	5.37	1.84	170,000	180,000
1G	17.82	6.71	9.61	6.51	200,000	920,000
1I, 1H	29.92	7.19	6.78	5.04	190,000	190,000
1J	12.83	6.14	8.26	4.56	170,000	+
2A	15.46	4.91	6.70	4.82	110,000	+
2B	12.63	8.95	8.47	2.50	270,000	+
2C	7.21	3.62	8.71	4.17	120,000	+
2D	6.07	2.65	6.53	3.52	66,000	+
2E	7.06	2.81	6.31	4.64	43,000	140,000
2F	10.11	5.97	10.83	4.57	230,000	700,000
2G	6.38	5.02	7.58	1.76	130,000	160,000
3A, 3B	16.35	5.78	9.64	6.66	180,000	430,000
3C	10.06	7.90	4.69	0.99	130,000	890,000
3D	9.60	5.79	11.81	4.69	250,000	680,000
3E, 3F	17.81	10.65	8.86	4.18	300,000	1,400,000
3G	19.37	10.61	11.93	5.32	460,000	+
3H	15.89	6.03	9.61	6.05	210,000	+
Sec 3 (CR-683 and Perrine Rd.)	8.32	8.04	5.97	0.19	80,000	150,000
Sec 3 (Near Devil's Brook)	5.60	4.50	10.10	5.69	180,000	+
Sec 1 (East of US 130)	3.80	3.67	10.07	6.48	110,000	130,000
Sec 1 (US 130 - NE ramp)	11.32	5.07	2.61	0.52	42,000	590,000
Sec 1 (US 130 - SE ramp)	8.75	3.59	10.47	0.10	310,000	470,000
Total	**303.3**	**147.1**			**4,110,000**	**9,540,000**

* Calculated using the New Jersey Groundwater Recharge Spreadsheet (NJDEP, 2004)

be avoided if an effective connection to US Route 1 was to be achieved. The two finger-like extensions of the northern forest towards McCormack Lake provide a secluded travel corridor habitat as well as a limited area of interior forest habitat.

Wetland impacts were reduced through design modifications including reducing the median width through the Devil's Brook wetland complex and replacing slopes with retaining walls to minimize wetland filling. To further reduce wetland impacts and impacts to wildlife utilization of wetlands along Devil's Brook, bridges are proposed rather than fill to support sections of the roadway (see Figure 5-1). Shading impacts from the bridge structure may result in some modification of the underlying plant community; however, there would be less loss of wetland area and the wildlife travel corridor would remain. See Section 4.2.3.5.3 for a discussion of wildlife habitat impacts and Section 5.3.5 for mitigation measures.

The highway storm drain system was designed with several storm water detention/water quality basins along the proposed highway. Although not proposed as wetland mitigation areas, these basins would serve wetland functions of flood storage, flood flow alteration, and sediment trapping. The wetland units along the alignment are all rated as high to moderate for these wetland functions. Use of stormwater best management practices would serve to reduce indirect wetland impacts associated with highway runoff, namely increased rates of runoff and effects of non-point source runoff constituents to surface water quality. The stormwater basins are designed to reduce the flood flow discharges from the highway by detaining runoff and releasing it slowly to adjacent lands and waterways. Removal of sediment and the contaminants adsorbed to sediment in project detention basins would reduce the amount to sediment transported to natural wetlands. The project detention basins would reduce sediment build-up in wetlands as compared to a drainage system with no detention basins.

The wetlands that would be temporarily altered during construction would be restored in place after construction is completed. Temporarily altered wetlands include those wetland areas that would be altered during construction of adjacent retaining walls, slope grading, temporary access roads or staging areas. Upon completion of highway construction, temporarily altered wetlands would be restored to pre-construction grades, and planted with native wetland plants to restore the plant community.

To mitigate for the unavoidable direct permanent wetland impacts, NJTA proposes to create and maintain approximately 57 acres of wetlands and open water on land north and south of the proposed highway alignment, east of Haypress Road. The new wetland would have a hydrologic connection to the wetland bordering Devil's Brook. The mitigation plan would provide an approximately 4.5:1 ratio of created wetlands to permanently altered (filled or shaded) wetlands. (An excerpt of the conceptual wetland mitigation plan is provided in Appendix G.) The replacement wetland would be located within the same watershed as the majority of the wetland losses, and is designed to create a wetland complex composed of emergent marsh and wet meadow (12.24 acres), scrub-shrub wetland (8.2 acres) and forested wetland (36.7 acres). Approximately 0.85

acres of open water would also be created. NJTA proposes further mitigation in the form of preservation of 202 acres of existing forested wetland and upland in the vicinity of Friendship Road and Miller Road. Therefore, a total of approximately 260 acres would be preserved as a result of the mitigation plan.

Wetland replacement projects that are properly planned, designed, and constructed according to the design can be and have been successful. USACE believes that the keys to success are collection of adequate information on site hydrology prior to design and careful design based on the hydrological data collected. In addition, creation of forested wetland requires several decades for mature trees to grow. USACE and other federal and state agencies have evaluated wetland mitigation projects and have developed stringent review criteria and standards for mitigation plans and permit conditions to incorporate those standards into permits to improve wetland mitigation success. The Route 92 project sponsor proposes approximately a 4.5:1 ratio of mitigation wetlands to filled wetlands, an increase over suggested mitigation ratios. Final design plans and construction specifications will be developed to construct mitigation wetlands so there is a net gain of wetlands as a result of this project.

Creation of replacement wetlands and preservation of 202 additional acres of forested wetland and upland would also mitigate the conversion of land encumbered under the Green Acres program to highway use.

5.3.5 Wildlife

NJTA states that the proposed Route 92 project looks to minimize adverse impacts to wetland and upland habitats by avoiding loss of important habitat to the extent practicable. Bridging Devil's Creek and the associated riparian forest reduces direct impacts to this travel corridor, its principal wildlife function. No additional measures are proposed to mitigate the highway project to the two forest tracts north of McCormack Lake. Where the highway would be constructed at grade, adjacent to or through other forested land, preserving existing trees or replanting trees within the right of way to the maximum extent practicable is intended. This would minimize loss of woodlands and minimize the horizontal extent of adverse edge impacts into these woodlands.

Planting trees along the entire highway alignment through open field areas (grassland habitat) is not contemplated. Planting trees along the highway would serve to constrict the fields with a tree row and reduce the use of these fields by grassland birds, which would perceive these fields as small isolated patches. Maintaining grassy strips along the highway through open field areas would maintain the "openness" of these areas. Essentially, birds would be more likely to perceive the grass strip along the highway extending to the adjacent open fields as a single area. Placement of shrub masses or tree clumps scattered along the highway would provide perching habitat for some grassland birds (e.g. eastern meadowlark, grasshopper sparrow, loggerhead shrike and northern shrike).

5.3.6 Protected Species

5.3.6.1 State Endangered Species - Southern Arrowhead

A portion of the state-endangered southern arrowhead population would be adversely impacted by construction of proposed Route 92. Locations of these plants within and outside of the proposed ROW have been located and surveyed. Field studies indicate that southern arrowhead tends to grow in areas with a relatively open canopy, deep organic layer in the substrate, and either moderate ponding or shallow depth to groundwater. Studies also concluded that southern arrowhead is likely growing in all areas of suitable habitat within the Devil's Brook area, and the species seems capable of colonizing microhabitats (i.e., precise locations within a habitat) that meet the necessary criteria for suitable habitat.

An estimated 25% of the southern arrowhead population within the proposed ROW would be impacted by the construction of Route 92. This impact would occur due to either disruption by construction equipment, filling or shading by construction. The placement of snow fencing at the proposed limits of disturbance and monitoring of construction equipment movement would reduce the potential for arrowhead plants to be destroyed needlessly. Transplanting would be the preferred method for protecting individuals within the path of construction, and the chance of success for transplanting southern arrowhead is relatively good.

Individual plants within the limit of disturbance may be dug up prior to the start of construction activities and transplanted elsewhere within the Devil's Brook project area. Individual transplants should be distributed among the existing colonies of southern arrowhead, provided there appears to be sufficient microhabitat available to accommodate additional plants. If adequate area within existing colonies is not available, then alternative locations for transplanting the species must be identified.

As the preferred habitat of southern arrowhead is very specific and not always easily identified, transplanting to random locations within the Devil's brook area is not recommended. The findings of the field study can be used to identify specific locations that meet all the habitat criteria except for canopy cover. Selected trees can be removed in these locations to open the canopy. Southern arrowhead plants can then be transplanted into the areas of created habitat. Restriction on the timing of transplanting, length of time the plants can be held before transplanting, and methods of holding plants must be developed in order to maximize transplant success.

Another method for reestablishing the population lost due to construction of proposed Route 92 is seed propagation. Seeds can be collected from specimens within the Devil's Brook project area after flowering, or obtained from commercial seed sources (southern arrowhead is a common plant in the southeastern United States). Use of local seeds would be preferred. The proportion of seeds taken should not threaten the existing southern arrowhead colonies.

The seeds would be propagated in a greenhouse environment and planted at the appropriate time in appropriate habitat within the Devil's Brook area. As with the transplanting of existing individuals the propagated plants must be located either within existing colonies or within created habitat. This method could be used in combination with the transplanting of individuals. The advantages of this method either alone or with transplanting are the increased chance of success (i.e., percent survival of planted individuals) and the opportunity to increase the size of the population in the Devil's Brook area. If transplanting alone were performed and some of the plants did not survive, there would be a net loss of individuals from the project. If propagation were performed, then many more plants could be introduced to the Devil's Brook area, thereby increasing the likelihood that more plants would survive and become a viable population.

NJTA states that in an effort to save plants situated between the limits of disturbance and the ROW boundary, typical ROW line fencing would not be installed in the Devil's Brook wetland area.

In its review of the revised 1999 stream encroachment permit, the NJDEP Land Use Regulation Program contacted the NJDEP Office of Natural Lands Management, Division of Parks and Forestry (DPF) regarding the southern arrowhead impacts resulting from the construction of proposed Route 92 and appropriate mitigation. The DPF made recommendations in its response memorandum dated June 30, 1999 regarding potential mitigation options for the southern arrowhead plants and habitat impacted by the proposed Route 92 project. The DPF noted its lack of experience with transplantation, but indicated that transplantation could be accomplished, provided that a rigorous monitoring and maintenance program for the transplanted plants was implemented.

5.3.6.2 State Species of Concern - Savannah Sparrow and Bobolink

In a comment on the DEIS, NJDEP suggested that additional grassland habitat for savannah sparrow and bobolink, state species of concern, be created as mitigation for the grassland habitat displaced by proposed Route 92. This will be considered if the project advances.

5.3.7 Noise

Although up to six Category B receivers would experience noise levels that equal or exceed 67 dBA, only five were evaluated for noise abatement measures. The impacted residential receptors located outside the proposed Route 92 ROW are R-6, R-13, R-14, R-16 and R-17. The Boy Scouts of America site (R-12) is located within the Route 92/US Route 1 ROW; therefore, NJTA proposes to incorporate it as part of the Route 92 project. For the commercial receivers (C-1 and C-4) that were predicted to have noise levels equal to or greater than 72 dBA, FHWA regulations (23 CFR 722) state that NAC noise levels only apply to areas that have regular human use and do not apply to parking lots, industrial areas, and open spaces. FHWA does not require evaluating noise abatement measures that reduce exterior noise impacts for commercial land uses. In addition,

barriers may not be suitable for commercial development, because they tend to block advertisement and visibility of the development from the street.

Noise abatement measures were evaluated based on procedures provided in *Highway Traffic Noise Analysis and Abatement Policy and Guidance* (FHWA, 1995) and *Policy for Construction of Sound Barriers* (NJTA, 1991). These noise abatement measures included:

- Traffic management measures (e.g. traffic control devices and signing for prohibition of certain vehicles types, time-use restrictions for certain vehicle types, modified speed limits and exclusive land designations);
- Alteration of horizontal and vertical alignments;
- Acquisition of property rights (either in fee or lesser interest) for the construction of noise barriers;
- Construction of noise barriers (including landscaping for aesthetic purposes) within or outside the highway right-of-way;
- Use of noise insulation at public use or nonprofit institutional structures.

The NJTA traffic noise policy for construction of sound barriers establishes criteria for evaluating noise abatement barriers. These criteria include:

- Noise levels from the New Jersey Turnpike must be projected to exceed an L_{eq} of 67 dBA at the exterior of the homes immediately adjacent to the Turnpike ROW;
- The New Jersey Turnpike roadway itself must be at least 12 feet closer to an existing home after construction;
- A proposed barrier must be expected to cause a minimum reduction of 4 dBA at the home(s);
- The cost of the proposed barrier must be less than $45,000 per dwelling unit to be protected;
- Construction must be feasible from an engineering perspective in the opinion of NJTA, and
- The height of the barrier shall not exceed 26 feet, unless the NJTA Executive Director determines that extraordinary circumstances justify a higher barrier in a particular case.

The following subsections present the results of the noise abatement evaluation for the impacted receivers.

5.3.7.1 Traffic Management

In order to achieve a 5-dBA reduction, the speed limit would have to be reduced along designated portions of proposed Route 92 by approximately 25 mph (typically about a 1 dBA reduction for every 5 mph reduction in speed). This measure does not appear to be feasible because it would adversely affect traffic flow along proposed Route 92. Other approaches would require limiting truck traffic along proposed Route 92 or restricting the hours truck traffic would be able to access the highway. Neither option appears feasible given that Route 92 would be a major throughway in this region, and restrictions on truck traffic would be inconsistent with the stated purpose and need.

5.3.7.2 Horizontal and Vertical Alignments

NJTA does not consider adjustment of the horizontal or vertical alignment of proposed Route 92 to be a feasible option, given that existing vertical alignment is relatively flat and that adjusting the horizontal alignment would affect property owners adjacent to the corridor. In order to achieve a 5-dBA reduction, the road would have to be moved approximately twice the distance from where it is currently proposed from each affected receptor. For example, if a receptor were located 100 feet away from the edge of the proposed roadway, it would have to be adjusted another 100 feet away from its existing location.

5.3.7.3 Noise Insulation

As there are no public or nonprofit institutions in the project study area outside the proposed ROW, provision of noise insulation at institutional sites is not applicable as a mitigation measure.

5.3.7.4 Noise Barriers

Noise barriers are solid obstructions built between the highway and sensitive receivers along the highway. Effective noise barriers may reduce noise levels by 10 to 15 dBA. Barriers can be formed from earthen berms or from high vertical walls. Noise barriers do have limitations. These limitations include:

- To be effective, the barrier should extend along a highway four times as far in each direction as the distance from the receiver to the barrier.
- The barrier must break the line of sight from the roadway to the receptor in order achieve a 5-dBA noise level reduction.
- Openings in noise walls for driveway connections or intersecting streets severely reduce the effectiveness of the barriers.

Noise barriers were evaluated for each of the impacted residential receivers (R-6, R-7, R13, R-14, R-16 and R-17). Initially, a barrier height of 10 feet was chosen because it is the minimum height that was determined to achieve at least a 4-dBA noise level reduction for most of the receivers. A length of 600 feet erected at the ROW was evaluated to try to achieve the necessary 4-dBA-noise reduction at each receiver. However, a barrier of

these dimensions did not meet the necessary 4-dBA noise reduction for receivers R-16 and R-17, and therefore, a barrier height of 12 feet was evaluated. The additional 2-foot increase in barrier height did provide greater noise reduction by an additional 1 dBA. However, neither the 10-foot nor 12-foot barrier heights would meet the NJTA cost limit of $45,000 per residential dwelling affected by noise (NJTA, 1991). Therefore, NJTA does not recommend a sound barrier for any of these locations. Table 5-4 presents a summary of the barrier evaluation.

5.3.8 Land Use and Farmland

To mitigate for the conversion of wetlands and other open space to transportation use, NJTA proposes to create and maintain approximately 57 acres of wetlands and open water on land north and south of the proposed highway alignment, east of Haypress Road, and to preserve 202 acres of existing forested wetland and upland in the vicinity of Friendship Road and Miller Road (see Section 5.3.4 above).

Vegetative screening is proposed wherever feasible between Route 92 and existing land uses.

NJTA indicates that property acquisition required for the proposed Route 92 ROW and relocation of current occupants would be conducted in accordance with the New Jersey Relocation Act of 1971, as amended. Relocation assistance would be available to all displaced residents, businesses, and organizations.

Table 5-4
Noise Barrier Evaluation

OPTIMA Modeling Results [1]					**Receptor Data**	
Barrier Dimensions			**Cost**	**Max. Insertion Loss**	**No. of Benefited**	**Cost/Receptor**
height (ft)	length (ft)	area (ft2)	($)	(dB)	**Receptors**	($)
Receiver R-6 Sound Barrier						
10	600	6,000	120,000	7	1	120,000
Receiver R-13 Sound Barrier						
10	600	6,000	120,000	5	1	120,000
Receiver R-14 Sound Barrier						
10	600	6,000	120,000	5	1	120,000
Receiver R-16 Sound Barrier						
10	600	6,000	120,000	3	1	120,000
12	600	7,200	144,000	4	1	144,000
Receiver R-17 Sound Barrier						
10	600	6,000	120,000	3	1	120,000
12	600	7,200	144,000	4	1	144,000

Note: $20 per square foot of barrier was used as a cost estimation for evaluating cost effectiveness.

Three ball fields owned by Princeton University would be displaced by realignment of Research Way to accommodate the proposed interchange between Perrine Road and Route 92. NJTA and Princeton University have discussed the possibility of reconstructing the ball fields on adjacent land.

USACE will explore the feasibility of mitigation for loss of access to agricultural land with NJTA prior to making a permit decision.

5.3.9 Socioeconomics

Provision of emergency-only access to proposed Route 92 where it crosses Friendship Road would give the Monmouth Junction fire company and rescue squad access to Route 92 within two miles of their stations. This would reduce the difficulty of providing emergency services on the limited-access highway.

5.3.10 Transportation

Section 4.2.7 identified a potential undesirable impact of constructing proposed Route 92, namely an increase in the usage of Ridge Road/Heathcote Road between Route 27 and US Route 1 by trucks. In this EIS, "trucks" means vehicles with more than two axles or more than four wheels. A possible mitigation measure, if the proper approvals were secured, would be to restrict truck traffic on this section of Ridge Road/Heathcote Road to emergency vehicles and trucks making pickups and deliveries along Ridge Road. The Circulation Element of the Township of South Brunswick Master Plan anticipates restriction of truck traffic from Ridge Road west of US Route 1 after certain intersection improvements are complete. Assuming compliance with and enforcement of the truck restriction, trucks would divert to a variety of alternate routes, such as Raymond Road from US Route 1 to NJ Route 27. South Brunswick anticipates that after improvement of the intersection of US Route 1 and Route 522, Route 522 would provide a good alternative truck route between Route 27 and US Route 1.

In addition to truck traffic restrictions, traffic calming measures are another possible means to mitigate the traffic impact. Potential traffic calming measures include textured pavement, roadway narrowings, and speed humps or tables. Roadway narrowings may not be appropriate on Heathcote Road near the center of Kingston, where the roadway is already narrow, but could be used closer to US Route 1. The Kingston Volunteer Fire Company has objected to the idea of installing speed humps, but it may be that a type of speed hump or table could be installed that would not interfere with rapid response by emergency vehicles.

NJTA is open to contributing part of the cost of implementing truck restrictions and traffic calming measures on Ridge Road/Heathcote Road.

Figures 5-2 and 5-3 display the projected changes (with respect to the No Action alternative) in 2028 peak-hour truck volumes in the Traffic Study Area that would result from the construction of Route 92, if truck usage of Ridge Road/Heathcote Road were restricted. Comparison to Figures 4-1 and 4-2 shows that Ridge Road/Heathcote Road

Figure 5-2

2028 A.M.

Peak Hour Truck Volume Changes with Truck Prohibitions

Route 92 vs. No Action

US Army Corps of Engineers
Proposed Route 92
Environmental Impact Statement

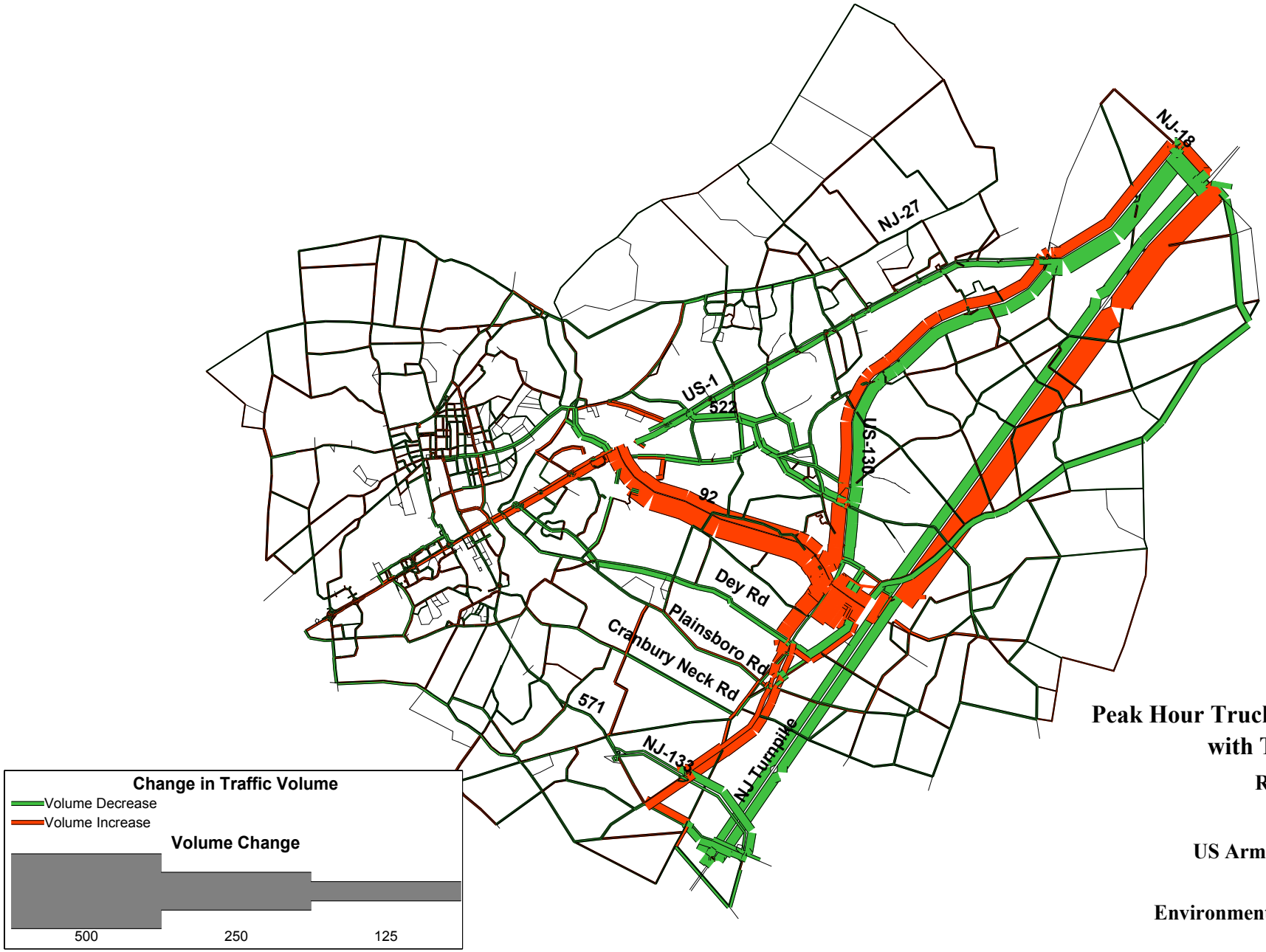

Figure 5-3

2028 P.M.

Peak Hour Truck Volume Changes with Truck Prohibitions

Route 92 vs. No Action

US Army Corps of Engineers
Proposed Route 92
Environmental Impact Statement

would be expected to see a decrease in traffic volume on both sides of the road, rather than the volume increase expected on westbound Ridge Road if no truck prohibition is enacted.

5.3.11 Air Quality

Newer equipment used by contractors constructing proposed Route 92 would have to comply with the federal emissions standards discussed in Section 4.2.6.2. For older pieces of equipment, NJTA would require contractors to add particulate filters and catalytic oxidizers as "after treatment" technologies on construction equipment. Filters are used to remove and burn particulate emissions. Catalysts for diesel engines are used for reducing NO_x and particulate emissions by converting them to less harmful compounds.

Measures recommended to mitigate impacts of fugitive dust include:

- Water or chemical dust suppressant spraying on exposed areas;
- Covering trucks hauling dust generating materials to and from the site;
- Washing wheels and underbodies of construction vehicles prior to departure from the site;
- Reducing vehicle flow over unpaved areas;
- Routinely cleaning paved areas to lessen the amount of dust available to be resuspended.

NJTA will be required to implement measures to ensure that the construction phase of the project meets the state and federal ambient air quality standards and does not exceed the NO_x de minimis level of 100 tpy. The specifications for the project will require that the contractor implement the following measures:

- Assemble a comprehensive inventory list (i.e. make, model, engine year, horsepower, emission rates) of all heavy-duty off-road (portable and mobile) equipment (50 horsepower and greater) that will be used an aggregate of 40 or more hours during construction.
- Provide a plan demonstrating that the heavy-duty (equal to or greater than 50 horsepower) off-road equipment to be used during construction including owned, leased and subcontractor vehicles, will achieve a project-wide fleet-average 20 percent or greater NO_x reduction.
- Require use of engines equipped with post-combustion control technology, such as selective catalytic reduction units, NO_x absorbers or other applicable NO_x control technology, and require use of ultra-low-sulfur diesel fuel or low-emission alternative fuels.

- Ensure that all construction equipment is properly tuned and maintained.
- Minimize idling time to 10 minutes to save fuel and reduce emissions.
- Use existing power sources (e.g., power poles) or clean fuel generators rather than high emission generators.
- Develop a traffic plan to minimize traffic flow interference from construction activities. The plan may include advance public notice of routing, use of public transportation, and satellite parking areas with a shuttle service. Schedule operations affecting traffic for off-peak hours. Minimize obstruction of through-traffic lanes and provide a flag person to guide traffic and ensure safety at construction sites.

5.3.12 Aesthetics

Vegetative screening could be provided between proposed Route 92 and residences close to the highway.

Lighting associated with proposed Route 92 has not yet been designed. Pole-mounted area lighting is available that shines down but not to the side, reducing impacts beyond the area to be illuminated.

5.4 Route 1 Mitigation Actions

5.4.1 Acid-Producing Deposits

As there is the potential for acid-producing deposits to be present along the Route 1 Corridor between Northumberland Way and New Road, soil testing would need to be performed to determine whether or not these deposits exist. If it were determined that there are acid-producing deposits and that they would be exposed due to excavation, steps similar to those described in Section 5.3.1 would need to be taken to minimize the rate at which acid is produced.

5.4.2 Streams and Floodplains

The floodplains of Heathcote Brook and Oakeys Brook, as well as some of the tributaries to these streams, would be crossed if the US Route 1 Widening and Signal Removal alternative were implemented. As a result, any culverts, bridges, or other structures that would be added or modified within the floodplains would require mitigation similar to that described in Section 5.3.2. Minimization of fill within the floodplains would also be sought by regulatory agencies reviewing permit applications for this alternative.

5.4.3 Water Quality

NJDEP has issued a NJPDES permit to the New Jersey Department of Transportation for the state highway system, which includes US Route 1. The permit requires that runoff from US Route 1 comply with the New Jersey stormwater regulations at NJSA 7:8-5 (see Section 4.2.3.1). If the US Route 1 Widening and Signal Removal alternative were implemented, the existing stormwater management system would need to be upgraded

to be able to convey and manage the quality of the additional stormwater that would be generated by this alternative.

5.4.4 Wetlands

The US Route 1 Widening and Signal Removal alternative is estimated to impact a total of 7.7 acres of wetlands if implemented. Since forested wetlands typically require mitigation at a ratio of at least 2:1, a minimum of 15.4 acres of wetlands would have to be created as mitigation, or an alternative method of mitigation proposed. In addition, any wetlands temporarily impacted due to construction easements would need to be mitigated in-place at the end of construction.

5.4.5 Land Use

Acquisition of properties required for new US Route 1 interchanges and relocation of current occupants would need to be conducted in accordance with the New Jersey Relocation Act of 1971, as amended. Relocation assistance would need to be made available to all displaced residents, businesses, and organizations.

5.4.6 Socioeconomics

Gaps could be provided in the Jersey barriers dividing the northbound and southbound lanes of US Route 1 to allow emergency vehicles to make U-turns. This would mitigate the increase in response time caused by elimination of at-grade intersections.

Section 6
Public Involvement

6.1 Public Coordination

On February 26, 1999, the US Army Corps of Engineers New York District (USACE) issued a public notice of the NJTA Section 404 permit application for proposed Route 92. USACE held a public hearing on the application on March 29, 1999 in Plainsboro, New Jersey. After receipt of comments in response to the notice and at the public hearing, USACE determined that preparation of a federal Environmental Impact Statement (EIS) regarding the permit application was in order.

In the Federal Register of April 28, 2000, USACE published a notice of intent to prepare a draft EIS. The notice of intent encouraged interested parties to submit their names and addresses to the USACE contact for inclusion on the distribution list for the draft and final EIS and related public notices.

Written comments on the proposed scope of the EIS were accepted for 45 days following publication of the notice of intent. In addition, USACE held a public scoping meeting on June 8, 2000, at the Holiday Inn Princeton on US Route 1 at Ridge Road, near the western terminus of proposed Route 92. The public scoping meeting was announced at least 30 days in advance and was publicized through mailings and on the USACE New York District website.

At the public scoping meeting, USACE received oral and written comments on the proposed scope of the EIS. Commenters included officials from South Brunswick, Plainsboro, Franklin and Hopewell townships; residents of the area; and representatives of environmental and citizen groups, a construction laborers union, and a trucking organization.

The Draft Environmental Impact Statement was issued in April 2004. Notice of Availability and announcement of a public hearing was published in the Federal Register on April 20, 2004. A public hearing was held on May 20, 2004 and the hearing record was kept open until June 14, 2004 for the receipt of written comments.

Seventy-five speaker presentations at the public hearing, 37 tape recorded statements and 155 comment letters were submitted for the record, containing a total of approximately 1,300 comments on the Draft EIS. The comments and responses thereto are contained in the "Response to Comments" documents that are part of this Final EIS.

6.2 Permits/Legal Requirements

Construction of the proposed Route 92 highway requires a permit from USACE allowing filling of wetlands under Section 404 of the Clean Water Act (33 USC 1344). This permit is commonly called a "Section 404 permit." NJTA submitted an application for a Section 404 permit for proposed Route 92 on January 6, 1999. This EIS will assist

USACE in determining whether to issue a Section 404 permit for the project. The EIS process follows USACE procedures for implementing the National Environmental Policy Act (NEPA), 33 CFR parts 230 and 325.

NJTA originally submitted an application for a freshwater wetlands individual permit (FWIP) for proposed Route 92 to the New Jersey Department of Environmental Protection (NJDEP) in September 1996. On March 29, 1999, NJDEP issued a FWIP and Water Quality Certificate for proposed Route 92. That FWIP and Water Quality Certificate expired on March 29, 2004. NJTA submitted a new application on December 27, 2004. Under USACE regulations, no Section 404 permit can be granted until the required NJDEP water quality certification has been issued or waived.

Because implementation of proposed Route 92 would involve construction in flood plains, the project also requires a stream encroachment permit from NJDEP. NJTA originally submitted an application for a stream encroachment permit for proposed Route 92 on November 21, 1996. Six revisions and supplements to the application were submitted, the last of which was submitted on April 21, 1999. NJDEP did not act on that application. A new stream encroachment permit application was submitted on December 27, 2004.

The Freehold Soil Conservation District must certify the soil erosion and sediment control plan for proposed Route 92. The plan was submitted for certification on July 30, 1997 and was certified on April 6, 1998. The certification expired on October 6, 2001. The soil erosion and sediment control plan will have to be resubmitted for recertification.

The Delaware & Raritan Canal Commission certificate of approval for proposed Route 92 also has lapsed. Commission approval would be required prior to construction of Route 92. NJTA plans to submit a new application to the Commission if NJDEP issues permits for the project.

6.3 Cooperating Agencies

Federal

United States Environmental Protection Agency Region 2
United States Department of the Interior Fish and Wildlife Service

State

New Jersey Department of Transportation

Section 7
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The Route 92 EIS was prepared by CDM and its subcontractors under the direction of the U.S. Army Corps of Engineers New York District. The following personnel contributed to and assisted in the preparation of the document.

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Section 8
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GIS Figure References

Figure 1-1, Location Map:
County boundary, municipal boundary, major highway - NJDEP GIS data download (http://www.state.nj.us/dep/gis/).
Route 92 centerline - provided by DMJM+HARRIS, Inc. Iselin, New Jersey, in Auto CAD format.

Figure 1-4, Regional Road Network and Land Use Patterns:
County boundary, municipal boundary, streams - NJDEP GIS data (ARC/INFO format) available on CD ROM – 1998 update.
Street centerline – 2000 Census GIS data (E00 format)
County and state parks – GIS data (E00 format) from NJ Department of Community Affairs website (http://www.state.nj.us/osp/ospmaps3.htm)
Year 1995 Land Use/Land Cover – NJDEP GIS data download.

Figures 2-1, 2-2, 2-3, Alternatives Analysis:
Street centerline, major highway – Enhanced TIGER files (http://www.esri.com).
Alternatives lines – hand digitized.

Figure 3-1, Topography, Sheets 1 - 8:
Route 92 center line and impact corridor line - provided by DMJM+HARRIS, Inc. in Auto CAD format.
USGS monochromatic bitmap images: NJDEP GIS data download.

Figure 3-2, Geologic Formations:
Street centerline, major highway, PSE&G, railroad, hydrologic feature – Enhanced TIGER files.
Water (polygon) - NJDEP GIS data download (land use coverage).
Geologic formations – NJ Geologic Survey data available on CD.

Figure 3-3a, Soils (Route 92 Corridor)
Soils line - provided by DMJM+HARRIS, Inc. in Auto CAD format.

Figure 3-4, Surface Water Features with Water Quality Monitoring Locations:
Street centerline, major highway, PSE&G, railroad, hydrologic feature – Enhanced TIGER files.
Municipal boundary, county boundary – NJDEP GIS data download.
Route 1 impact corridor – hand digitized.
NJDEP watershed management area boundary - NJDEP GIS data.
USGS/NJDEP Water Quality Monitoring Locations – NJDEP GIS data download.
NJDEP Permit Sites: NJDEP GIS data download.

Figure 3-5, FEMA Flood Hazard Areas:
Street centerline, major highway, PSE&G, railroad, hydrologic feature – Enhanced TIGER files.
FEMA 100 Year Flood Zone – 1996 FEMA Flood Mapping CD (E00 format files)

Figure 3-6, NJDEP Flood Hazard Areas:
Street centerline, major highway, PSE&G, railroad, hydrologic feature – Enhanced TIGER files.
Municipal boundary, county boundary – NJDEP GIS data.
NJDEP Flood Hazard Areas – NJDEP 1998 GIS data on CD.
NJDEP Disclaimer for this map: This map was developed using NJDEP Geographic Information System digital data, but this secondary product has not been verified by NJDEP and is not state-authorized. Actual floodplain locations are subject to field investigation, survey and assessment.

Figure 3-7, Bedrock Aquifers:
Street centerline, major highway, PSE&G, railroad, hydrologic feature – Enhanced TIGER files.
Municipal boundary, county boundary – NJDEP GIS data download.
Bedrock aquifers - NJ Geologic Survey data available on CD.

Figure 3-8, Surficial and Sole Source Aquifers:
Street centerline, major highway, PSE&G, railroad, hydrologic feature – Enhanced TIGER files.
Municipal boundary, county boundary – NJDEP GIS data download.
Bedrock aquifers - NJ Geologic Survey data available on CD.

Figure 3-9, Major Wetlands Systems in Route 92 Study Area:
Street centerline, major highway, PSE&G, railroad, hydrologic feature – Enhanced TIGER files.
Municipal boundary, county boundary – NJDEP GIS data download.
NJDEP Wetlands Delineation- 1995 Land Use/Land Cover, NJDEP GIS data download.

Figure 3-10, Major Wetlands Systems in Route 1 Study Area:
Street centerline, major highway, PSE&G, railroad, hydrologic feature – Enhanced TIGER files.
Municipal boundary, county boundary – NJDEP GIS data download.
NJDEP Wetlands Delineation- 1995 Land Use/Land Cover, NJDEP GIS data download.

Figure 3-11, Wetland Area Locations:
Street centerline, major highway, PSE&G, railroad, hydrologic feature – Enhanced TIGER files.
Municipal boundary, county boundary – NJDEP GIS data download.
Wetland area – digitized from the 1994 DEIS prepared by Harris.

Figure 3-12, Study Area Habitat:
Street centerline, major highway, PSE&G, railroad, hydrologic feature – Enhanced TIGER files.
Municipal boundary, county boundary – NJDEP GIS data download.
Study area habitats – digitized from the 1994 DEIS prepared by Harris.

Figure 3-13, Middlesex County Farmland Preservation Program:
Street centerline, major highway, PSE&G, railroad, hydrologic feature – Enhanced TIGER files.
Municipal boundary, county boundary – NJDEP GIS data download.
Farmland preservation program coverages – Middlesex County Planning Department.

Figure 3-20, Noise Monitoring and Modeling Locations, Sheets 1 – 3:
Route 92 centerline, impact corridor and surrounding features – Auto CAD drawing provided by DMJM+HARRIS, Inc.

Figure 3-21, Prior Noise Monitoring Locations:
Street centerline, major highway, PSE&G, railroad, hydrologic feature – Enhanced TIGER files.
Municipal boundary, county boundary – NJDEP GIS data download.
Noise monitoring locations - digitized from the 1994 DEIS prepared by Harris.

Figure 3-22, Known Contaminated Sites:
Street centerline, major highway, PSE&G, railroad, hydrologic feature – Enhanced TIGER files.
Municipal boundary, county boundary – NJDEP GIS data download.
Known contaminated sites – NJDEP GIS data download (KCS 2001 update).

Figures 3-23a and 3-23b, Land Use (Route 92 and Route 1 corridors):
Street centerline, major highway, PSE&G, railroad, hydrologic feature – Enhanced TIGER files.
Municipal boundary, county boundary – NJDEP GIS data download.
Land use – NJDEP 1995 land use coverage.

Figures 3-24a and 3-24b, Zoning (Route 92 and Route 1 corridors):
Street centerline, major highway, PSE&G, railroad, hydrologic feature – Enhanced TIGER files.
Municipal boundary, county boundary – NJDEP GIS data download.
Zoning – digitized from Plainsboro, South Brunswick, and North Brunswick Townships zoning maps.

Figure 3-25, Minority Status for Blocks in Route 92 Corridor:
United States Bureau of the Census, 2000 Census of Population and Housing