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

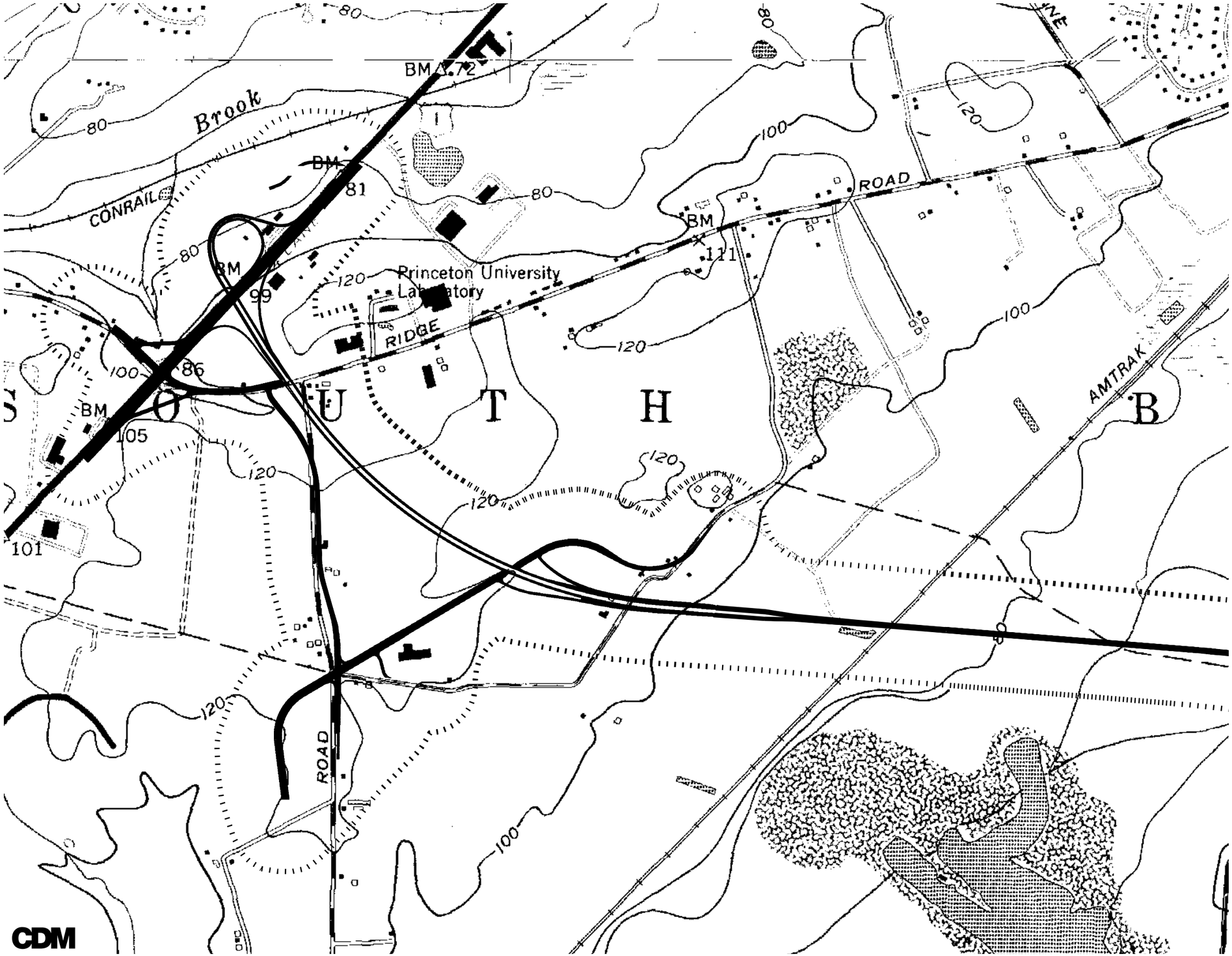
[1]This block group is the Rossmoor planned retirement community.

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.



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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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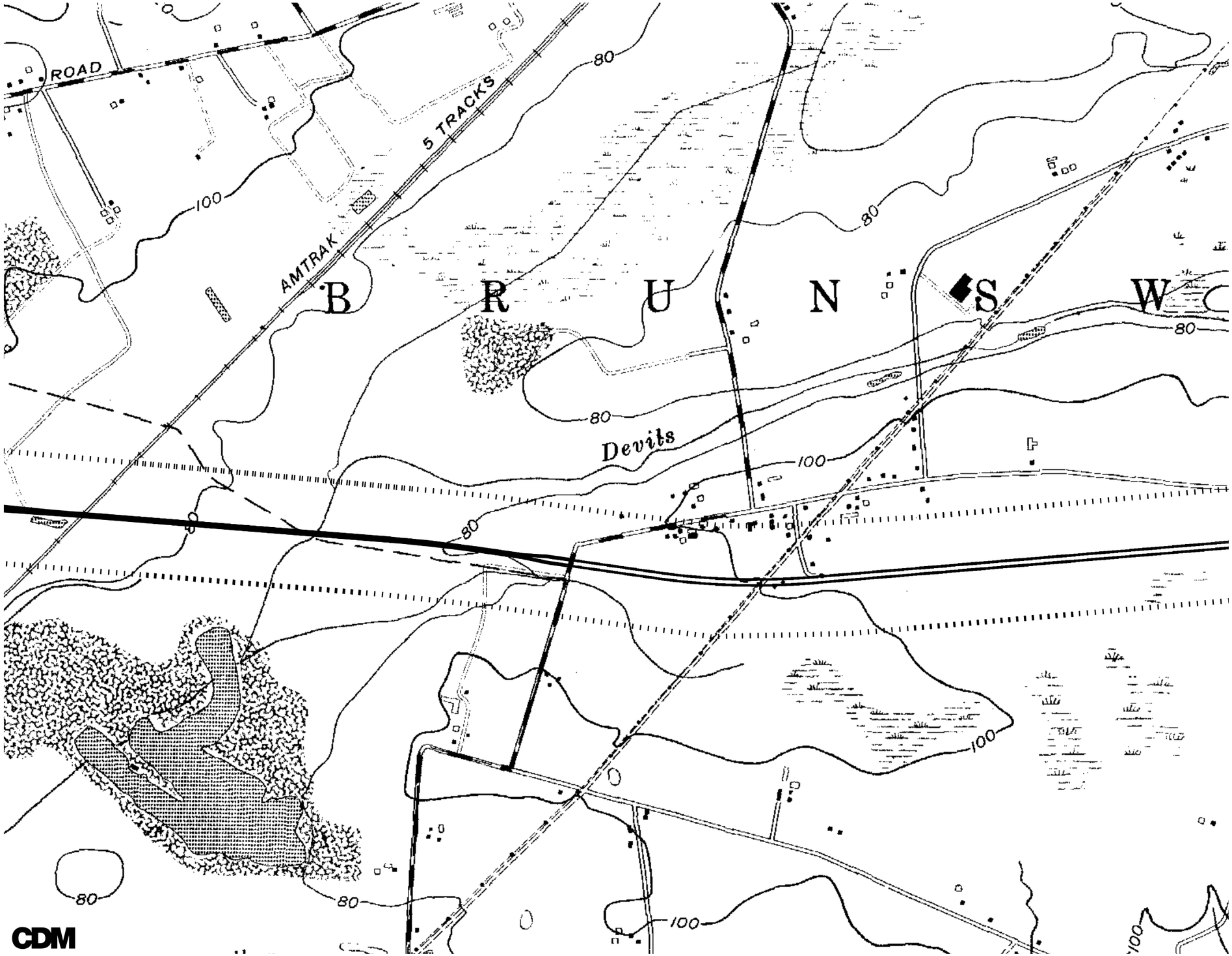

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Projection: Universal Transverse Mercator
Coordinate System: State Plane
Datum: NAD83

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

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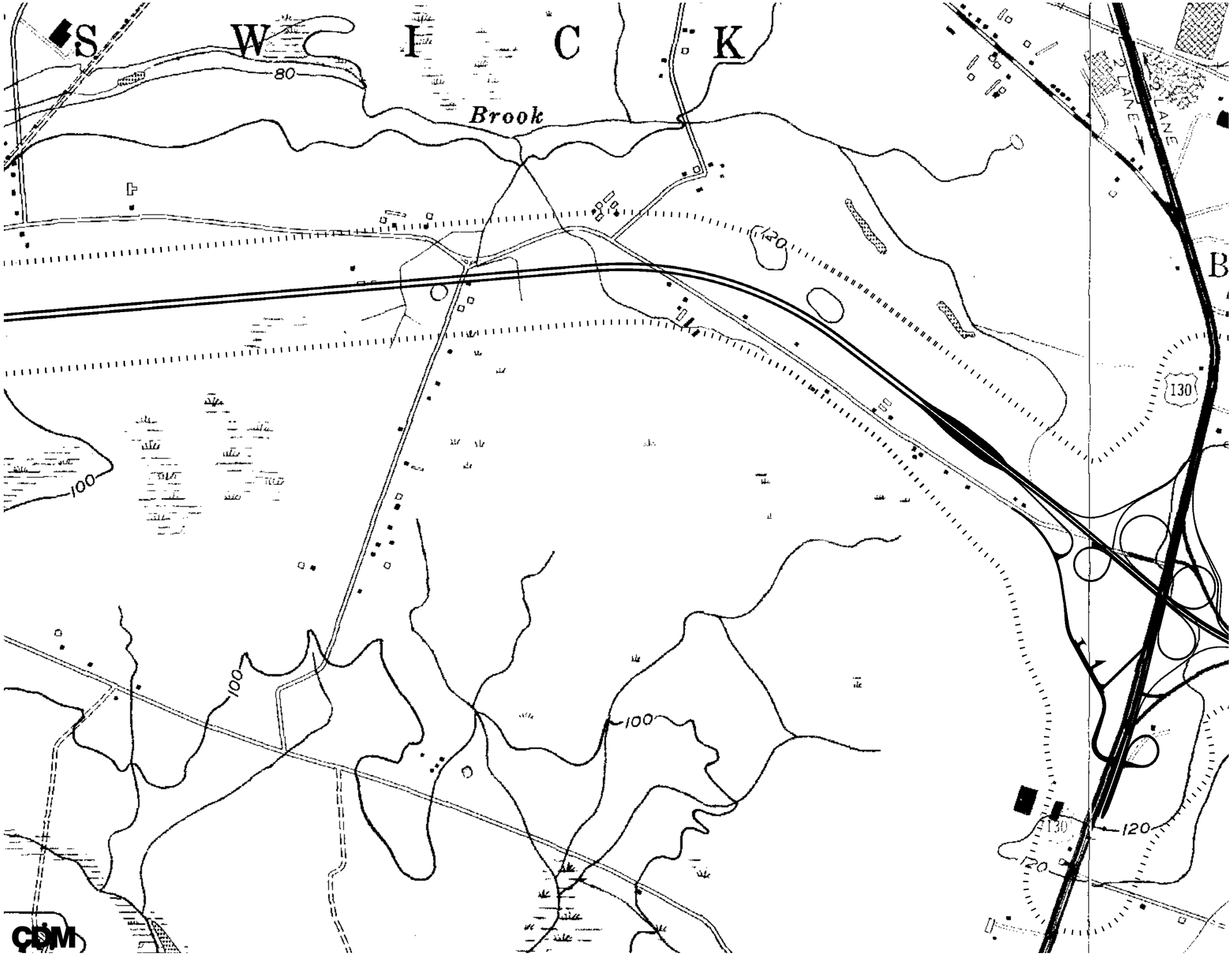

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Projection: Universal Transverse Mercator
Coordinate System: State Plane
Datum: NAD83

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

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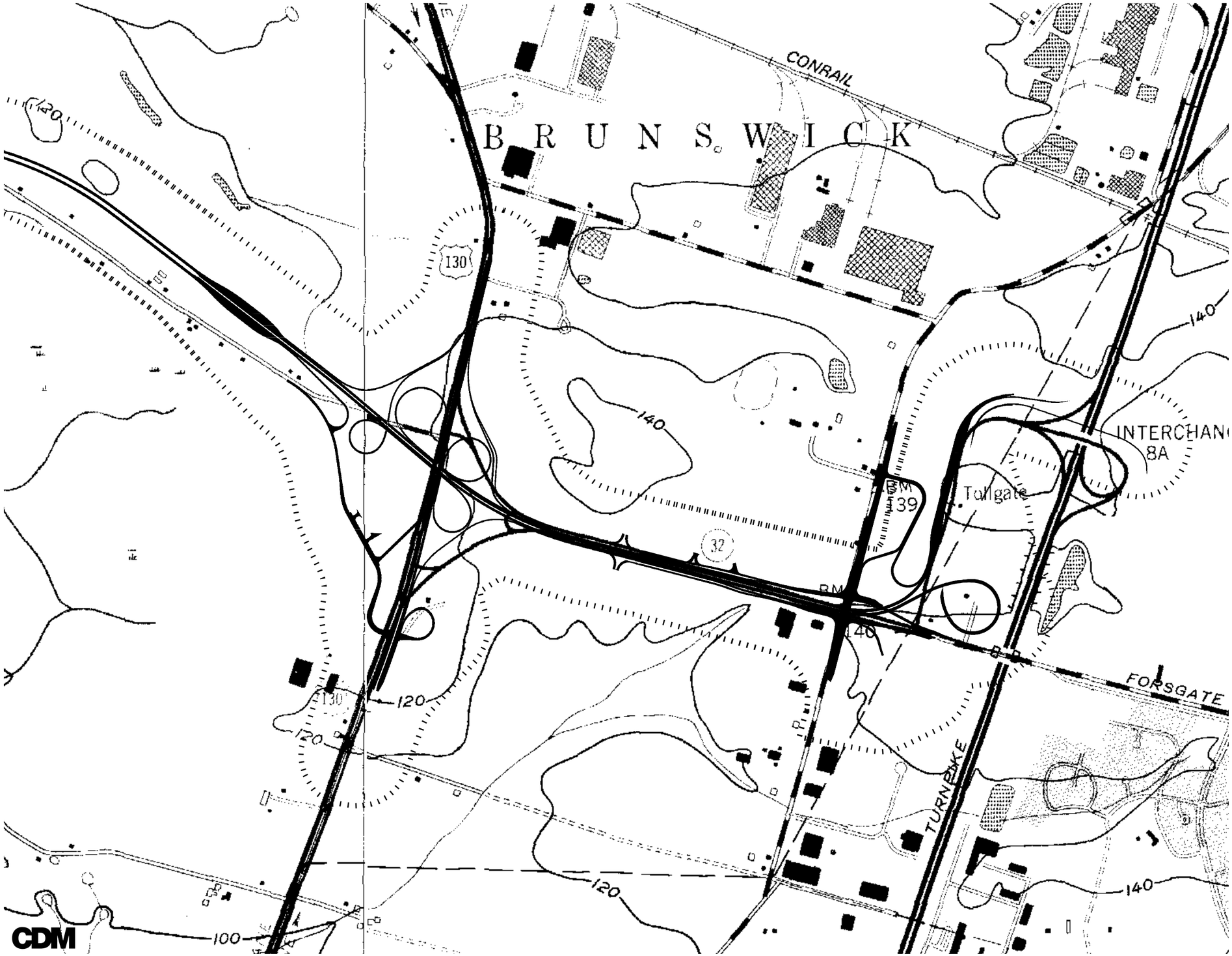

N

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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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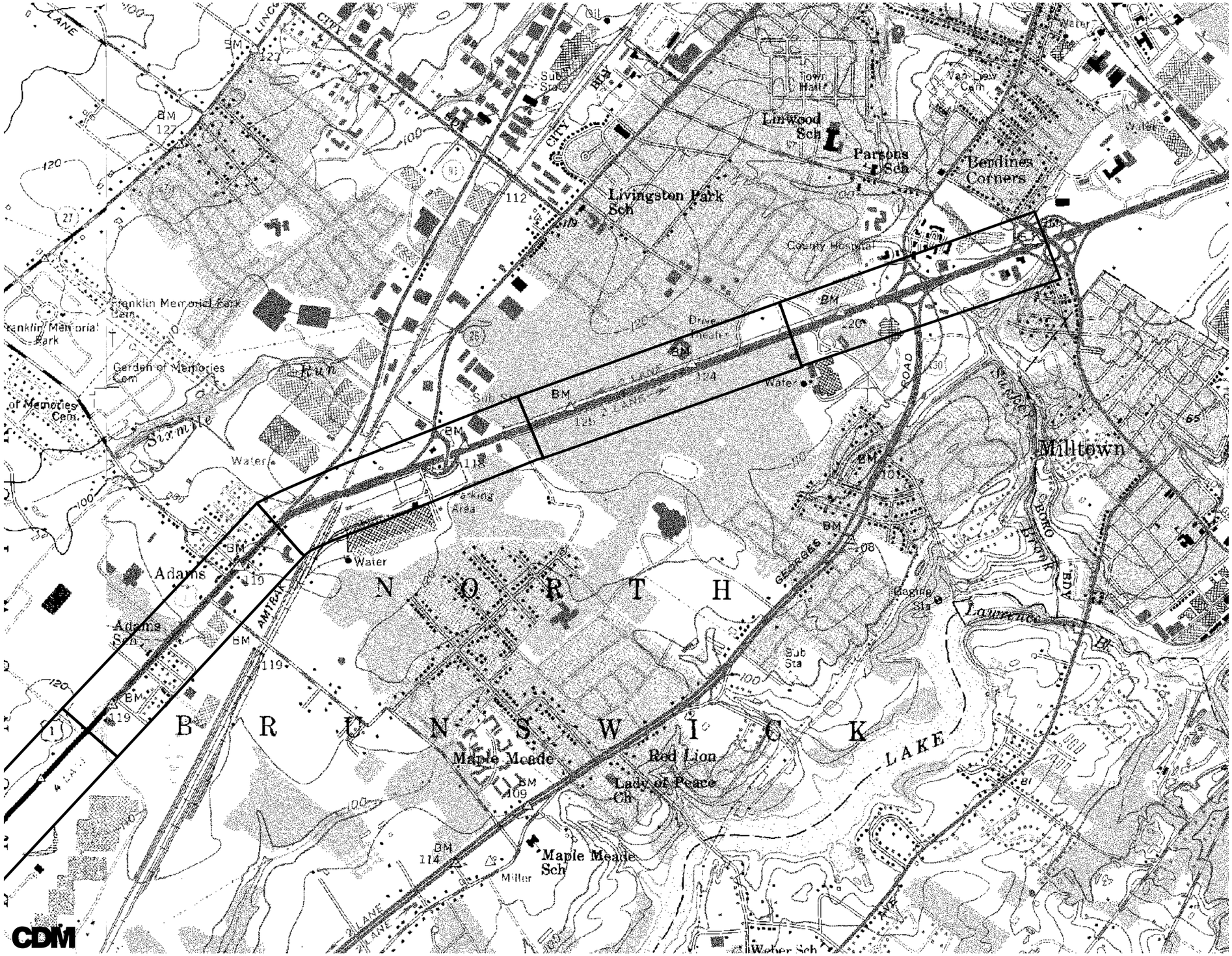

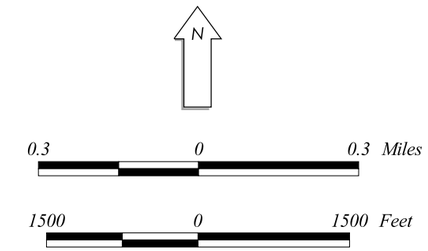

Projection: Universal Transverse Mercator
Coordinate System: State Plane
Datum: NAD83

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

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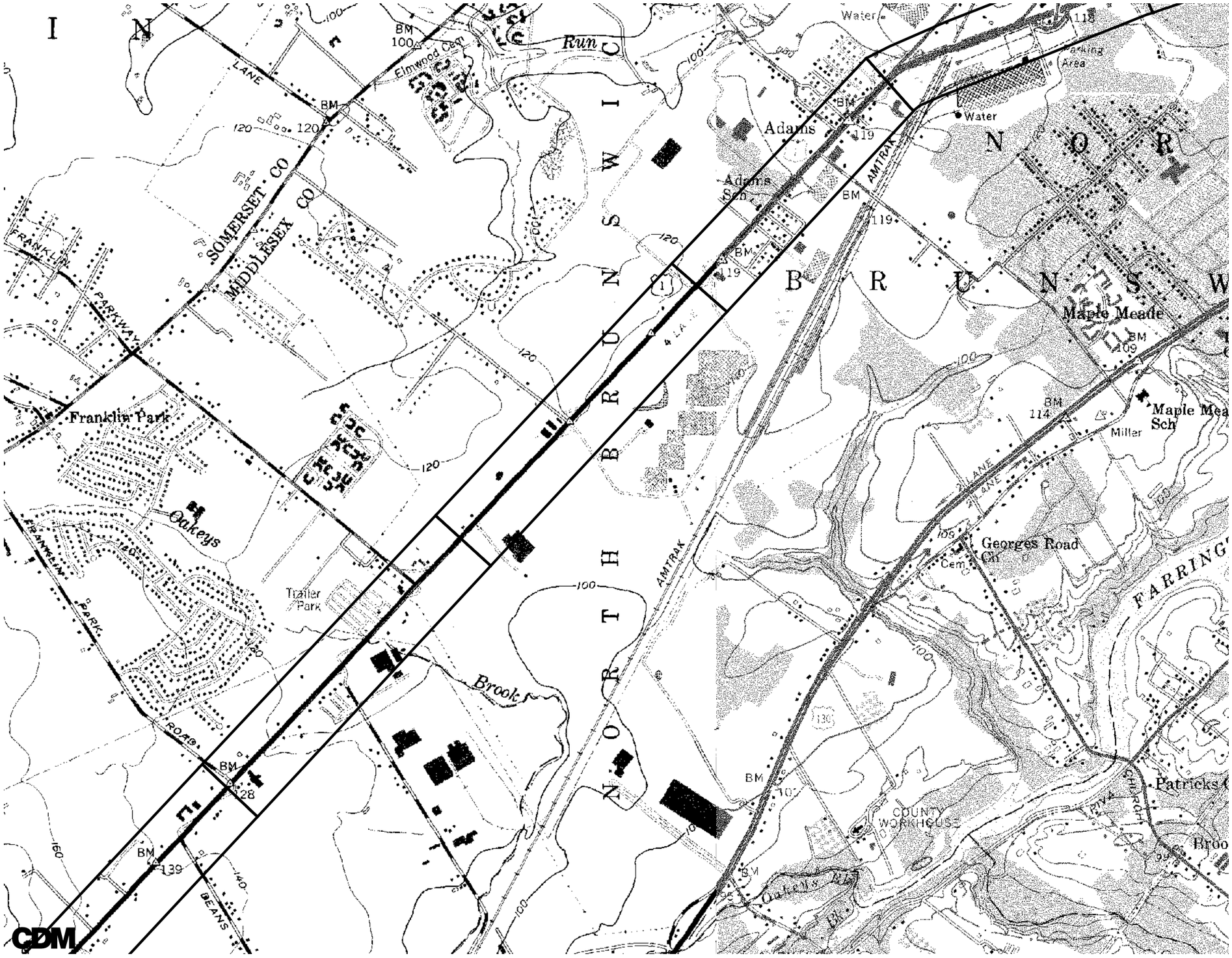

N

0.3 0 0.3 Miles

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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 6
(Section 3.2.1, Sheets 1 - 8)

Topography

US Army Corps of Engineers
Proposed Route 92
Environmental Impact Statement

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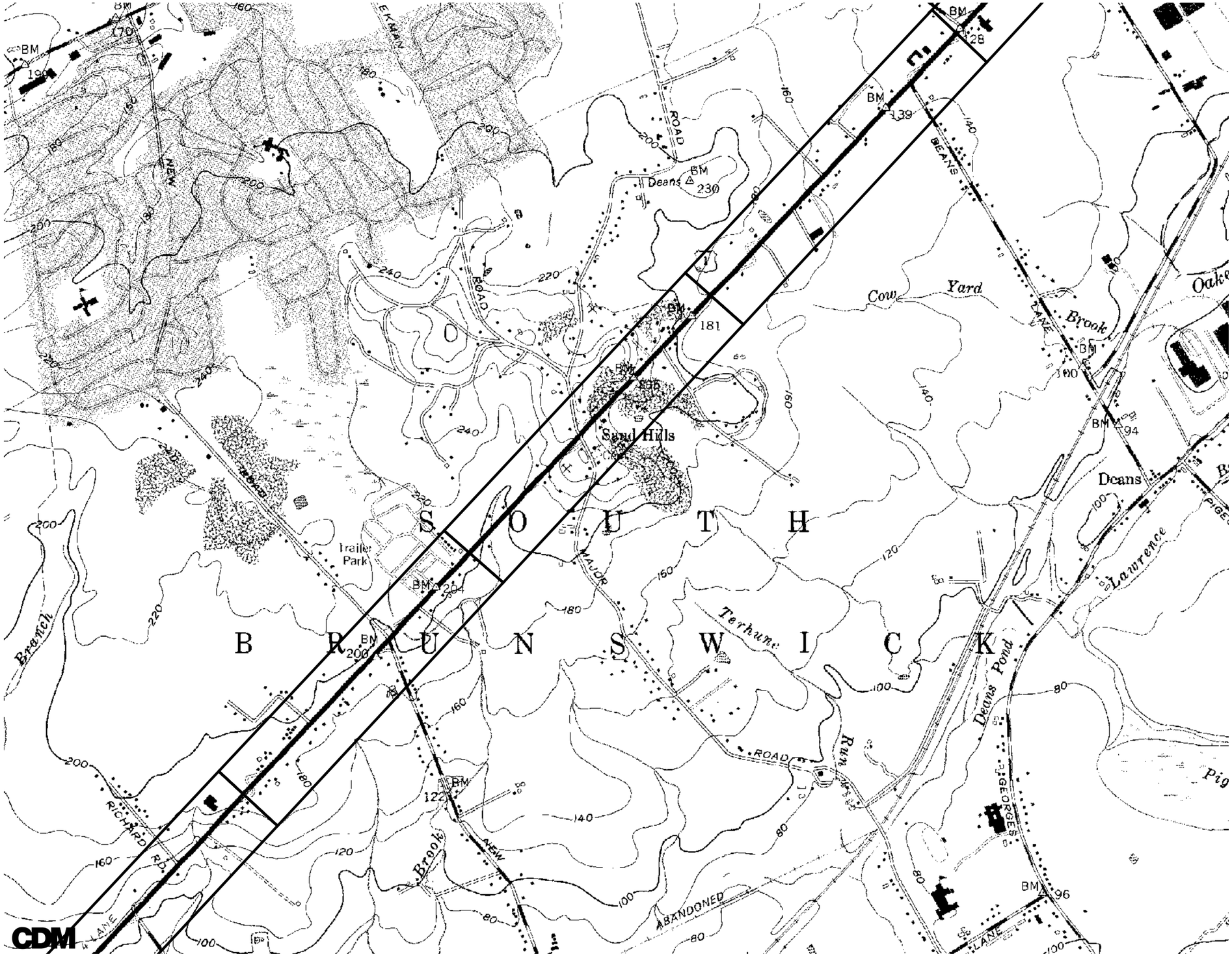

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Projection: Universal Transverse Mercator
Coordinate System: State Plane
Datum: NAD83

Legend

Route 1 Impact Corridor

Basemap:
USGS Monmouth Junction and
New Brunswick, NJ Quadrangles
(Monochromatic Bitmap
Images from NJDEP)

Figure 3-1, Sheet 7
(Section 3.2.1, Sheets 1 - 8)

Topography

US Army Corps of Engineers
Proposed Route 92
Environmental Impact Statement

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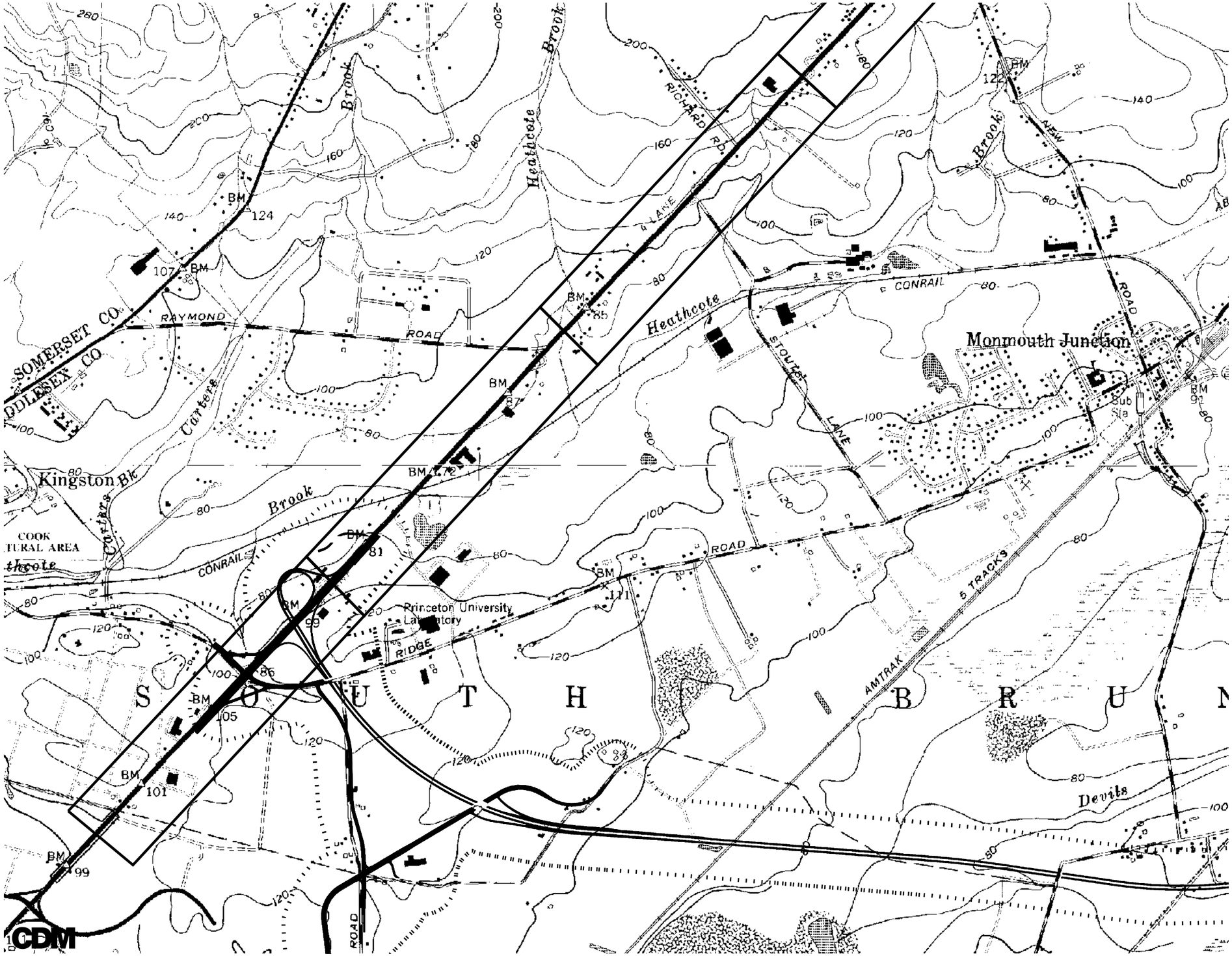

N

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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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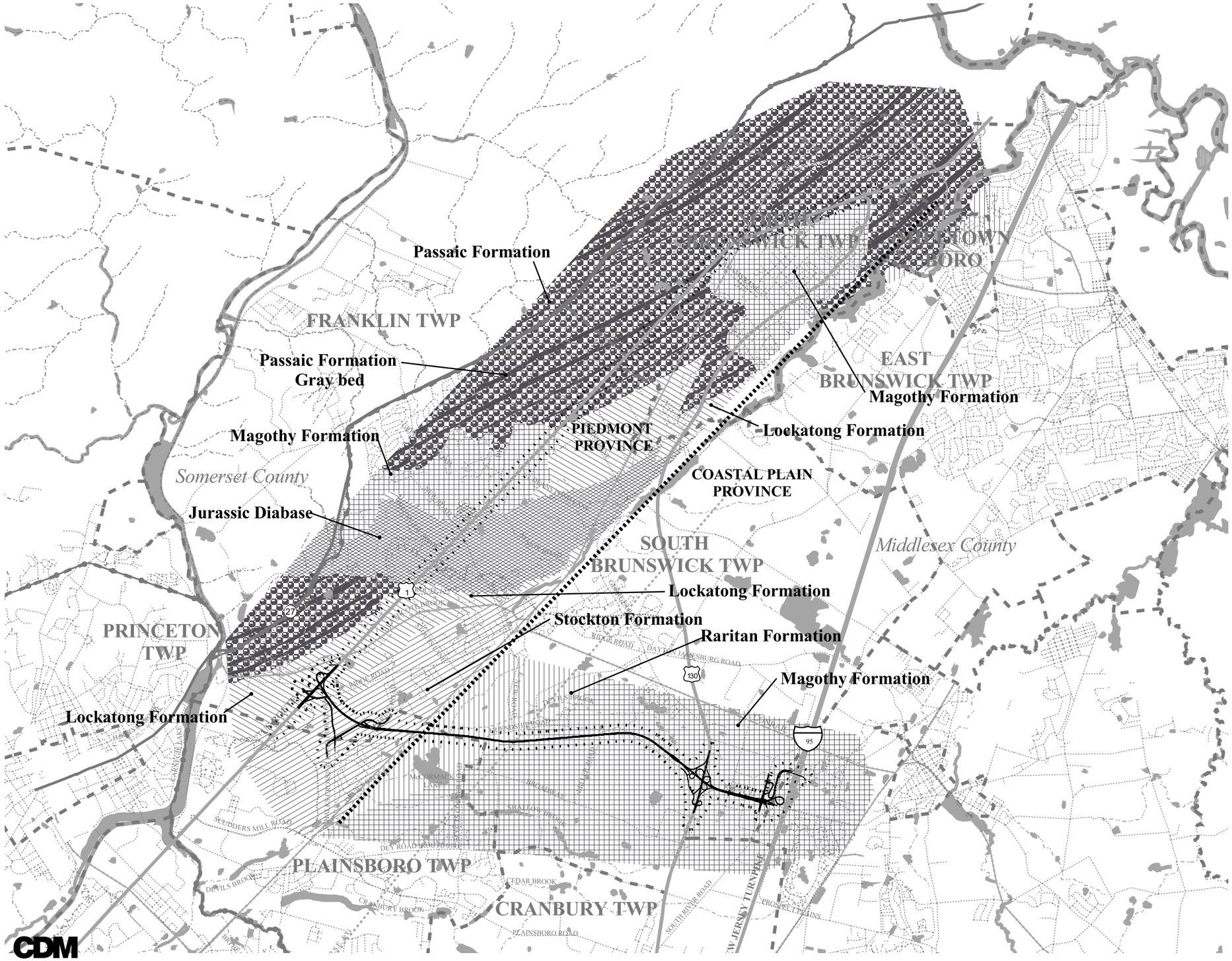

N

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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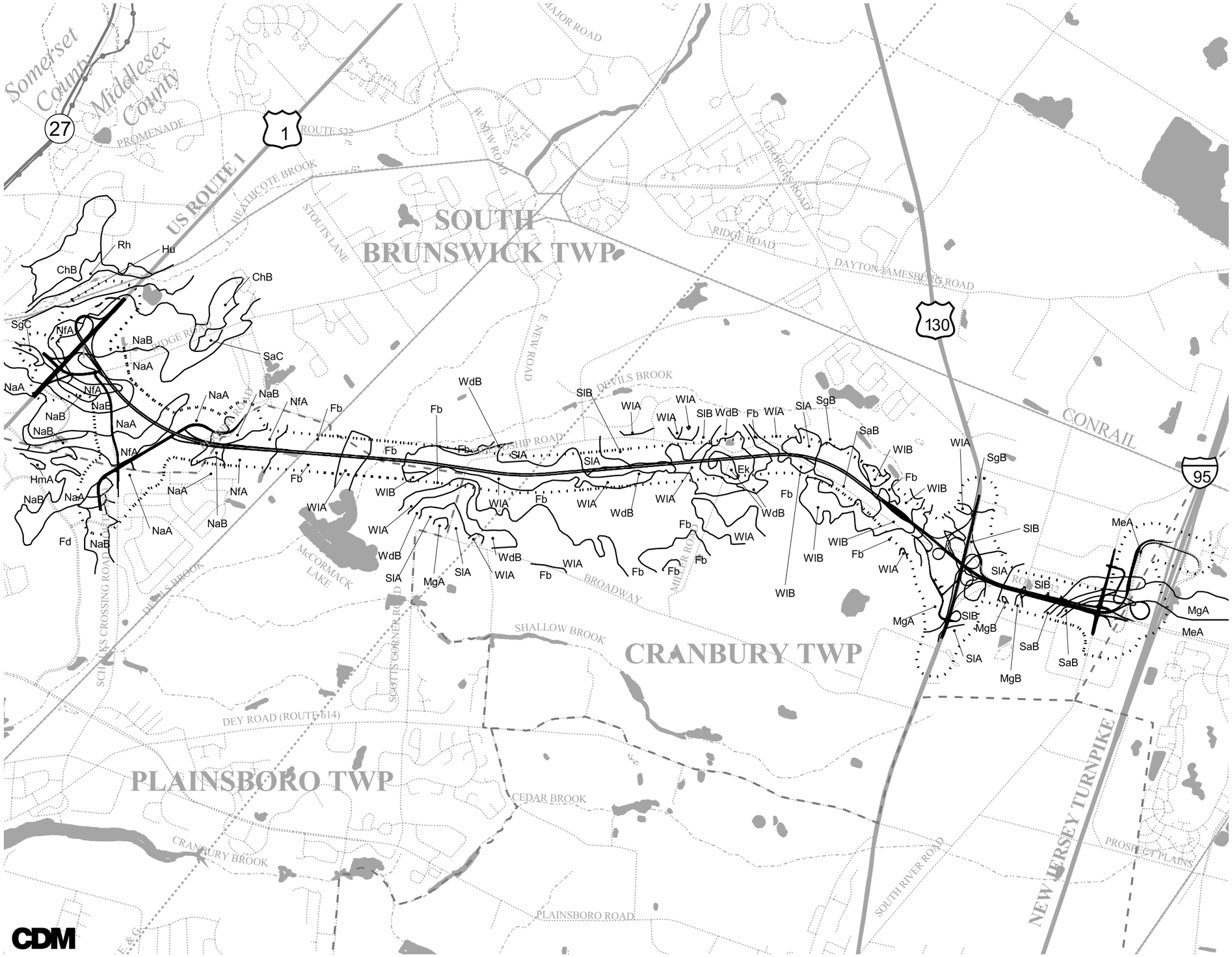

N

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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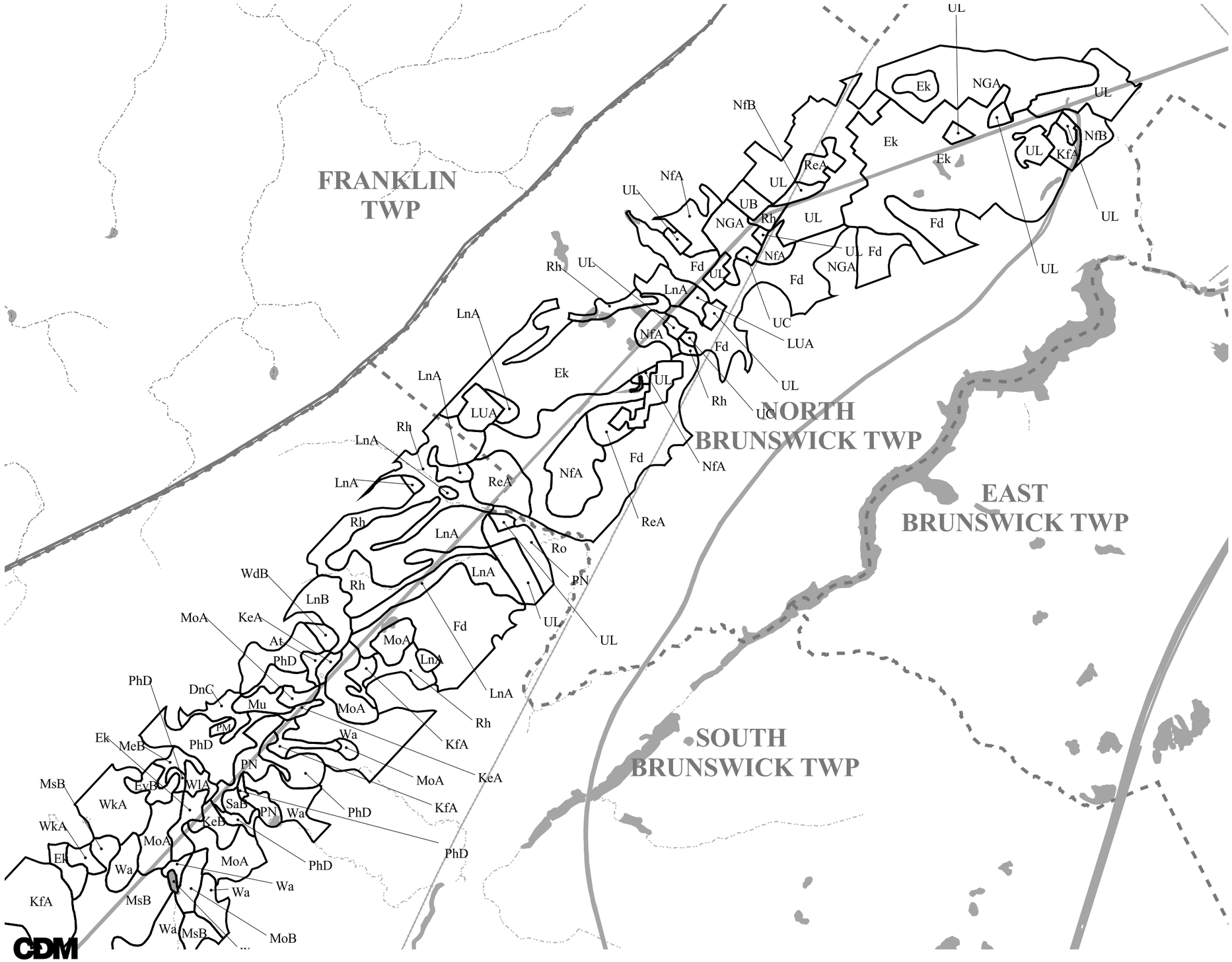

N

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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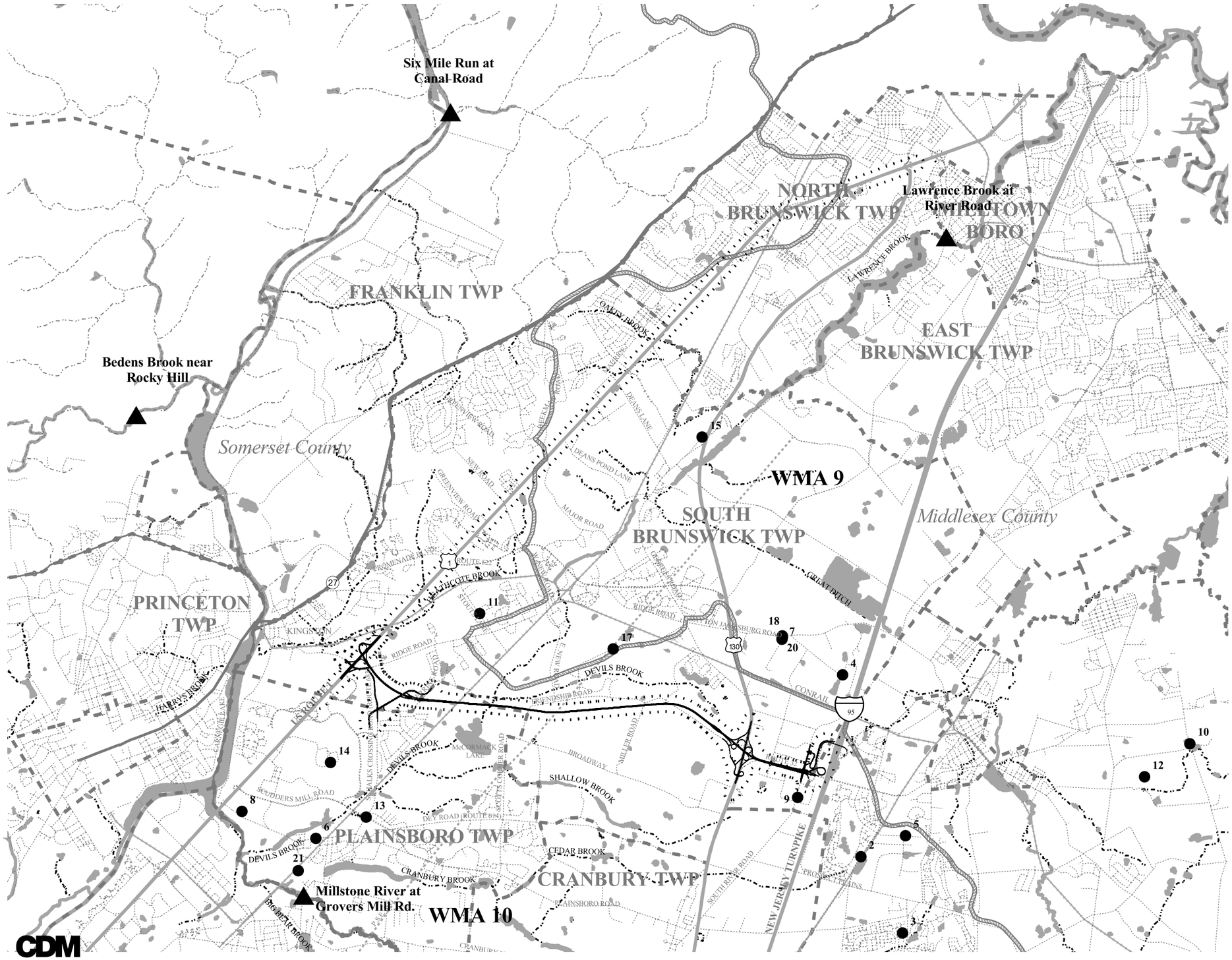

N

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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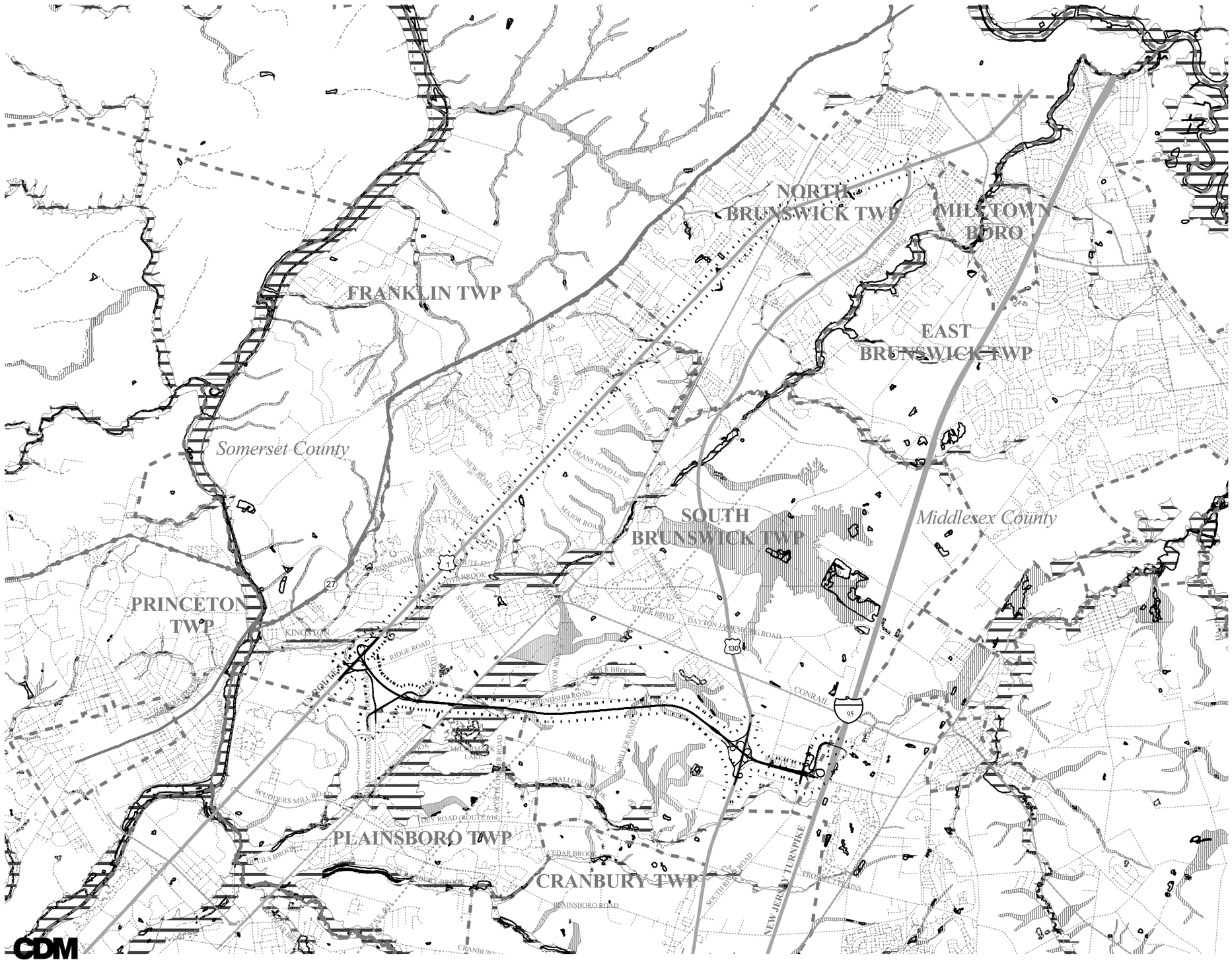

N

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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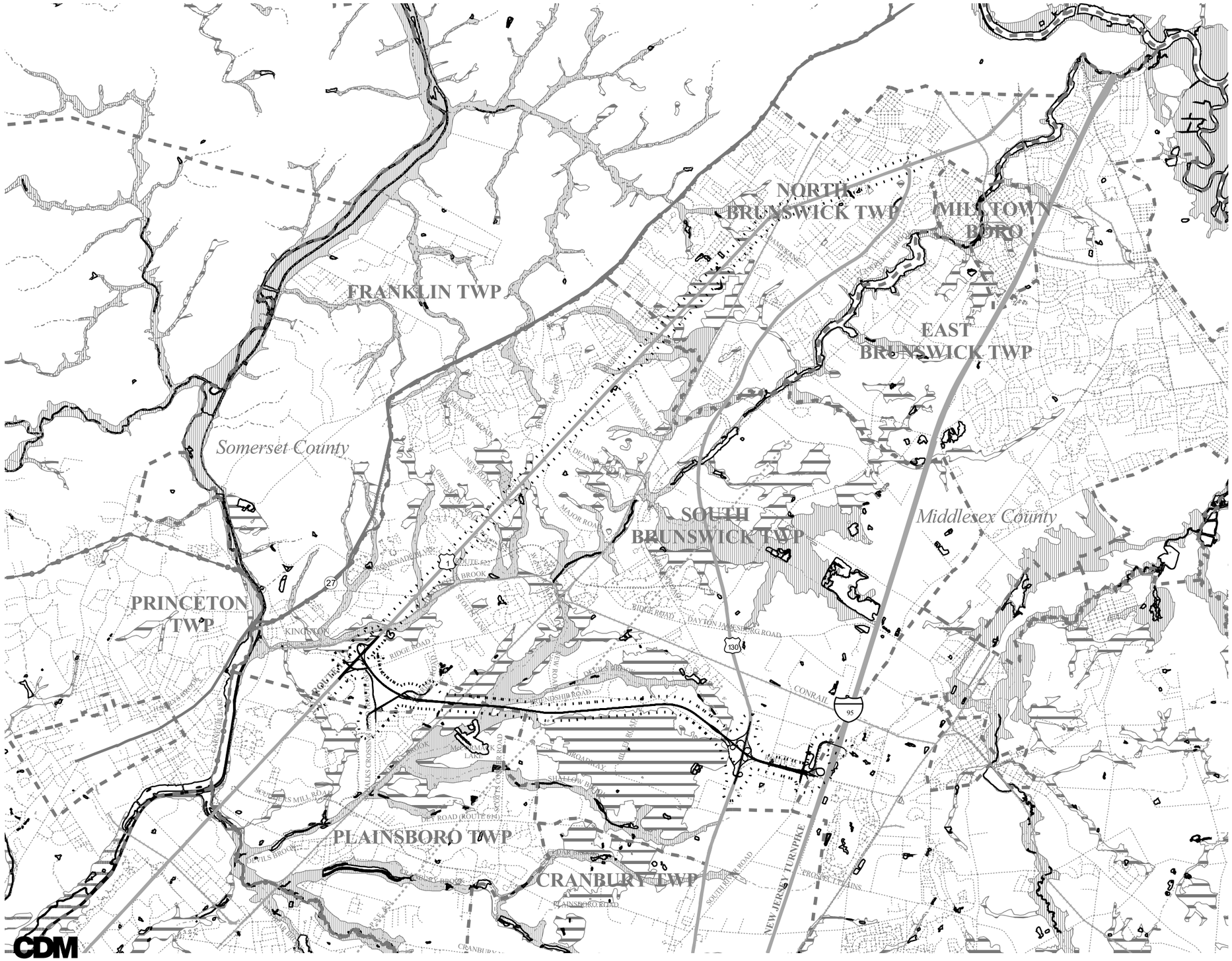

N

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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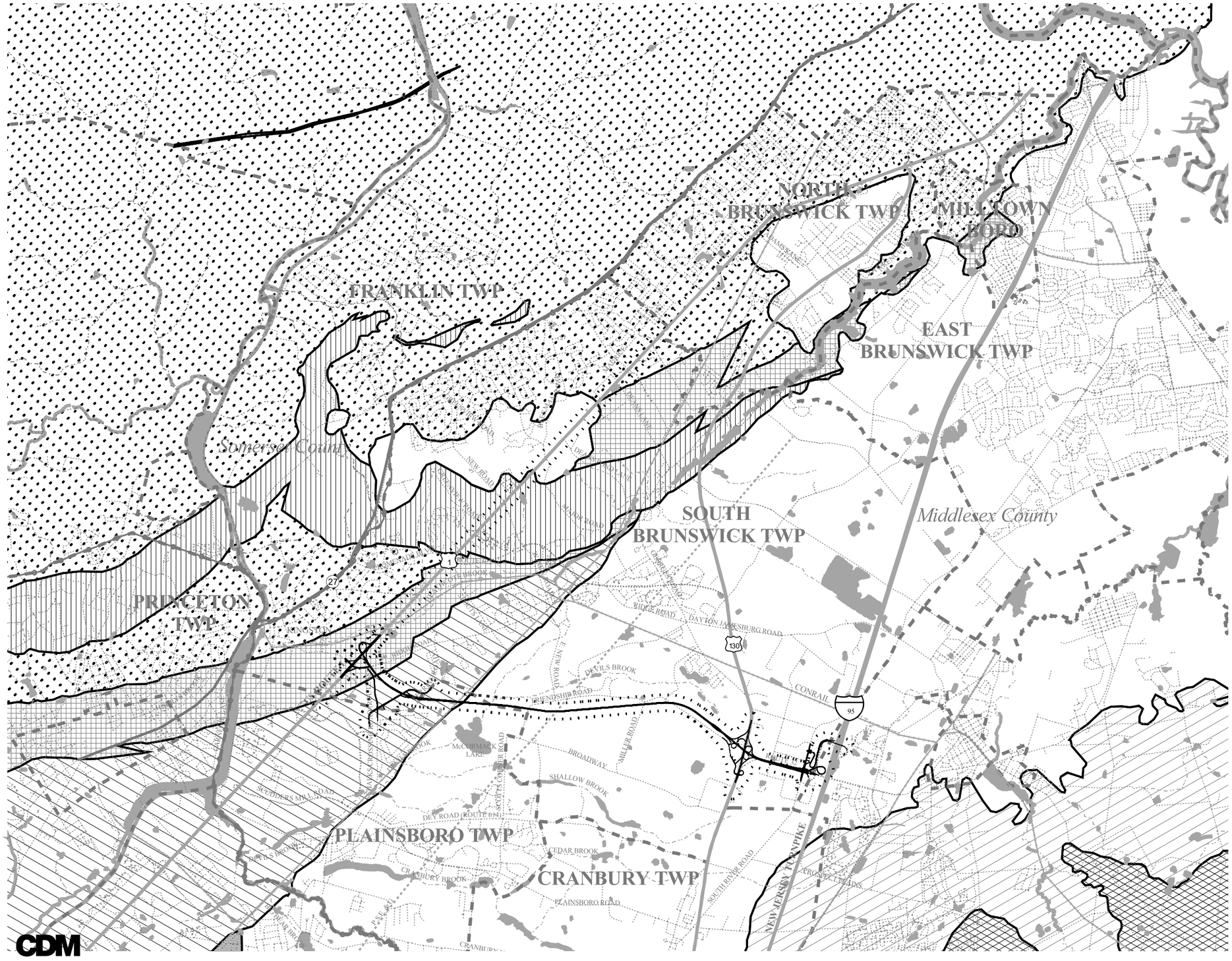

N

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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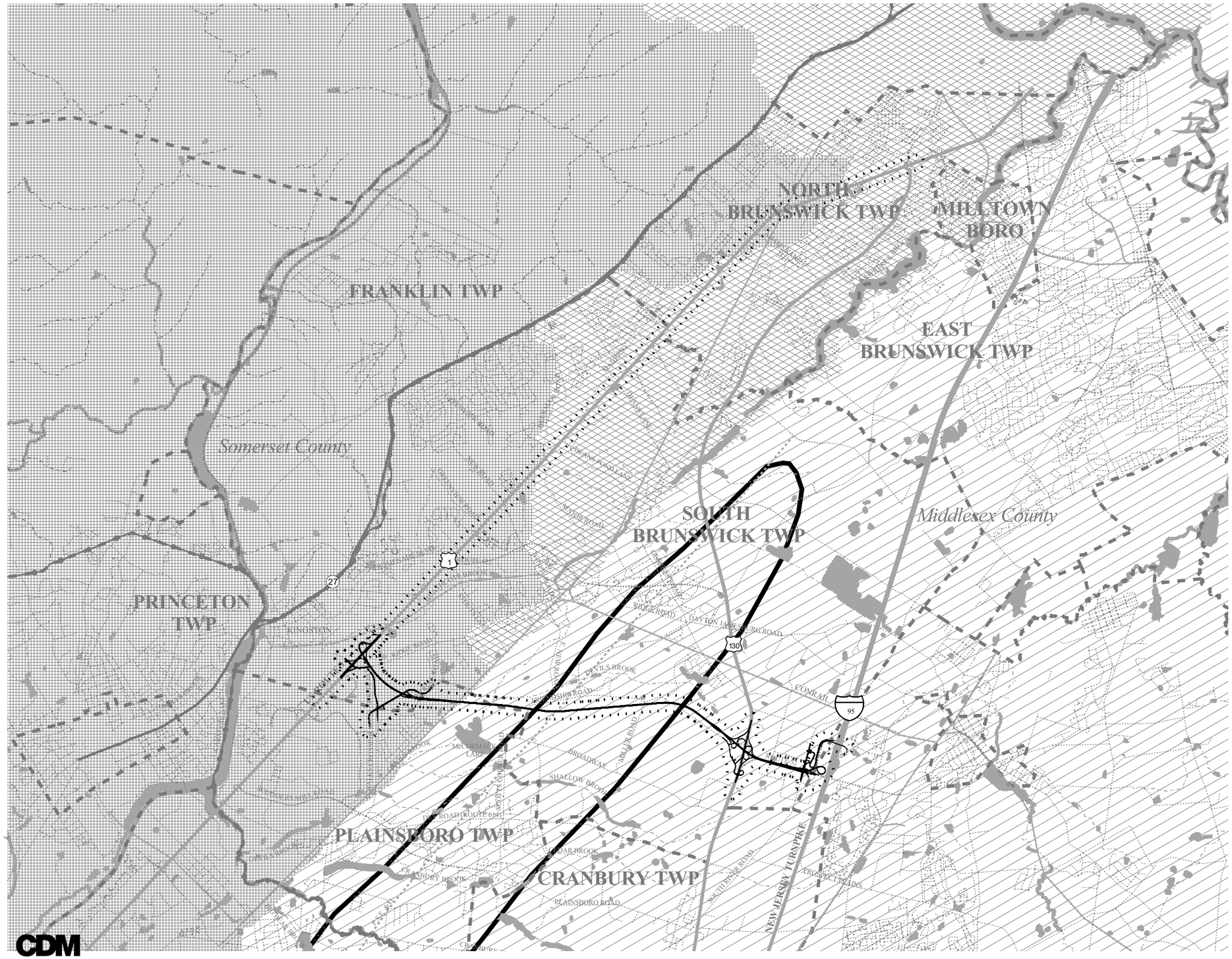

0.7 0 0.7 1.4 Miles

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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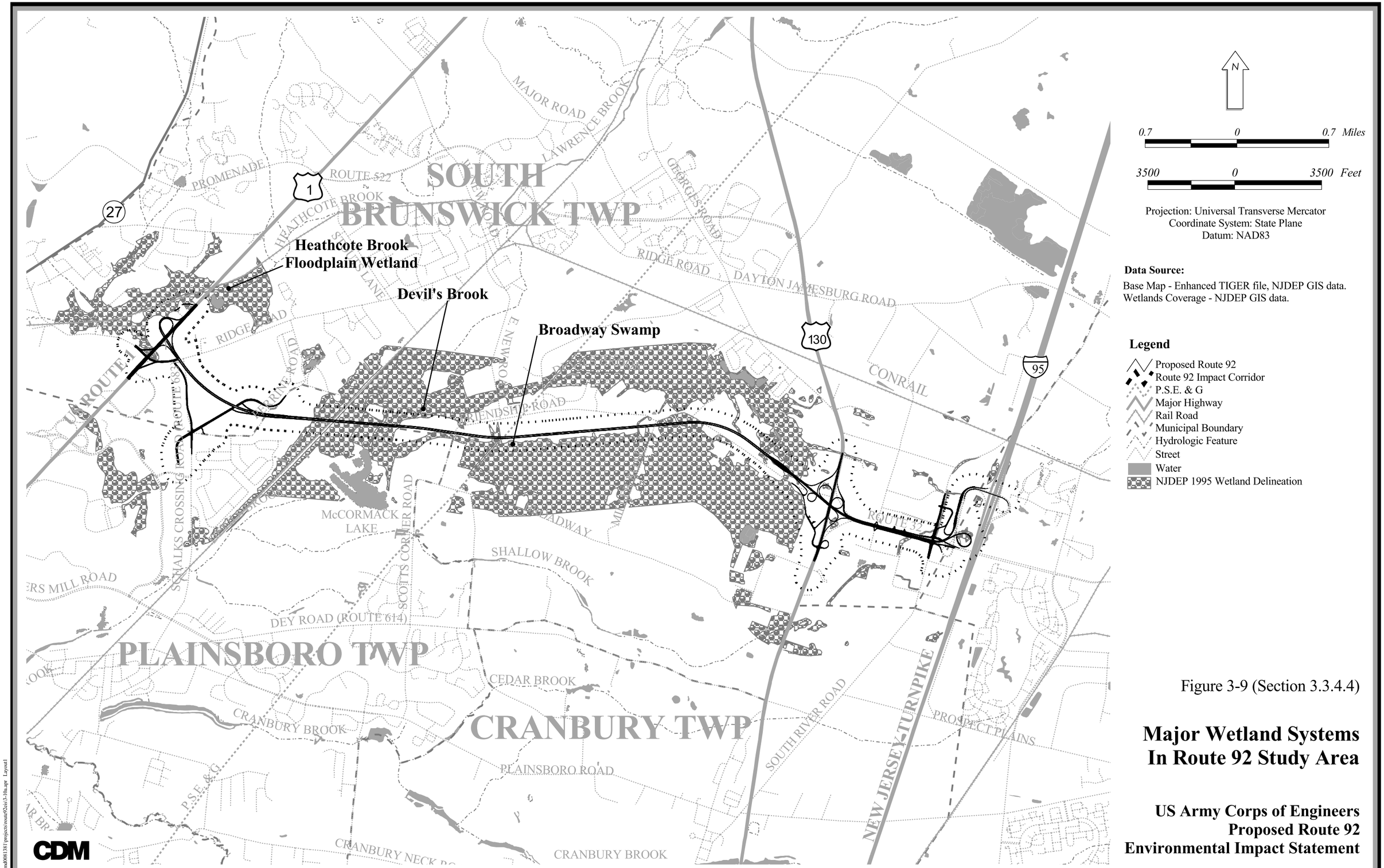

Figure 3-9 (Section 3.3.4.4)

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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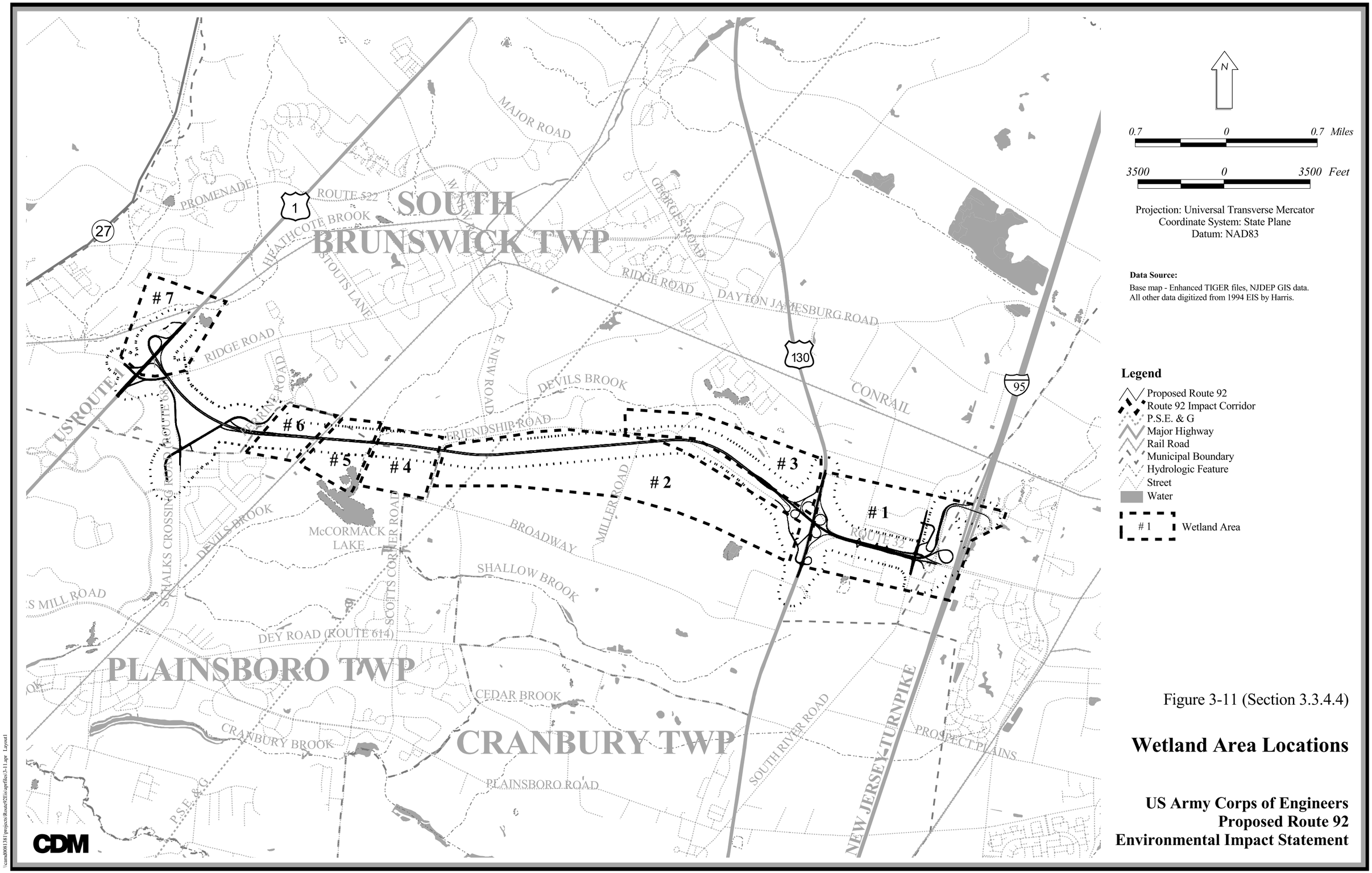

Figure 3-11 (Section 3.3.4.4)

Wetland Area Locations

US Army Corps of Engineers
Proposed Route 92
Environmental Impact Statement

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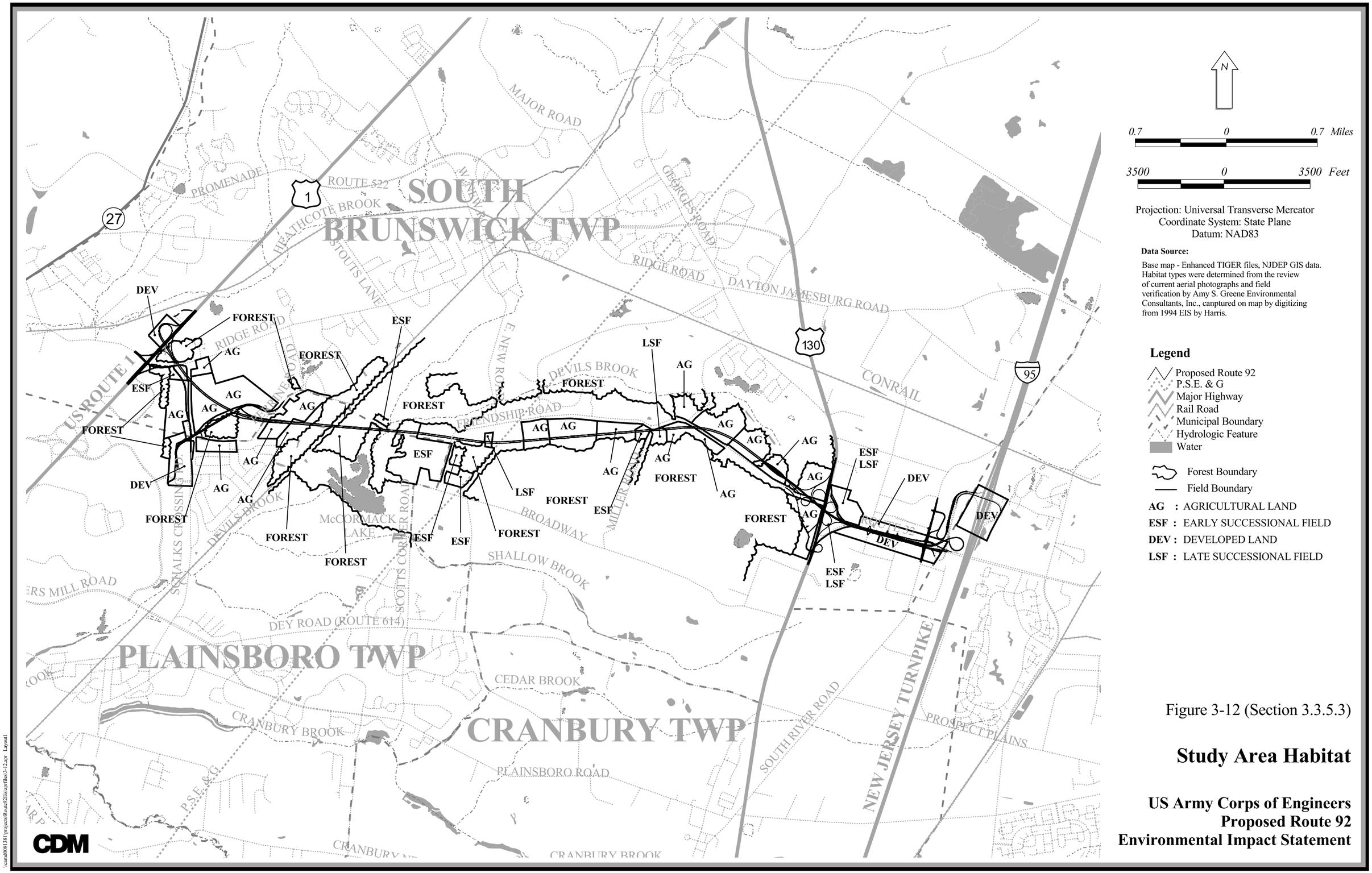

Figure 3-12 (Section 3.3.5.3)

Study Area Habitat

US Army Corps of Engineers
Proposed Route 92
Environmental Impact Statement

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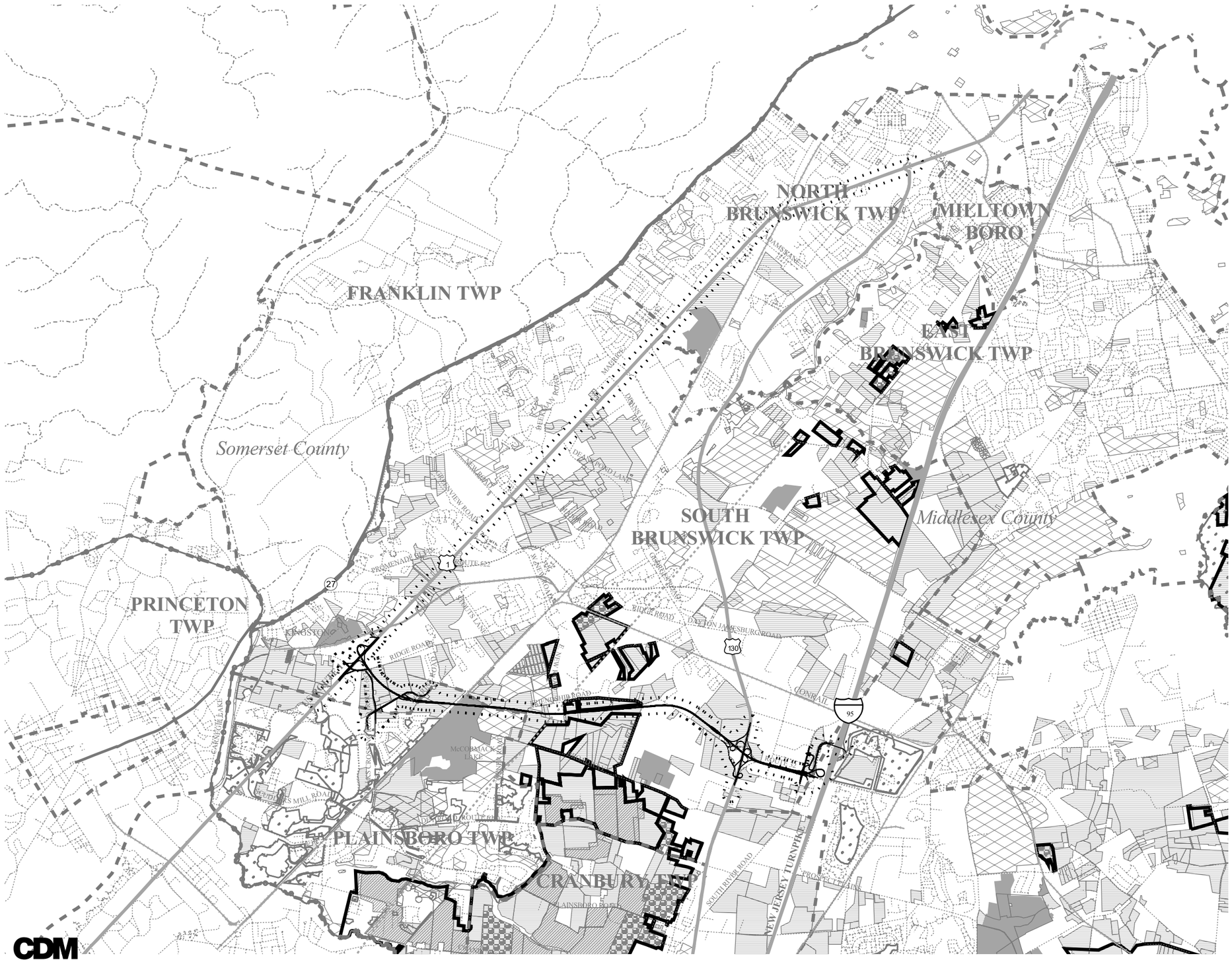

N

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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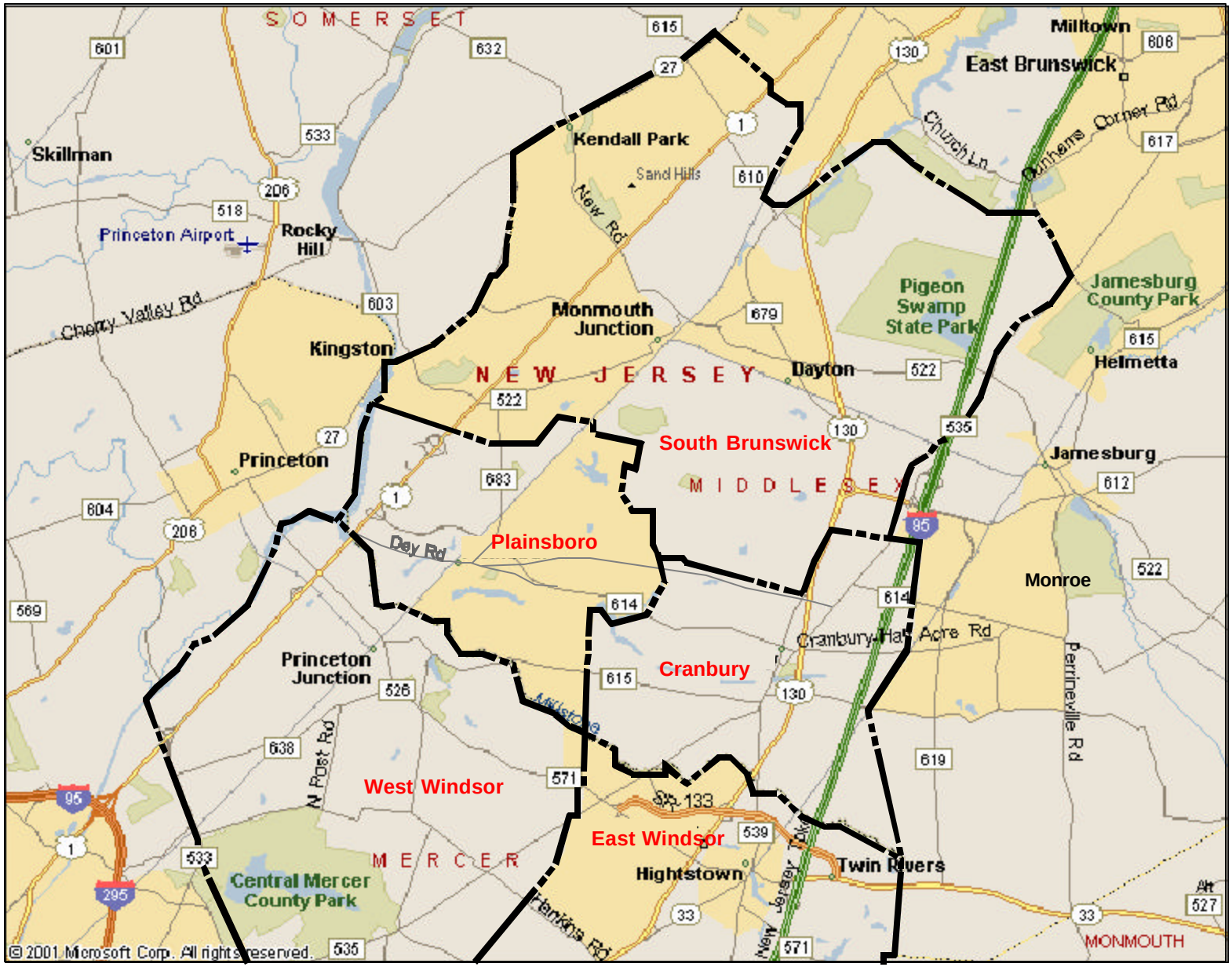


Legend:

Town Boundary

0 mi 2 mi 4 mi
Approximate Scale

Figure 3-14
Southwestern Middlesex County/Northeastern Mercer County

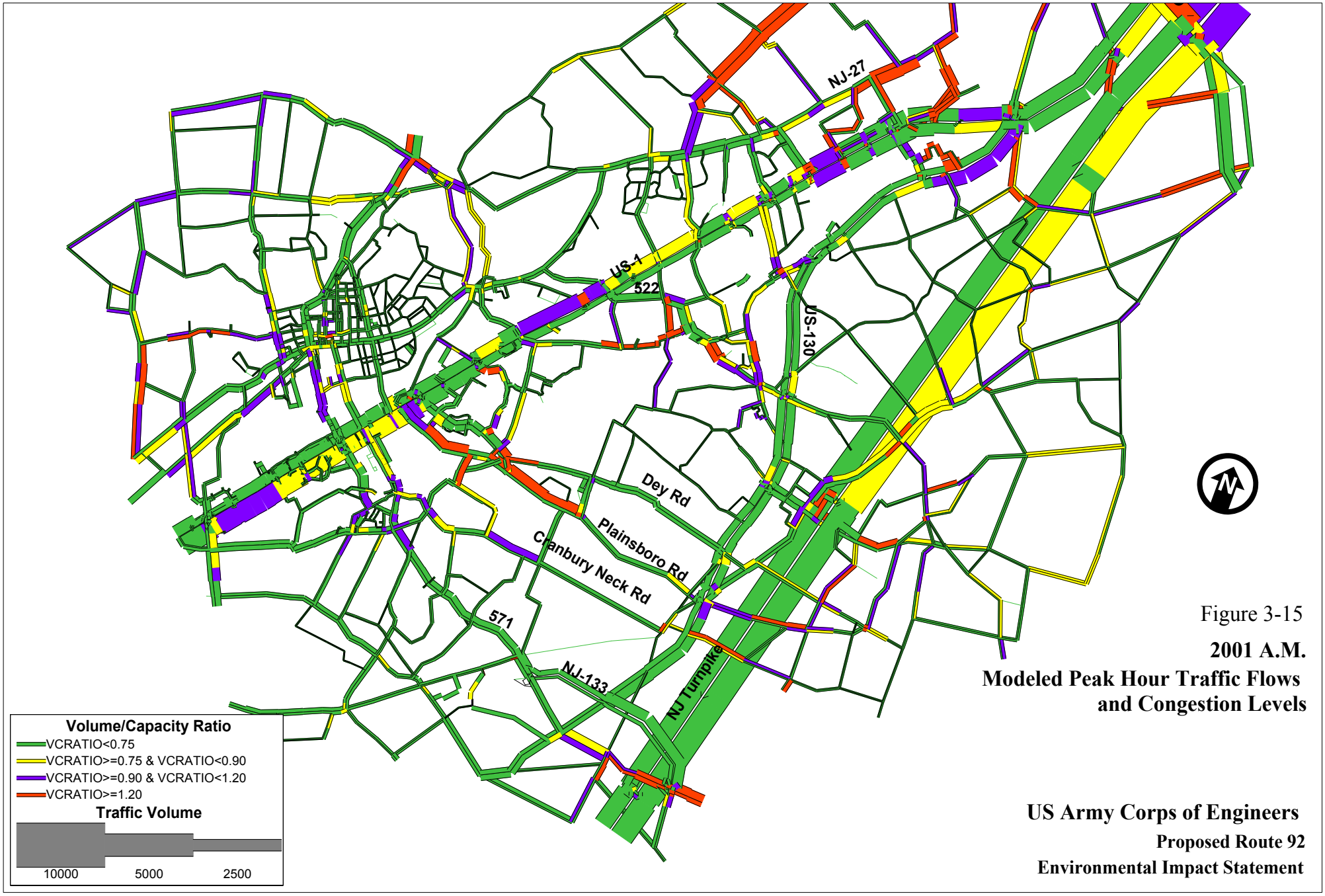


Figure 3-15

2001 A.M.
Modeled Peak Hour Traffic Flows and Congestion Levels

US Army Corps of Engineers
Proposed Route 92
Environmental Impact Statement

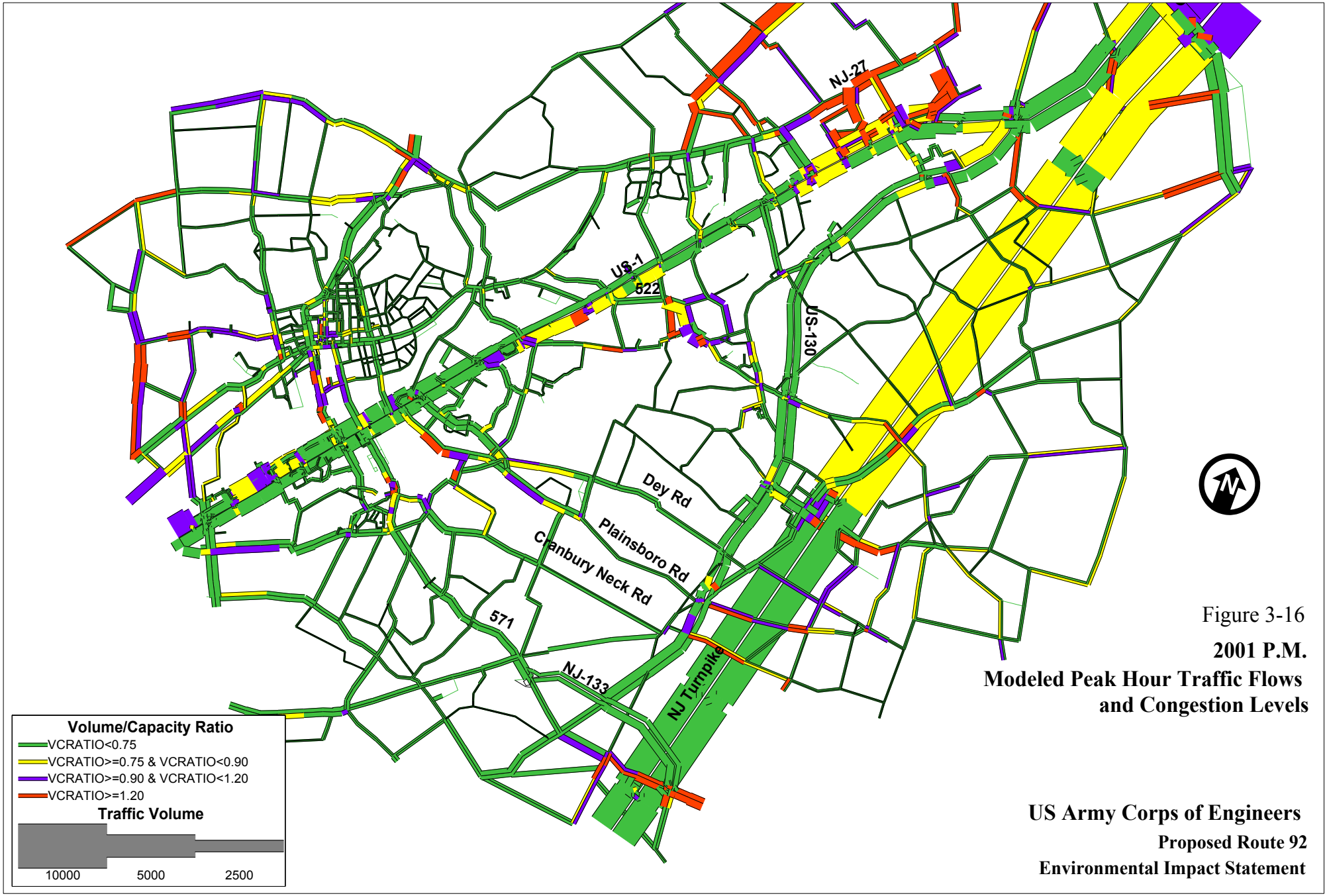


Figure 3-16

2001 P.M.
Modeled Peak Hour Traffic Flows and Congestion Levels

US Army Corps of Engineers
Proposed Route 92
Environmental Impact Statement

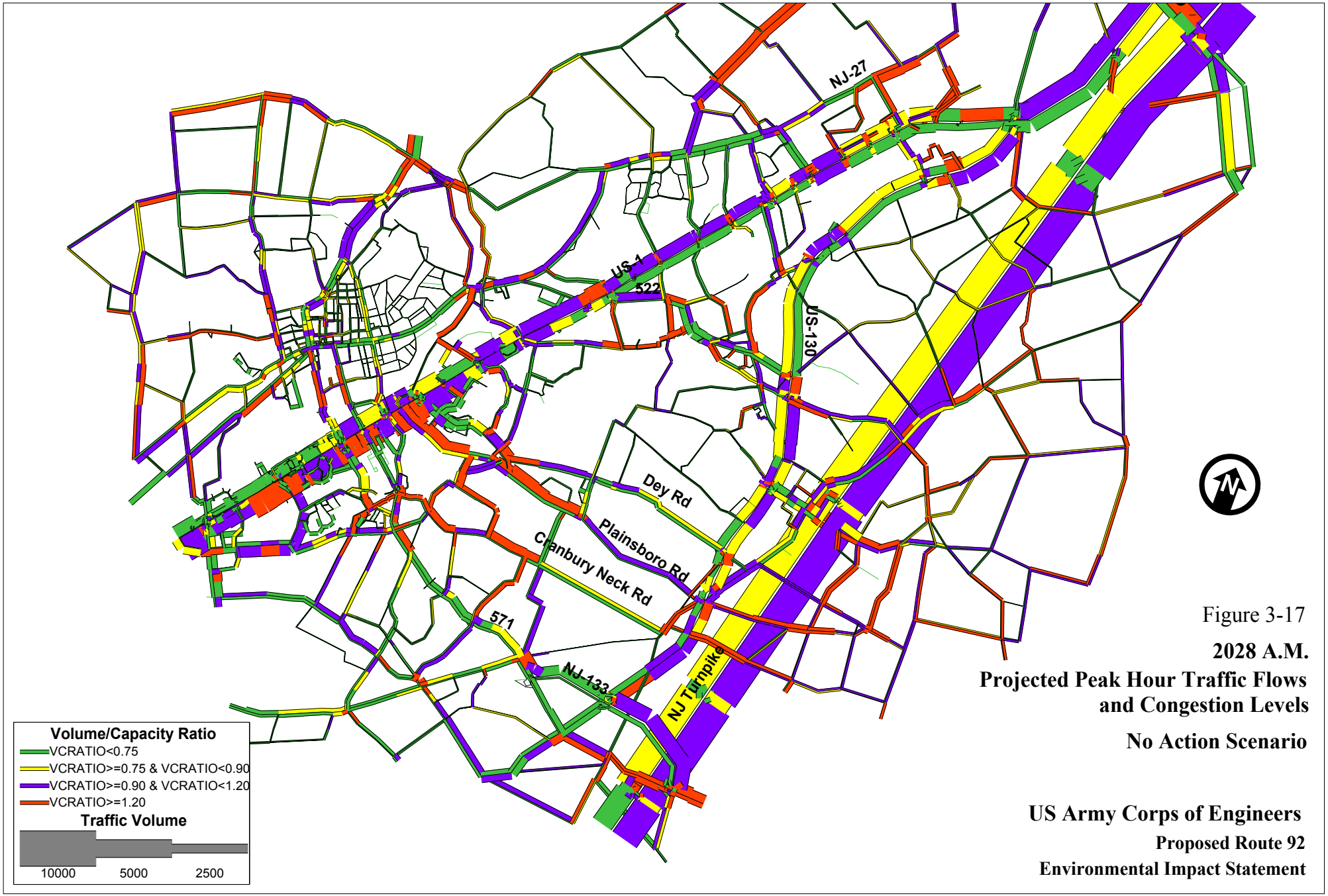


Figure 3-17

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

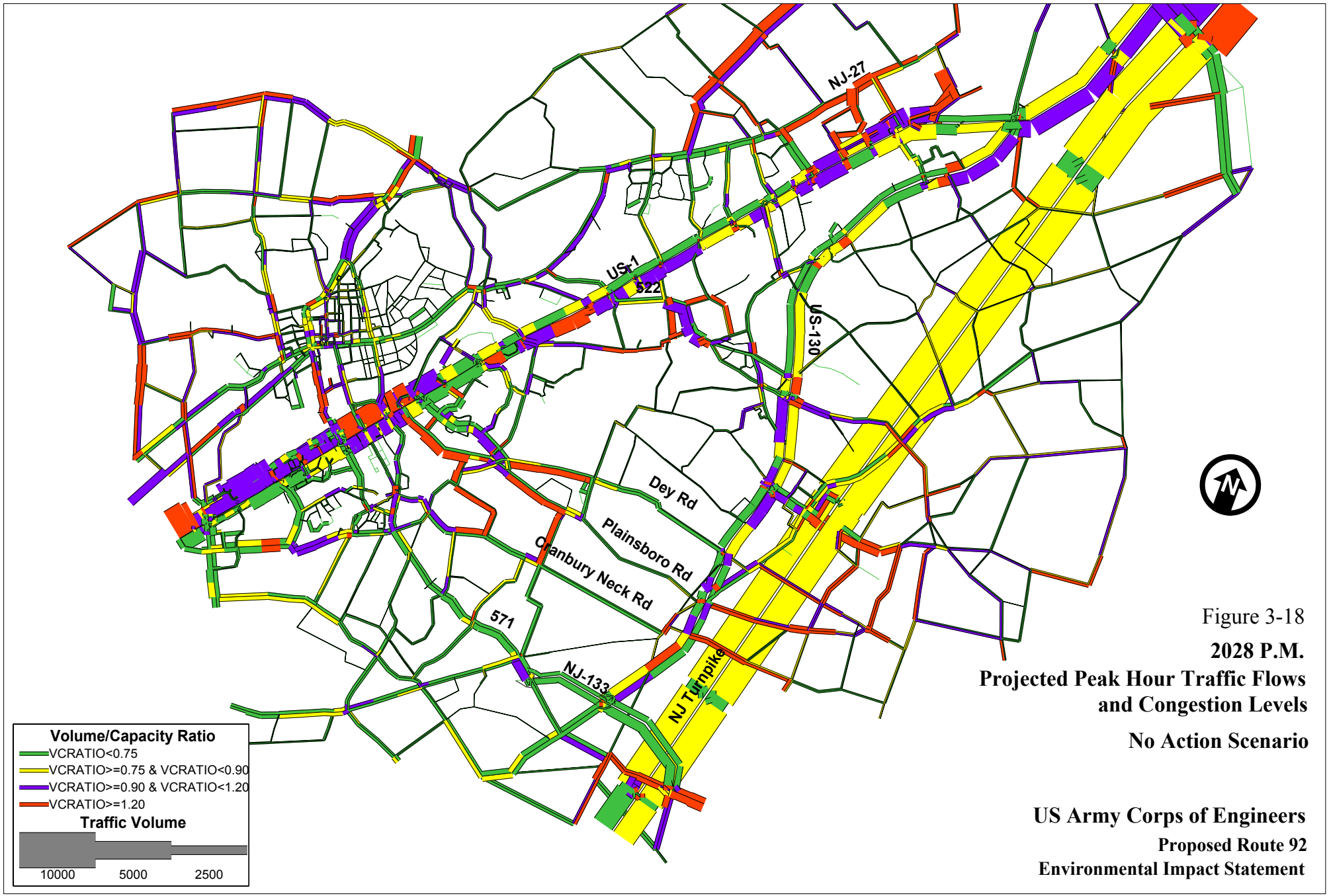


Figure 3-18

2028 P.M.

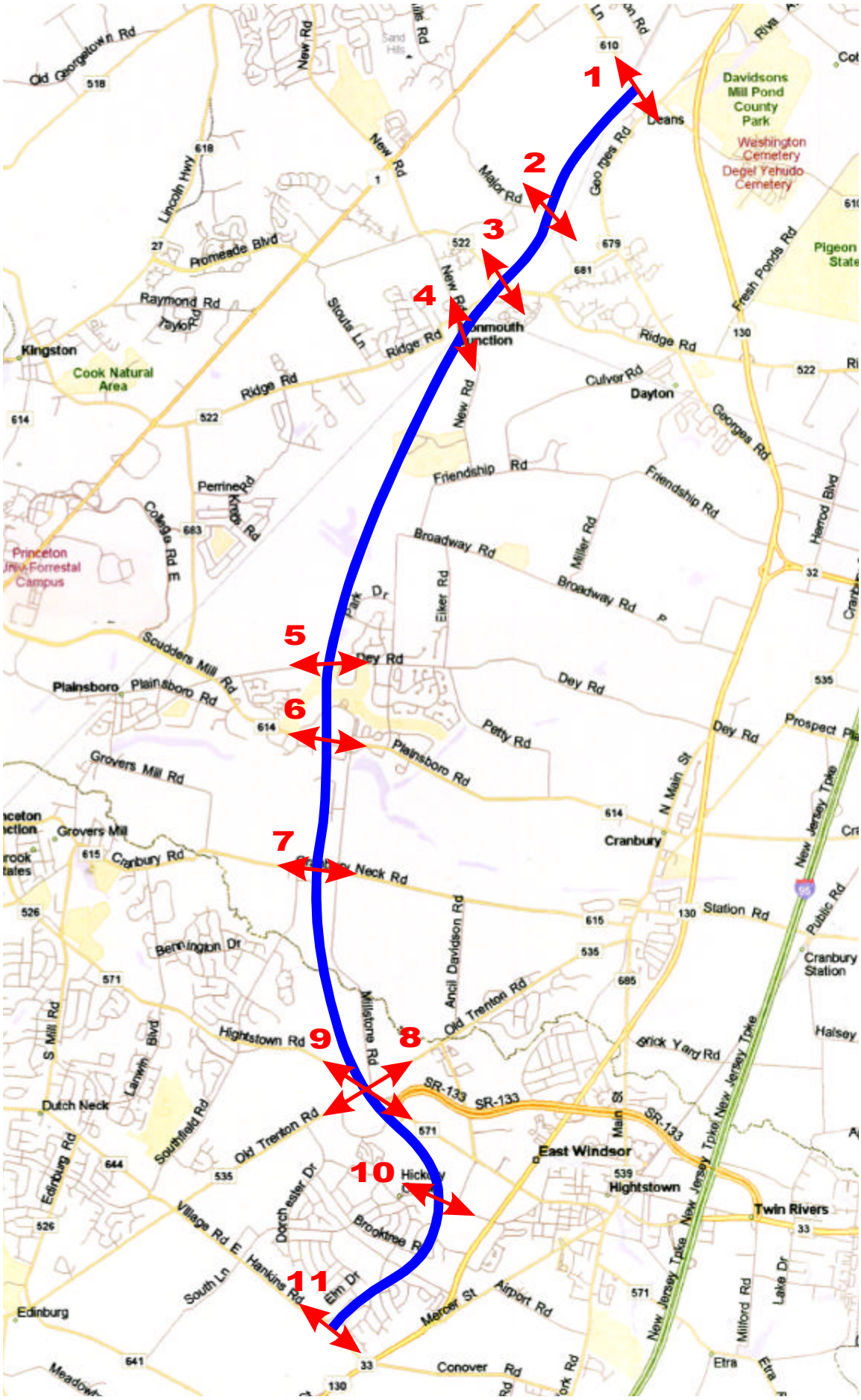
Projected Peak Hour Traffic Flows and Congestion Levels

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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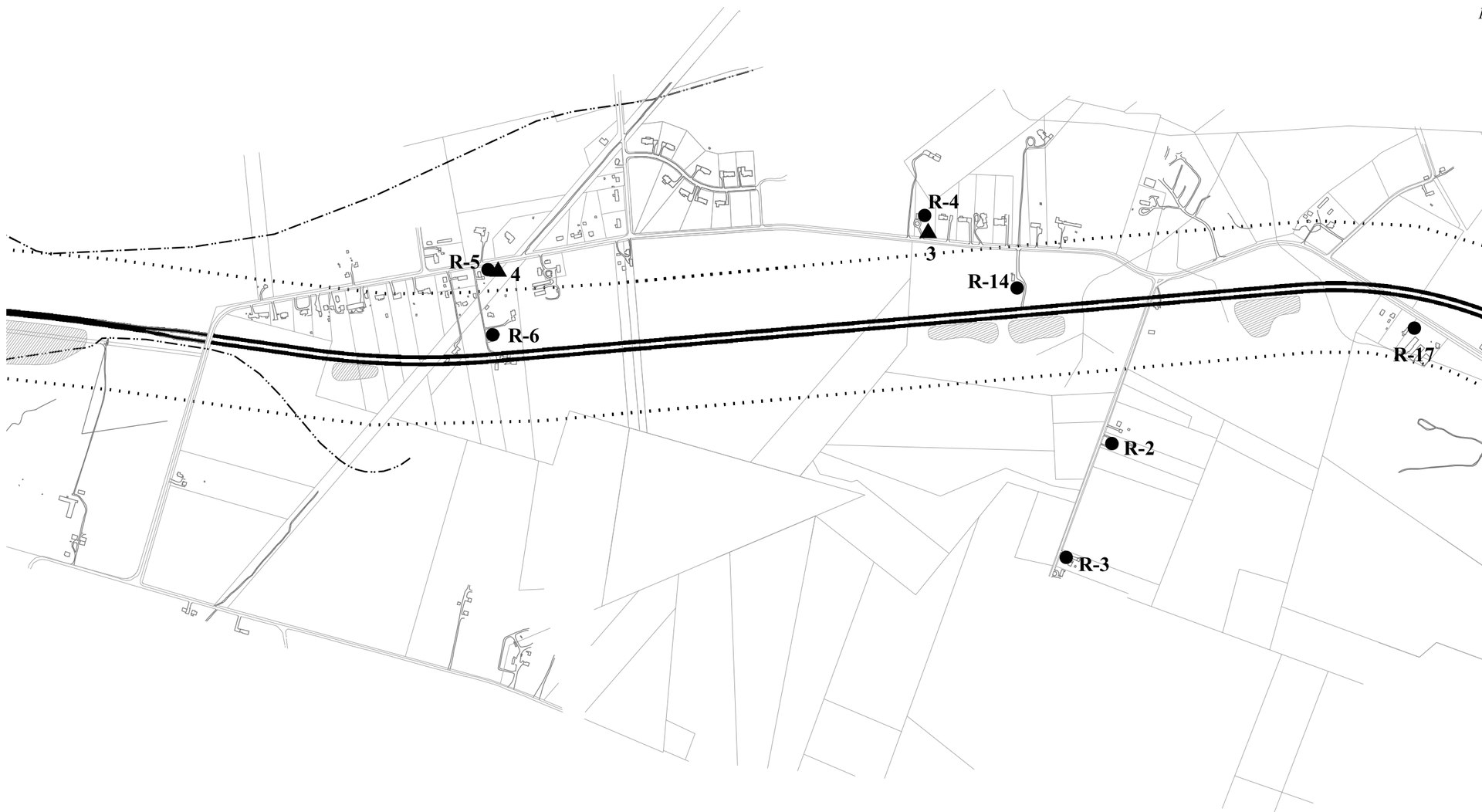

N

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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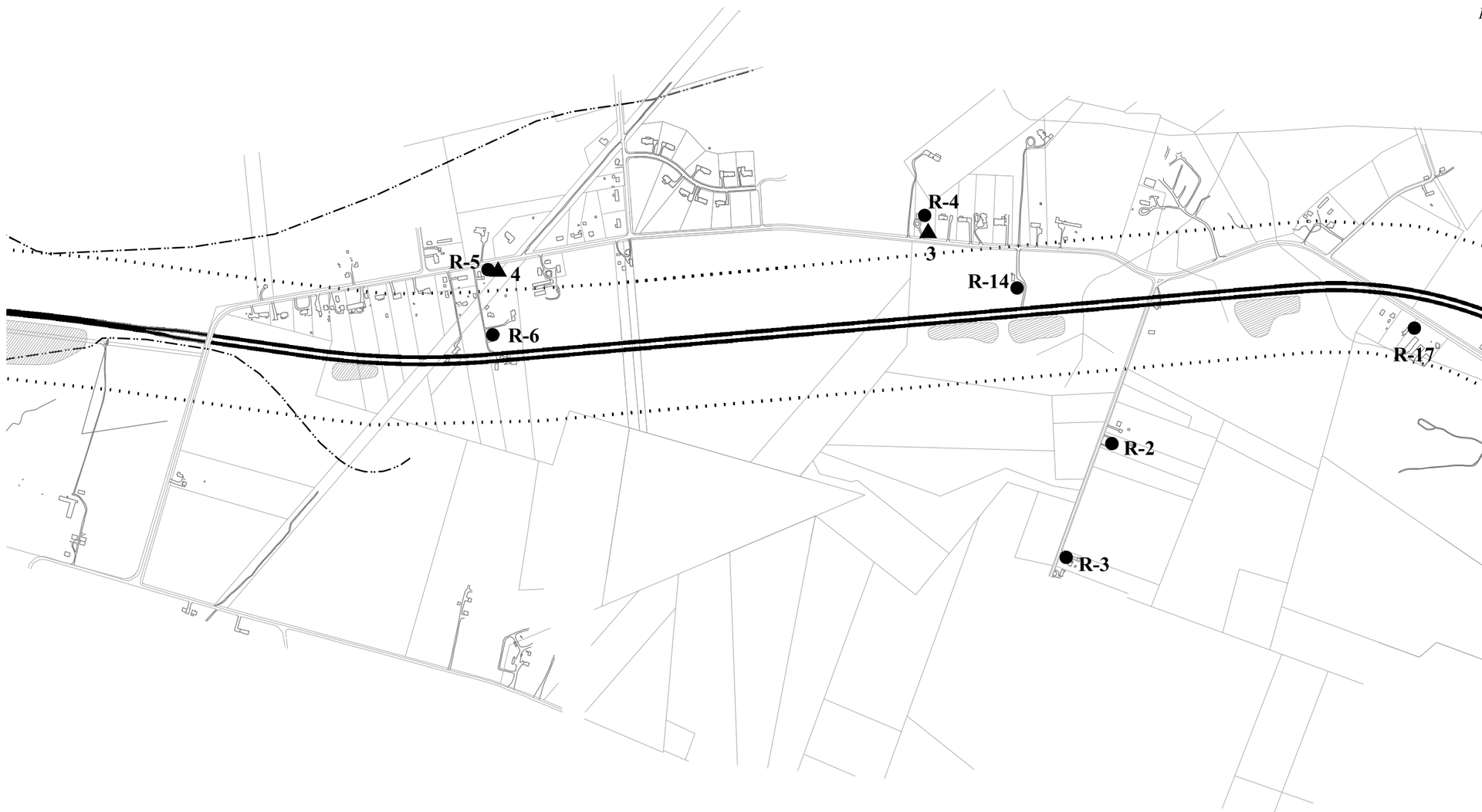

N

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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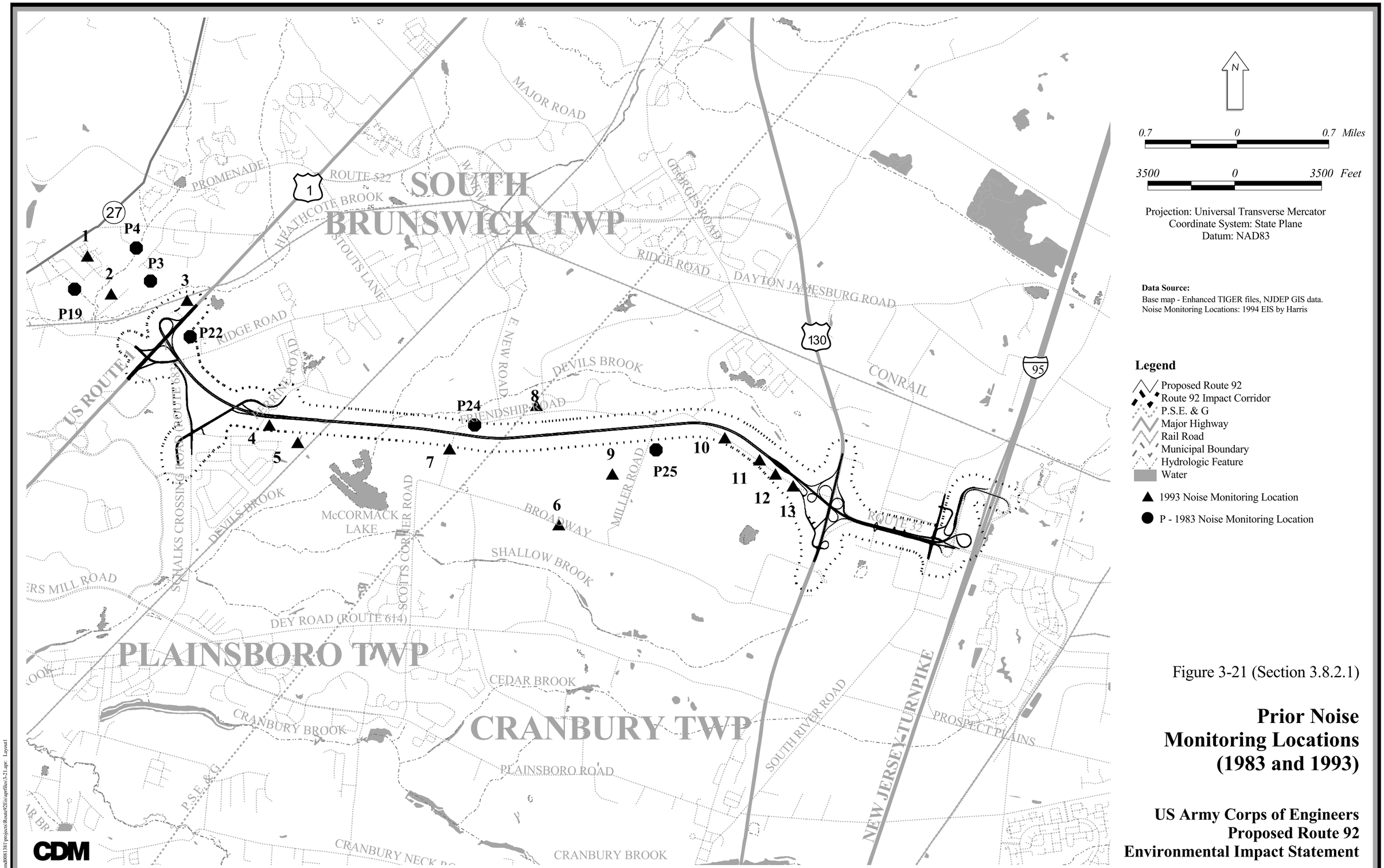

Figure 3-21 (Section 3.8.2.1)

Prior Noise Monitoring Locations (1983 and 1993)

US Army Corps of Engineers
Proposed Route 92
Environmental Impact Statement

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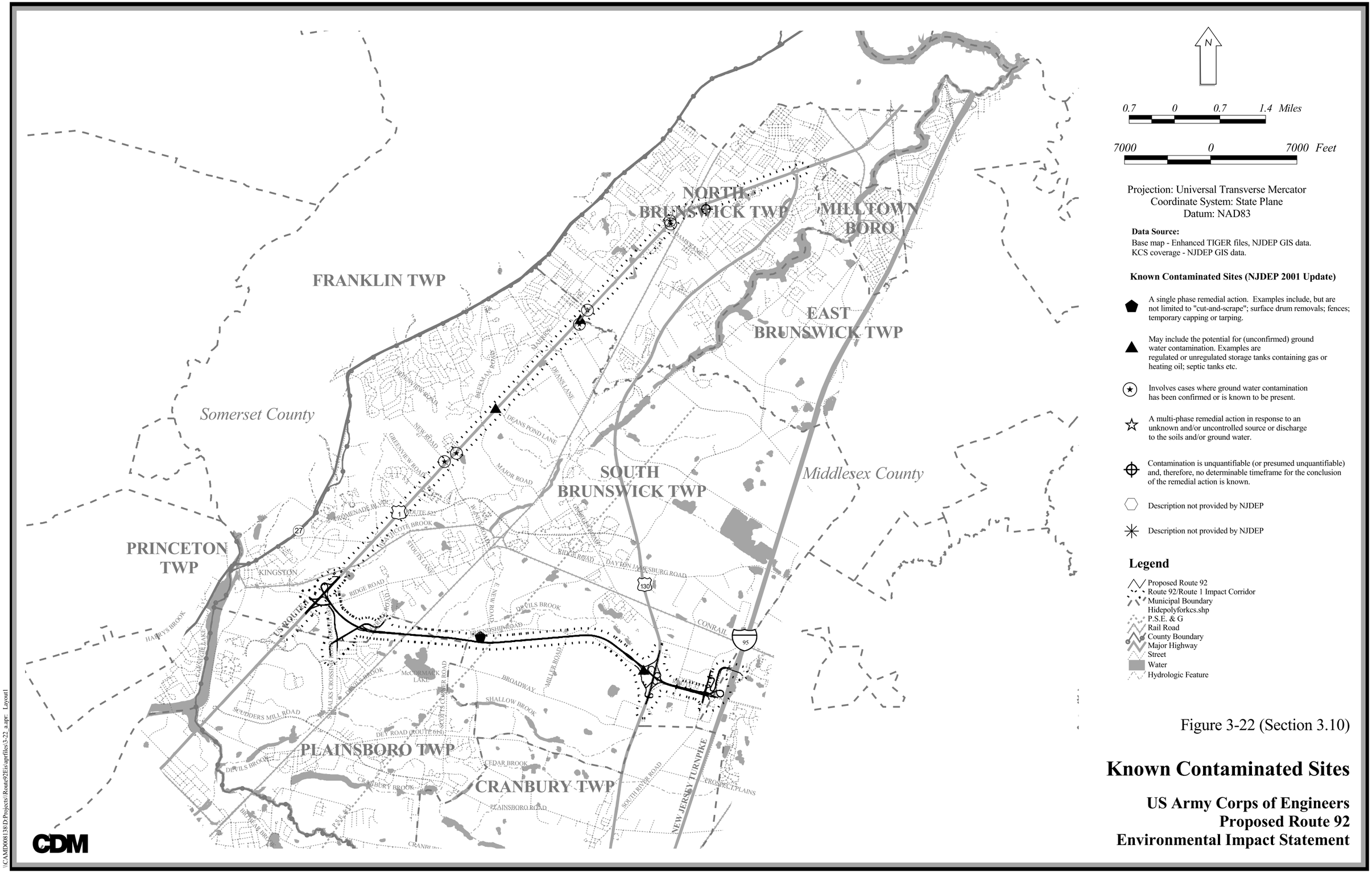

Figure 3-22 (Section 3.10)

Known Contaminated Sites

US Army Corps of Engineers
Proposed Route 92
Environmental Impact Statement

CDM

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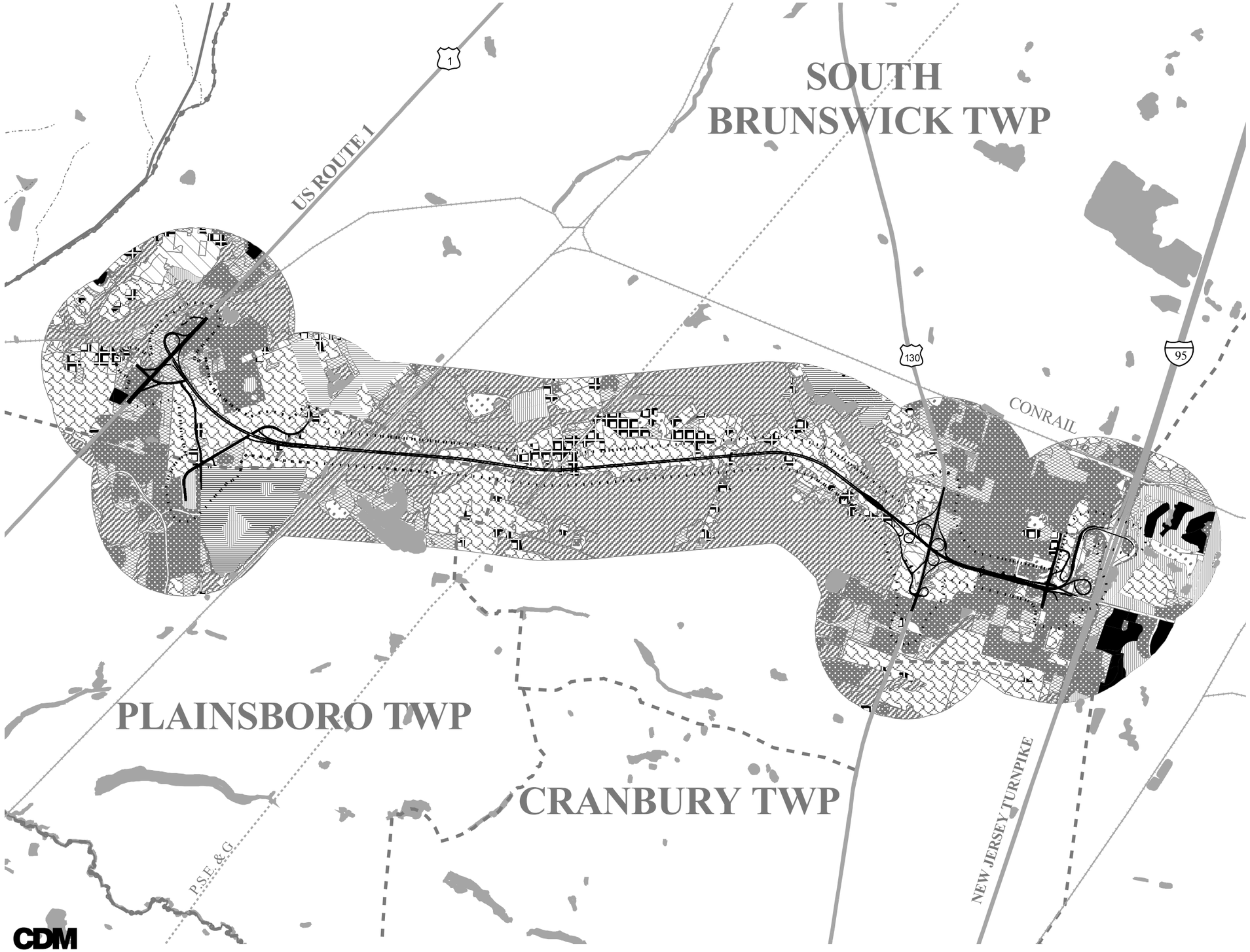

N

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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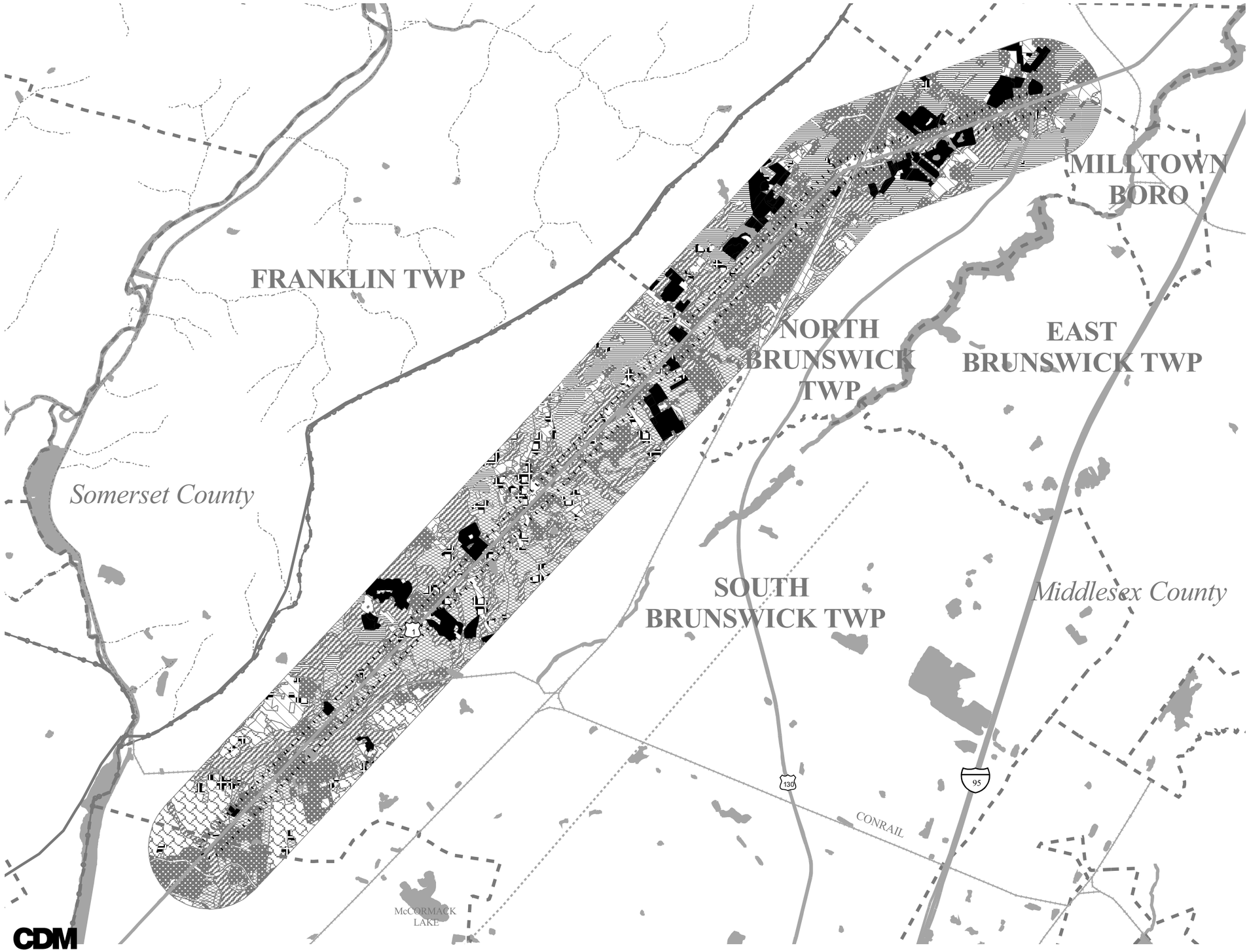

N

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

\\cam\0081381\projects\Route92Eis\aprfiles\3-23b.apr: Layout1

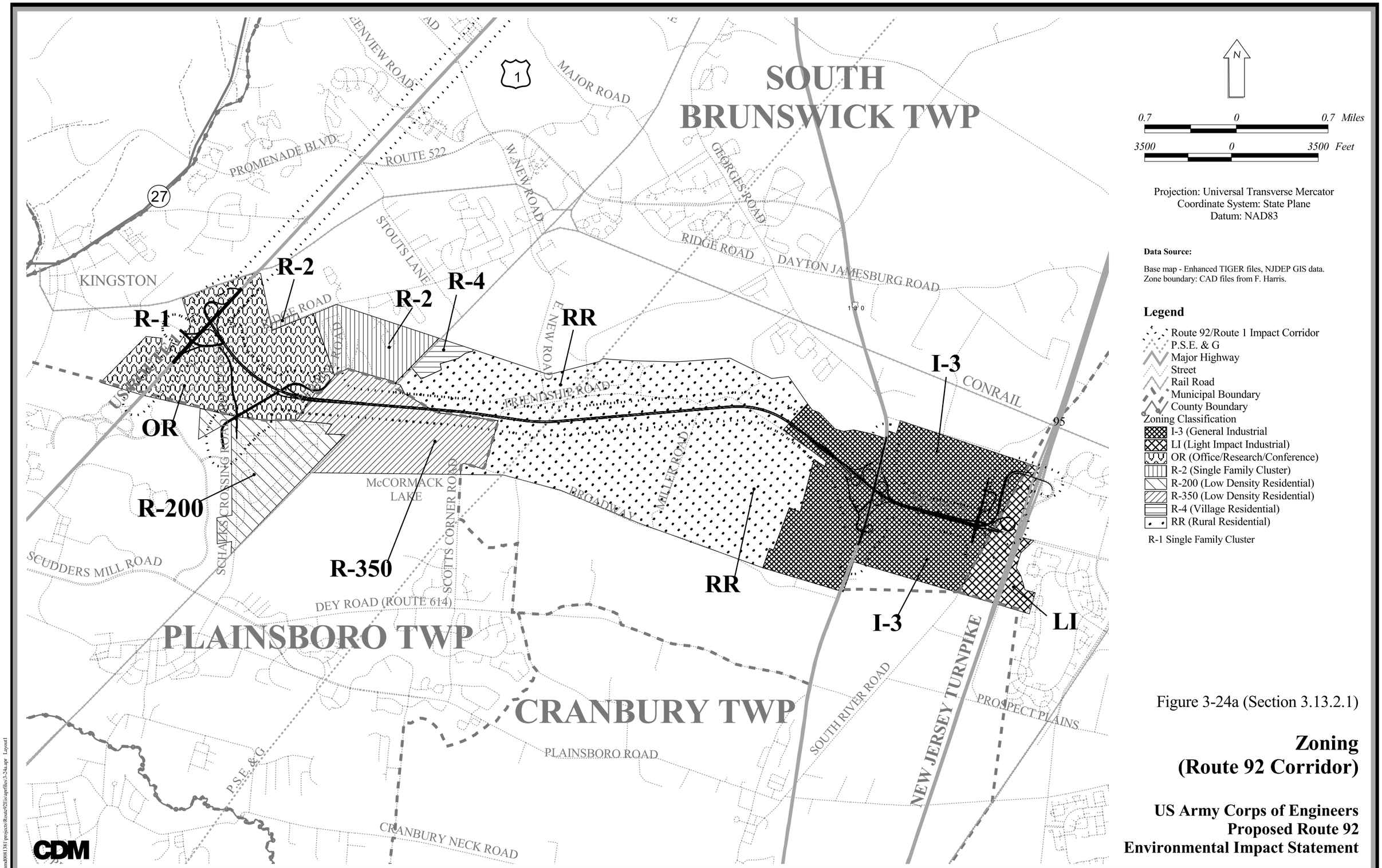

Figure 3-24a (Section 3.13.2.1)

Zoning (Route 92 Corridor)

US Army Corps of Engineers
Proposed Route 92
Environmental Impact Statement

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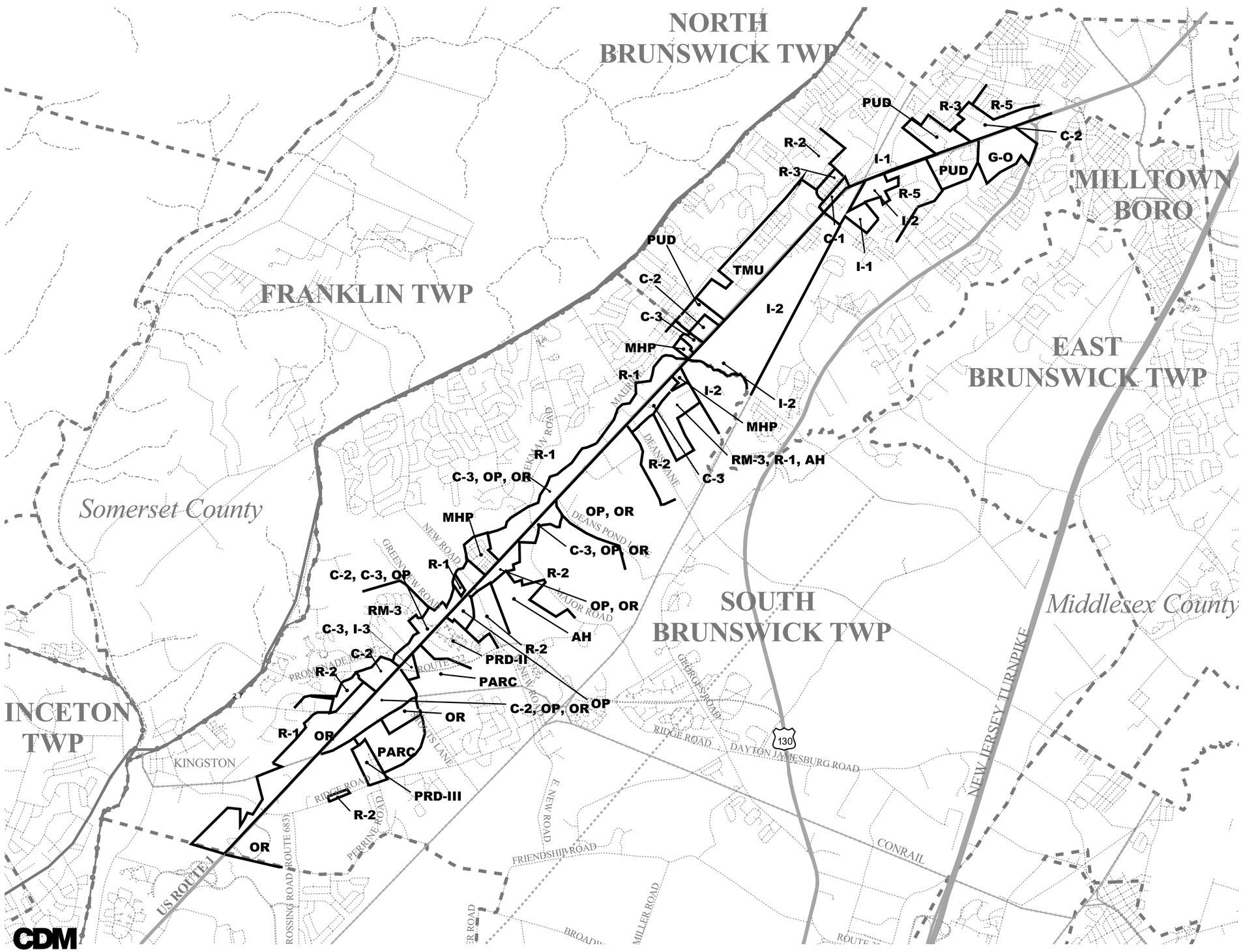


N

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

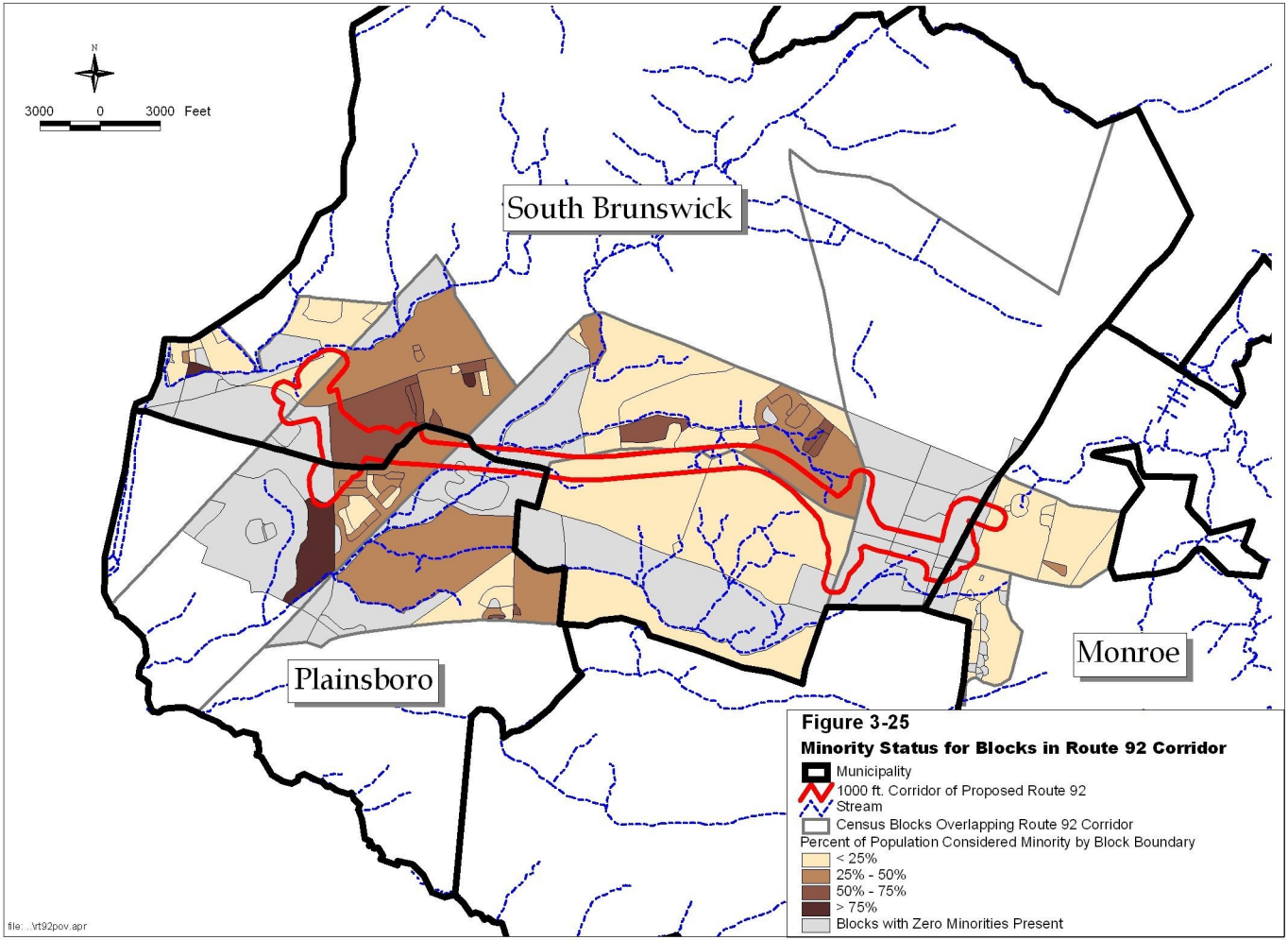
Figure 3-24b (Section 3.13.2.1)

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