

4.0 EXISTING ENVIRONMENTAL CONDITIONS, IMPACTS, AND MITIGATION

This section of the EA/4(f) provides a discussion of existing environmental conditions within and near the project area, the impacts expected to result from the proposed action, and mitigation measures incorporated into the project design to minimize or eliminate impacts. For comparison purposes, this section also evaluates the impacts associated with the No-Build Alternative.

4.1 Air Quality

Transportation projects located in nonattainment areas are required to demonstrate conformity to State and Federal Implementation Plans for the area. An air quality analysis was performed to demonstrate compliance of the proposed project with the transportation conformity guidelines established in 40 CFR, Part 51, entitled *Conformity to State and Federal Implementation Plans of Transportation Plans, Programs, and Projects Developed, Funded or Approved Under Title 23 USC or the Federal Transit Act* (known herein after as the rule). The rule applies to those federal actions which are located in areas of nonattainment of the National Ambient Air Quality Standards (NAAQS). Nonattainment areas are those areas which have been designated by the United States Environmental Protection Agency (EPA) as not meeting the standard or are in *Nonattainment*. This project is located in a designated nonattainment area for National AAQS pollutant ozone and must meet the conformity criteria established in the rule.

Section 51.424 of the rule states that projects must not cause or contribute to any new localized CO violations or increase the frequency or severity of any existing CO violations in CO nonattainment areas. While the project area is located in Mercer and Middlesex Counties, which are classified by the EPA as in attainment for the National AAQS for CO, counties to the north - Essex, Hudson, and Union - are classified as moderate nonattainment for CO. Due to the proximity of Mercer and Middlesex Counties to these nonattainment areas, it was determined that a CO *hot spot* analysis for the Route U.S. 1/Penns Neck Area Improvements project could be deemed appropriate. For this reason, an intersection *hot spot* analysis was conducted for CO impacts to demonstrate that no new local violations would be created and that the severity of existing violations would not be increased.

The procedures used to perform the air quality impact analysis followed the methodologies approved and recommended by the EPA and the NJDOT. Primary constituents of motor vehicle emissions include carbon monoxide (CO), hydrocarbons (HC), and nitrogen oxides (NO_x). Of these, the EPA and the NJDOT target CO as the primary pollutant of concern when assessing potential air quality impacts from motor vehicle exhaust. Increased concentrations of CO can be expected in places where large numbers of motor vehicles are prevalent. Generally, this situation occurs at crowded intersections where long delays are common during peak traffic periods.

This section summarizes the findings of the air quality analysis. The methodology and results of the modeling are presented in greater detail in the *Air Quality Technical Environmental Study, Route U.S. 1 Penns Neck Area Improvements* (Harris, 1996a).

4.1.1 Existing Conditions

The traffic capacity and levels of service (LOS) analysis indicate that most locations within the project area currently operate at fair to poor LOS (Harris, 1993a). Thus, overall CO emissions concentrations in the project area are expected to be generally acceptable with respect to the National AAQS but locally high where existing traffic signals cause queuing during peak traffic periods. For example, a temporary localized elevation in CO levels is expected to occur at the Route U.S. 1/Harrison Street intersection where heavy traffic volumes, particularly left-turn volumes from the eastbound Harrison

Street approach occur during peak periods. This same pattern occurs at the intersections of Route U.S. 1 with Washington Road and Fisher Place.

4.1.2 Impacts

A project is considered to have an impact on air quality if one of the following occurs:

- ! The project causes a new violation of the CO National or State Ambient Air Quality Standards (Appendix A) or makes an existing violation worse (negative impact).
- ! The project eliminates a violation of the National or State Ambient Air Quality Standards (positive impact).

National and New Jersey AAQS have been adopted for CO which are designed to protect public health and welfare with an adequate margin of safety. The National AAQS were adopted pursuant to the Clean Air Act of 1970. The New Jersey AAQS were adopted to meet these National criteria. The National and New Jersey primary and secondary CO AAQS are 35 parts per million (ppm) over a 1-hour period and 9 ppm over an 8-hour period, not to be exceeded more than once per year.

Build Alternative

Vehicular emissions of CO were calculated through a modeling process using the MOBILE5a EPA Source Emission Factor Model, the CAL3QHC atmospheric dispersion model, and the procedures and parameters specified by the EPA, NJDOT, and New Jersey Department of Environmental Protection (NJDEP, 1995).

Predicted CO concentrations for both the 1-hour and 8-hour periods in the design year, inclusive of background levels, fall within acceptable levels relative to the National and New Jersey AAQS. No predicted CO values are expected to meet or exceed these standards, and no new violations of these standards or worsening of existing violations is expected to occur. The highest concentrations of CO were found to originate from Route U.S. 1 due to the expected heavy traffic volumes and the fact that the elimination of traffic signals would enable Route U.S. 1 to more efficiently handle the volume of traffic during the peak period. In contrast, emissions from traffic on Relocated Route 571 and other roadways studied were found to be much lower. The elimination of intersection queues on Washington Road and Harrison Street associated with the existing Route U.S. 1 traffic signals, would result in lower CO levels for the Build Alternative compared to the No-Build Alternative for both the Years (2002 and 2022) of comparison. The CO levels for both the years would be below the National AAQS of 1-hour (35 ppm) and 8-hour (9 ppm) for both the No-Build and Build Alternatives. Lower emission factors by the design year, due in part to improvements in future vehicle emissions control and implementation of improved vehicle inspection and maintenance programs, contribute to some reduction in predicted design year CO concentrations.

The U.S. EPA promulgated the Transportation Conformity Rules (TCR) under the Clean Air Act Amendments of 1990 effective December 27, 1993. The TCR provides criteria for determining conformity to the State Implementation Plan (SIP) for Air Quality of transportation plans, programs, and projects which are developed, funded or approved under Title 23 USC of the Federal Transit Act. This project is located in an ozone nonattainment area and hence a conformity determination is required. The conformity requirements are as follows:

- ! The project must come from a conforming transportation improvement plan and program (TIP), and,

- ! In CO nonattainment areas, the project must eliminate or reduce the severity and number of violations of the National AAQS for CO.

The Route U.S. 1/Penns Neck Area Improvements project is included in the approved FY 2001-2005 Transportation Improvement Program (TIP) of the Delaware Valley Regional Planning Commission (DVRPC), a Metropolitan Planning Organization (MPO) for the New Jersey region (Appendix A).

No-Build Alternative

In comparison to the Build Alternative, the No-Build alternative would result in higher CO levels due to the fact that no measures would be taken to improve flow and congestion in the Route U.S. 1/Penns Neck area. Therefore, while CO levels for the No-Build alternative would still be below the National AAQS of 1-hour (35 ppm) and 8-hour (9 ppm), this alternative would provide less of an air quality benefit than the Build Alternative. Furthermore, it would not eliminate or reduce traffic congestion or associated vehicular emissions. As such, the No-Build alternative would not comply with regional conformity goals or Transportation Implementation Program provisions.

4.1.3 Mitigation

The results of the air quality analysis indicate that the project (build alternative) would comply with the federal transportation conformity guidelines as the project would not cause or contribute to any new localized CO violations or increase the frequency or severity of any existing CO violations in CO nonattainment areas. In accordance with the TCR for ozone nonattainment areas, the project would be part of the DVRPC TIP. No mitigation measures are warranted.

4.2 Noise

Noise is an undesirable or unwanted sound perceived subjectively by the individual. Acceptance of a certain noise level may vary among individuals, neighborhoods, and the time of day. Sound can affect all human activities and must be considered in local and regional land use planning.

The FHWA has assigned Noise Abatement Criteria (NAC) levels to five categories of land use (Table 4-1). The threshold of noise interference levels are Leq and L10 levels above which noise will begin to intrude for the corresponding land use. The threshold levels are provided for information only. According to the FHWA guidance, a project is defined as having a noise impact should either of the following conditions occur:

1. Predicted Leq noise levels approach or exceed the NAC. Noise levels approaching the NAC are defined as occurring at 3 dBA less than the NAC.
2. A substantial increase in predicted noise levels over the existing noise levels (10 dBA or greater) even though the NAC is not reached. Increases in noise levels which approach 10 dBA may be evaluated and discussed as circumstances dictate.

Determination of the NAC that is applicable to a particular study requires the evaluation of existing land uses in a project area that may be potentially affected by the proposed action and the selection of one or more activity categories that apply. In the case of the Route U.S. 1/Penns Neck Area Improvements, land use in the project area consists of residences, recreation areas, a school, a church, and a park, all of which are included in activity category B for exterior noise levels or category E for interior levels. Thus, the NAC B and E apply to the project. Evaluation of potential noise impact relative to the NAC B

was the focus of this analysis, although analysis relative to the NAC E was undertaken for specific uses. Where significant noise impact was predicted to occur, the evaluation of noise abatement measures to reduce impacts relative to both the NAC B and E was considered.

Noise analysis was performed using the FHWA Noise Prediction Model (FHWA-RD-77-108) and the noise barrier cost reduction procedure STAMINA/OPTIMA (FHWA-DP-58-1). This section summarizes the findings of the noise analysis. The methodology and results of the modeling are presented in greater detail in the *Noise Technical Environmental Study, Route U.S. 1 Penns Neck Area Improvements* (Harris, 1996d).

4.2.1 Existing Conditions

The NJDOT obtained measurements of existing noise in the project area and compiled a report of findings entitled *Noise Measurement Study, Route 1 Penns Neck*, which is contained in the *Noise Technical Environmental Study, Route U.S. 1/Penns Neck Area Improvements*, (Harris, 1996d). Table 4-2 summarizes the results of the noise measurement study. The noise measurement data indicates that traffic noise is a primary component in ambient noise levels, such that measurements at locations in proximity to roadways are greater than measurements at locations that are distant from the same roadways. Of the measurements obtained, noise samples from two locations (Sites 2a and 3) exceed the 67 dBA NAC B guideline and samples from one location (Site 4) approach the NAC B guideline, under existing conditions.

In addition to measurements of exterior noise, the NJDOT obtained 15 minute measurements of interior noise in the Penns Neck Baptist Church when no activity was taking place in the structure. The 15 minute Leq with the windows closed was 46 dBA at 10:00 AM on a weekday and 55 dBA at 10:15 AM on a weekday with windows open.

4.2.2 Impacts

Noise sensitive receptors were identified in the project area using the FHWA definition of noise sensitive receptors associated with the exterior noise abatement criteria B (NAC B) of 67 dBA. Sensitive receptors identified in the project area included residences, churches, schools, the Princeton University athletic fields, and the D&R Canal State Park. Where many similar uses occur in a cluster, such as residences in the Penns Neck community, the nearest uses to the proposed improvements were selected to represent worst-case conditions.

Table 4-1

Table 4-2

Build Alternative

Tables 4-3 and 4-4 summarize the results of the noise analysis. Noise contours are shown on Figure 4-1. These results indicate the following with respect to the proposed improvements:

- ! Route U.S. 1 - Measured and predicted noise levels exceed the 67 dBA NAC B at each of the selected modeling sites. The realignment of Route U.S. 1 is expected to result in an increase in noise levels at the selected sites by design year. The maximum predicted increase in noise levels over existing measured noise levels is below the threshold criteria for substantial exceedance of existing noise levels as defined by the NJDOT and FHWA.

- ! Washington Road (County Route 571) - Under the proposed action, the diversion of through traffic to Relocated Route 571 would significantly reduce traffic volumes on Washington Road. Under design year Build conditions, only sensitive receptors close to Washington Road would be expected to experience noise levels approaching the NAC. No sensitive receptors along Washington Road are expected to be exposed to levels that meet or exceed the NAC under Build conditions.

- ! Harrison Street - Predicted design year Build noise levels at selected sensitive receptors along Harrison Street east of the canal were generally found to be lower than existing levels due primarily to the elimination of most or all of through traffic on Harrison Street. Noise levels under design year Build conditions are below the NAC.

- ! Relocated Route 571 - East of Route U.S. 1, predicted design year Build noise levels at Fisher Place are well below the NAC, as well as the level considered a substantial increase in noise. Traffic noise level exposure to selected receptors along Harrison Street is expected to increase slightly due to the Relocated Route 571 alignment location. However, no predicted noise levels for the Harrison Street receptors approach or exceed the NAC, or substantially exceed existing noise levels under the proposed action. Noise levels in the D&R Canal Park between Washington Road and Harrison Street would approach the NAC under both Build and No-Build conditions. No exceedance of the NAC is anticipated to result from the project in the Park, and no substantial increase in noise levels is expected due to the project.

As summarized on Table 4-4, for the Build alternative, a total of 15 residences, a school, and a church would experience noise levels at or above the NAC. Thirteen (13) residences and a park would experience noise levels that approach the NAC.

Construction activities for the Build Alternative would temporarily increase noise levels in portions of the project area. During construction activities, the character and level of noise would vary depending on the type and number of sources operating at any one time. Sources of construction noise would include trucks, earthmoving equipment, generators and other equipment required to undertake the various phases of road construction.

Receptors sensitive to construction noise would be the same as identified for traffic noise: residences, churches, hospitals, schools, libraries, hotels, motels, parks, playgrounds, picnic areas, active sports areas, and other recreational uses. Construction equipment noise levels are typically controlled by restricting operations to normal daytime hours when human tolerance to noise is at its highest and the focus of daytime activities is away from residences. Further, NJDOT standard construction noise specifications would be included in the project.



**Table 4-3
Sensitive Receptor Exposure to Project-Related Noise Levels That Approach or Exceed the NAC**

Receptor			2022 NAC Status (c)	Source	Abatement Warranted ?
Block	Lot	Type			
2	2	School	Exceedance	Route 1 realignment	No (d)
3	16	Park	Approach NAC	Washington Road, Harrison Street Traffic	No (a, l)
39	7	Residence	Exceedance	Route 1 traffic growth	No (a, l)
39	16	Residence	Exceedance	Route 1 traffic growth	No (a, l)
40	4	Church	Exceedance	Route 1 traffic growth	No (e, f, l)
40	4	Church Hall (g)	Exceedance (h)	Route 1 traffic growth	No (a, l)
40	6	Residence	Exceedance	Route 1 traffic growth	No (a)
41	4	Residence	Approach NAC	Washington Road traffic	No (b, l)
41	5	Residence	Exceedance	Route 1 traffic growth	No (a)
83	30	Residence	Approach NAC	Washington Road traffic	No (b, l)

- (a) Noise level is due to area traffic growth rather than proposed roadway improvements.
- (b) Noise level is a reduction when compared to the No-Build alternative.
- (c) Either "Exceedance" of the NAC, or "Approach" the NAC.
- (d) Property take.
- (e) Existing noise level also exceeds the NAC.
- (f) Limited use; facility schedule does not coincide with peak traffic periods.
- (g) Church hall houses the Waldorf School.
- (h) Interior noise levels at the church hall are expected to be below the criteria (NAC E).
- (l) Noise mitigation is not feasible due to land service of roadways.

No-Build Alternative

A summary of noise impacts is provided in Table 4-4. For the No-Build condition, a total of 16 residences, a school, and a church would experience noise levels at or exceeding the NAC category B level of 67 dBA Leq. Fifty-six (56) residences and a park would experience noise levels that approach the NAC under No-Build conditions. Comparison of Build and No-Build alternatives indicates that a greater number of residential receptors (44 more) would be impacted by traffic noise under the No-Build alternative.

Table 4-4
Route U.S. 1/Penns Neck Area Improvements
Summary of Predicted 2022 Traffic Noise Impacts

No-Build	Build Alternative
16 Residences 1 School 1 Church (56 Residences) (1 Park)	15 Residences 1 School 1 Church (13 Residences) (1 Park)

Figures in parentheses are impacts where predicted noise levels approach the NAC.

4.2.3 Mitigation

Sites were identified that would potentially experience noise levels which either approach or exceed the NAC under design year Build conditions. The sites examined included the Princeton Operating Station, Penns Neck Baptist Church and the church hall, the D&R Canal Park, and six residences near northbound Route U.S. 1. Presently, Eden Institute, which is housed in the Princeton Operating Station building is planning to relocate to new facilities under construction on the south side of Harrison Street.

Because of their relocation, the Princeton Operating Station building is no longer a consideration for noise abatement. The Penns Neck Baptist Church and adjoining church hall were also evaluated due to their proximity to Route U.S. 1 and the existing and design year noise levels which exceed the NAC. Noise impact to the D&R Canal Park was determined to occur near the existing Washington Road and Harrison Street crossings. The design year noise level would be due to area traffic growth rather than the proposed improvements. Mitigation is not feasible due to the perpendicular crossings of these roads relative to the Park. The remaining six sites were preliminarily evaluated for possible abatement.

The FHWA abatement strategies (traffic management, alternative roadway alignments, barriers, buffers, and insulation of a public structure) were evaluated to determine feasibility and reasonableness in their potential application to this project. Closer evaluation of the noise level data and the abatement strategies described below indicates that mitigation is either not warranted or that the feasibility and reasonableness criteria for mitigation cannot be met.

Traffic Management Strategies

Traffic management strategies may include traffic control devices and signing for prohibition of certain vehicle types, time-use restrictions for certain vehicle types, modified speed limits, and lane assignments. These measures, while they may be effective in certain applications, are not appropriate for this project. The proposed improvements are intended to utilize one Relocated Route 571 alignment. The prohibition of certain vehicle types, the imposition of time-use restrictions, lane assignment, and traffic control device strategies are not appropriate or useful for a single road proposal. The modification of speed limits to reduce traffic noise impact can be effective at relatively high speeds; however, traffic speed reduction would have little to no impact on traffic noise levels and may increase congestion by reducing overall roadway capacity.

Discussion of traffic demand strategies to be incorporated into the project as a result of the Congestion Management Systems (CMS) analysis is provided in Section 2.1.5. These strategies, although not specifically intended to reduce traffic noise impact, would contribute to a reduction in traffic demand.

Alternatives on Location

The development of the proposed Route U.S. 1 improvements considered alternatives including widening exclusively to the east or west, or both. Existing residential development to the east as well as the historic Penns Neck Baptist Church, located in proximity to Route U.S. 1, precluded alternatives involving roadway widening to the east. As a consequence, widening to the west was considered the only feasible alternative.

Barriers

Abatement of traffic noise at the identified sites through the use of barriers would be infeasible due to the lack of adequate space (less than 50 feet from the proposed right-of-way to the nearest building) to construct a barrier. Further, Route U.S. 1, Harrison Street and Washington Road are land service roadways. Access considerations on these roadways render the use of barriers infeasible.

Buffers

Buffer zones would include land areas that separate the source of noise from a noise sensitive receptor. Typically, buffer zones are acquired and set aside for that specific purpose. The effectiveness of a buffer zone depends on its size and configuration, topography, and the condition and extent of vegetation present. Generally, buffer zones are most effective for noise abatement when thickly vegetated, preferably year round, and a minimum of 30 meters (100 feet) deep. As with barriers, insufficient land area is available for the purpose of providing an effective noise buffer. This abatement measure is therefore infeasible.

Insulation/Relocation of Public Buildings

The addition of insulative building materials or air-conditioning to impacted public structures or moving public structures is an invasive strategy usually reserved for public buildings where the maintenance of interior noise levels is critically important to the health and welfare of the occupants and to the continuity of the activity taking place therein. Depending on the size and nature of the building, the costs to retrofit or move a structure can be exorbitant. Such measures are usually restricted to public structures where the noise impact is extreme, causing physical discomfort, and the inability to function properly.

Noise level exposure at the Penns Neck Baptist Church was evaluated in terms of the FHWA NAC E interior threshold noise level of 52 dB. The wood frame building is not currently air-conditioned and the interior noise measurements were taken with the windows open to simulate warm weather conditions (NJDOT, 1995). Review of the existing noise levels measured outside and within the church building during the Route U.S. 1 peak truck period indicates that the building provides approximately 16 to 28 dB of noise attenuation. The resulting noise level exposure within the building ranged from 46 to 55 dB which exceeds the NAC E in the upper end of the range. Using the range of attenuation based on the noise measurement results, design year Build exterior noise levels at 77 dB would yield interior noise levels in the range of 49 to 61 dB. The upper end of this range exceeds the existing interior range by 6 dB.

The schedule of activities in the church includes services on weekday evenings and on Sundays, a limited schedule that excludes peak daily traffic periods. Traffic noise levels during scheduled activities are expected to be lower such that mitigation by means such as installing air-conditioning would be costly relative to the potential benefit. As a consequence, no abatement measures are proposed.

Noise level exposure at the Penns Neck Baptist Church hall (Waldorf School) located behind the main church structure was also evaluated in terms of the FHWA NAC E. The masonry building is not

currently air-conditioned and it is expected that the windows would be open in warm weather conditions. Exterior noise level exposure at the church hall is currently approximately 63 dBA (NJDOT, 1995), and is predicted to be approximately 67 dBA in the design year Build condition. Average sound transmission loss through masonry walls 12 inches thick is approximately 50 dB (Harris, 1971). Windows are located on the walls that face away from Route U.S. 1. These windows reduce the attenuative capability of the walls, particularly when they are open. However, the location of the windows away from the Route U.S. 1 traffic sound path minimizes impact of that noise on the interior space. Given the masonry construction and window orientation on the building, design year Build noise levels within the building are expected to be below the NAC E.

4.3 Topography, Geology, Soils and Groundwater

4.3.1 Existing Conditions

Topography

According to United States Geological Survey 7.5 minute series topographic maps, elevations within the project area range from a maximum of approximately +105 feet above mean sea level (msl) along Route U.S. 1, to a minimum of approximately +60 feet above msl along the D&R Canal, Millstone River and Little Bear Brook. The entire project area can be characterized as relatively flat with gentle slopes descending towards flooded valleys.

Because the project area is relatively flat, past development actions have resulted in minor changes in area relief associated with cuts and/or fills. Residential and commercial development as well as transportation improvements have resulted in such modifications in the project area.

Geology

Mercer County is unequally divided into the Piedmont and Coastal Plain Provinces. The project area is divided by the "fall line," which represents the line of separation between these two major physiographic provinces. The *fall line* divides the Coastal Plain Province to the east and the Piedmont Province to the west, and is similar in alignment to the D&R Canal, yet located farther east than the canal (USDA, 1972).

Three geologic formations predominate within the Penns Neck Interchange Area. The Stockton Formation (T_{RS}) of the Newark Group is the underlying bedrock and the Cape May Formation (Q_{CM}) and Pennsauken Formation (Q_{PS}) of the Columbia Group, are the surficial geologic features. The boundary between the two surficial deposits is west of Route U.S. 1 on a line that parallels the D&R Canal. The entire project area is underlain by Stockton Sandstones (Widmer, 1965). No surface outcroppings of the Stockton Formation were found during field investigations. The Stockton Formation is a fractured medium, dominated by secondary permeability features. The small area of Coastal Plain unconsolidated sediments present in the project area is dominated by primary permeability features.

In accordance with the State of New Jersey geologic overlay of the project area (map 28), there are no geologic faults within or adjacent to the Penns Neck project area. Additionally, there are no economic or unique geologic features within or adjacent to the project area.

Soils

There are eighteen major soil types within the project area, many of which would be impacted by construction of the proposed roadway (see Figure 4-2 in the back pocket). Table 4-5 provides a

summary description of project area soil characteristics taken from the *Soil Survey of Mercer County, N.J.* (USDA, 1972).

Generally, soils within the project area have medium erosion potential and are acidic. Soil pH values for the Galestown, Klej, Matapeake and Mattapex and Bertie series range from 4.0 to 5.0 and pH values for the Birdsboro, Landsdale and Bowmansville series range from 5.0 to 6.0.

Twelve of the eighteen soil types described above are listed on the *New Jersey Important Farmlands Soil Inventory* (USDA, 1990). The soils documented in this inventory have been determined to be valuable to farming in New Jersey and are categorized according to the following classifications: Prime Farmlands, Soils of Statewide Importance, Unique Soils and Soils of Local Importance.

Prime Farmland Soils found within the project area include Downer fine silty loam(Df), Dragston and Woodstown sandy loam (DwB), Galestown sandy loam (GeB), Landsdale sandy loam (LaB), Matapeake loam (MoA, MoB), and Sassafras sandy loam (SrB). Soils of Statewide Importance that occur within the project area include Bowmansville silt loam (Bt), Klej sandy loam (Km), Landsdale channery loam (LcC2), Mattapex and Bertie loam (Mq). The USDA (1990) identifies Galestown loam sand (GaB) as the only Unique Farmland Soil located within the project area. The only soils of Local Importance found within the project area are the Birdsboro soils (BoB).

Even though farmland soils are mapped in the project area, none of this area is zoned for agricultural production purposes. In addition, no Agricultural Development Areas (ADAs) exist within the project boundaries.

Existing development has changed the original characteristics of the soil types mapped by the Soil Survey of Mercer County over portions of the project area. Developments including the David Sarnoff Research Center, residential developments along Washington Avenue and Fisher Place, and transportation projects including Route U.S. 1 have modified existing soil profiles by cut and/or fill activities and introduction of impervious surfaces (e.g., buildings, roads, parking areas). Soils associated with the majority of lands owned by Princeton University (west of Route U.S. 1) have been modified to some extent by agricultural activities. Soils located proximate to the Millstone River, Little Bear Brook, and the D&R Canal are relatively undisturbed as they are located primarily within wetland/floodplain areas.

Insert Table 4-5

Groundwater

Groundwater Quality

Little information on groundwater quality exists for the project area in NJDEP well files. The wells for which water quality data was provided generally listed the quality as good, with no taste, odor or color. A modest number of aberrations were noted in the files, mainly hardness and acidity. Drinking water criteria and water supply data are presented in Tables 4-4 and 4-5 respectively in Section 4.1.5 in the Natural Ecosystems TES (Harris, 1996).

As presented in the Natural Resources TES, available well data for wells located within the project area indicated no evidence of contamination, and those parameters analyzed were at or below the maximum contaminant levels as part of the drinking water quality standards developed by the USEPA and NJDEP.

Aquifer Recharge

Incident precipitation that falls on the project area would either infiltrate the soil surface or become surface runoff discharged to nearby receiving water bodies. Groundwater recharge capability was estimated in the project area using the New Jersey Department of Environmental Protection and Energy - Division of Science and Research publication entitled, *A Method for Evaluating Ground-Water Recharge Areas in New Jersey* (NJDEP, 1993a). The Method enables calculation of recharge potential based on the relationship of the following area-specific parameters: precipitation, surface runoff, evapotranspiration, land use/land cover, hydrologic soil group, soil type, and root barrier depth. Using the procedures set forth in the Method, it was determined that the project area, exclusive of wetlands, floodplains, and existing impervious surfaces, contains sizable areas of high, moderate, and moderate to low recharge capability. Recharge within the project area under existing conditions is estimated to be approximately 369 million gallons per year. Existing development within the project area has introduced approximately 160 acres of impervious surfaces.

Sole-Source Aquifers

The Route U.S. 1/Penns Neck Area Improvements would be located partly within the Millstone River Basin Aquifer System (one of the Northwestern New Jersey Fifteen Basin Aquifer System), and the Coastal Plain Aquifer System, both of which are federally designated sole-source aquifers (NJDEP, 1998). The boundary between the two aquifer systems is the junction between the Piedmont and Inner Coastal Plain Provinces, which lies within the project area. The Piedmont sandstones terminate approximately on a line following the Amtrak corridor at the eastern boundary of the site. The fall line between Piedmont and Inner Coastal Plain soils lies west of Route U.S. 1 on a line that parallels the D&R Canal. Between this fall line and Amtrak, Coastal Plain soils overlie the Piedmont sandstones.

Public and Private Well Information

NJDEP well records were reviewed in order to establish a list of wells within a one-half mile radius of the project area. The records indicate a total of 180 wells within and adjacent to the project area; the locations of which were determined by the NJDEP grid system. Nearly half of these wells are listed as monitoring wells. The remaining wells are generally divided between domestic and industrial supply. No public water supply wells have been identified within the project area. Public water supply to the project area is obtained from the Jefferson Park Well operated by the Elizabethtown Water Supply Company, and is located approximately 6 miles from the site. Figure 4-3 indicates the approximate

locations of known wells within 500 feet of the preferred alignment¹. A listing of all wells within and adjacent to the project area is provided in Appendix B of the Natural Ecosystems TES (Harris, 1996c).

Public Water Supply and Treatment

West Windsor Township is supplied with water from the Jefferson Park well, which is located near Bruntsfield Avenue in Washington Township, New Jersey (approximately 6 miles from the project area).

If this well is deemed non-functional for any reason, water is supplied by the surface water treatment plant in Bridgewater, New Jersey (Elizabethtown Water Supply Company, 1995). Wastewater treatment services for West Windsor Township are supplied by the Stony Brook Water and Sewerage Authority as well as numerous individual residential septic systems located throughout the township.

Landfill Status

Two landfills are located in the vicinity of the project area; however, neither landfill is located within the project area boundaries. One landfill (inactive) is situated between Route U.S. 1 and the D&R Canal, just south of Washington Road. This landfill was used to stockpile dredge spoils from Carnegie Lake in the 1970's, and has since been covered. Another landfill exists southeast of the project area, north of Alexander Road. The location of this sanitary landfill was determined using the NJDEP Sewage and Landfill overlay (1975, map 28).

4.3.2 Impacts

Topography

Build Alternative

Impacts to the existing topography within the project area include excavation for detention basin construction and wetland mitigation, and fill for grade-separated interchanges and waterway crossings.

No-Build Alternative

Since the No-Build Alternative would only involve in-kind replacement of the Millstone River bridge, there would be no impact to topography within the project area.

Geology

Build Alternative

No economic and/or unique geologic features occur within the project area. Existing quarries are located outside the project area. The majority of the highway excavation proposed for the project area would impact the geology associated with the Pennsauken and Cape May Formations. These materials have widespread occurrence throughout Middlesex and Mercer Counties and are not considered unique (Widmer, 1964). Blasting of the bedrock (Stockton Sandstone) may be required in areas where the bedrock is located within the depth of excavation or close to the minimal excavation surface. According to the *Technical Manual for Land Use Regulation Program* (NJDEP, 1995a), there are no acid-producing deposits located within the project area.

¹ Harris recommends that a site investigation be conducted prior to construction in order to identify the exact location of potentially impacted wells.

No-Build Alternative

Since the No-Build Alternative would only involve in-kind replacement of the Millstone River bridge, there would be no impact to geology within the project area.

Soils

Build Alternative

Erosion is the primary potential impact to project area soils during roadway construction. Construction of the proposed roadway would mainly impact the Galestown and Landsdale soils (low and medium erodibility), as they cover large portions of the project area. Other soils of low to medium erodibility that would be impacted by the roadway include Sassafra, Birdsboro, Klej, Mattapex and Bertie, Dragston and Woodstown, and Bowmansville soils. Freshwater Marsh would be disturbed by the crossing of Little Bear Brook and the Millstone River bridge alterations. A relatively small amount of Cut and Fill land would also be impacted by the proposed roadway. Bowmansville silt loam (Bt), located adjacent to the D&R Canal, is the only highly erodible soil within the project area. Approximately 10,000 square feet of this soil would be impacted during construction of the proposed roadway. Table 4-6 lists each soil type that would be disturbed during the construction phase of the proposed project.

Disturbance of forested areas and subsequent tree removal would leave soil highly susceptible to erosion during rainfall. The alluvial deposits associated with Little Bear Brook and the Millstone River also represent sources of erosion, as these materials are easily transported downstream during construction activities.

No-Build Alternative

Since the No-Build Alternative would only involve in-kind replacement of the Millstone River bridge, there would be no impact to soils within the project area.

Groundwater

Build Alternative

The project area is situated partially within the Millstone River Basin Aquifer System and partially within the Coastal Plain Aquifer System. Both aquifers are U.S. EPA-designated Sole-Source Aquifers. The proposed project would introduce approximately 21 acres of impervious surfaces to the project area. In light of the estimated existing impervious coverage in the project area, approximately 160 acres, the project would increase total impervious surfaces in the project area by approximately 13% percent. The NJDEP's method for estimating groundwater recharge, presented in Section 4.3.1 above, was utilized to identify the impact of project impervious surfaces on groundwater recharge potential in the project area. The results of this analysis determined that the proposed project would reduce groundwater recharge in the project area by approximately 3.36 percent, or 12 million gallons per year. Following construction of the proposed improvements, recharge within the project area is estimated to be approximately 357 million gallons per year.

**TABLE 4-6
POTENTIALLY IMPACTED SOILS**

	Soil Impact for the	Erodibility
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SOIL TYPE	Preferred Alternative (acres)*	(K) Factors
BoB - Birdsboro	4.66	0.28
Bt - Bowmansville silt loam	0.44	0.43
Cg - Cut and fill land	1.44	NA
DwB - Dragston and Woodstown sandy loams	1.24	0.28
Fm - Freshwater marsh	3.08	NA
GaB - Galestown loamy sand	14.60	0.17
GeB - Galestown sandy loam	35.87	0.17
Km - Klej	0.83	0.17
LaB - Landsdale sandy loam	2.50	0.28
LcC2 - Landsdale channery loam (6-12% slopes)	3.57	0.28
MoA - Matapeake loam (0-2% slopes)	0.00	0.32
MoB - Matapeake loam (2-5% slopes)	0.00	0.32
Mq - Mattapex and Bertie loam	1.47	0.37
Pg - Pits	0.15	NA
SrB - Sassafras sandy loam	2.14	0.28
Total	71.99	NA

* Note: These estimates do not include the PSE&G substation or any area under the US Route 1 bridge over the Millstone River.

This 3.36% recharge reduction within the project area assumes that all the water would be unavailable for recharge because it will be lost to surface waters as runoff. However, this project employs over-the-shoulder roadway drainage. Runoff will be conveyed through vegetated roadside drainage swales to three detention basins, all of which will provide the opportunity for the infiltration of runoff, and will result in decreasing the predicted amount of lost recharge.

The calculated 3.36% reduction relative to the approximately 1.2-square-mile local project area is minimal. In the context of the large geographic extent (approximately 6,389 square miles) of the Northwest New Jersey and Coastal Area aquifer systems, the reduction in recharge capability due to project impervious surfaces is insignificant.

The nearest public water supply well to the project area is the Jefferson Park well operated by the Elizabethtown Water Supply Company. This well is located approximately six (6) miles from the project study area. Due to the distance of the well from the study area and the negligible reduction in overall aquifer recharge capability, the project will not have an adverse impact on groundwater from the standpoint of water supply.

Pollutant loading analysis was performed for the project using the Federal Highway Administration *Predictive Procedure for Determining Pollutant Characteristics of Highway Runoff* (FHWA/RD-81-044). The result of this analysis are summarized in Table 4-8. This analysis determined that total pollutant loads discharged as a result of the project would not exceed New Jersey Water Quality Standards, except for iron which exhibits naturally occurring elevated levels. As with the recharge study, the pollutant loading analysis did not take into consideration the reduction in pollutant loading that would occur in the project stormwater management system. The proposed vegetated swales and detention basins would allow for settling, filtration, and infiltration of stormwater prior to discharge.

In summary, without even considering the attenuation of project impacts to both recharge quantity and water quality provided by the proposed drainage swales and detention basins, the minimal reduction in recharge and the negligible impact to water quality anticipated for this project will not create a significant hazard to public health or contaminate the aquifer to a level requiring additional treatment.

No-Build Alternative

Since the No-Build Alternative would only involve in-kind replacement of the Millstone River bridge, there would be no new pavement, no change in the rate or volume of stormwater runoff, no increase in pollutants generated from pavement areas, and no impacts to groundwater resources within the project area.

Public Water Supply

Build Alternative

Approximately 34 well locations have been identified within 500 feet of the project right-of-way; of which, approximately one-third are designated as private/domestic by NJDEP well files. Those wells directly impacted by right-of-way acquisition would be relocated. No impacts to the remaining wells are anticipated.

No-Build Alternative

Since the No-Build Alternative would only involve in-kind replacement of the Millstone River bridge, there would be no impact to existing wells identified within and adjacent to the project right-of-way.

Landfill Status

Build Alternative

Two landfills are located in the vicinity of the project area. Neither landfill is located within the project area and neither would be disturbed by construction of the proposed roadway.

No-Build Alternative

Since the No-Build Alternative would only involve in-kind replacement of the Millstone River bridge, there would be no impact to the two landfills located in the vicinity of the project area.

4.3.3 Mitigation

As there are no soils containing acid-producing deposits located within the project area, no mitigation procedures are necessary regarding this environmental issue.

Mitigation measures in accordance with standards set forth in the *Soil Erosion and Sediment Control Standards* (NJDOT, 1989) would be implemented during and after roadway construction. The most efficient method to minimize soil erosion is to stabilize the soil immediately after disturbance has occurred. This can be accomplished by the following procedures:

- C Seeding immediately after the slope is graded with an appropriate ground cover.
- C Placement of mulch or wood chips immediately after soil disturbance has occurred.
- C Seeding the slopes simultaneously with road construction.

Wells that must be relocated, including those within the proposed right-of-way, would be legally abandoned and sealed by a well driller, licensed by the State of New Jersey to perform such work. As required, new wells would be installed in suitable location(s) by a licensed well driller.

Design of an umbrella section for much of Relocated Route 571 would enable runoff to be captured in adjacent drainage swales. Infiltration of stormwater in these swales would provide an additional recharge opportunity. Additional discussion of proposed stormwater management strategies and project obligations with respect to compliance with state regulatory requirements regarding stormwater management is provided in Section 4.4.2.

4.4 Floodplains

4.4.1 Existing Conditions

The Penns Neck area includes National Flood Insurance Program (NFIP) and NJDEP mapped floodplains for the Millstone River, Little Bear Brook, Big Bear Brook and the D&R Canal.

Within the immediate project area, the 100-year floodplain of the Millstone River ranges in width from 800 to 1,000 feet. The floodplain elevation varies from +67 feet at the Amtrak Northeast Corridor crossing to +58 feet downstream of the confluence with Stony Brook at Carnegie Lake. The 100-year floodplain extends upstream along the Millstone River to the confluence with Little Bear Brook and Big Bear Brook. The NFIP mapped 100-year floodplain boundary for the Millstone River, Little Bear Brook and Big Bear Brook is presented in Figure 4-4. According to the most recent Flood Insurance Study by the Federal Emergency Management Agency (FEMA, 1983) at the Route U.S. 1 crossing, the 100-year discharge of the Millstone River is 9,030 cubic feet per second (cfs) with a mean velocity of 1.3 feet per second (fps).

4.4.2 Impacts

Build Alternative

Roadway improvements in the Route U.S. 1/Penns Neck area would result in unavoidable impacts to 100-year floodplains associated with Little Bear Brook, the Millstone River and the D&R Canal. The three Floodplain Impact Areas (FIAs) are illustrated on Figure 4-4; specifically, the proposed Harrison Street connector road and Harrison Street re-alignment, the Millstone River bridge and Route U.S. 1 approaches, and the Relocated Route 571 crossing of Little Bear Brook.

The proposed Harrison Street connector road and Harrison Street re-alignment would involve crossing of floodplain and would impact approximately 0.57 acres of FIA 1. Replacement of the Millstone River bridge and widening of Route U.S. 1 north of Harrison Street would involve crossing of floodplain and would impact approximately 0.35 acres of FIA 3. The Little Bear Brook crossing would impact approximately 1.65 acres of FIA 2.

Relocated Route 571 would generally parallel the Millstone River east of Route U.S. 1. Although the project design would avoid floodplain impacts in much of this area, the configuration of the floodplain and the proximity of land use constraints on the Sarnoff Research Center campus renders limited floodplain impacts at two locations unavoidable. These locations, both west of the Little Bear Brook crossing, involve disturbances of approximately 440 linear feet and 205 linear feet, respectively. These unavoidable impacts do not constitute longitudinal impacts according to the criteria promulgated under 23 CFR 650.

Project impacts on floodplains were examined in the context of the FHWA requirements for location and hydraulic design of encroachments on floodplains (FHWA, 1984). Considerations in this assessment included:

1. Reasons why project elements must be located in a floodplain;
2. Alternatives considered and why they are not practicable;
3. Risks associated with the implementation of the project;
4. Measures to minimize floodplain impacts;
5. Measures to restore and preserve the natural and beneficial floodplain values;
6. Project conformance to applicable state and regional floodplain protection standards.

As described above, the proposed roadway improvements would involve unavoidable impacts to floodplains in several areas: the widening of Route U.S. 1 and replacement of the existing bridge over the Millstone River, construction of the Relocated Route 571 crossing over Little Bear Brook, and Harrison Street connector road construction and realignment of the portion of Harrison Street just east of the canal. These improvements would increase safety and provide a roadway section that is consistent with the existing network located north and south of the project area. As well, the existing traffic flow constriction at the Millstone River bridge would be eliminated.

The area of floodplain impact due to the roadway widening and replacement of the Route U.S. 1 bridge over the Millstone River has been minimized in the design, by the use of retaining walls on either side of the roadway rather than earth side slopes and by the design of the bridge wing walls parallel to, rather than perpendicular to the roadway. The improvements cannot be undertaken without impacting the floodplain at this location. All NJDOT alternatives investigated in the development of the proposed design, and discussed in Section 3.0, would involve similar improvements and consequently, similar impacts.

The Little Bear Brook bridge would span the floodway and place fill in the floodplain for Relocated Route 571. All NJDOT alternatives investigated would require crossing Little Bear Brook (Section 3.0). The location and alignment of the proposed crossing was designed to minimize impacts to floodplains and wetlands by traversing the brook at the narrowest point of these resources.

The Harrison Street connector road and realignment of the portion of Harrison Street just east of the canal would involve unavoidable impacts to the floodplain associated with the Millstone River near the D&R Canal. This connector road is an integral part of the overall project as it would provide the only access to Harrison Street from Route U.S. 1. The alignment of the connector road is intended to straighten the existing roadway curvature east of the bridge over the D&R Canal, thereby improving sight distance and vehicular and pedestrian safety (Section 2.1.4). The connector road also enables the portion of Harrison Street between Route U.S. 1 and the canal to be relieved of its service as an east-west through connector road, as this portion of Harrison Street has neither the geometry to support existing or future volumes nor a compatible adjacent land use character. As no shoulder would be provided on the Harrison Street connector road as part of the design, the width of the roadway would be minimized. Hydrology would be maintained between the bisected sections of the floodplain by cleaning the existing culvert under Harrison Street just east of the canal and construction of a new culvert under the relocated portion of Harrison Street.

Several alternatives considered in the development of the proposed design would utilize existing Harrison Street as a through roadway or even upgrade a portion of the roadway. However, as approximately 1,250 linear feet of Harrison Street is currently located in the floodplain, a substantial volume of fill to alter the roadway profile and geometry would be required in the floodplain. This action would be unjustified in light of other alternatives considered, including the proposed design.

Design of the proposed improvements described above is in accordance with the NJDEP Flood Hazard Control Rules (N.J.A.C. 7:13) and the D&R Canal Commission (DRCC) regulations (N.J.A.C. 7:45). A Stream Encroachment Permit and DRCC approval would be required for the project. Under NJDEP regulations, the proposed crossings cannot increase water surface elevations by more than 0.2 foot, which is more stringent than the FHWA allowance of 1 foot of elevation increase. The total impact to floodplains is not expected to exceed the 20 percent net fill requirement as promulgated under N.J.A.C. 7: 13-2.14(a). Thus, the project would meet NJDEP Flood Hazard Area Control requirements as they relate to net fill. In addition, the project would be in accordance with the NJDEP requirement that the post-construction rate of runoff is limited to 75 percent of the pre-development rate for the 10 and 100-year storms and to 50 percent of the pre-development rate for the 2-year storm. Post-construction outflow to the Millstone River and Little Bear Brook would decrease for the 2, 10, and 100-year storms through the use of detention basins and their associated outlet control structures. Three basins are proposed to be located in the vicinity (in-field areas) of the proposed interchange. As such, construction of the proposed project would not result in increased flood elevations up or downstream of the project. The new roadway surfaces would be above the 100-year flood elevation for their entire length, with the exception of the proposed Harrison Street improvements due to the need to meet existing grades.

Route U.S. 1 is not a sole evacuation route for the area, and the project would maintain traffic. As described previously, the project does not constitute longitudinal floodplain encroachment. As the project would be designed in compliance with NJDEP Stream Encroachment regulations, it is anticipated that the project would involve no significant risks to life or property as defined by FHWA regulations. Nor would there be substantial adverse impacts on natural or beneficial floodplain values. Furthermore, the proposed creation of wetland mitigation along the Millstone River would restore some of those values. Therefore, the proposed action does not constitute a significant encroachment as defined in the Federal-Aid Policy Guide 23 CFR 650, Subpart A. The project is in compliance with Executive Order 11988, Floodplains.

No-Build Alternative

Since the No-Build Alternative would only involve in-kind replacement of the Millstone River bridge, there would be no impact to existing floodplains in the vicinity of the project area.

4.4.3 Mitigation

Various forms of mitigation would be implemented to maintain the function and quality of the affected waterways and floodplains during construction of proposed improvements. These recommended measures include the following:

- C Bridges would be designed and constructed so that the natural stream bed is maintained and not replaced by an artificial floor.
- C Bridges would be designed with the capacity to pass the flood hazard area design flood, which is the 100-year flood plus 25 percent.
- C All culverts would be designed to allow for the passage of fish during periods of low flow, if such passage exists before the encroachment occurs.
- C If practicable, construction within streams and floodplains would be conducted during the anticipated low-flow period of July-August. This would reduce the volume of water available to erode stream bed soils, thus minimizing sediment transport downstream.
- C Once construction of an outfall to a waterway is complete, disturbed areas would be stabilized and re-vegetated.
- C Construction materials would not be stockpiled in floodplain or wetland areas.

4.5 Water Quality

4.5.1 Existing Conditions

Surface Water Bodies

The project area is defined on the northern and western borders by open water systems located within the 271 square mile drainage basin of the Millstone River (NJDEP, 1993b). The Millstone River forms the northern border of the project area. Little Bear Brook, a tributary of the Millstone, bisects the eastern portion of the project area in the vicinity of Manor Avenue. The western border of the project area is defined by the D&R Canal. A summary description of each waterway is presented in Table 4-7.

Both the Millstone River and Little Bear Brook are classified as Freshwater Class 2, Non-Trout Waters (FW2-NT) by the New Jersey Department of Environmental Protection, Surface Water Quality Standards (NJDEP, 1994a). FW2-NT waters have the following designated uses as defined in the New Jersey Surface Water Quality Standards:

- C Maintenance, migration and propagation of the natural and established biota;
- C Primary and secondary contact recreation;
- C Industrial and agricultural water supply;
- C Public potable water supply after such treatment as required by law or regulation; and,
- C Any other reasonable uses.

**TABLE 4-7
WATERWAY CHARACTERISTICS**

DESCRIPTION	DELAWARE & RARITAN CANAL	LITTLE BEAR BROOK	BIG BEAR BROOK	MILLSTONE RIVER
SUBSTRATE	No Data	Sand / Muck ^c	Gravel / Sand ^c	Clay ^d
CONFIGURATION	Straight ^b	Meandering ^c	Meandering ^c	Meandering ^c
WIDTH	75 feet ^a	17.5 feet ^c	27.6 feet ^c	46 feet ^d
DEPTH	8.0 feet ^a	1.5 feet ^c	2.17 feet ^c	7.5 feet ^d
AVERAGE VELOCITY	No Data	2.3 feet/sec ^b	0.5 feet/sec ^b	1.3 feet/sec ^b

Sources: ^a D&R Canal Commission, ^b FEMA (1983), ^c Harris field investigation (1995), ^d NJDOT (1985)

According to the NJDEP (1994a), non-trout waters are *"fresh waters that have not been designated as trout production or trout maintenance. Non-trout waters are generally not suitable for trout because of their physical, chemical, or biological characteristics, but are suitable for a wide variety of other fish species"*.

Discharges Affecting Water Bodies

Stormwater from impervious surfaces in the project area either infiltrates or is discharged to the Millstone River and its tributaries. Existing drainage systems along Route U.S. 1 between Washington Road and the Millstone River bridge currently discharge to the Millstone River.

According to the NJDEP Bureau of Permit Management, two permits have been issued during the past five years and two applications have been received for review for discharges within or adjacent to the project area. A review of the State Water Quality Inventory Report (1993) revealed an additional two permitted dischargers within the project area. All discharges to surface and groundwater are required to be in compliance with the specifications of the New Jersey Pollutant Discharge Elimination System (NJPDES) program.

Elizabethtown Water Supply Company confirmed that no potable water intakes are located within or adjacent to the project area. All potable water for Princeton and West Windsor Townships is derived from the Jefferson Park well, which is located outside of the project area. Further, the West Windsor Planning Board verified that no water resource developments are planned for the project area including channelization, reservoirs, potable water intakes or sewage outfalls (West Windsor Planning Board, 1995). West Windsor Township does not maintain any storm water, sanitary or industrial sewer outfalls within or adjacent to the project area. According to the Stony Brook Sewerage and Treatment Authority, all sanitary sewer outfalls are located well north of the project area (Stony Brook Sewerage and Treatment Authority, 1995).

Surface Water Quality Data

Data was obtained from the NJDEP (1995c) and Bauersfeld (1995) for waterways surrounding the project area. This data, in conjunction with other information, was used to estimate the current water quality conditions for the project area. Existing water quality data from three sampling stations, Grovers Mill, Princeton and Kingston, were compared to the Surface Water Quality Standards for FW2-NT water bodies. The three sampling stations, are located both upstream and downstream of the project area. Although none of the sampling stations are within or adjacent to the project area, these three stations are located in proximity.

Each of the sampling stations has average fecal coliform counts higher than the Maximum Contaminant Level (MCL) set by the state. High fecal coliform counts may be a consequence of the location of the sampling station in relation to a wastewater treatment plant, increased wildlife use of the waterways (e.g., migratory or resident waterfowl), or a variety of other reasons. No seasonal effect regarding increased coliform counts could be determined as fecal coliform counts exceed the MCL during both summer and fall months. No other parameters in the data set appear to exceed recommended MCLs.

4.5.2 Impacts

Build Alternative

The proposed roadway section throughout most of the project (Relocated Route 571, Harrison Street Connector Road, and Harrison Street) would be uncurbed, so as to allow stormwater runoff to flow overland to vegetated ditches constructed alongside and parallel to the roadways. The vegetative cover would consist of a grass or other suitable herbaceous material. Swales would provide for velocities of 1 to 2 feet per second based on a 10-year storm event. The vegetated ditches would ultimately discharge to the Millstone River. Figure 4-5 shows the typical Umbrella® type roadway section proposed. Within the proposed grade-separated interchange at Route U.S. 1, curbed roadway sections would be provided along with stormwater inlets. Collected runoff from this area would be discharged to three proposed stormwater detention basins to be located within the interchange ramp system (Figure 1-2). Stormwater would be discharged from these basins to the Millstone River.

The proposed detention basins and vegetated swales would provide a combination of project runoff quantity control as well as water quality control. In terms of quantity, project stormwater would be diverted to the basins and swales that would collect and control project runoff rates so as not to cause erosion or inundate receiving waters. In terms of quality, these structures would encourage filtration and settling of waterborne sediments and contaminants prior to discharge to receiving waters.

The wetlands adjacent to the east side of the canal are flooded mostly by backwater from the Millstone River, and also collect runoff from the open fields east of the canal. This wetland area would collect runoff from the portion of Relocated Route 571 between the connector road and Washington Road. Examination of the flood data for this area indicates that the wetland is sufficiently large to adequately accommodate project runoff in addition to other runoff and flooding already being contributed. Construction of the new connector road would include provision to clean the existing culvert under Harrison Street that connects the wetland to the river.

Existing drainage along Route 1 from Washington Avenue to the Millstone River Bridge would be redirected to the proposed stormwater management system (proposed basins and/or drainage swales). The exception to this proposal would be the proposed inlets along Route U.S. 1 southbound from Ramp A- to the Millstone River which would discharge directly into the river. The existing inlet system along Route U.S. 1 from Washington Avenue to the southern project limits would be replaced, and the new inlet system would be tied into the new infield detention system.

As roadway construction would include alterations to the Millstone River bridge and the placement of a structure for the crossing of Little Bear Brook, the potential for adverse water quality impacts to these

two water bodies has been assessed. Impacts to the Millstone River and Little Bear Brook may originate from three distinct activities associated with the construction of the proposed roadway:

- C Bridge and Roadway Construction - soil erosion and stream sedimentation.
- C Vehicular Traffic - deposition of vehicular related pollutants on highway surfaces.
- C Application of Deicing Material - deposition of salts and sands on highway surfaces.

Roadway-associated pollutant loading was estimated using the *Predictive Procedure for Determining Pollutant Characteristics of Highway Runoff - Constituents of Highway Runoff* (Kobriger, 1981) and the Toler Analysis for estimating chlorides (Toler, 1973).

Under the *Predictive Procedure*, the annual concentrations of 17 constituents were estimated for the Preferred Alternative. The results of this analysis, summarized in Table 4-8, indicate no exceedances of the state water quality standards. One parameter, iron, was shown to exceed the state drinking water standard in the existing water quality sampling. This is likely the result, in part, of a naturally occurring high iron content in the surrounding environment. As this is a drinking water standard, it is included only as a point of reference.

The concentration of chlorides was estimated using the Toler analysis. An increase of 0.06 mg/L of chloride per year is anticipated to result from construction of the proposed roadway. This increase refers to the amount of additional chloride that would be present in roadway-associated runoff. When compared to existing Millstone River data, the additional amount of chloride is minimal. Review of data from three stations in proximity to the project area, revealed an average range of 21-29 mg/L chloride in the Millstone River and its tributaries. If the level of chloride were increased due to runoff from the proposed project, the concentration of chloride would remain well below the 250 mg/L standard for FW2-NT surface waters. This is true even in the worst case scenario requiring several salt applications per storm event.

**Table 4-8
Summary of Pollutant Loading Analysis Results**

Parameter	State Standards FW2-NT	Existing Millstone River Concentrations (mg/l)(a)	Total Build Concentrations (mg/l)(b)
Suspended Solids (SS)	40 mg/l	14.12	32.43
Total Volatile Solids (TVS)	--	96.60	104.73
Chemical Oxygen Demand (COD)	--	43.75	49.86
Total Nitrate (TN)	10 (d)	1.93	1.97
Total Phosphorus (TP ₀₄)	--	0.17	0.24
Chloride (Cl)	250 mg/l	26.32	27.69
Lead (Pb)	0.05 mg/l	0.01	0.04
Zinc (Zn)	5 mg/l (d)	0.04	0.06
Iron (Fe)	0.3 mg/l (e)	0.92	1.49
Copper (Cu)	1 mg/l (d)	0.02	0.03
Cadmium (Cd)	0.01 mg/l	0.01	0.01
Chromium (Cr)	0.05 mg/l	0.01	0.01
Mercury (Hg)	0.002 mg/l	0.001	0.001

(a) Mean of Water Quality Data (Harris, 1996c).

(b) Ambient and project concentrations.

(d) EPA domestic water supply criteria.

(e) EPA drinking water criteria.

The pollutant loading and Toler analyses do not account for the pollutant settling and filtration benefits of the project stormwater management system in the Build alternative. It is expected that the proposed detention basins and vegetated swales would assist in the removal of pollutants from runoff prior to surface water discharge. Thus, the constituent concentrations discharged to the river would likely be less than these calculations predict.

As with the existing constituent contribution, once in the river the project contribution would be substantially diluted in the river volume, and further diluted when the Millstone discharges to the Raritan River. Under normal stream flows, the Millstone River passes beneath the D&R Canal via an aqueduct and the two water bodies do not mix. However, during 10-year and greater storms, river flood waters overtop the aqueduct and mix with the D&R Canal. Such flooding provides some flushing of the local sections of the canal. In the mixing of river and canal water, some exchange of waterborne pollutants in both waterways would be expected. Typically, the so called "water quality@storms" (1-year and 2-year types) carry the heaviest concentration of waterborne pollutants from runoff. Storms 10-year and greater carry lower pavement pollutant concentrations because the volume of runoff is

greater. Thus, the types of storms carrying the highest pollutant concentrations would not generate sufficient runoff to cause the river to flood and over-top the aqueduct. By the same token, the 10-year and greater storms that would mix river and canal waters would contribute a much smaller concentration of pollutant constituents.

No-Build Alternative

Since the No-Build Alternative would only involve in-kind replacement of the Millstone River bridge, there would be no increase in impervious surfaces, and therefore no increase in pollutants generated from such surfaces. It should be noted that the Build alternative would incorporate drainage from the portion of Route U.S. 1 near Harrison Street into the proposed stormwater management system at the interchange. Presently, and under the No-Build alternative, runoff from this portion of Route U.S. 1 would discharge to the Millstone River without treatment or detention.

4.5.3 Mitigation

Sediment

Grading of the existing landscape would be necessary for the construction of the proposed roadway. In accordance with the *Soil Erosion and Sediment Control Standards* (NJDOT, 1989), a soil erosion and sediment control plan would be developed for the proposed roadway project and implemented during construction to insure the protection of exposed soils, adjacent properties, and downstream areas.

Construction Materials

Water pollution control measures would be enforced during the construction of the proposed roadway and interchange so that construction material spills are minimized. Specifically, construction material would not be stockpiled in or near adjacent streams or wetlands. If materials require stockpiling for significant durations, they would be covered with an impermeable liner to eliminate runoff and leachate during precipitation.

Road Salts

The introduction of road salts into receiving waters is an impact that warrants further discussion regarding mitigation. In accordance with the *Stormwater and Non-Point Source Pollution Control: Best Management Practices Manual* (NJDEP, 1994b), the following is a list of appropriate mitigation measures that may be implemented to minimize the impact of road salts in stormwater runoff:

- C The application practices for deicing materials would vary depending upon storm characteristics, roadway conditions, type and availability of equipment, and managing agency policy. Salt is not spread uniformly. Road intersections, hills, low points, and areas with poor drainage would receive the most attention. Abrasives such as sand and gravel would be used for traction. These substances can be added to sodium chloride, calcium chloride, or a mixture of the two, to promote melting.
- C Plowed snow, treated with sodium chloride, has the potential to contaminate groundwater. Heavily salted snow would not be disposed of in areas around public supply wells or in areas of recharge. Snow would not be dumped directly into surface waters.
- C Consideration would be given to using a combination of products for winter roadway maintenance. Urea, an environmentally sensitive material synthesized from ammonia and carbon dioxide, is best applied early in the season (prior to mid-February) and sodium chloride

or calcium chloride later in the season. Early application of urea fixes nitrogen in the soil as ammonium with release occurring in the warmer spring temperatures for plant growth. A combination of deicing materials would aid in the prevention of overloading the soil and subsequent contamination of water while providing the public with safe roadways.

Fertilizers/Herbicides

Fertilizers would be used only initially for the establishment of new vegetation. Continual use of fertilizers or use of herbicides are not standard NJDOT practice, and would not occur as an element of the proposed project.

4.6 Aquatic Ecology

4.6.1 Existing Conditions

Macroinvertebrate Study

A study was conducted in 1985 by the NJDOT to determine the species diversity and water quality of the Millstone River. The study indicated that molluscs, in particular gastropods (univalve snails), were the most abundant macroinvertebrate group collected in the Millstone River, comprising 52% of all invertebrates collected. *Helisoma trivolvus* comprised 29.5% of the sample; *Gyraulus* spp., constituted 22.6% of the total.

Gyraulus spp. are pollution tolerant and able to live in septic systems. Dipteran larva, represented by mosquitos, *Culex* spp., and midges, *Chironomus* spp., comprised 26% of the total catch. *Chironomus* are present in almost all aquatic habitats. These organisms are considered one of the most important groups of all aquatic insects due to their abundance and use as an aquatic food source (Wetzel, 1983). The oligochaete, *Limnodrilus hoffmeisteri*, comprised 20% of the species collected. This species is widely distributed in poorly oxygenated and polluted waters. A Shannon-Wiener Diversity Index value of 1.62 was reported for this study, suggesting a moderately stressed population. However, the percentage of pollution tolerant gastropods and other pollution tolerant species suggests poor or declining water quality.

Freshwater Fisheries Studies

A stream bioassessment was conducted by the EPA in 1993 for the Millstone River. This assessment revealed that the quality of water upstream from the project area was fair and the water quality downstream was fair to good. Fish communities at both locations had low benthic insectivore richness and insectivorous cyprinid abundances. Reduction in species "richness" or diversity suggests that water quality is declining due to pollution. More specifically, decreases in insectivore/insectivorous species suggests that an appropriate food source depletion has led to a loss of species richness.

A diverse fish community is depicted for both stations within this report. A total of seventeen (17) fish and seven (7) different fish species were documented for Station 1 (downstream). For Station 2 (upstream), 114 fish and twelve (12) fish species were documented. The documented species represent both pollution tolerant and pollution intolerant fish. The diversity of the fish species indicates at least fair water quality. However, the pollution tolerant species greatly outnumbered the intolerant species. This may be suggestive of declining water quality.

In addition to the EPA fisheries study, a report by the NJDEP (conducted in 1982) was also reviewed to estimate the existing water quality conditions in the Millstone River. Pollution tolerant and pollution intolerant species were identified at each of four stations, all located downstream of the project area.

Similar to the EPA study previously described, the number of pollution intolerant species is smaller than the number of pollution tolerant species.

4.6.2 Impacts

Build Alternative

Impacts to water bodies in the project area are anticipated to be short-term and minimal. Activities within the floodplain, such as bridge and roadway construction, would temporarily disturb the vegetation and soils consequent to earthmoving, grading, and the placement of structures. The area of disturbance would be limited to within the proposed right-of-way to minimize disruption of the floodplains. Tasks such as refueling would be located away from floodplains and waterways to minimize the potential for contamination by chemical and oil/gasoline spills.

The project would involve construction of a new bridge over Little Bear Brook and replacement of the existing Millstone River bridge with a slightly wider bridge. Construction activities associated with these structures may temporarily increase erosion and turbidity in the waterways, though soil erosion control measures would be implemented to minimize the potential for such occurrences.

The new bridges would shade the portion of the waterways over which they pass. The proposed crossing of Little Bear Brook would cause the shading of approximately 1120 square feet of waterway. The Millstone River bridge alterations would result in the shading of approximately 5,727 square feet of waterway, in total. The replacement bridge would be wider than the existing bridge and would be supported by one pier rather than two piers, as is the case with the existing bridge. The replacement bridge would increase the area of waterway shading by 1,587 square feet. Plant species that are not shade tolerant would eventually die. However, they would be replaced by shade tolerant plant species and other organisms that prefer cooler habitats. With respect to the aquatic ecology, shading would result in the loss of associated primary productivity under structures. However, adverse impacts to aquatic biota are expected to be minimal as mitigation measures would be implemented during and post-construction.

As described in Section 4.5.2, roadway construction within the project area would cause an increase in local runoff. A slight increase in the amount of roadway associated pollutants reaching adjacent water bodies is also anticipated. However, this amount is expected to be minimal as most runoff would be directed to stormwater management systems and would not result in any long-term adverse impacts. Adverse impacts to the aquatic ecology of the project area have been minimized and cannot be avoided while still meeting the project goals.

No-Build Alternative

Since the No-Build Alternative would only involve in-kind replacement of the Millstone River bridge, there would be no long-term impact to aquatic resources of the Delaware and Raritan Canal, Little Bear Brook, Big Bear Brook or the Millstone River.

4.6.3 Mitigation

Impacts to the aquatic ecosystem from the construction and operation of the proposed project would be reduced by employing various mitigation measures as follows:

- C Minimization of the area disturbed by construction activity.
- C Implementation of a soil erosion and sediment control plan.
- C Proper design of proposed bridges to maintain stream velocities.
- C Re-vegetation of stream banks.

Subsequent to roadway and bridge construction, plant and animal species would re-establish, as the project would preserve a suitable bottom substrate and maintain similar water flow regimes. Shading from roadway structures may cause a change in the ecology of the stream bank and bottom communities; however, these changes should be site specific and minimal.

4.7 Vegetation and Wildlife

4.7.1 Existing Conditions

The majority of the project area is devoted to human use. More specifically, the project area is divided among horticulture (sod, nursery), landscaped lawns, office/research complexes, commercial and residential uses. The project area also contains undeveloped areas consisting of forested upland, forested wetland or other types of wetlands. The existing land cover of the project area is illustrated on Figure 4-6.

Vegetation

Forest

Forested areas border most of the project area except south, along Washington Road. The forested zones differ in acreage and composition.

A disturbed section of forest exists along the D & R Canal. This area is currently being used for the stockpiling of compost and building materials. The continued movement of large machinery for this purpose prevents re-growth of ground cover. Most of this area is bare soil; however, the area is surrounded by forest containing various oak species (*Quercus spp.*), black cherry (*Prunus serotina*), red maple (*Acer rubrum*), box elder maple (*Acer negundo*), multiflora rose (*Rosa multiflora*), climbing bittersweet (*Celastrus scandens*), and pokeweed (*Phytolacca americana*).

Two other disturbed areas exist to the north of the David Sarnoff Research Center and to the east of the Center, near the Amtrak Northeast Corridor. It appears that these areas were disturbed years ago and have since been re-vegetated and are maintained, as evidenced by extensive grassways and the presence of exotic plant species.

The area east of the David Sarnoff Research Center, near the Amtrak Northeast Corridor consists of maintained grassways and rows of various tree species. The dominant species in the section of the project area are white pine (*Pinus strobus*), eastern hemlock (*Tsuga canadensis*), quaking aspen

(*Populus tremuloides*) and various species of oak (*Quercus spp.*). The forested areas closer to Little Bear Brook contain ground cover consisting of royal fern (*Osmunda regalis*), dogbane (*Apocynum spp.*), arrow arum (*Peltandra virginica*), common reed (*Phragmites communis*) and soft rush (*Juncus effusus*).

The following species characterize the portion of disturbed forest situated north of the David Sarnoff Research Center and along the floodplain of the Millstone River: Russian olive (*Elaeagnus angustifolia*), black locust (*Robinia pseudoacacia*), quaking aspen (*Populus tremuloides*), river birch (*Betula nigra*), sycamore (*Platanus occidentalis*), box elder maple, sweetgum (*Liquidambar styraciflua*), flowering dogwood (*Cornus florida*), mulberry (*Morus spp.*), red oak (*Quercus rubra*) and pin oak (*Quercus palustris*), blackgum (*Nyssa sylvatica*), black birch (*Betula lenta*), white ash (*Fraxinus americana*), black cherry and sassafras (*Sassafras albidum*). Shrubs are not abundant in this area as much of the area is mowed and maintained. Those shrub species present include tartarian honeysuckle (*Lonicera tartarica*), privet (*Ligustrum spp.*), spicebush (*Lindera benzoin*), multiflora rose, cat-brier, Virginia knotweed (*Tovara virginiana*) and raspberry (*Rubus spp.*). Ground cover consists of common mugwort (*Artemisia vulgaris*), foxtail (*Alopecurus spp.*), burdock (*Articum spp.*), asters, grasses, onion (*Allium spp.*), goldenrods, common plantain (*Plantago major*), pokeweed, evening primrose (*Oenothera biennis*), smartweed (*Polygonum hydropiper*) and others. Vine species found along the forest floor and extending up into existing trees include Japanese honeysuckle (*Lonicera japonica*), Virginia creeper (*Parthenocissus quinquefolia*) and fox grape (*Vitis labrusca*) and are relatively abundant throughout this area.

Other Areas

The remaining upland habitat within the project area consists of developed land, landscaped lawns and a moderate amount of acreage used for horticultural purposes. Developed and landscaped properties have a mix of native and ornamental plant species predominantly consisting of trees and shrubs. Horticultural areas consist of a mix of agricultural fields, athletic fields of grass, and nursery lands containing various trees and shrubs in cultivation.

Wildlife

The project area is a composite of horticultural and athletic fields, forested wetlands, forested uplands, residential and office development. Edge, open field, upland forest and forested wetland habitat types are available for use by wildlife within and adjacent to the project area. Collectively, these habitat types are capable of supporting complex and diverse wildlife communities. In particular, edges act as transition zones between fields and forests, supporting high densities of wildlife. Based solely upon diversity of vegetation, the majority of the project area consists of wildlife habitat of moderate value.

Wildlife diversity was assessed based on review of published literature and the quality of habitat present within the project area. This assessment was conducted to determine those species that would most likely occupy those habitats at the geographical locale of the project area. Field observations of wildlife species were used to support this assessment of wildlife diversity within the project area.

Mammals

Upland Forest

Mammals likely to utilize the upland forest habitat include white-tailed deer (*Odocoileus virginianus*), raccoon (*Procyon lotor*), gray squirrel (*Sciurus carolinensis*), eastern chipmunk (*Tamias striatus*), opossum (*Didelphis virginiana*), woodchuck (*Marmota monax*), red fox (*Vulpes fulva*), gray fox (*Urocyon*

cinereoargenteus), striped skunk (*Mephitis mephitis*), longtail weasel (*Mustela frenata*), deer mouse (*Peromyscus maniculatus*) and big brown bat (*Eptesicus fuscus*). Sightings during field investigations included white-tailed deer, gray squirrel, eastern chipmunk, and woodchuck.

Agricultural Fields

Agricultural areas are likely to harbor mammals such as eastern cottontail (*Sylvilagus floridanus*), red fox, woodchuck, coyote (*Canis latrans*) as well as a variety of small rodents. Mammals observed during field investigations were red fox (*Vulpes fulva*) and woodchuck (*Marmota monax*).

Athletic Fields

Mammals likely to utilize athletic fields include the eastern cottontail, red fox, woodchuck, eastern mole (*Scalopus aquaticus*) and various mice, rats, shrews and voles.

Forested Wetland

Forested wetlands provide habitat for mammals such as white-tailed deer, raccoon, opossum, red fox, gray fox, striped skunk, longtail weasel, deer mouse, big brown bat, little brown bat (*Myotis lucifugus*), gray squirrel, coyote, star-nose mole (*Condylura cristata*), and various mice, rats, shrews and voles. Mammals observed in the forested wetland during field investigations were white-tailed deer.

Birds

Upland Forest

Avian species expected to utilize the upland forest habitat are the red-tailed hawk (*Buteo jamaicensis*), sharp-shinned hawk (*Accipiter striatus*), great horned owl (*Bubo virginianus*), screech owl (*Otus asio*), rufous-sided towhee (*Pipilo erythrophthalmus*), blue jay (*Cyanocitta cristata*), northern cardinal (*Cardinalis cardinalis*), downy woodpecker (*Picoides pubescens*), hairy woodpecker (*Picoides villosus*), common flicker (*Colaptes auratus*), tufted titmouse (*Parus bicolor*), ovenbird (*Seiurus aurocapillus*), woodthrush (*Hylocichla mustelina*), gray catbird (*Dumetella carolinensis*), northern oriole (*Icterus galbula*), tanagers (*Piranga spp.*), warblers (*Dendroica spp.*), sparrows, northern junco (*Junco hyemalis*), and mourning dove (*Zenaidura macroura*). The majority of these species were observed during site visits.

Agricultural Fields

Avian species that feed on insects and seeds are likely to forage in the agricultural field habitat. Birds sighted include American crow (*Corvus brachyrhynchos*), common grackle (*Quiscalus quiscula*), brown-headed cowbird (*Molothrus ater*), European starling (*Sturnus vulgaris*), killdeer (*Charadrius vociferus*), eastern meadowlark (*Sturnella magna*), red-winged blackbird (*Agelaius phoeniceus*), mourning dove, American robin (*Turdus migratorius*), northern mockingbird (*Mimus polyglottis*), and song sparrow (*Melospiza melodia*). A red-tailed hawk and turkey vulture (*Cathartes aura*) were seen flying over the agricultural fields during the field visits while song sparrows, meadowlarks, starlings, and blackbirds were seen foraging in the agricultural fields. Numerous species of warblers, sparrows and finches as well as Canada geese (*Branta canadensis*) may use this area during migration to and from their wintering habitat.

Athletic Fields

Avian species likely to utilize the athletic field habitat include eastern kingbird (*Tyrannus tyrannus*), American crow, common grackle, European starling, northern mockingbird, killdeer, Canada geese, and barn swallow (*Hirundo rustica*). Numerous species of warblers, sparrows and finches may use this area during migration to and from their wintering habitat. Eastern kingbirds were observed in the athletic fields during various field investigations.

Forested Wetland

Avian species likely to be found using the forested wetland habitat are red-bellied woodpecker (*Melanerpes carolinus*), common flicker, mallard (*Anas platyrhynchos*), wood duck (*Aix sponsa*), green heron (*Butorides striatus*), wild turkey (*Meleagris gallopavo*), mourning dove, flycatchers (*Empidonax spp.*), veery (*Catharus fuscescens*), warblers, and sparrows. Bird species observed in the forested wetland habitat during various field investigations were red-bellied woodpecker, common flicker, common grackle, gray catbird, and northern cardinal.

Reptiles/Amphibians

Upland Forest

Reptiles commonly found in the upland forest habitat are various snakes such as hognose snake (*Heterodon platyrhinos*), eastern garter snake (*Thamnophis sirtalis*), milk snake (*Lampropeltis triangulum*), racer (*Coluber constrictor*), and the eastern ribbon snake (*Thamnophis sauritus*). Possible turtles inhabiting these areas include eastern box turtle (*Terrapene carolina*). Amphibians likely to be found in this habitat include various salamanders.

Agricultural and Athletic Fields

Reptile species which may be found in the agricultural field habitat are various snakes such as hognose snake, eastern garter snake, and the eastern ribbon snake. Amphibians likely to be found in this habitat include various salamanders, and the Woodhouse's toad (*Bufo woodhousei*).

Forested Wetland

Reptile species commonly found in the forested wetland habitat include eastern box turtle, northern water snake (*Nerodia sipedon*), northern brown snake (*Storeria dekayi*). Amphibians include the spring peeper (*Hyla crucifer*), bullfrog (*Rana catesbeiana*) and the northern leopard frog (*Rana pipiens*). The painted turtle (*Chrysemys picta*), slider (*Chrysemys scripta*), and snapping turtle (*Chelydra serpentina*) are other reptiles likely to be found near water. A painted turtle was basking on an emerged rock in Little Bear Brook during one of the field visits.

Threatened and Endangered Species

The Federal government, through the U.S. Fish and Wildlife Service (USFWS), and the State, through the NJDEP Natural Heritage Program, publish lists of threatened and endangered plant and animal species. These sources provide information regarding the potential existence of any threatened and/or endangered species in or around the project area.

Mammals

No mammals classified as endangered or threatened by the NJDEP or the USFWS are known to occur within the project area. Likewise, there are no rare mammals listed by the Natural Heritage Program as occurring in Mercer County.

Birds

According to the USFWS (1995), "except for an occasional transient bald eagle (Haliaeetus leucocephalus) or peregrine falcon (Falco peregrinus), no other federally-listed or proposed threatened or endangered flora or fauna under Service jurisdiction are known to occur within the vicinity of the proposed project site." In addition, the Natural Heritage Program of the NJDEP does not list any rare birds for the proposed project area.

It should be noted, that a report of a cliff swallow (*Hirundo pyrrhonota*) sighting in the vicinity of the Route U.S. 1 crossing of the Millstone River has been investigated, as this bird is listed as a rare species in Mercer County. However, no verification of this sighting was available according to the NJDEP Division of Fish, Game and Wildlife (NJDEP, 1995d). Additionally, during several site visits, no signs of this bird were observed.

Invertebrates

According to the USFWS no threatened or endangered species of invertebrate are known to occur in the vicinity of the proposed project area. The Natural Heritage Database of the NJDEP suggests that no rare invertebrates have been recorded recently for the project area although, two sightings were documented for 1909 and 1919, respectively.

The Natural Heritage Database revealed a report of a sighting of the green floater (*Lasmigona subviridis*), tidewater mucket (*Leptodea ochracea*) and eastern pondmussel (*Ligumia nasuta*) in the vicinity of the D&R Canal, Princeton in 1909. The other report, documented by Clarke (1985), suggests that the green floater was present in the D&R Canal in 1919. All three of the aforementioned organisms are freshwater mussels. Only the green floater has the federal status listing as a species "of special concern." Very little additional information could be found regarding any of the three freshwater mussel species.

Plants

The USFWS and the NJDEP Natural Heritage Program do not have any records of threatened or endangered species of plants in the vicinity of the proposed project area.

4.7.2 Impacts

Vegetation

Build Alternative

The primary impact to the vegetative community within and adjacent to the project area would be removal and disturbance during construction of the proposed roadway. The preferred alternative would impact a total of approximately 58 acres of upland vegetation. Generally, a loss of vegetation represents a loss of wildlife habitat and soil stability. The long-term impact of vegetation removal is expected to be minimal since the disturbed areas would be re-vegetated both artificially as well as naturally. The landscaping plan will use native species where possible, as well as improved cultivars where hardiness and improved habit are particularly important. It is NJDOT's intention to avoid the use of invasive plant species as part of this project.

The area disturbed by roadway construction would be minimized to the greatest extent possible. Consequently, adjacent vegetation would remain undisturbed. No loss of species or changes in successional stages in the project area is anticipated as a result of this roadway improvement project. The existing vegetation does not appear to be experiencing detrimental effects from salt application on the existing roadway, air pollution, or other roadway associated pollutants. Although, construction of the proposed roadway would cause slight increases in the amounts of these materials within the project area (see Section 4.5.2), impacts to the remaining vegetative communities are expected to be minimal. These impacts have been minimized and cannot be avoided while still meeting the project goals.

No-Build Alternative

Since the No-Build Alternative would only involve in-kind replacement of the Millstone River bridge, there would be no impact to existing vegetation in the project area.

Wildlife

Build Alternative

Impacts to wildlife resulting from roadway construction would involve the reduction in the amount and quality of habitat within the project right-of-way. Areas functioning as wildlife habitat would be paved or disturbed during grading operations and subsequently seeded. Proposed roadway improvements would result in the introduction of traffic noise and other disturbances associated with roadway use. A negative change in the quality or quantity of habitat could be manifested by reductions in wildlife diversity, population sizes, reproduction success and changes in behavior.

Construction of the proposed roadway improvements would result in the displacement of wildlife to undisturbed areas. The proposed roadway may affect the population composition of wildlife species in the area adjacent to the roadway. Several birds including the red-eyed vireo, towhee, tufted titmouse, woodthrush, scarlet tanager, and most woodpeckers require forested areas for nesting and feeding and would not inhabit the right-of-way, but would relocate to nearby woodland. Upon completion of the roadway, certain wildlife species may acclimate to newly created roadside habitat. This habitat would consist of grasses, low bush vegetative communities, and trees that would be planted within the right-of-way after construction. This type of habitat would be suitable for birds as well as small mammals and may compensate for a portion of lost habitat.

The right-of-way may provide suitable wildlife habitats for various wildlife species. Many birds typically utilize these areas for feeding, perching sites, display and mating areas, and nesting. The pavement

and shoulders are used for dust bathing and delousing as well as a source of grit. Rabbits and many other small mammals frequent rights-of-way and utilize the roadside cover for nesting and burrowing. Vegetation within the right-of-way provides nourishment for many mammalian herbivores, including white-tailed deer and rabbits. The salts used for deicing during the winter may also attract deer to the edge of the roadway. Carnivores and birds of prey utilize the areas adjacent to the roadway for hunting grounds. Scavengers, such as crows and vultures, often feed on road kills found in this area.

Operation and maintenance of the proposed roadway would also impact wildlife through increased mortality (i.e., vehicle/animal collisions) and increased ingestion of roadway-associated pollutants. Wildlife mortality is particularly high when the road interferes with the natural movements between different habitat types. White-tailed deer commonly utilize roadside edges as feeding and resting sites. This activity leads to increased mortality due to motor vehicle collisions. Typically, deer mortality due to motor vehicle collisions is lower in areas where fields and cultivated crops adjacent to the roadway are abundant. In such areas, the draw to the right-of-way is not as strong since feeding areas exist outside of the right-of-way. The proposed roadway design does not utilize land that is heavily populated by deer. As such, additional losses to vehicle collisions are expected to be minimal.

Wildlife ingest deicing chemicals and other pollutants from such sources as the air, soil, surface water bodies, snow, vegetation, and prey. It has been found that wildlife populations that utilize the right-of-way for food and cover have greater concentrations of vehicular related pollutants in their systems than do wildlife populations that do not utilize such areas for food and cover. Deicing chemicals have been found to be poisonous to animals; however, due to difficulties in quantifying mortality resulting from ingestion of these chemicals, the extent to which this occurs is not attainable. Pesticides used to maintain rights-of-way and vehicular related contaminants can also be ingested by animals, posing additional health hazards.

No-Build Alternative

Since the No-Build Alternative would only involve in-kind replacement of the Millstone River bridge, there would be no impact to wildlife resources within the project area.

Threatened and Endangered Species

Build Alternative

According to the USFWS, no threatened, endangered or candidate species are documented for the project area. In addition, the Natural Heritage Database of the NJDEP has no recent records of rare, threatened and endangered species within project site.

The possible sighting of a cliff swallow (*Hirundo pyrrhonota*), a rare species in Mercer County, led to further investigation with the Division of Fish, Game and Wildlife. The Division suggested that time restrictions be placed on the disturbance of the existing bridge if any cliff swallows are sighted during their nesting season (April through June). According to the Division, construction of the proposed replacement bridge should not be constrained by the existence of cliff swallows, but should not disturb nesting sites if nests are present. To date, various field visits have revealed no cliff swallow nests.

No-Build Alternative

Since the No-Build Alternative would only involve in-kind replacement of the Millstone River bridge, and there are no documented endangered or threatened species in the area, no impact would occur.

4.7.3 Mitigation

Impacts to vegetation and wildlife have been minimized to the greatest extent possible and cannot be avoided while still meeting the project goals.

Vegetation

To minimize impacts to vegetation within the project area, the following measures would be implemented:

- C Minimize the area disturbed by construction activities.
- C Establish and implement a soil erosion and sedimentation control plan.
- C Incorporate appropriate landscaping practices to stabilize slopes, prevent erosion and indirectly provide wildlife habitats.

Wildlife

Mitigation of impacts that affect wildlife include both minimizing habitat disturbance and restoring/enhancing areas that have been disturbed. Mitigation of direct impacts to wildlife focuses on reducing vehicle-wildlife collisions. For example, appropriate signing should be posted in areas where deer traffic is evident to caution motorists.

Plant species preferred by deer would not be selected for seeding or planting along the right-of-way. Species that are known to be desirable to deer would be avoided.

The wildlife and habitat of the project area are typical of suburban environments to the east and west of Route U.S. 1. Wildlife presently found within the project area have already adapted to the impacts resulting from dust, noise, habitat disturbance, lighting, disturbance of runs, turbidity and sedimentation associated with Route U.S. 1, County Route 571, other area roadways, and adjacent development. However, the proposed project would allow for these same impacts to infiltrate a portion of the undisturbed habitat located east of the David Sarnoff Research Center and the property west of Route U.S. 1, owned by Princeton University. Except for the few animals unavoidably killed by construction activities and equipment, the major impact to wildlife would be displacement. During construction of the proposed roadway, wildlife populations and habitat would be reduced. These populations would be forced to relocate to adjacent areas that contain similar and suitable habitat to support such species. When construction ceases, some species may eventually re-establish themselves in re-vegetated areas. Overall populations would be reduced in both size and number compared to that which originally existed. However, some species such as songbirds and small rodents may increase in number due to preference for the proposed habitat modifications.

4.8 Socioeconomics and Land Use

Socioeconomic and land use data were collected and compared against data from previous years and data forecasts to determine local and regional trends for socioeconomic and land use parameters. This information was then assessed with regard to potential impacts consequent to the proposed improvements. Two study areas were designated for analytical purposes. The Primary Study Area (PSA) includes those areas within West Windsor Township and Plainsboro Township that would be directly impacted by the proposed improvements. The Secondary Study Area (SSA) includes the remainder of West Windsor and Plainsboro Townships, Princeton Township and Princeton Borough, which would be indirectly impacted by the proposed improvements. This section presents a summary of findings while a more detailed analysis was compiled in a report entitled, *Socioeconomic and Land Use Technical Environmental Study, Route U.S. 1/Penns Neck Area Improvements* (Harris, 1996e).

4.8.1 Existing Conditions

Existing zoning within the PSA and SSA comprises three primary categories: residential, non-residential, and undeveloped land. Within the residential zones are high-density and low-density single-family and multi-family housing. Within the non-residential zones are research/office/manufacturing zones, business zones, industrial zones, and structures such as public buildings, schools, churches and utilities. Figure 4-7 shows current zoning within the PSA of West Windsor and Figure 4-8 shows current land uses.

The majority of residential housing in the PSA is characterized by low-density, single-family units which are clustered into two areas, the Penns Neck community along Washington Road and the Harrison Street/Logan Drive area between Route U.S. 1 and the D&R Canal. Research/office/manufacturing zones and uses surround the Penns Neck community and make up much of the remainder of land use east of Route U.S. 1. Princeton University is a major landholder within the PSA, owning the majority of property located west of Route U.S. 1. A second educational facility is the Eden Institute for Autistic Children located on Route U.S. 1 at Logan Drive adjacent to the PSE&G substation. Eden will soon relocate to new facilities being constructed on the south side of Harrison Street. The Penns Neck Baptist Church and cemetery are located on northbound Route U.S. 1 adjacent to the Penns Neck Circle. Other land uses in the PSA include athletic fields, an historic cemetery known as the Penns Neck Cemetery, horticulture, residences, properties leased to businesses along Route U.S. 1, Washington Road, and Harrison Street. These businesses include restaurants, service stations, child day care, horticulture centers, and real estate offices, among others.

The D&R Canal State Park forms the western border of the PSA between Harrison Street and the Dinky rail line. As described in Section 2.1.1, the 0.70 mile extent of the Park within the project area is part of a greater than 60 mile linear recreational corridor and waterway. The Park serves four primary purposes: a human recreational resource, an historical resource, a naturalized corridor, and a potable water supply in the form of a manmade canal. The Park is managed by the State of New Jersey, under an entity known as the Delaware & Raritan Canal Commission who is responsible for the protection of the Park and its contributing watershed.

Two railroad lines traverse the PSA. The NJ Transit Princeton Line (Dinky/Princeton Line) bisects the PSA in an east-west direction and provides service between Princeton University and the Amtrak/Northeast Corridor Railroad Line at Princeton Junction Railroad Station located in the eastern portion of the PSA. The Amtrak/Northeast Corridor provides north-south service to New York City and is a major commuter route. Extensive parking facilities are located on both sides of the track in the eastern portion of the PSA.

PSE&G operates a power substation located south of Harrison Street on Route U.S. 1 adjacent to the Princeton Operating Station building and provides electric service within the PSA. PSE&G has decommissioned the northern portion of this substation. Bell Atlantic New Jersey has offices on Washington Road within the PSA. Potable water in the PSA is provided by the Elizabethtown Water Company, and sewerage is provided by the Stony Brook Sewerage and Water Authority.

The properties of Princeton University and the David Sarnoff Research Center are primarily undeveloped and represent the largest undeveloped sites within the PSA. The Princeton University properties located west of Route U.S. 1 are used for horticultural purposes and as athletic fields. The campus of the David Sarnoff Research Center includes large areas of maintained lawns, ballfields, and landscaped areas. The remaining undeveloped areas, which lie along the Millstone River and Little Bear Brook corridors, are primarily wetland, disturbed forest, and greenbelt areas (as designated by the West Windsor Planning Board) and are zoned Research/Office/Manufacturing and Low-Density Residential.

West Windsor and surrounding municipalities have experienced substantial population growth and economic development over recent decades. The primary effect of this growth has been the increase in traffic volume on roadways within the PSA, particularly Route U.S. 1, Washington Road (County Route 571), and Harrison Street (Harris, 1993a). The proposed Route U.S. 1/Penns Neck Area Improvements are designed to respond to existing roadway requirements as well as anticipated long-term demand.

4.8.2 Impacts

Build Alternative

Route U.S. 1 widening in the project area would require the acquisition of additional right-of-way on the east and west sides of Route U.S. 1. Right-of-way acquisition would displace three service stations, the Eden Institute, and four residences. Construction of Relocated Route 571 and the interchange would require the acquisition of primarily undeveloped land from Princeton University and the David Sarnoff Research Center. The total ROW acquisition is 50.44 acres. Approximately 14.31 acres would be acquired from Princeton University, 30.96 from David Sarnoff, and 5.17 acres from other landholders. Table 4-9 summarizes right-of-way required to implement the project.

Harrison Street would be terminated at Route U.S. 1 with a cul-de-sac, eliminating the existing Route U.S. 1/Harrison Street intersection. This improvement, along with the elimination of through traffic from Washington Road east of Route U.S. 1, would significantly reduce the volume of through traffic on the portion of Harrison Street between Route U.S. 1 and the canal, and on Washington Road, thereby creating substantially quieter communities.

Access to Washington Road from Relocated Route 571 would be provided by new ramps near the Amtrak bridge, while access to Harrison Street would be provided from Relocated Route 571 via the proposed connector road.

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table 4-9, p. 2 of 2

Impacts to Community Facilities and Services

Community facilities were identified using local maps and queries to municipal officials, and field verification. The following types of community facilities were identified: educational, religious, recreational, commercial, public services (i.e., police, fire, rescue squads), and health care facilities.

The West Windsor Township Police Department, located in the Township Municipal Building at the intersection of Clarksville and North Post Roads, has an average maximum emergency response time of three to five minutes. During peak traffic periods, however, response times can increase significantly due to the traffic congestion which occurs along Route U.S. 1, Washington Road, and Harrison Street during these peak periods. Likewise, the township volunteer fire departments (the Princeton Junction Volunteer Fire Company located on Alexander Road and the West Windsor Volunteer Fire Company on south Mill Road) and a volunteer rescue squad (Twin "W" First Aid Squad located on Everett Drive), experience peak period delays in their response times. The proposed Penns Neck Area Improvements are expected to improve peak period emergency response times by improving the flow of traffic along these corridors. Accessibility to the nearest hospital, Princeton Medical Center, is expected to be improved by the project.

The proposed improvements would affect some businesses either temporarily during construction or permanently. In some cases, business relocation would be required due to acquisition of right-of-way. In other cases, some businesses would suffer from impaired access, changes in traffic patterns or proximity to the proposed improvements.

Businesses expected to experience impacts due to the proposed action include:

- C Pits Gulf - Displacement
- C Larry's Sunoco - Displacement
- C Princeton Circle Exxon Station - Displacement
- C David Sarnoff Research Center - Partial property acquisition
- C Princeton University - Partial property acquisition
- C Bowers & Sons Maintenance - Partial property acquisition
- C Century 21 Carnegie Realty - Change in access
- C Princeton Getty - Change in access
- C Eden Institute - displacement
- C Furniture Store - Displacement

Of these, property acquisition for right-of-way purposes would displace Princeton Circle Exxon, Pits Gulf, Larry's Sunoco, and Eden Institute. Princeton Circle Exxon and Pits Gulf are located on lands owned by Princeton University. These properties would have to be vacated by Princeton University and lessees prior to acquisition by NJDOT.

A portion of the David Sarnoff Research Center property would be acquired for construction of Relocated Route 571 and the interchange. The resulting loss of undeveloped land would not have an adverse impact on Sarnoff's existing operations. Access to and from Route U.S. 1 would be maintained by connection of the northern access driveway to Relocated Route 571.

Loop ramp construction near Amtrak would require partial property acquisition from Bowers & Sons Maintenance (Block 13, Lot 14).

The proposed modification of the existing Route U.S. 1/Washington Road intersection into a T-intersection permitting only right-turn movements to and from northbound Route U.S. 1 would deny Century 21 Carnegie Realty and Princeton Getty direct access from southbound Route U.S. 1. Motorists traveling south on Route U.S. 1 would be required to make a U-turn at the Route U.S.

1/Alexander Road intersection to access these businesses. According to the real estate office owner, drive-in customers represent approximately 35 to 45 percent of the firm's business with the majority of these customers coming from southbound Route U.S. 1. Convenient access is important in attracting these customers. As a consequence, it appears probable that the denial of access from southbound Route U.S. 1 may result in some loss of business.

Project implementation is not anticipated to have any land use impacts to the D&R Canal Park. No land acquisition of Park property is required that would have a deleterious impact on the four primary Park objectives: recreation, historic preservation, natural resource preservation, and water supply. As described in Section 2.1.1, the project intends to have a beneficial impact with respect to Park access and safety. Specifically, sight distance for park users and motorists at Harrison Street would be improved by straightening the existing roadway curvature. In addition, the project would provide for relocation of the existing Park parking area at Harrison Street to a new, nearby location having improved sight distance. To a similar benefit, the project includes relocation of the Park parking area located adjacent to Washington Road to Princeton University land.

Residential Impacts

The project would acquire four residential properties on the west side of Route U.S. 1 to implement the interchange and highway widening portions of the project. The properties are all owned by Princeton University and are used as housing for graduate students and faculty. Relocation assistance for displaced residents would be provided by the NJDOT as discussed in Section 4.8.3 below.

Agricultural Impacts

No part of the proposed project area is zoned as agricultural nor is any portion currently farmed. As such, no farmland impacts would result from roadway construction in the project area.

Tax Revenue Impacts

The proposed Route U.S. 1/Penns Neck Area Improvements would have a minor effect on the fiscal situation of West Windsor and Plainsboro Townships. West Windsor Township would lose revenues generated by property taxes on approximately 50.44 acres by the proposed project. Plainsboro Township would lose revenues on approximately 0.30 acres.

The property tax base would be reduced by between approximately \$3,000,000 and \$5,300,000. Some properties that are presently exempt from taxation and some existing property values may change as a result of roadway construction. Tax revenue loss for this analysis is based on the percentage of property expected to be acquired for ROW according to the NJDOT Right-of-Way Study. The figures presented here represent approximate values based on static taxation values, rates, and categories, and are not for representation of exact tax losses. Additionally, amounts presented here are preliminary and may change with refinement of roadway design. The estimated total revenue losses would be approximately \$99,000 due to the proposed action. West Windsor presently has a tax base of approximately \$52,000,000, thus the percentage of revenue loss would be approximately 0.20% due to the proposed action.

Secondary Growth Impacts

The proposed project would have no substantive effect on the pace of future development, and is unlikely to induce additional growth. Despite traffic congestion in the Route U.S. 1 corridor, recent and current development in the region is on-going without development of the proposed project. Consequently, the nature of traffic operations in the corridor is neither an inducement nor an inhibitor of regional development. Relocated Route 571 would be located primarily on properties owned by Princeton University and Sarnoff Research Center. The University proposes campus expansion in the project area irrespective of the roadway improvements. Sarnoff has no plans to expand their facilities or alter their land holding status. Neither stakeholder has plans to sell any portion of their holdings in the project area for development by others. Consequently, no development along Relocated Route 571 is expected to occur as a result of the project. Thus, the improvement of traffic operations is not anticipated to substantially affect future growth and development.

This on-going regional growth trend is acknowledged in the State Development and Redevelopment Plan (SDRP), the Mercer County Growth Management Plan, the West Windsor Township Master Plan, the Plainsboro Township Master Plan, and the Princeton Community Master Plan. Each of these planning documents contains goals and policies that focus on the need to enhance and coordinate the regional road system to accommodate transportation demand safely and efficiently. To these ends, the proposed project would be consistent with the regional plans as the project objectives to improve mobility on Route U.S. 1 in the project area would be achieved while maintaining and facilitating east-west access routes. By reducing delays and congestion, travel times on these corridors would be expected to improve. Thus, accessibility between home, work, school, shopping, and other destinations in the Primary Study Area and Secondary Study Area would be enhanced.

No-Build Alternative

The No-Build Alternative would be both beneficial and an impediment with respect to socioeconomic impacts, in comparison to the Build Alternative. The No-Build Alternative would not require ROW acquisition of 50.44 acres, or associated displacement of businesses and residences.

The Build Alternative calls for elimination of the existing Harrison Street/U.S. Route 1 intersection and termination of Harrison Street with a cul-de-sac, thus significantly reducing the volume of traffic on Harrison Street between Route U.S. 1 and the canal, and on Washington Road east of Route U.S. 1. Substantially quieter communities, in terms of reduced traffic volume and noise, would result from the Build Alternative. The No-Build Alternative would maintain the existing roadway network, and thus, this quality of life benefit would not be realized by the Harrison Street and Washington Road communities.

The No-Build Alternative would not result in the of loss of tax revenues generated by the 50.44 acres of land to be acquired under the Build Alternative. This equates to approximately \$99,000 of tax revenue that would be preserved under the No-Build Alternative.

The No-Build alternative would result in no sight distance or geometrical improvements to the Washington Road or Harrison Street approaches to the D&R Canal Park.

Although the potential for secondary growth impacts is low for the Build Alternative, there would be no potential for secondary growth under the No-Build Alternative.

4.8.3 Mitigation

Displacement and relocation of residences and businesses would be an unavoidable adverse impact of the proposed action. The proposed action would require the relocation and/or compensation of four commercial enterprises and four residences. In total, approximately nine buildings would be taken under the proposed action (NJDOT, 1996). The NJDOT, Bureau of Property and Relocation, provides the following services under the Relocation Assistance Program:

- 1) Assistance in finding replacement houses and business locations;
- 2) Moving expense reimbursement;
- 3) Allowance to businesses in lieu of moving reimbursement;
- 4) Business re-establishment expenses;
- 5) Payment of replacement housing supplements, mortgage interest rate differentials and closing costs on new homes;
- 6) Payment of rent supplements;
- 7) Down payment alternates and closing costs on new home (when applicable);
- 8) Last resort housing, if needed; and,
- 9) Provision of related supporting services and assistance from the following:

Veterans Administration
Regional Office
20 Washington Place
Newark, NJ 07102

Federal Housing Authority
Raymond Plaza
Newark, NJ 07102

NJ Mortgage Finance Agency
1180 Raymond Boulevard
Newark, NJ 07102

4.9 Environmental Justice

Executive Order No. 12898 entitled *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* provides that federal agencies shall ensure achievement of environmental justice by identification and assessment of disproportionately high and adverse human health or environmental effects of its actions on minority and/or low-income populations. The Presidential Memorandum accompanying the Order emphasized that the Order was intended to promote non-discrimination in federal programs substantially affecting human health and the environment, and to provide minority and low-income communities access to public information on, and opportunity for public participation in, matters relating to human health and/or the environment.®

4.9.1 Existing Conditions

Socioeconomic evaluation of the project area in the *Socioeconomic and Land Use TES* identified no minority or low-income populations located within or comprising the communities affected by the proposed project (Harris, 1996e).

4.9.2 Impacts

Build Alternative

As the project area contains no minority or low-income populations, the proposed project will not result in disproportionate adverse impacts to minority or low-income populations.

As part of the proposed project, the NJDOT has provided many opportunities for public participation throughout all stages of project development, including community access to project information (Section 7.0). The NJDOT's public outreach program began in the late 1980's by holding informal meetings with local officials and members of the community to discuss preliminary development of the project. In 1994, the NJDOT began presenting potential alignment schemes to local officials and community members. This led to the development of the preferred alternative.

Preliminary design was begun in September 1995 and throughout remaining 1995 and 1996 through 1999, numerous meetings were held between the NJDOT, Mercer County, municipalities, regulatory agencies, and community members to present preliminary design of the preferred alternative, receive comments on the project by all those concerned, and subsequently modify the design to address concerns and achieve project goals. A Public Information Center (PIC) was held on September 10, 1996. A complete chronology of community involvement is presented in Section 7.0 of this EA/4(f). Additional opportunity for public comment will be provided via the public hearing which will be scheduled upon circulation of the EA/4(f).

No-Build Alternative

Since the No-Build Alternative would only involve in-kind replacement of the Millstone River bridge, and there are no minority or low income populations meeting Executive Order No. 12898 criteria in the project area, there would be no disproportionate impacts to these populations.

4.9.3 Mitigation

As the project will involve no environmental justice issues, no mitigation measures are warranted.

4.10 Cultural Resources

Several historical and archaeological investigations have been undertaken in the Area of Potential Effect (APE), the results of which form the basis for this section of the EA/4(f):

- ! *Technical Environmental Study, Historic Architecture, Route U.S. 1/Penns Neck Interchange, West Windsor Township* (John Milner Associates (JMA), 1986)
- ! *Supplemental Architectural Resources Investigation, Route U.S. 1/Penns Neck Interchange, West Windsor, Mercer County and Plainsboro Township, Middlesex County, New Jersey* (JMA, 1996a)
- ! *Determination of Eligibility, Washington Road Elms, West Windsor Township, Mercer County, New Jersey* (JMA, 1997a)
- ! *NJDEP Historic Preservation Office (HPO) Individual Structure Survey Form, RCA Laboratories* (JMA, 1997b)
- ! *NJDEP HPO Individual Structure Survey Form, Princeton Operating Station* (JMA, 1997c)

- ! *NJDEP HPO Individual Structure Survey Form, Covenhoven-Silvers-Logan House (JMA, 1997d)*
- ! *Phase I/II Archaeological Survey of the U.S. Route 1 Corridor, Penn's Neck, Mercer County, New Jersey (Greenhouse Consultants (GC), 1988)*
- ! *Supplemental Phase I Archaeological Survey and Phase II Archaeological Evaluations of Three Sites, Route U.S. 1/Penns Neck Interchange, West Windsor, Mercer County and Plainsboro Township, Middlesex County, New Jersey (JMA, 1996b)*
- ! *Noise and Visual Impact Assessment Technical Memorandum for Delaware and Raritan Canal and Lake Carnegie Historic Districts, Route U.S. 1/Penns Neck Improvements (Harris, 1999).*

4.10.1 Existing Conditions

The scope of cultural resources investigations for this project was defined by delineation of an area of potential effects (APE). According to the implementing regulations of the National Historic Preservation Act (36 CFR 800.16), an APE is the geographic area or areas within which an undertaking may cause changes in the character or use of historic properties, if any such properties exist. The process of defining the APE for the project involved including all areas encompassed by the NJDOT alternatives (Section 3.0). As defined and shown in Figure 4-9, the APE encompasses lands on both sides of Route U.S. 1 from a point just north of the Dinky bridge to the Mapleton Road intersection. To the west, the APE boundary extends down the south side of Washington Road to the D&R Canal Park, north along the Park to the Millstone River, and then east along the Millstone River to Route U.S. 1. East of Route U.S. 1, the APE boundary generally follows the Millstone River to the Amtrak right-of-way, then south along the Amtrak right-of-way to the south side of Washington Road. From that point the APE boundary turns west, crossing to the north side of Washington Road at Little Bear Brook. The boundary follows Little Bear Brook northward, turning left at Fisher Place and following Fisher Place west to Route U.S. 1. At the Route U.S. 1/Washington Road intersection, the APE encompasses properties on either side of Washington Road for several hundred feet east of the intersection (JMA, 1996).

Within the APE, land use includes all of Route U.S. 1 in the project area, most businesses and residences on either side of Route U.S. 1 in the project area, all of Princeton University's land holdings north of Washington Road and west of Route U.S. 1, the D&R Canal Park, residences and businesses along Harrison Street and Logan Drive, a large portion of the Sarnoff Research Center property, some residences and businesses along Washington Road, and some residences on Fisher Place.

The National Register nomination criteria for determining property eligibility (36 CFR Part 63) were utilized in the evaluation of properties within the APE. The criteria specify, The quality of significance in American history, architecture, archaeology, and culture is present in areas, sites, buildings, structures and objects that possess integrity of location, design, setting, materials, workmanship, feeling and association, and:

- A) that are associated with events that have made a significant contribution to the broad patterns of our history; or
 - B) that are associated with the lives of persons significant in our past; or
 - C) that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
 - D) that have yielded, or may be likely to yield, information important in pre-history or history.
- Properties within the APE listed on the National Register of Historic Places are shown in Figure 4-9 and include:

Penns Neck Baptist Church (National Register (NR) listed 12/28/98) - The Penns Neck Baptist Church listing includes the meeting house, the adjacent tavern/parsonage, and the churchyard containing a cemetery. The significant characteristics of the church that form the basis for National Register eligibility are the intact assemblage of components and the retention of exterior and interior detailing in the meeting house and parsonage.

Delaware and Raritan Canal Historic District (NR listed 5/11/75) - The D&R Canal Historic District characteristics that form the basis of its National Register eligibility are the intact prism, associated berm and towpath, associated structures, and locks.

Lake Carnegie Historic District (NR listed 6/28/90) - The significant characteristics of the Lake Carnegie Historic District that form the basis of its National Register eligibility include the lake, its designed landscape, walkways, and bridges.

Properties within the APE determined eligible for National Register listing (shown in Figure 4-9), and the dates opinions on these resources were rendered by the State Historic Preservation Office follow:

Covenhoven-Silvers-Logan House (NR eligible 7/8/98) - Located at 31 Logan Drive, this house is one of the few standing Dutch farmhouses in West Windsor Township, a portion of which dates from the mid-eighteenth century.

Princeton Operating Station (AT&T Building)(NR eligible 7/8/98) - Located on Route U.S. 1 just north of Logan Drive, this building is a significant component associated with the development of the east coast long-distance telephone network in the early twentieth century. This building served as a repeater station for long-distance call traveling through New Jersey. Architecturally, the building is a rare surviving example of this type of station.

Aqueduct Mills Historic District (NR eligible 12/20/88 and 7/8/98) - Aqueduct Mills, known initially as Scudders Mills, is the site of a village settlement west of Route U.S. 1 on the north side of the Millstone River. Associated with a grist mill established in the 1730's, the character of Aqueduct Mills was transformed by the construction of Lake Carnegie in 1905. Today, four homes and associated structures remain which are the basis for recommendation as an historic district (JMA, 1996a). An extension of this District is located on the north side of Harrison Street. This area comprises five residential properties related to the nearby Aqueduct Mills Historic District.

Penns Neck Cemetery (NR eligible 3/10/97) - The Penns Neck Cemetery was recommended eligible for the National Register on the basis of the early burials, and their association with the early period of settlement in West Windsor Township.

Washington Road Elm Allee (NR eligible 3/10/97) - Consisting of a regularly spaced progression of mature elm trees lining Washington Road, the allee forms a scenic entranceway to Princeton Borough. The allee is determined eligible as a planned landscape characteristic of early twentieth century roadway beautification design.

Archaeological Site 28-Me-2 (NR eligible 9/13/76) - Site 28ME2 was determined through Phase I and II investigations to be a prehistoric site with an historic component. Prehistoric occupation was determined to span the Late Archaic through Early Woodland periods and the historic deposits date to a Nineteenth Century residence at the site (GC, 1988). The studies conducted indicate a good potential that prehistoric deposits extend into the undisturbed sediments underlying the plowzone. Thus, Site 28ME2 was recommended eligible for the National Register.

Archaeological Site 28-Me-23 (NR eligible 3/10/97) - Site 28ME23 was occupied during the Late Archaic and Late Woodland periods. The integrity of the archaeological deposits at this site appears to be good and culturally stratified.

Archaeological Site 28-Me-86 (NR eligible 9/9/76) - The integrity of this prehistoric archaeological site appears to be good based on studies in the 1970's.

Consultation comments from the SHPO on the matter of these properties is provided in Appendix D of this EA/4(f). Descriptions of these properties and the National Register criteria they have been determined to meet are described in more detail in the above-referenced documentation.

4.10.2 Impacts

Build Alternative

Consultation comments from the SHPO include an assessment of project effects according to 36 CFR 800.5. This assessment determined that the project would have no effect on the Penns Neck Baptist Church, the Penns Neck Cemetery, or the Lake Carnegie Historic District.

The assessment of effects determined that the project would have an adverse effect on the following resources for the reasons presented:

- C Delaware & Raritan Canal Historic District - The proposed project would substantially alter the physical and visual setting of the Canal (portion in the project area), and would introduce visual, atmospheric, and audible elements not currently or previously present.
- C Covenhoven-Silvers-Logan House - The proposed project would physically impact the resource.
- C Princeton Operating Station - The proposed project would physically impact the resource.
- C Aqueduct Mills Historic District and Extension - The proposed project would physically impact a resource in this District.
- C Washington Road Elm Allee - The proposed project would physically impact a portion of this resource.
- C Archaeological Sites 28-Me-2, 28-Me-23, and 28-Me-86 - The proposed project would physically impact these resources.

Examination of the Preferred Alternative and other Build alternatives determined that all Build alternatives would affect two or more historic resources in the project area. In the context of the project purpose, need, and supporting objectives, the Preferred Alternative would fulfill the project purpose and need as well as each of the project objectives (Section 3.0).

No-Build Alternative

Since the No-Build Alternative would only involve in-kind replacement of the Millstone River bridge, there would be no adverse effect on the six resources affected by the Build Alternative, or the others in the project area.

4.10.3 Mitigation

Mitigation for unavoidable impacts to cultural resources would be identified in a Memorandum of Agreement developed between the NJDOT, the FHWA, the SHPO, and the Advisory Council on Historic Preservation.

4.11 Aesthetics

4.11.1 Existing Conditions

Aesthetic resources within the project area include sites that are of importance to the visual character of the area concerned. Adverse impacts to visual resources should be evaluated from two perspectives: the appearance of the project from the surrounding areas, and the appearance of the surrounding areas from the project (FHWA, 1988). Primary issues include project encroachment on existing viewsheds, visual compatibility of project design with the surroundings, and views created by construction of the project, both from the structure and of the structure.

According to the FHWA (1988), three categories of viewsheds exist for consideration of such impacts: highly sensitive sites, moderately sensitive sites, and low sensitivity sites. Highly sensitive sites include locations such as bodies of water, meadows, lawns and landscaped areas, and unique natural or manmade features. Moderately sensitive sites include structures such as residences and religious sites, or areas that are partially blocked by vegetation, such as forests and hedgerows. Sites of low visual sensitivity include developed areas such as urban and industrial settings. Viewsheds of each sensitivity occur within the project area. The eastern edge of the project area abuts the Princeton Junction Railroad Station and adjacent parking lots and development; thus, it is definable as a low sensitivity site. Continuing westward, viewsheds are a combination of moderately and highly sensitive areas of open space interspersed with a variety of structures, manicured lawns and landscaping, horticulture, forests and bodies of water.

These viewsheds are mapped on Figure 4-10 as public and private viewsheds. Public resources are those that are accessible and of interest to the general public. The Millstone River is an important public visual resource that is flanked by wide lawn areas on the east side of Route U.S. 1. The front lawn of the Sarnoff property east of Route U.S. 1 and the fields owned by Princeton University to the west of Route U.S. 1 reveal attractive open spaces that are visually accessible to the public from Route U.S. 1. Along County Route 571 west of Route U.S. 1, the rows of mature elms are a significant visual resource accessible to the public, as are the fields maintained by the University beyond the elms. The existing mature pine grove located on the Sarnoff property adjacent to the State Route 64 bridge over the Amtrak railroad near the eastern border of the project area is a visually sensitive site, and the Penns Neck Baptist Church is a visually important structure along the Route U.S. 1 corridor in Penns Neck. Accessible from public viewsheds, the Princeton Operating Station building is visible from Route U.S. 1, Princeton University property, and nearby residences.

The D&R Canal Park serves as an important visual resource along the western perimeter of the project area. As a recreational area and historic resource, aesthetic considerations including the visual context of Park elements, and the visual experience by users within the Park are important. When purchased by the State, much of the contextual fabric of the Park was retained (buildings, water structures, canal and towpath). Despite, the fact that the D&R Canal Park traverses a range of rural to urban contexts on its more than 60 mile route, the association of Park elements is readily identifiable. Because of the diverse land use context through which the Park passes, the user experience differs depending on location. In the project area, the Park is relatively remote from the highly developed context of the surrounding municipalities. Bordered by undeveloped University land to the east and Carnegie Lake to the west, the user has a temporary experience of visual separation from the familiar built environment.

There are a number of important visual sites that are currently privately accessible. Within the Sarnoff property, the main entrance driveway at Fisher Place features a mature oak alley and large maintained lawn areas. Open lawn sites border the Sarnoff building cluster to the north and east. Much of the Millstone River on the Sarnoff property east of Route U.S. 1 is currently a private viewshed. The Princeton University property west of Route U.S. 1 provides viewsheds from the private access roads within the athletic field areas and from the backyards of properties along the south side of Harrison Street.

4.11.2 Impacts

Build Alternative

Potential impacts to these viewsheds may fall into three categories as outlined by the DOT: 1) generally not significant, 2) possibly significant, and 3) generally significant. Impacts considered generally not significant include those with no physical changes to the area or those with project design that blends into the surroundings. Possibly significant impacts result from those structures with differing character from surrounding developments, or those projects that encroach upon historic sites or sites that serve as focal points, such as city halls. Generally significant impacts are those where the character of the project differs greatly in scale from the surroundings, or projects that obstruct important scenic views.

Roadway improvements along the Route U.S. 1 corridor or modification to the alternative of an east-west corridor through the project area would have an impact on existing public and private visual resources. The project may have a positive impact on public access to existing visually sensitive sites that are not currently within the public viewsheds, such as the development of a corridor through the Sarnoff property that would reveal views of the internal lawn areas, woodland and the Millstone River. Conversely, roadway construction may change or obstruct scenic views that currently exist.

The proposed action would adversely impact existing views of the northern portion of the Sarnoff property to the north, along the Millstone River. As well, Relocated Route 571 would be located near an area occupied by Sarnoff's maintenance building. The Sarnoff lawns along Route U.S. 1 would be bisected by Relocated Route 571.

The D&R Canal Park would experience no direct impacts that would alter the aesthetic elements of the Park. Viewsheds of the Park from Washington Road and Harrison Street would be unchanged. The existing visual experience within the Park would be largely unchanged. The existing woodland edge on University property east of the Park was determined to be insufficiently dense in the vicinity of the Relocated Route 571/Connector Road intersection to completely obscure views from the Park. At this point, the intersection would be located 450 feet from the Park. A small portion of the new roadway may be visible, particularly in winter when the trees are without leaves.

The proposed improvements would alter the visual appearance of a portion of the Washington Road Elm Allee. This impact is unavoidable, given Objective No. 2 of the project purpose and need, which states that the existing traffic distribution patterns are to be maintained. As described in Section 3.0, eliminating a Washington Road connection west of Route U.S. 1 would result in the disproportionate allocation of the traffic burden on Alexander Road and/or Harrison Street. Such a burden would affect residences on these roads as well as the D&R Canal Park and Historic District. In view of these concerns, and the goal of meeting all project Objectives, impact to the allee was determined to be unavoidable.

Access to existing sensitive visual resources would increase as a result of Relocated Route 571 as the new road would open up currently private viewsheds of the manicured lawns and forested areas of the

Sarnoff property by travelers on Relocated Route 571. Undeveloped Princeton property west of Route U.S. 1 would also be opened to the public as a visual resource. The proposed action would not negatively impact the oaks at the entrance to the Sarnoff Center or the Penns Neck Baptist Church.

No-Build Alternative

Under the No-Build Alternative, the existing viewsheds impacted by the Build Alternative would be maintained. In addition, access to currently private views of the manicured lawns and forest on the Sarnoff property that would be provided from proposed Relocated Route 571 under the Build Alternative, would not be revealed under the No-Build Alternative.

4.11.3 Mitigation

A number of mitigation measures have been developed for the proposed project area. As scenic views may be obstructed by the proposed project, the roadway has been designed to preserve, to the greatest extent possible, the integrity of existing sensitive visual resources. Such resources include the oaks and lawns at the formal entrance to Sarnoff, the Sarnoff lawns visible from Route U.S. 1, the Penns Neck Baptist Church and Cemetery, lawn areas owned by Princeton University, and the D&R Canal.

The impact to the Washington Road Elm Allee will be mitigated in accordance with strategies agreed upon between the FHWA, the NJDOT, the SHPO, and the Advisory Council on Historic Preservation as part of an MOA for cultural resources impacts (Section 4.10.3).

Additionally, visual buffering may be provided for the areas adjacent to the Sarnoff maintenance buildings. The division of the lawn by the proposed project may be abated by landscaping, thus preserving the natural character of the area. Further, vegetative screening of remaining residences along Harrison Street may be provided to mitigate visual impacts of Relocated Route 571. The portion of Relocated Route 571 that may be seen during winter months from the D&R Canal Park may also be mitigated by vegetative screening. The NJDOT is negotiating with the University and Sarnoff to use areas outside the proposed right-of-way for additional landscape treatments. During development of the design plans, the NJDOT Bureau of Landscape Architecture would evaluate for implementation, the recommended mitigation plantings.

4.12 Hazardous Waste Screening

4.12.1 Existing Conditions

A hazardous waste screening of the project area was conducted to identify known and suspected sources of hazardous waste and to determine their potential impacts on the proposed action. The results of this screening effort, presented in a report entitled, *Hazardous Waste Technical Environmental Study* (Harris, 1996b), were obtained through the conduct of the following tasks:

- C Industrial Site Recovery Act (ISRA) investigation through review of Standard Industrial Codes (SIC);
- C Project area history review;
- C Project area field investigation for the presence of hazardous waste sites and related concerns;
- C Review of available federal, state, and local documents;
- C Agency coordination through contacts with state and local government agencies.

Five areas of potential hazardous waste concern were identified within the project area which may impact the preferred alternative. These potential areas of concern are identified in Table 4-10.

4.12.2 Impacts

Build Alternative

The five areas of potential hazardous waste concern are located within or adjacent to the proposed right-of-way. Partial property taking is anticipated from the David Sarnoff Research Center property, while properties occupied by the Sunoco, Exxon and Gulf Service Stations, and the Princeton Operating Station would be entirely acquired.

Relocated Route 571 would traverse the northern portion of the David Sarnoff Research Center property where several potential hazardous waste concerns were identified. These concerns were a site of a former leaking underground storage tank (LUST) and associated groundwater monitoring wells; abandoned and active storage sheds; and a disturbed area, presumably a former laboratory dump site. Impacts from one or more of these identified concerns to Relocated Route 571 are likely. Actions associated with the LUST are currently a matter of discussion between the property owner

TABLE 4-10 Route U.S. 1/Penns Neck Area Improvements SUSPECTED AND KNOWN AREAS OF HAZARDOUS WASTE CONCERN		
Concern Site/ Area	Location	Potential Hazardous Waste Concern(s)
David Sarnoff Research Center (RCA Corp.)	201 Washington Road	Laboratory equipment dump site, subsurface contamination with petroleum hydrocarbons, and former low radioactive waste disposal site.
Sunoco Service Station (Larry's Car Care)	3771 Route U.S. 1	Subsurface contamination with petroleum hydrocarbons, due to leaking UST(s).
Exxon Service Station (a)	3713 Route U.S. 1	Subsurface contamination with petroleum hydrocarbons, due to leaking UST(s).
Gulf Service Station	3717 Route U.S. 1	Subsurface contamination with petroleum hydrocarbons, due to leaking UST(s).
Princeton Operating Station Building (a)	One Logan Drive	Presence of a UST.

Notes: (a) The Exxon Service Station property is leased to the current occupants by the Princeton University.

and the NJDEP. However, the current preferred alignment is not impacted by any potential residual soil contamination and is not likely to be impacted by the groundwater contamination from this area of concern. One or more groundwater monitoring wells, as well as the storage sheds, may need relocation as a result of the proposed construction.

For the disturbed area, a more detailed, Phase I Site Assessment (SA) was conducted to determine the presence or absence of contaminated materials in the suspected dump site area. The Phase I SA confirmed the site as a dump site (historic fill), discovered evidence of incinerated waste and broken laboratory glassware, among other non-sanitary solid waste type items, and confirmed the presence of metals contamination in excess of NJDEP Residential Soil Cleanup Criteria (RSCC). Therefore, a Remedial Investigation (RI) was conducted to determine the horizontal and vertical extent of the contamination and its potential for impacting the off-site environment. The RI concluded that lead, at hazardous waste levels, was associated with certain bands of incinerated material (ash) in the fill and that arsenic, at NJDEP RSCC levels, was widely present in the historic fill and also in apparently undisturbed, underlying native soils. Based on the RI, the NJDOT stated that within the proposed project ROW through the dump site, all fill material would be removed and properly disposed during project construction. Thus, all lead contamination and the part of the arsenic contamination in the fill within the proposed project limits would be remediated. Regarding the arsenic contamination in the underlying native soils, the RI report recommends that the groundwater be tested for arsenic (as well as lead) contamination for the purpose of determining if it is mobile. Future study or action, if needed, would be undertaken on the basis of the results of that planned sampling and analysis.

The Sunoco Service Station, located at the southwest corner of the Route U.S. 1 and Harrison Street intersection, the Exxon Service Station, located at the southwest corner of the Washington Road and Route U.S. 1 intersection, and the Gulf Service Station, located at the northwest corner of the Washington Road and Route U.S. 1 intersection, were identified as having subsurface petroleum hydrocarbons contamination. Groundwater monitoring wells were installed as a result. These properties would be entirely acquired prior to implementation of the proposed action. These three sites would undergo further study, through contact with the NJDEP - Bureau of Underground Storage Tanks and other Regulatory agencies, to determine the extent of existing contamination and degree of impact from these sites to the proposed improvements.

The proposed action would require a 100 percent acquisition of the Princeton Operating Station property. One potential hazardous waste concern, a UST containing No. 2 heating oil which exceeded its life expectancy in 1992, is currently in use at this property. As such, there is the potential for subsurface petroleum hydrocarbon contamination in the vicinity of this UST. The UST and any hazardous materials stored inside the building would need to be removed prior to any demolition work at this property. No further studies are recommended at the Princeton Operating Station property as the UST and any hazardous material such as asbestos inside the building would be handled during construction using standard specifications.

No-Build Alternative

Since the No-Build Alternative would only involve in-kind replacement of the Millstone River bridge, no impact to potential or known hazardous waste sites is expected to occur. Thus, no further study would be warranted.

4.12.3 Mitigation

Mitigation strategies would be developed as needed in response to the findings of planned Phase I SA investigations. Such strategies would be detailed when available.

4.13 Wetlands

4.13.1 Existing Conditions

Within the project area, the area of wetlands is estimated to be approximately 74.81 acres. Freshwater wetlands in the project area are regulated by Section 404 of the Clean Water Act administered by the United States Army Corps of Engineers (ACOE) and the State of New Jersey Freshwater Wetland Protection Act Rules (N.J.A.C. 7:7A, adopted May 16, 1988a) administered by the NJDEP. In 1993, the NJDEP assumed regulatory control over the Section 404 program in New Jersey although the ACOE retains program oversight.

Wetlands within the project area 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 project area, the routine method was utilized due to the undisturbed and natural condition of the wetlands. Figure 4-11 illustrates the extent of wetlands within the project area.

The Millstone River and Little Bear Brook support the majority of the forested wetlands within the project area. These watercourses flow through corridor forested areas that support broad-leaved deciduous (hardwood) wetlands, as well as more open areas of scrub-shrub vegetation and emergent species. The hardwood wetlands are dominated by red maple, black cherry, red oak, pin oak, sweetbay magnolia (*Magnolia virginiana*), green ash, sweetgum and black willow (*Salix nigra*). The shrub and herbaceous understory is somewhat open, yet frequently dense near the water's edge. Characteristic species include arrowwood, sweet pepperbush (*Clethra alnifolia*), skunk cabbage (*Symplocarpus foetidus*), sensitive fern (*Onoclea sensibilis*), jewelweed (*Impatiens capensis*), cat-brier (*Smilax hispida*), Virginia creeper, and multiflora rose. Scrub-shrub wetlands are characterized by sweet pepperbush, spicebush, arrowwood, silky dogwood (*Cornus amomum*), purple loosestrife (*Lythrum salicaria*), broad-leaved cattail, sensitive fern, young willows and red maples. Scrub-shrub wetlands are usually associated with waterway corridors and forested wetland areas. Within the project area, these wetlands are found adjacent to waterways and on sediment islands located in the river channel.

The New Jersey Freshwater Wetlands Protection Act (N.J.A.C. 7:7A) prohibits most types of development within wetlands. The NJDEP regulations promulgated under the Act require transition areas around wetlands in which development is also restricted. This added measure of protection is intended to reduce the potential for wetland impacts where activities would occur near, but not in wetlands. The NJDEP specifies a minimum of a 50-foot wide transition area for most wetlands. 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 the NJDEP to have exceptional resource value.

Wetland Area Descriptions

The wetlands identified within the project area were separated into four wetland areas, each representing a wetland system. However, more than one wetland type may be present within one wetland area. Each wetland area was evaluated for diversity, productivity, uniqueness and value. The four wetland areas are illustrated in Figure 4-11 and are classified using the NJDEP classification system.

! Description of Wetland Area 1

Adjacent to the western boundary of the project area (D&R Canal), are four wetland areas that are grouped as wetland area 1 (WA 1). WA 1 occupies approximately 11.02 acres. WA 1 is classified as PFO1B and PSS1B:

System: Palustrine
Class: Forested
Subclass: Broad-leaved deciduous
Water Regime: Non-tidal, saturated

System: Palustrine
Class: Scrub/shrub
Subclass: Broad-leaved deciduous
Water Regime: Non-tidal, saturated

Common vegetation includes such trees as the tree-of-heaven (*Ailanthus altissima*), American chestnut (*Castanea dentata*), red maple, silver maple (*Acer saccharinum*), Norway maple (*A. platanoides*), box elder maple, red oak, swamp white oak (*Quercus bicolor*), black cherry, American elm, black gum, green ash, white ash, sweetgum, white mulberry (*Morus alba*), princess-tree (*Paulownia tomentosa*), sassafras, black locust, Russian olive, pin oak and river birch (*Betula nigra*). Shrubs were abundant in many portions of WA 1. The species present include spicebush, arrowwood, sweet pepperbush, multiflora rose, cat-brier, elderberry (*Sambucus canadensis*), highbush blueberry (*Vaccinium corymbosum*) and winterberry (*Ilex verticillata*). Ground cover species include winterberry, goldenrods (*Solidago spp.*), panicum grass (*Panicum spp.*), Japanese honeysuckle, Virginia creeper, cinnamon fern (*Osmunda cinnamomea*), sensitive fern, poison ivy (*Toxicodendron radicans*), violets (*Viola spp.*), sedges (*Cyperus spp.*), false nettle, asters (*Aster spp.*), grasses, smartweed (*Polygonum spp.*), pale touch-me-not (*Impatiens pallida*) and others. The major source of water to wetland area 1 appears to be groundwater with precipitation and runoff from adjacent areas also contributing. This area is normally saturated and is occasionally inundated by several inches of water, particularly during wet weather.

The four wetlands of WA 1 are very similar in composition and rated as moderate in diversity and productivity. Each wetland contained a moderate number of plant species with relatively even distribution among the ground cover, herbaceous, scrub/shrub and canopy layers. Wildlife is limited in this area due to the proximity of these wetlands to the D&R Canal Park, Princeton athletic field and Harrison Street. Each of the wetlands is moderate in value based on their location and composition. The location of these wetlands allows them to act as sediment and toxicant retention basins as well as possible nutrient removal mechanisms. In addition, they provide habitat for wildlife. None of the wetlands are unique in type or species composition.

! Description of Wetland Area 2

Wetland area 2 (WA 2) is a 0.19 acre site located approximately 800 feet west of Route U.S. 1 and south of Harrison Street. The wetland appears to be a manmade pond. The pond is surrounded by a mound of spoils and is located on a piece of property that once was a residence. Although this wetland is depicted on NJDEP Freshwater Wetland maps as PSS1A, field delineations revealed an open water system:

System: Palustrine
Class: Open water - unknown bottom

The wetland is pond-like with steep banks and standing water. It is enclosed by a 20-foot wide band of mature hardwood trees. Vegetation existing on the banks of the pond included such trees as princess-

tree, white ash, tree-of-heaven, weeping willow (*Salix babylonica*), black cherry and box elder maple. Shrubs include Japanese barberry (*Berberis thunbergii*) and multiflora rose. Vegetation present in the herbaceous layer includes Japanese honeysuckle, poison ivy, violets, and fox grape. The only emergent vegetation associated with the pond was floating duckweed (*Lemna minor*).

Wetland area 2 is low in species diversity and productivity due to relatively recent disturbances. This ponded area appears to be man-made and no emergent vegetation exists. Vegetation is lacking on the steep banks and that which surrounds the edges of the pond consists of a 20-foot band of mature trees, which ultimately yields to cropland. Evidence of former structures further exemplifies the disturbance in this area. Wildlife is limited in this area due to its location. The pond is surrounded by active cropland. Some birds and small mammals may frequent this area; however, wildlife diversity is thought to be low. This wetland appears to be fed by groundwater, based on the fact that water was present after months of dry weather. This water retention may act as supply for the surrounding area; however, the size of the pond limits its capacity in this regard. The fact that there is no obvious inlet for surface run-off limits the capacity of this wetland to act as a sediment trap or a nutrient removal mechanism. Overall, the value of this wetland is low.

! Description of Wetland Area 3

Wetland Area 3 (WA3) is a 22.76 acre area located on both sides of Route U.S. 1. This wetland area includes the Millstone River and its associated marshlands. A mix of wetland types exists along this waterway. The various wetland types within wetland area 3 are classified as R2OW, POWH, PFO1C, PSS1B, PSS1C and PEM:

System: Riverine
Subsystem: Lower perennial
Class: Open water

System: Palustrine
Class: Open water
Water regime: Permanent

System: Palustrine
Class: Forested
Subclass: Broad-leaved deciduous
Water regime: Seasonal

System: Palustrine
Class: Scrub-shrub
Subclass: Broad-leaved deciduous
Water regime: Saturated/Seasonal

System: Palustrine
Class: Emergent

The entire area of wetland area 3 is a mixture of forested and scrub-shrub wetlands with some small pockets of emergent vegetation. The soils of wetland area 3 are permanently flooded due to their proximity to the existing open water system. The soils are clearly hydric.

The predominant vegetation type is scrub-shrub. Trees present include red maple, ashes, box elder, alder (*Alnus spp.*), pin oak, American elm and willow. Shrubs include silky dogwood and red-osier dogwood (*Cornus stolonifera*), swamp rose mallow, arrowwood, elderberry, tartarian honeysuckle and

buttonbush (*Cephalanthus occidentalis*). Other vegetation documented during field investigations include iris (*Iris spp.*), duckweed, arrow arum, waterlily (*Nymphaea spp.*), water smartweed, purple loosestrife, sensitive fern, royal fern (*Osmunda regalis*), sedges, sphagnum moss (*Sphagnum spp.*), tearthumbs (*Polygonum spp.*), cinnamon fern, cattail and ironweed (*Vernonia spp.*).

Wetland area 3 consists of a series of wetlands with no distinct boundaries between them. The difference in wetland type suggests that this wetland area is more diverse than others within the project area. In addition, the location of these wetlands provides a larger buffer zone from human activity than in other wetland areas of the project area. Each wetland contained a moderate number of plant species with relatively even distribution among the ground cover, herbaceous, scrub/shrub and canopy layers. Wildlife is more abundant in this area, again due to its relative seclusion. The fact that Route U.S. 1 divides this wetland area, lessens its relative value. Although parts of wetland area 3 may be higher in value than others, taken as a whole, wetland area 3 is of moderate value. The fact that these wetlands are located along the Millstone River allows them to act as sediment/toxicant traps as well as possible nutrient removal mechanisms. Floodflow alteration and shoreline stabilization are possible attributes of this wetland due to their location and composition. In addition, they may provide moderate wildlife and aquatic (shoreline) habitat. None of the wetlands are unique in type or species composition.

! Description of Wetland Area 4

Wetland area 4 (WA 4) includes Little Bear Brook and its associated forested, scrub/shrub and emergent wetlands. It comprises approximately 40.84 acres. WA 4 is classified as PFO1C and PSS1B:

System: Palustrine
Class: Forested
Subclass: Broad-leaved deciduous
Water regime: Seasonal

System: Palustrine
Class: Scrub/shrub
Subclass: Broad-leaved deciduous
Water regime: Seasonal

WA 4 is very similar in species composition to the PFO1C wetlands described above for WA 3. The location of these wetlands provides a larger buffer zone from human activity than in some other wetland areas of the project area. Each wetland contained a moderate number of plant species with relatively even distribution among the ground cover, herbaceous, scrub/shrub and canopy layers. Wildlife is more abundant in this area due to its relative seclusion. Although parts of WA 4 may be higher in value than others, taken as a whole, WA 4 is of moderate value. The fact that these wetlands are located along the Little Bear Brook allows them to act as sediment/toxicant traps as well as possible nutrient removal mechanisms. Floodflow alteration and shoreline stabilization are possible attributes of this wetland due to their location and composition. In addition, they may provide moderate wildlife and aquatic (shoreline) habitat. None of the wetlands are unique in type or species composition.

4.13.2 Impacts

Build Alternative

Wetland areas 1, 3 and 4 would be unavoidably impacted by construction of the proposed roadway. The project would impact approximately 0.53 acres of WA 1 due to construction of the Harrison Street connector road and Harrison Street realignment. Approximately 0.18 acres of WA 3 would be

impacted by widening Route U.S. 1 and replacement of the Millstone River bridge. Approximately 0.39 acres of WA 4 would be impacted by construction of the Little Bear Brook bridge. This represents approximately 5, 0.8 and 1 percent of the available wetland acreage of WAs 1, 3 and 4, respectively. These impact areas have been minimized and cannot be avoided while still meeting the project goals. The project is in compliance with Executive Order 11990, Wetlands.

Wetlands within the project area would remain extensive. Total impacts would require the taking of approximately 1.1 acres of the 74.81 acres of wetlands, or 1.4% of the wetlands, that presently exist within the project area. Existing drainage patterns would be preserved and temporarily disturbed areas would be restored to the maximum extent practicable (see Section 5.3.2.4 of the Natural Ecosystems TES). Where proposed bridges bisect a wetland, the flow of water would be maintained under the proposed structures. This would ensure that the separated portion of the wetland continues to receive an adequate supply of water and that wetland hydrology is maintained.

Indirect Impacts

Potential indirect wetland impacts may include erosion and sedimentation, increases in total suspended solids (TSS), and roadway-associated pollutant loading. Erosion and sedimentation would be minimized by the implementation of a soil erosion and sediment control plan during construction and permanent stormwater management measures (Sections 4.3 and 4.5). Consequently, the contribution of particulate matter to downstream wetlands would be minimal.

No-Build Alternative

Since the No-Build Alternative would only involve in-kind replacement of the Millstone River bridge, there would be no new direct or indirect impact to wetland resources identified in the project area.

4.13.3 Mitigation

The proposed Route U.S. 1/Penns Neck Area Improvements would result in the loss of 1.1 acres of primarily forested wetland. Thus, an individual freshwater wetland permit and approval of a mitigation plan that provides for 2:1 replacement would be required from the NJDEP for permanently impacted wetlands. Therefore, approximately 2.2 acres of wetlands would have to be created within either the project area or within the Millstone River Drainage Basin. In accordance with the Freshwater Wetlands Protection Act, creation of 2.2 acres of wetland would result in a no net loss of wetlands. Activities that only temporarily disturb wetlands, require subsequent mitigation to restore the disturbed area.

A potential wetland creation site was identified along the Millstone River. This area is located adjacent to wetland area 3 and is within the 100-year floodplain boundary. The potential creation site is currently lawn/landscaped land with a wooded fringe, which separates it from wetland area 3. This area was selected as a potential mitigation site for the following reasons:

- C The potential mitigation site is within the project area and within the affected watershed.
- C The site is adjacent to existing wetlands.
- C The Millstone River provides a hydrologic source for the proposed site.
- C The site would serve dual mitigation purposes (i.e., flood storage capacity and wetland creation).

4.14 Construction Impacts

The following discussion of construction impacts focuses on the Build alternative. As the No-Build Alternative would only involve in-kind replacement of the Millstone River bridge, impacts on traffic/circulation patterns, air quality, noise, and utilities would occur at a much more limited extent.

4.14.1 Traffic/Circulation Patterns

Construction of the proposed improvements is expected to occur in stages over a 12- to 18-month period. This construction may result in short-term impacts to local area residents, and uses of Route U.S. 1, Washington Road, and Harrison Street in the project corridor. The proposed construction activity may result in temporary congestion and longer travel times through the project area. However, a project construction phasing plan and appropriate traffic control plan would be developed as part of the final design to coordinate construction activities and minimize disruption of traffic flow. In addition, public awareness programs to inform residents and motorists about potential construction delays and alternate travel opportunities would be implemented by the NJDOT.

Maintenance and protection of traffic flow in the project area may necessitate temporary land disturbance and travel lane construction, such as in the vicinity of the Route U.S. 1 bridge over the Millstone River. The final design phase would examine the warrant for such disturbance and identify means to avoid, or at least minimize such temporary impacts. All temporarily disturbed areas would be restored prior to construction completion.

4.14.2 Air Quality

The proposed improvements may result in minor, short-term impacts to local air quality resulting from construction activities and any resulting changes in traffic operations and distribution. An increase in particulates can be expected as a result of topsoil disturbance and equipment operation during construction. Vehicle emissions and localized concentrations of CO may also increase as a result of construction. These impacts would be short-term and can be minimized by standard erosion control strategies, including transport of topsoil through tarpaulin-covered trucks, and selected wetting of soils within the construction zone. Appropriate traffic control plans may also serve to limit localized concentrations of emissions during construction.

4.14.3 Noise

Construction of the proposed improvements may result in a short-term, localized increase in noise levels. The increase in noise may result from the operation of construction equipment and related construction activities. This construction noise can be minimized by limiting certain construction practices between late morning and early evening periods. Construction contracts would include language that requires construction equipment and activities to comply with local noise control ordinances and NJDOT contract requirements.

4.14.4 Utilities

Construction of the proposed improvements may require the temporary or permanent relocation of utilities along the project corridor. Coordination of construction activities with local utility officials and implementation of staged construction would insure that continuous utility services are provided to local area residents and businesses.

4.15 Section 6(f) Resources

Build Alternative

As defined under Section 6(f)(3) of the Land and Water Conservation Fund Act, 36 CFR Part 59, the proposed improvements are not expected to result in any direct or indirect impacts to any properties considered to be Section 6(f) resources. Coordination with the NJDEP Department of Parks and Forestry would be undertaken to verify this determination.

No-Build Alternative

Since the No-Build Alternative would only involve in-kind replacement of the Millstone River bridge, there would be no impact to Section 6(f) resources within the vicinity of the project area.

4.16 Cumulative Impacts and Induced Growth

4.16.1 Cumulative Impacts

Build Alternative

A cumulative impact is defined as the impact on the environment which results from the incremental impact of the action when added to other past, present and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time. (40 CFR 1508.7).

Route U.S. 1 and the east-west corridors in the project area are components of a regional transportation network of major and secondary roadways in Mercer and Middlesex Counties. The *Route U.S. 1 Quakerbridge Road to Just North of Sayre Drive Environmental Assessment* (NJDOT, 1991) identified and evaluated potential impacts associated with proposed improvements to Route U.S. 1 within the study corridor: 1) widening Route U.S. 1 to six lanes from Quakerbridge Road to Alexander Road; 2) construction of the Alexander Road interchange; 3) striping Route U.S. 1 in the Penns Neck area to provide three travel lanes in each direction; 4) replacement of the Dinky railroad bridge; 5) construction of the Scudders Mill Road interchange; and, 6) ramp improvements to the Sayre Drive/Forrestal Road interchange.

In addition to examining the planned improvements, the 1991 EA evaluated the improvements in the context of other planned projects in the region. These projects included the Route U.S. 1/Penns Neck Area Improvements (the subject of the current EA), Route U.S. 1 improvements from the Trenton Freeway (limited access portion of Route U.S. 1 through Trenton) to Quakerbridge Road, the Grovers Mill Road Extension, proposed Route 92, and the Hightstown Bypass which was included in the EA discussions of Route 92.

Each of these planned projects was evaluated and advanced separately from the Route U.S. 1 project examined in the 1991 EA. However, information pertaining to these other planned projects, particularly traffic data, was compiled and used to evaluate project and cumulative impacts in the 1991 EA. It is this encompassing data that was also applied to the current EA analyses of the Route U.S. 1/Penns Neck Area Improvements. Thus, the traffic and environmental analyses in the current EA include impacts from the collective implementation of these planned projects.

The findings of the 1991 EA indicated that the Route U.S. 1 improvements, in the context of completed Route 92, the Penns Neck Area Improvements, and other planned projects would have no substantive impact on soils, geology, groundwater, water quality, aquatic ecology, land use, cultural resources, or hazardous waste sites. Beneficial impacts on air quality and socioeconomics (access) would be

anticipated due to improved mobility. Moreover, the projects studied were included on the Transportation Improvement Program (TIP) and were found to conform with the State Implementation Plan (SIP) for air quality. Incremental noise, floodplain, vegetation and wildlife, socioeconomic (right-of-way acquisition), visual, and wetlands impacts would occur consequent to Route U.S. 1 widening and interchange construction activities.

The current, Route U.S. 1/Penns Neck Area Improvements EA picks up where the 1991 leaves off in terms of evaluating the missing link on Route U.S. 1. The findings of the environmental analyses described in this EA and summarized in Section 4.17 indicate that the project would have no substantive impact on soils, geology, groundwater, water quality, aquatic ecology, land use, or hazardous waste sites. Beneficial impacts on air quality and socioeconomics (access) would be anticipated due to improved mobility. Moreover, the project is included on the Transportation Improvement Program (TIP) and was found to conform with the State Implementation Plan (SIP) for air quality. Only incremental noise, floodplain, vegetation and wildlife, socioeconomic (right-of-way acquisition), visual, and wetlands impacts would occur as a result of this project. Unavoidable cultural resource impacts would occur, necessitating mitigation.

The cumulative impact of the current (Route U.S. 1/Penns Neck Improvements) and the previously studied (Route U.S. 1/Quakerbridge Rd. to Sayre Dr.) projects is examined in the following discussion:

Air Quality

Both the current and previously studied projects have as their primary purpose and need the improvement of traffic mobility. Reducing congestion and delays would have a beneficial impact on air quality due to a reduction in traffic emissions. Inclusion of the projects on the TIP and demonstrated conformity with the SIP and federal conformity guidelines indicate that the projects, taken as a whole, would not have an adverse impact on air quality, whether considered individually or collectively.

Noise

Both the current and previously studied projects were determined to have an incremental noise impact. Because these impacts are localized and project-specific, they are not likely to cause cumulative impacts. Examination of the predicted project-related noise levels indicates that design year Build and No-Build noise levels would be equal to or slightly greater than existing levels. This would occur primarily due to traffic growth between now and the design year. Examination of the current project data and potential abatement strategies determined that mitigation is either not warranted or the feasibility and reasonableness criteria cannot be met.

Topography, Geology, Soils and Groundwater

Both the current and previously studied projects were determined to have minimal impacts on topography, soil, and geology. As these minor impacts would be localized to each immediate project area, no substantive cumulative impacts on the resources would be expected. In the context of the regional aquifers and watersheds, both the current and previously studied projects would result in a slight reduction in groundwater recharge area and a slight increase in runoff from impervious surfaces.

This effect would be incremental with each project. Regulatory requirements mandate that the proposed project, as well as others, comply with federal, state, regional, county and local regulations and ordinances to minimize cumulative and individual impacts to surface and groundwater.

Floodplains

Both the current and previously studied projects were determined to have only incremental impacts on floodplains. These impacts tend to be localized to the specific floodplains crossed. NJDEP Stream Encroachment regulations are designed to minimize both individual and cumulative impacts to floodplains. The Route U.S. 1/Penns Neck project will be designed, as were the previous projects, to ensure compliance with NJDEP Stream Encroachment regulations, thus demonstrating that unavoidable impacts, including risk to life and property, have been minimized.

Aquatic Ecology

The 1991 EA for the previous Route U.S. 1 projects showed only minimal impacts to the five streams in the project areas, primarily due to temporary construction activities. The Route U.S. 1/Penns Neck Improvements will also have only minimal impact on two waterways, Millstone River and Little Bear Brook. Short-term, temporary, construction-related impacts will be minimized by implementation of a sedimentation and erosion control plan. Long-term impacts will consist of shading under the new structures and very minor impact to water quality (see Water Quality section below). These site-specific and minimal impacts do not constitute significant cumulative impacts to the aquatic environment.

Water Quality

Regulatory requirements mandate that the proposed project, as well as others, comply with federal and state regulations to minimize cumulative and individual impacts to water quality. The 1991 EA indicated that the other Route U.S. 1 projects would have no long-term impacts on the water quality of the five streams involved in the projects. Results of the studies for the Route U.S. 1/Penns Neck project also show no long-term water quality impacts to the two streams involved. Each project must provide its own treatment for runoff. On previous projects, stormwater management facilities were utilized to ensure that no cumulative impacts are unaddressed. The previous Route U.S. 1 projects demonstrated adequate compliance with water quality requirements and received Water Quality Certificates from the NJDEP with the issued Freshwater Wetland Permits. Compliance with water quality requirements is anticipated for the Route U.S. 1/Penns Neck Improvements due to the stormwater management measures included in the project (see Section 4.5.2). There will be no significant cumulative impacts to water quality as a result of the previous Route U.S. 1 projects and the Penns Neck project.

Wetlands

Previously constructed Route U.S. 1 projects mentioned in the 1991 EA include Sections 2L and 3H (Quakerbridge Rd. to Scudders Mill Rd.) and 2M (Grovers Mill Rd. Extension). These projects and the Penns Neck project all have independent utility and, therefore, qualify for separate permits from NJDEP. The first two received Individual Freshwater Wetland Permits from NJDEP, requiring mitigation.

The wetland impacts for these projects were 2.79 ac. (2L and 3H), and 1.5 ac. (2M). The proposed Penns Neck project will impact 1.1 ac. of wetlands, requiring an Individual Wetland Permit and mitigation. If all of these projects had been considered and submitted as one, their Apermitability@ would not have been affected. Separately or combined, all comply with EO 11990, Wetlands, and NJDEP Freshwater Wetlands regulations, in that they avoid wetlands where practicable, and minimize impacts where they cannot be avoided. The total impact would be the same whether or not the projects were combined. Therefore, no significant cumulative effect on wetlands would occur among these projects as a result of their sequential implementation.

Vegetation and Wildlife

Both the current and previously studied projects were determined to have only incremental impacts on vegetation and wildlife. These impacts tend to be localized. Mitigation measures for each project typically include replanting of temporarily disturbed areas as well as wetland mitigation. NJDOT project landscaping plans focus on the use of native species and suitable cultivars.

Aesthetics

The current and previously studied projects were determined to have only incremental impacts on aesthetics. Aesthetic impacts are typically mitigated through new landscaping and other plantings. These impacts tend to be localized for each project. No cumulative impacts on aesthetics would occur as a result of the previous Route U.S. 1 projects and the Penns Neck project.

Hazardous Materials

Both the current and previously studied projects were determined to have minimal impacts with regard to hazardous materials sites. Typically, impacts are localized and property-specific. Regulatory requirements mandate that the proposed project, as well as others, comply with federal, state, regional, county and local regulations and ordinances with regard to minimizing and managing hazardous materials concerns. No cumulative impacts would occur as a result of the previous Route U.S. 1 projects and the Penns Neck project.

Cultural Resources

Typically, project impacts on cultural resources are localized and property-specific. Current project impacts on cultural resources would be managed through cultural resource mitigation strategies to be developed as part of a Section 106 MOA and a landscaping enhancement program. No cumulative impacts on cultural resources would occur as a result of the previous Route U.S. 1 projects and the Penns Neck project.

Socioeconomic and Land Use

Both the current and previously studied projects were determined to have incremental impacts on socioeconomics in terms of right-of-way acquisition. These impacts tend to be localized and project-specific. Both the current and previously studied projects were determined to have beneficial impacts on socioeconomics in terms of improving access. By reducing delays and congestion, travel times on these corridors would be expected to improve. Both the current and previously studied projects have been determined to be consistent with state, regional, and local plans as mobility on Route U.S. 1 and east-west corridors encompassed by these projects would be improved by each, individually as well as collectively.

No-Build Alternative

Since the No-Build Alternative would only involve in-kind replacement of the Millstone River bridge, the impacts of the project would be greatly reduced. The impacts of the previously constructed Route U.S. 1 projects would still exist under the No-Build Alternative.

4.16.2 Induced Growth

Build Alternative

Development will continue to occur throughout the Route U.S. 1 corridor and region, regardless of the proposed roadway improvements (Section 2.1.2.2). This is due to the fact that existing zoning allows for it, corporations and businesses along the corridor are planning for it, and the area is attractive for commercial development for reasons that are not related to the proposed roadway improvements.

The proposed project would have no substantive effect on the pace of future development, and is unlikely to induce additional growth. Despite traffic congestion in the Route U.S. 1 corridor, recent and current development in the region is on-going without development of the proposed project. Consequently, the nature of traffic operations in the corridor is neither an inducement nor an inhibitor of regional development. Relocated Route 571 would be located primarily on properties owned by Princeton University and Sarnoff Research Center. The University proposes campus expansion in the project area irrespective of the roadway improvements. Sarnoff has no plans to expand their facilities or alter their land holding status. Neither stakeholder has plans to sell any portion of their holdings in the project area for development by others. Consequently, no development along Relocated Route 571 is expected to occur as a result of the project. Thus, the improvement of traffic operations is not anticipated to substantially affect future growth and development.

The on-going regional growth trend is acknowledged in the State Development and Redevelopment Plan (SDRP), the Mercer County Growth Management Plan, the West Windsor Township Master Plan, the Plainsboro Township Master Plan, and the Princeton Community Master Plan. Each of these planning documents contains goals and policies that focus on the need to enhance and coordinate the regional road system to accommodate transportation demand safely and efficiently. To these ends, the proposed project would be consistent with the regional plans as the project objectives to improve mobility on Route U.S. 1 in the project area would be achieved while maintaining and facilitating east-west access routes. By reducing delays and congestion, travel times on these corridors would be expected to improve. Thus, accessibility between home, work, school, shopping, and other destinations in the Primary Study Area and Secondary Study Area would be enhanced.

No-Build Alternative

The No-Build Alternative would have no impact on the potential for induced growth in the project area. Although the No-Build Alternative would neither ease traffic congestion, nor improve traffic flow along the Route U.S. 1 corridor, this is not expected to encourage or discourage further growth and development in the corridor. As stated above, regional development is on-going and is not sensitive to the condition of Route U.S. 1.

4.17 Conclusions

The results of this assessment, summarized below, demonstrate that the project avoids environmental impacts where possible. Where unavoidable impacts occur, appropriate mitigation measures would be taken, such that the project would not result in significant adverse environmental impacts that cannot be mitigated.

Air Quality - The results of air quality analysis indicate that the project would comply with the federal transportation conformity guidelines and is part of the current Transportation Improvement Program (TIP). The project would not cause or contribute to any new localized carbon monoxide (CO) violations or increase the frequency and severity of any existing CO violations. The project may benefit air quality as improved mobility would reduce congestion and associated vehicular emissions.

Noise - The results of noise analysis identified several sites that would experience noise impacts as a result of the project. These sites were examined to determine the feasibility and reasonableness of abatement strategies. This examination determined that either abatement was not warranted, or that the federal criteria for feasibility and reasonableness could not be met.

Topography, Geology, Soils, and Groundwater - The project would have no substantive impact on these existing resources. NJDOT soil erosion control standards would be implemented during and after construction. Well relocation or abandonment would be undertaken by a New Jersey licensed driller. New impervious surfaces would slightly reduce groundwater recharge in the project area; however, no substantive impact to the underlying sole-source aquifer is expected to result.

Floodplains - Floodplain impacts would be avoided except in the case of roadway crossings. Natural stream beds would be preserved; disturbed floodplain areas would be stabilized during and after construction. The project would comply with state regulations and Executive Order 11988, Floodplains.

Water Quality - The project would utilize stormwater management strategies to control the quantity and quality of runoff, including detention basins and vegetated ditches and swales. Impacts to water quality in the watershed have been minimized. The project would comply with state regulations as they pertain to water quality.

Aquatic Ecology - Waterway crossings would have a minimal, localized impact on aquatic ecology due to construction activity and shading from the new bridges. The project would comply with state regulations as they pertain to water quality.

Vegetation and Wildlife - The project would result in a loss of vegetation and associated wildlife habitat along the right-of-way. In addition, the roadway may alter wildlife travel patterns. This unavoidable impact would be mitigated by minimizing construction disturbance, and use of appropriate landscaping practices, particularly selection of native species. No known threatened or endangered species would be impacted by the project.

Socioeconomics and Land Use - The project would impact specific land uses along Route U.S. 1 and Relocated Route 571, and would require acquisition of land from Princeton University and Sarnoff Research Center. The project would require relocation of approximately 4 residences and 4 businesses. Relocation and compensation of impacted businesses and residences would be undertaken according to the federal Relocation Assistance Program.

Cultural Resources - The project would have an adverse effect on eight historic resources. Mitigation would be implemented in accordance with an agreement reached in a Memorandum of Agreement between the FHWA, the NJDOT, the SHPO, and the Advisory Council on Historic Preservation.

Aesthetics - The project would alter existing views within the project area, particularly by converting private views to public views. Sensitive visual resources would be protected. New landscaping, including contemplated supplemental zones of vegetation on adjacent private lands, would visually buffer the project.

Hazardous Waste Screening - The project would impact five properties having potential concerns. Appropriate federal and state guidelines for the management and remediation of these sites would be followed, as warranted.

Wetlands - The project has been designed to avoid wetland impacts to the maximum extent practicable. Impacts to wetlands are subject to a permit pursuant to the NJ Freshwater Wetlands Protection Act, which would require mitigation through creation of replacement wetlands. The project would comply with state regulations and Executive Order 11990, Wetlands.