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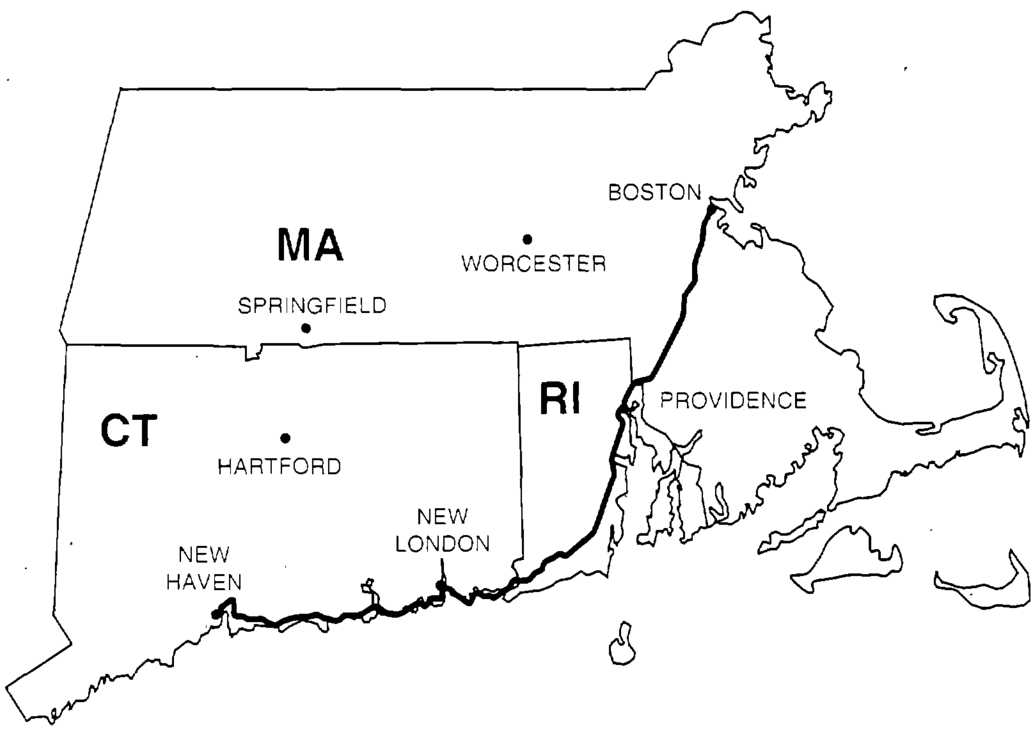
Federal Railroad Administration

Draft Environmental Impact Statement/Report

Volume I:

Office of Railroad Development
Washington, D.C. 20590

Northeast Corridor Improvement Project Electrification - New Haven, CT to Boston, MA



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John A. Volpe National Transportation Systems Center
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Final Report
September 1993

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DRAFT ENVIRONMENTAL IMPACT STATEMENT
NORTHEAST CORRIDOR IMPROVEMENT PROJECT - ELECTRIFICATION
NEW HAVEN, CT - BOSTON, MA

U.S. Department of Transportation
Federal Railroad Administration
Office of Railroad Development

September 2, 1993
DATE

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13. ABSTRACT (Maximum 200 words)

The impacts of extending electrification on the National Railroad Passenger Corporation's (Amtrak) Northeast Corridor (NEC) from New Haven, Connecticut to Boston, Massachusetts are of direct concern to the Federal Railroad Administration (FRA). To improve rail service and increase ridership between New York and Boston, Amtrak proposes the electrification of the NEC main line between New Haven, CT and Boston, MA using an overhead 2 X 25,000 volt - 60 hertz power system. Congress has appropriated funds to the FRA for transfer to Amtrak for the purpose of undertaking this project. FRA has determined the transfer of these funds would constitute "a major federal action" within the meaning of the National Environmental Policy Act (NEPA) of 1969. Pursuant to the regulations of the President's Council of Environmental Quality implementing the procedural provisions of NEPA (40 CFR Parts 1500-1508), and FRA's "Procedures for Considering Environmental Impacts," (FR Vol. 45 Page 40854), and Massachusetts Environmental Policy Act (MEPA) regulations (301 CMR 11:00), FRA is preparing an Environmental Impact Statement/Report (EIS/R) for Amtrak's proposed electrification of the NEC main line.

This volume considers impacts on the Human and Natural Environment utilizing guidance as outlined in CFR Part 1500, Council on Environmental Quality, Regulations for Implementing the Procedural Requirements of NEPA as amended and the MEPA regulations (301 CMR 11:00). Impacts analyzed include changes in the natural environment (air quality, noise & vibration, energy, electromagnetic fields, natural resources, hazardous materials and visual/aesthetics), changes in the social environment (land use and recreation, transportation and traffic), impacts on historic and archaeological sites, changes in transit service and patronage, associated changes in highway and airport congestion, capital costs, operating and maintenance costs, and financial implications. Impacts are identified both for the proposed construction period and for the long-term operation of the alternatives.

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METRIC/ENGLISH CONVERSION FACTORS

ENGLISH TO METRIC

LENGTH (APPROXIMATE)

1 inch (in) = 2.5 centimeters (cm)
1 foot (ft) = 30 centimeters (cm)
1 yard (yd) = 0.9 meter (m)
1 mile (mi) = 1.6 kilometers (km)

AREA (APPROXIMATE)

1 square inch (sq in, in^2 = 6.5 square centimeters (cm^2)
1 square foot (sq ft, ft^2 = 0.09 square meter (m_2)
1 square yard (sq yd, yd^2) = 0.8 square meter (m^2)
1 square mile (sq mi, mi^2) = 2.6 square kilometers (km^2)
1 acre = 0.4 hectares (he) = 4,000 square meters (m^2)

MASS - WEIGHT (APPROXIMATE)

1 ounce (oz) = 28 grams (gr)
1 pound (lb) = .45 kilogram (kg)
1 short ton = 2,000 pounds (lb) = 0.9 tonne (t)

VOLUME (APPROXIMATE)

1 teaspoon (tsp) = 5 milliliters (ml)
1 tablespoon (tbsp) = 15 milliliters (ml)
1 fluid ounce (fl oz) = 30 milliliters (ml)
1 cup (c) = 0.24 liter (1)
1 pint (pt) = 0.47 liter (1)
1 quart (qt) = 0.96 liter (1)
1 gallon (gal) = 3.8 liters (1)
1 cubic foot (cu ft, ft^3) = 0.03 cubic meter (m^3)
1 cubic yard (cu yd, yd^3) = 0.76 cubic meter (m^3)

TEMPERATURE (EXACT)

$[(x-32)(5/9)]\ ^{o}F = y\ ^{o}C$

METRIC TO ENGLISH

LENGTH (APPROXIMATE)

1 millimeter (mm) = 0.04 inch (in)
1 centimeter (cm) = 0.4 inch (in)
1 meter (m) = 3.3 feet (ft)
1 meter (m) = 1.1 yards (yd)
1 kilometer (km) = 0.6 mile (mi)

AREA (APPROXIMATE)

1 square centimeter (cm^2) = 0.16 square inch (sq in, in^2)
1 square meter (m^2) = 1.2 square yeards (sq yd, yd^2)
1 square kilometer (km^2) = 0.4 square mile (sq mi, mi^2)
1 hectare (he) = 10,000 square meters (m^2) = 2.5 acres

MASS - WEIGHT (APPROXIMATE)

1 gram (gr) = 0.036 ounce (oz)
1 kilogram (kg) = 2.2 pounds (lb)
1 tonne (t) = 1,000 kilograms (kg) = 1.1 short tons

VOLUME (APPROXIMATE)

1 milliliters (ml) = 0.03 fluid ounce (fl oz)
1 liter (1) = 2.1 pints (pt)
1 liter (1) = 1.06 quarts (qt)
1 liter (1) = 0.26 gallon (gal)
1 cubic meter (m^3) = 36 cubic feet (cu ft, ft^3)
1 cubic meter (m^3) = 1.3 cubic yards (cu yd, yd^3)

TEMPERATURE (EXACT)

$[(9/5)\ y + 32]\ ^{o}C = x\ ^{o}F$

QUICK INCH-CENTIMETER LENGTH CONVERSION

INCHES: 0 1 2 3 4 5 6 7 8 9 10

CENTIMETERS: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 25.40

QUICK FAHRENHEIT-CELSIUS TEMPERATURE CONVERSION

^{o}F	-40^{o}	-22^{o}	-4^{o}	14^{o}	32^{o}	50^{o}	68^{o}	86^{o}	104^{o}	122^{o}	140^{o}	158^{o}	176^{o}	194^{o}	212^{o}
^{o}C	-40^{o}	-30^{o}	-20^{o}	-10^{o}	0^{o}	10^{o}	20^{o}	30^{o}	40^{o}	50^{o}	60^{o}	70^{o}	80^{o}	90^{o}	100^{o}

For more exact and or other conversion factors, see NBS Miscellaneous Publication 286, Units of Weights and Measures. Price $2.50. SD Catalog No. C13 10286.

NORTHEAST CORRIDOR IMPROVEMENT PROJECT
DRAFT ENVIRONMENTAL IMPACT STATEMENT/REPORT

FOR ELECTRIFICATION OF NORTHEAST CORRIDOR
NEW HAVEN, CT TO BOSTON, MA

PREFACE

Congress has appropriated funds to the Federal Railroad Administration (FRA) for transfer to the National Railroad Passenger Corporation (Amtrak) for the purpose of extending electric traction to (electrification of) Amtrak's Northeast Corridor main line between New Haven, CT and Boston, MA. FRA has determined that the transfer of these funds would constitute "a major Federal action" within the meaning of the National Environmental Policy Act of 1969 (NEPA). Pursuant to the regulations of the President's Council on Environmental Quality (CEQ) implementing the procedural provisions of NEPA (40 CFR Parts 1500-1508), FRA's "Procedures for Considering Environmental Impacts" (FR Vol. 45 page 40854), and Massachusetts Environmental Policy Act (MEPA) regulations (301 CMR 11.00), FRA is preparing a Draft Environmental Impact Statement/Draft Environmental Impact Report (DEIS/R) for this project.

The FRA and the John A. Volpe National Transportation Systems Center (Volpe Center) through a contract with the joint venture of Daniel Mann Johnson and Mendenhall Inc. and Frederic R. Harris, Inc. (DMJM/Harris) have prepared this DEIS/R.

The environmental review process is governed under both Federal and state law. The Federal process is regulated by NEPA. The process for the state of Massachusetts is regulated by the MEPA Unit of the state Executive Office of Environmental Affairs (EOEA). The environmental processes of Connecticut and Rhode Island are not triggered by the proposed action.

NEPA and MEPA afford public officials and citizens the opportunity to comment on the environmental impacts of major projects. Under NEPA and MEPA, the DEIS/R serves as the vehicle for obtaining public comments. In addition, the FRA has encouraged the active participation of private citizens and Federal, state and local agencies throughout the course of this study. This involvement is important to ensure that issues of concern to communities and agencies are addressed in the DEIS/R, and that the resulting project is responsive to those concerns and in compliance with relevant Federal and state mandates. The public involvement program for this DEIS/R consists of four elements. These include: 1) scoping sessions; 2) public information meetings; 3) coordination and consultation with regulatory agencies; and 4) public hearings.

The environmental review process was initiated in the Fall of 1991. A Notice of Intent was published in the Federal Register on October 21, 1991. An Environmental Notification Form (ENF) was published in the Massachusetts Environmental Monitor on August 7, 1992.

Following publication of these notices, public scoping sessions were held in accordance with NEPA and MEPA requirements. A preliminary evaluation was performed to screen out those alternatives with excessive environmental, social or economic costs, those that were not capable of achieving the project goal of reduced travel time between New York City and Boston; or that required new technologies that would not be available within the proposed implementation period for the project. At the conclusion of this screening process, two alternatives were selected for detailed analysis in the DEIS/R, as documented in Chapter 2. These are the electrification project as proposed by Amtrak and the no build alternative.

This DEIS/R provides a comprehensive assessment of the consequences of each project alternative on the natural, physical and social environment. Aspects of the natural environment addressed include noise and vibration, energy, air quality, aesthetics and natural or ecological resources. The physical environment includes land use, electromagnetic fields and interference, and archaeological resources. The social environment includes socioeconomics, historic resources, public safety, and transportation patterns and traffic. The severity of environmental consequences (or impacts) is identified, and where possible, quantified. Mitigation measures that could reduce or eliminate the impacts are also identified. Based on these factors, the environmental impact of each alternative is assessed.

Volume I of the DEIS/R consists of the following chapters and appendices.

<u>Chapter 1 - Introduction, Purpose and Need:</u>

This chapter is an introduction to the DEIS/R. It provides a general description of the study area and the transportation services provided. The chapter also describes both the history of the NEC and the history and status of the NEC Improvement Project (NECIP). The chapter describes the objectives of electrifying the rail line between New Haven and Boston, the relevant parties involved, the organization of the report and subsequent steps in the DEIS/R process.

<u>Chapter 2 - Development and Description of Alternatives:</u>

This chapter summarizes the scoping and alternatives screening process and describes in detail the alternatives fully analyzed in this DEIS/R.

<u>Chapter 3 - Affected Environment:</u>

This chapter provides an overview of the current natural, physical and social environmental conditions in the project corridor.

<u>Chapter 4 - Environmental Consequences:</u>

This chapter describes the potential beneficial environmental impacts and adverse impacts of the alternatives. This chapter also describes the evaluation criteria and methods used to identify and assess the adverse impacts.

<u>Chapter 5 - Summary of Impacts, Mitigation and Permit Requirements:</u>

This chapter summarizes the beneficial and adverse impacts of the alternatives and identifies possible measures to mitigate the impacts.

<u>Appendix A - Electrification Facilities and Bridge Modification Sites:</u>

This appendix contains the site plans for the electrification facilities and location plans for bridge modifications as described in Chapter 2.

<u>Appendix B - Chapter 3 Tables:</u>

This appendix provides the tables referenced in Chapter 3.

Appendix C - Public Participation Program:

This appendix describes the public participation program for the DEIS/R including scoping sessions, public information meetings, coordination with regulatory agencies, and public hearings that are all part of the DEIS/R process. The Federal and state scoping notices and the ENF are also included in this appendix.

Appendix D - List of Preparers and Reviewers:

This appendix provides a list of the participants involved in the preparation or review of this document and their educational background.

Appendix E - List of Agencies, Organizations and Persons Receiving the DEIS/R:

This appendix is comprised of a list of those Federal, state and municipal agencies and officials, public libraries and individuals that have received copies of the DEIS/R.

Appendix F - Correspondence:

This appendix contains correspondence with state and Federal agencies that provide instrumental information with regard to the assessment of environmental impacts.

Supporting technical information is provided in the following additional volumes that have been distributed to and are available for review at public agencies and libraries.

Volume II - Atlas of Land Use and Regulated Areas:

This volume contains 11 by 17 inch color maps of the 156 mile project corridor. Existing land use and regulated areas such as wetlands, floodplains, the coastal zone and resources listed on the National Register of Historic Places are illustrated.

Volume III - Technical Studies:

This volume contains eleven technical studies which provide detailed technical information and documentation of analysis methods and actions. The technical studies are as follows:

Technical Study 1 - Land Use
Technical Study 2 - Socioeconomics
Technical Study 3 - Historic Resources
Technical Study 4 - Noise and Vibration
Technical Study 5 - Electromagnetic Fields and Interference
Technical Study 6 - Energy
Technical Study 7 - Archaeological Survey
Technical Study 8 - Public Safety
Technical Study 9 - Transportation and Traffic
Technical Study 10 - Air Quality
Technical Study 11 - Natural Resources

There will be a 45 day public comment period upon publication and release of this DEIS/R. Comments received during the public comment period will be analyzed and addressed in the final environmental impact statement/report (FEIS/R) which will be provided to all interested parties.

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DRAFT ENVIRONMENTAL IMPACT STATEMENT/REPORT

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EXECUTIVE SUMMARY

ES.1 INTRODUCTION, PURPOSE AND NEED

The Northeast Corridor Improvement Project (NECIP) is an ongoing comprehensive program whose goal is to improve intercity rail passenger service between Washington, DC, through New York City, NY, to Boston, MA. NECIP was authorized by Congress as part of the Railroad Revitalization and Regulatory Reform Act of 1976, and the Federal Railroad Administration (FRA) prepared a programmatic environmental impact statement (PEIS) on NECIP which was published in June 1978. Based in part on that PEIS, FRA made a program decision which defined the activities to be incorporated into NECIP and initiated the program. To date, over $2.7 billion has been invested as part of NECIP in upgrading the rail infrastructure of the Northeast Corridor (NEC) with significant improvements to intercity rail service provided by the National Railroad Passenger Corporation (Amtrak) and to commuter rail passenger service provided by various public agencies.

The current focus of NECIP is on those remaining improvements between New York City and Boston necessary to reduce intercity express train trip times between those two cities, with intermediate stops, to less than three hours. The current express train trip time between Boston and New York City is approximately four hours. Amtrak believes that by improving the intercity trip times to less than three hours, Amtrak will become the preferred intercity common carrier in the Boston to New York City market much as it is presently the preferred intercity common carrier between New York City and Washington where trip times are approximately two hours and fifty minutes. Proponents of improved intercity rail service believe that this will result in reduced congestion on highways and at airports and reduce the need to provide additional capacity in these forms of transportation at high monetary and environmental costs.

One of the remaining uncompleted elements of NECIP that Amtrak has identified as necessary to meet its trip time goals is the extension of electric traction over the 156 miles of the NEC main line between New Haven, CT and Boston (Figure ES.1-1). Presently, trains operating on the NEC between Washington and New Haven are powered by electricity provided by an overhead catenary system. North of New Haven, trains use diesel-electric locomotives which have poorer acceleration and slower peak speeds than their electric counterparts. As a result of this dual traction system, Amtrak must switch locomotives at New Haven, thereby adding 10 to 20 minutes to each trip.

By converting the remaining portion of the NEC main line to electric power, Amtrak will be able to eliminate this delay and use trains with operating characteristics comparable to or better than those presently operating south of New Haven. Combined with certain other track, bridge and station work to be undertaken as part of the NECIP, the proposed electrification would permit trip times of three hours or less.

Since 1991, Congress has appropriated a total of $448 million to FRA for improvements to the rail line between New York and Boston, including $233 million earmarked for the proposed electrification project. Amtrak has awarded a contract to a consortium of construction, engineering and electric traction firms, to design and build the proposed electrification improvements. Presently, the design of this system is at the 60 percent completion stage. Amtrak estimates that, with the necessary permits and approvals, construction can begin in the Spring of 1994 and will take approximately three years.

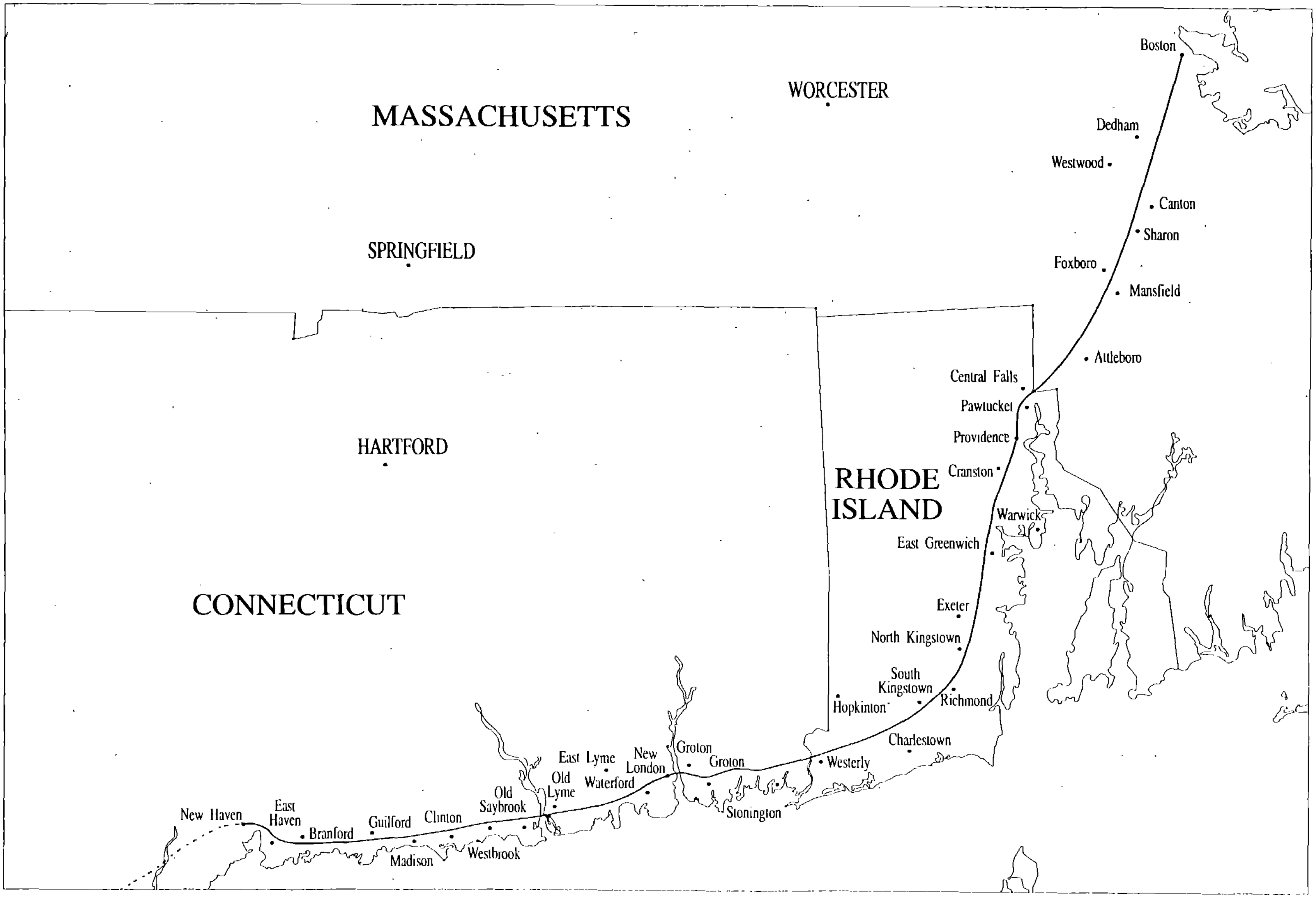

FIGURE ES.1-1. PROJECT STUDY AREA

ES.1.1 Purpose and Need for an EIS and EIR

Extension of electric traction (also referred to as electrification of the rail line) from New Haven to Boston is one element of a program of NECIP improvements selected by FRA in 1978 as the preferred alternative based on the PEIS. However, a more detailed, site specific EIS is required before FRA can make a final decision on whether to fund the proposed electrification project. This document is the site specific EIS for the proposed electrification project.

The Massachusetts Secretary of Environmental Affairs issued a Certificate on the Environmental Notification Form on September 9, 1992 under the authority of the Massachusetts Environmental Policy Act (MEPA), directing preparation of an environmental impact report (EIR) on the proposed project. To reconcile the Federal and state environmental review processes, it was agreed that a single document would serve as both the EIS and EIR (EIS/R). Therefore, this document will also serve as the EIR required by the Commonwealth of Massachusetts.

This Draft EIS/R (DEIS/R) is being circulated to all Federal, state and municipal agencies, and elected officials whose jurisdictional responsibilities may be affected by the electrification project, as well as to other parties that have expressed an interest in the project, and to public libraries and other depositories along the study corridor. FRA will sponsor public hearings during the review period, at which interested officials and citizens will be invited to comment on the document. Written comments may also be submitted to the individuals listed on the cover sheet. Following circulation, a Final EIS/R (FEIS/R) will be prepared responding to all comments received on this Draft EIS/R (DEIS/R).

ES.2 ALTERNATIVES CONSIDERED

ES.2.1 Identification and Screening of Alternatives

The selection and screening of alternatives for improving service on the NEC began with the preparation of the PEIS in the mid-1970s and concluded after the National Environmental Policy Act (NEPA) and MEPA scoping sessions for the DEIS and DEIR, respectively, in late 1992. This section describes both the alternatives considered in the PEIS and alternatives raised in the scoping sessions for this EIS/R, as well as those carried forward for consideration in the DEIS/R.

ES.2.1.1 Alternatives Considered in the PEIS. Four types of alternatives to electrification were evaluated and subsequently eliminated from further consideration in the PEIS.

Non-Rail Alternatives. The do-nothing alternative, or no public investment in improved ground transportation was not considered economically prudent in 1978, as the transportation system in the NEC is a significant economic resource to the region. Investment only in non-rail modes of travel (e.g. highways and airports) or maintaining the existing levels of investment in all modes, fell short of attaining desired transportation and environmental goals, and involved significant environmental, social and economic costs because of the land takings that would be required for new airports or highway lanes.

New Technologies. Several new technologies raised in the public scoping sessions for this DEIS were also addressed in the PEIS. These technologies include advanced high-speed rail (HSR) (at 200 mph), underground tube vehicles, tracked air cushion vehicles (TACV) and magnetic levitation vehicles (Maglev). The underground tube system would require an enormous public investment because of the exorbitant costs of tunnel construction. The HSR, TACV and Maglev technologies would all require a new right of way (ROW) with minimum route curvature. As noted above, assembly of a new ROW through the heavily developed and densely populated region of the NEC would involve excessive cost, as well as enormous socioeconomic and environmental impacts associated with land acquisition.

Traction Power Alternatives. Four alternative traction power systems were assessed and dropped from further consideration in the PEIS. Retention of the existing dual traction system (diesel north of and electric south of New Haven) or extension of the diesel system south to Washington, DC (abandonment of the existing electrification south of New Haven) would not meet the project objectives of reduced travel time and increased ridership, and would result in either no change or increased environmental impacts, particularly air quality emissions and noise. The gas turbine locomotive alternative on the entire NEC was eliminated from further consideration in the PEIS due to cost, environmental and operational considerations.

Abandonment of the existing dual traction system in favor of DC power would have required a substantially greater number of substations along the entire NEC, and would have required conversion of AC current to DC current, adding equipment and weight to the train, thereby decreasing rather than increasing operating speeds along the corridor. The third-rail DC alternative involved the presence of lethal voltages on the ground and therefore presented an unacceptable public safety hazard.

Route Alternatives. Route alternatives were dropped from further consideration due to the environmental, social and economic impacts associated with the necessary land takings, as well as the significant cost of laying new track and constructing new stations.

ES.2.1.2 Alternatives Considered in the DEIS/R. The preliminary list of study alternatives included those raised at the scoping sessions by the public, the railroad industry, and environmental or transportation agencies; and those identified by members of the FRA staff and other experts in the railroad industry. Trade publications and other relevant literature were also reviewed in order to identify potential alternatives. Each of these alternatives was subjected to a screening process, involving a preliminary evaluation of the alternatives based on available information and objective criteria. The purpose of screening is to eliminate from further consideration those alternatives that are: 1) not feasible, 2) do not accomplish project goals, or 3) are similar and therefore can be consolidated into a single alternative. Two alternatives emerged from the screening process and are addressed in detail in the DEIS/R. These are the extension of electric traction as proposed by Amtrak and the do nothing, or no build, alternative.

As described previously, the primary goal of the NECIP is to reduce intercity rail passenger trip time between Boston and New York and points south in order to increase ridership. Therefore, the first screening criterion applied was the ability of the alternative to offer a significant improvement over existing trip times. This screening level also considered whether the proposed technology would be available during the project period. Most of the alternatives raised during the scoping period did not meet these criteria. These included:

- Diesel electric locomotive with third rail electric capability;
- Liquid Natural Gas (LNG) locomotive with third rail electric capability;
- Diesel-electric locomotive with catenary electric capability;
- Third rail electric locomotive with catenary electric capability;
- Third rail electric locomotive with locomotive change in New Haven;
- Gas turbine locomotive with third rail electric capability;
- Gas turbine locomotive with locomotive change at New Haven; and
- Extension of alternative catenary systems.

ES.2.2 Alternatives Analyzed in the DEIS/R

As a result of the screening process described above, two alternatives were carried forward into the DEIS/R for detailed analysis. Each of these is described below.

ES.2.2.1 No-Build Alternative. The no-build alternative would consist of continuation of the existing operation of diesel trains between Boston and New Haven with a switch at New Haven to an electric locomotive. This alternative involves;

- Ten trains in each direction on an average weekday between Boston and New York;
- Three hour and fifty five minute express service between New York's Pennsylvania Station and Boston's South Station; and
- Schedules include 10 to 20 minutes required to change locomotives at New Haven.

It is estimated that the slight increase in ridership demand anticipated between now and 2010 under this alternative (from 1 to 1.8 million passengers annually) would require two additional trips in each direction.

ES.2.2.2 Amtrak's Proposed Electrification Project. Amtrak's proposed electrification project is composed of a number of elements that may impact environmental resources. These include:

- An overhead catenary system (OCS) composed of wires suspended over the railroad tracks supported by pairs of steel poles, approximately 28 feet high, placed on either side of the railroad tracks. The poles would support a cantilevered arm from which the wires are suspended. Each set of poles would be spaced approximately 200 feet from the next pair tangent along the track, and closer along curved track sections.

- Substations and utility supplies to provide electricity from the local utility company to the substation via a tie-in from the utility's transmission network. The utility lines consists of either overhead or underground wires from local transmission lines to the new substation. The substation "steps down" or converts the 115,000 volts (115 kV) on the utility's power line to the 25 kV levels via a transformer at the substation. The 25 kV feed is then connected to the OCS for use by the locomotive. Each of the four substations on the NEC would consist of a fenced area of approximately 0.5 acres.

- Switching stations and paralleling stations (intermediate power supply points for the OCS) are smaller in scale than substations and contain transformers that connect the feeder to the catenary. By employing these smaller facilities, fewer substations and utility tie-ins are needed, since power can be carried farther down the rail line than if no feeder and intermediate supply points are used. Eighteen paralleling stations of approximately 0.15 acres and three switching stations of approximately 0.25 acres would be constructed along the NEC.

- Bridge modifications would be required in some areas of the NEC where overhead structures, such as roadway and pedestrian bridges, currently restrict vertical clearance over the tracks. One of three actions would be taken at these bridges where there is insufficient room to accommodate both the train and proposed catenary. These measures are (in order of least cost and disruption, and therefore highest preference): 1) the railroad tracks would be lowered using a technology known as undercutting; 2) the bridge would be raised; or 3) the bridge would be demolished and replaced.

Amtrak's proposed express service would consist of 16 trains in each direction between Boston and New York on a typical weekday using electric power locomotives capable of 150 mph operation, with quick acceleration and deceleration characteristics and the ability to traverse curves at high speeds. In the study area, express service would make stops at New Haven, CT; Providence, RI; Route 128 Station in Dedham, MA; and Back Bay Station in Boston, MA before terminating at South Station in Boston, MA. Conventional service would continue on a schedule similar to that currently in operation, with ten trains in each direction on an average weekday. In addition to those stations served by express service north of New Haven, conventional train service would be provided at Old Saybrook, New London and Mystic, CT, and Westerly and Kingston, RI, although not all such trains would make all of these stops.

ES.3 PROJECTED RIDERSHIP

One of the most significant effects of the electrification project and other improvements in the NEC is the growth in intercity rail ridership, from 1.9 million riders under the no build alternative to over 3.6 million with electrification and the other improvements necessary for the three hour trip time. This growth in ridership would result in the following projected changes in the modal choices of NEC travelers (from the no build alternative) in the design year 2010:

	Change in Ridership	% Change
Automobile	-324,000	-2.0
Air	-1,430,000	-37.8
Intercity Train	+1,756,000	+93.9

The benefits and impacts of this shift, as well as of the general operation and construction of the proposed electrification, are described in the remainder of this Executive Summary.

ES.4 BENEFITS OF THE PROPOSED PROJECT

There are economic, transportation, air quality and energy benefits of the proposed project. Approximately 330 permanent and 600-700 temporary (construction) new jobs would be created by the proposed electrification. This represents an increase of approximately 0.1 percent of total employment in the affected communities. Each of the region's airports would experience improvement in ground traffic congestion, with the greatest improvement, a two percent reduction in average weekday traffic, occurring at Logan International in Boston.

The greatest environmental benefits derived as a result of the proposed electrification would come in the area of air quality. Although emissions from power generation would increase slightly due to the electrification, substantial net reductions would occur in total emissions in the region as a result of the elimination of diesel trains, as well as the reduction in aircraft and automobile emissions. These changes are shown below:

	Change over No-build due to Electrification (in kg/day)			
Pollutant	Transportation Sources	Power Generation	Net Change	% Net Change over 2010 No-build
Volatile Organic Compounds (VOCs)	-182	+8	-174	-7.0
Oxides of Nitrogen (NOx)	-2912	+1,254	-1,658	-13.0
Carbon Monoxide (CO)	-1,130	+92	-1,038	-4.0

Finally, while generation of electricity for the proposed project would require greater petroleum use to power the intercity electric rail service under the proposed project than diesel service under the no build alternative, the proposed electrification would result in a net reduction of petroleum by all travel modes in the NEC of nearly ten million gallons annually. Electric generation would also require that a net increase in natural gas of 1.0 billion cubic feet annually. Cumulatively, however, the use of petroleum would be 8.8 percent less under the proposed project, which would represent a decrease in dependence upon foreign sources of energy (petroleum) in favor of an increased dependence upon domestic products (natural gas).

ES.5 ENVIRONMENTAL IMPACTS

ES.5.1 No-build Alternative

As no new facilities would be required, and the increase in Amtrak service is expected to be limited to two trains daily in each direction, no adverse impacts are expected to result from the no-build alternative in the areas of land use, socioeconomics, historic and archaeological resources, electromagnetic fields and interference, public safety, transportation and traffic, visual and architectural effects and natural resources. Sixty-seven residences would be adversely affected by train noise and 369 residences and one school would be adversely affected by vibration from train operations associated with the no-build alternative. The energy and air quality impacts of this alternative are discussed below.

The no-build alternative would result in a 20 percent increase (508,000 gallons) in diesel fuel consumption in 2010 over the present condition. This is due to the projected addition of two intercity passenger trains daily in each direction. However, the number of intercity passenger miles traveled is anticipated to increase by 55 percent, resulting in a lower consumption of fuel per passenger mile in 2010 (1,254 Btus) than in 1992 (1,446 Btus). This is due to the greater number of intercity passengers anticipated in 2010, which would be accommodated not only by the two additional trains per day in each direction, but also by filling currently unused seats on existing trains.

Although the number of vehicle miles travelled in the NEC are anticipated to increase between 1992 and 2010, the emissions from transportation sources of volatile organic compounds (VOCs), oxides of nitrogen (NOx) and carbon monoxide (CO) are expected to decrease substantially due to the initiation prior to 2010 of the Federal Motor Vehicle Emissions Control Program (FMVCP) and the state inspection and maintenance (I/M) programs. These decreases are in compliance with and enhance goals of the Connecticut, Rhode Island and Massachusetts State Implementation Plans (SIPs), as required by the Federal Clean Air Act.

In addition to these rail-related impacts, at a minimum, the environmental effects of projected growth in vehicular and air traffic, including traffic congestion and delay, noise, and exhaust emissions, would increase unabated as overall demand for intercity travel increases. In addition, a range of major environmental effects could result if congestion reaches levels which exceed existing highway or airport capacity and new transportation infrastructure is needed.

ES.5.2 Amtrak's Proposed Electrification Alternative

This section summarizes the adverse environmental impacts of the proposed electrification, which are described below. No adverse impacts are anticipated in the areas of socioeconomics, energy and electromagnetic fields and interference.

ES.5.2.1 Land Use. One residence and one business would be displaced for construction of the Norton switching station and Warwick substation, respectively. Relocation of these uses in compliance with the Federal Uniform Relocation Assistance Act of 1970 would minimize any impacts associated with these relocations. Construction of the Noank paralleling station would require the taking by Amtrak of the parking lot of a public beach. The latter would be considered a "use" under Section 4(f) of the

Department of Transportation Act of 1966, requiring an investigation as to whether or not all prudent and feasible alternatives have been considered. This investigation will be completed prior to issuance of the Final EIS/R. Relocating the paralleling station to another site would eliminate this potential impact; if no feasible and prudent alternative for the paralleling site exists, relocation of the lost parking to another site could mitigate this impact.

ES.5.2.2 Historic Resources. Adverse effects could occur as a result of the raising of one roadway bridge that is eligible for listing on the National Register of Historic Places. These effects could be minimized by avoidance measures such as lowering the trackbed. Should the proposed modification be the only feasible option, possible mitigation measures would include preservation of as much of the historic integrity of this structure as possible. If these measures prove infeasible, the bridge could be recorded to the standards of the Historic American Engineering Record (HAER) prior to alteration.

Adverse visual and structural effects may result from the placement of eight-foot high barriers, designed to prevent the public from touching the wires, on an additional nine bridges listed or eligible for listing on the National Register. Such effects could be minimized through a variety of measures ranging from the redesign of the barriers to identification of less intrusive methods for protecting the catenary system. Catenary poles are expected to be installed on seven of the 36 railroad bridges that are listed or eligible for listing on the National Register, potentially resulting in an adverse effect. Adverse effects may result from the placement of catenary pole installation in two historic districts eligible for listing on the National Register.

The FRA will make final determinations of effect and adverse effect for all these resources and identify mitigation measures, where necessary, in consultation with the Massachusetts, Rhode Island and Connecticut SHPOs, as part of the FEIS/R.

ES.5.2.3 Noise and Vibration. Train noise is anticipated to be adverse at 787 residences, two churches and two recreation areas along the NEC. This represents an increase of 720 residences over the no-build alternative. The major source of this impact would be the rolling interaction of train wheels on rails, which would increase due to increased train frequency and speed. The sounding of horns at grade crossings could also contribute to increasing noise levels. Adverse train noise impacts could be mitigated through a variety of measures designed to control noise at its source (e.g. improved track and wheel maintenance), transmission path (e.g. barriers) or at the noise sensitive receiver (e.g. insulation of buildings). The impact of train horn noise could be eliminated by the closure of the rail-highway grade crossings. FRA is currently developing a plan for the elimination of these rail-highway grade crossings where practical, pursuant to Section 2 of the Amtrak Authorization and Development Act of 1992.

A total of eighty-one residences in the vicinity of 12 of the electrification facilities sites would be affected by increased levels of noise from transformers and ventilation systems. Incorporation of sound absorptive barrier walls, quiet fans or fan silencers into the facility designs could mitigate these impacts.

A total of thirty residences would experience elevated levels of noise during construction of two electrification facilities and modifications at five bridges. Construction noise impacts can be reduced by including specific noise control requirements in the construction contract specifications, including the selection of equipment and techniques that generate the lowest noise levels and use of mufflers. Noise from undercutting at another 27 bridges is not expected to be adverse due to the short duration (4 days) at each location. It should be noted that construction noise is intermittent and generally of short duration, and as a result, all such impacts could be mitigated.

Project-related increased levels of vibration are related to annoyance effects and not to building damage - no building damage effects are expected. Adverse vibration levels are anticipated at a total of 16 residences during construction at three bridges and one electrification facility. Such impacts could be mitigated by restricting the procedures and time permitted for vibration-intensive activities, and implementation of vibration monitoring to certify compliance with vibration limits. In addition, an active community liaison program would ensure residents are kept informed of construction activities and have a means to register complaints.

Vibration impact from train operations are projected in 28 communities along the NEC, with a total of 1,355 residences affected, as well as two churches and one school. This represents an increase of 986 residences and one school over the no-build alternative. Since the primary source of ground-borne vibration from trains is wheel/rail contact, an enhanced track and vehicle maintenance program could minimize vibration from this source. Vibration levels could be further reduced by installation of ballast mats or floating concrete slabs or construction of deep trenches parallel to the tracks between the tracks and sensitive receptors.

ES.5.2.4 Archaeology. There is a moderate or high potential for the presence of buried cultural remains at eleven of the proposed electrification facility sites and three of the bridges proposed for raising or replacement. As part of the FEIS/R, the FRA will, in consultation with the SHPOs, determine the need for and conduct, where necessary, further investigations to identify such resources and measures to mitigate any impacts to them.

ES.5.2.5 Pedestrian Hazards. Although the potential risk of train-pedestrian accidents cannot be quantified, the greater speeds and frequency of proposed Amtrak intercity through trains may increase the potential for pedestrian hazards on the NEC at the ten railroad stations without grade-separated pedestrian crosswalks, seven additional stations with low level platforms, and approximately 22 locations along the right of way at which pedestrians cross the tracks illegally.

The hazards at the stations could be minimized by the installation of flashing signals and bells and platform markings. At some of the stations additional safety measures could include holding commuter trains outside the station as Amtrak through trains pass or limiting Amtrak trains to certain tracks. Along the ROW, pedestrian hazards could be minimized by fencing the most heavily used areas and by developing community and school educational programs that stress the potential hazards associated with high speed trains and give guidance on crossing the tracks safely.

ES.5.2.6 Transportation. Although the projected shifts in passenger modal choice in the NEC (described in Section ES.3) would result in slight decreases in surface traffic around the region's major airports and slight increases in traffic around the express railroad stations, these changes would be relatively minor. The expected transportation impacts would be increased demand for parking at the express railroad stations, changes in traffic conditions on the detours associated with the roadway bridge modifications and potentially, impacts to other rail operations on the NEC.

Parking demand attributable to the proposed electrification is expected to exceed the current supply at all five express railroad stations by a range of 55 (Back Bay) to 1,090 (Route 128) spaces. As parking demand associated with commuter rail ridership is also anticipated to increase, the total shortfall would be even higher than these numbers indicate.

The intersection of Park and Reservoir Avenues in Cranston, RI would experience deterioration in traffic operations as a result of construction at the Park Avenue Bridge, from level of service (LOS) D to E, during the 4-month construction period. Reassigning the eastbound left turn and through lane of Park

Avenue to a left turn only, along with appropriate signal phasing to support this change, could serve to substantially alleviate the congestion created by the detour.

Eastbound right turning movements at the intersection of Maskwonicut Avenue and North Main Street in Sharon, MA would deteriorate from LOS A to LOS D during the 9-month construction period for the Maskwonicut Street Bridge. Installation of a signal or the presence of a police officer to direct traffic during peak periods for the duration of the construction could serve to improve circulation and alleviate congestion from the detour.

Finally, the potential exists for adverse economic impacts on the Providence and Worcester (P&W) freight railroad, which operates on a segment of the NEC. According to Amtrak estimates, some P&W movements may take an additional 1.5 to 3 hours to complete, all new freight movements would be limited to nighttime operation, and may also require additional time. The delays and timing of freight service may make it less desirable and some potential shippers may locate in other areas with more favorable transportation services. The installation of catenary under overhead bridges will also make it more difficult to undertake any future program to increase clearances to permit the use of modern, large dimension freight cars. These latter two impacts have implications for the State of Rhode Island's plans to develop a commercial port to be served by P&W at Quonset Point. According to estimates developed by the P&W, the additional operating costs and potential loss of new business related to schedule and height restrictions could result in an annual revenue loss of $900,000 and could cause P&W to cease operations on the NEC.

FRA is in the process of developing a master plan under Section 4 of the Amtrak Authorization and Development Act designed to coordinate the plans of Amtrak, the commuter railroads and the freight railroads. This master plan will identify potential measures to manage adverse impacts on other users of the NEC mainline.

ES.5.2.7 Air Quality. There are no adverse effects of the proposed electrification on air quality, aside from short-term construction-related impacts such as dust emissions that may affect the surrounding community ("fugitive dust"). There are six proposed electrification facility sites and five bridge modification sites located close to sensitive receptors that may be adversely affected by construction-related air quality impacts. Good housekeeping practices, such as wetting or chemically treating exposed earth areas, covering dust-producing materials during transport, and limiting construction activities during high wind conditions, could minimize the dust impacts. Direct emissions from construction equipment and trucks are generally not expected to be adverse. Keeping the trucks clean and routing them away from residential locations could further alleviate these potential adverse impacts.

ES.5.2.8 Visual and Architectural Resources. Of the approximately 200 waterfront residences along the NEC, sensitive views from 34 residences and along one public road could be diminished as a result of the proposed electrification. Most of this impact is due to the proposed catenary installation, although the Noank paralleling station could also have a visual effect. As the catenary support poles and pulleys are significantly more intrusive than the catenary wires, careful placement of them out of or on the edges of the affected views could serve to reduce such impacts. There is little that could be done to reduce the visual impact of the Noank paralleling station, short of moving it to another site.

The Roxbury substation and Noank paralleling station are located within residential neighborhoods. Construction of these facilities could have an impact on the character of the community, as they are out of character and scale with surrounding development in these areas. One way of reducing or possibly eliminating this effect could be to enclose the facilities in structures that are compatible in material and style with the surrounding neighborhood.

ES.5.2.9 Natural Resources. Impacts to wetlands, wildlife habitat, endangered species, floodplains, the coastal zone and water resources were evaluated. Construction of the Kingston paralleling station and placement of cables in the Connecticut River under the moveable portion of the Connecticut River Bridge could affect wildlife habitat determined to be of high value. Preservation of the large oak tree and the surrounding area could reduce the effects on the wildlife habitat at the Kingston site. Scheduling the work in the Connecticut River to avoid the breeding season could reduce the effects on wildlife in the river.

Turbidity and other water quality impacts associated with placement of cables in the Connecticut River may affect a Federally-listed endangered species that inhabits this river (short-nosed sturgeon, *Acipenser brevirostris*). Mitigation of such impacts will be evaluated in consultation with the National Marine Fisheries Service. Likewise, the appropriate state agencies will be contacted regarding potential impacts to a state-listed species (American bittern, *Botaurus lentiginosus*) that inhabits the area of the Stonington paralleling station and the four state-listed species that inhabit the Fowl Meadow Area of Critical Environmental Concern (ACEC), through which the corridor passes.

Five of the electrification facilities sites are proposed for locations within the 100-year floodplain, or flood hazard areas. Of these, four would be less than one-quarter acre in size and the fifth would be approximately one-half acre. The minimal size of these facilities would not result in any discernible impacts to flood storage capacity.

All five of the moveable railroad bridges in Connecticut, as well as several of the electrification facilities and much of the catenary installation are located in the coastal zone. Consultation with the Connecticut Department of Environmental Protection (ConnDEP) Long Island Sound Program will occur to determine consistency of all project activities with the appropriate coastal zone policies.

Thirteen of the electrification facilities and bridge modification sites are located in Federally-protected sole source aquifer protection areas, locally-designated groundwater protection districts or in close proximity to drinking water wells. Measures for minimizing the potential for contamination of these groundwater resources include staging construction equipment on impervious surfaces, storage and maintenance of equipment outside the protected areas, and preparing a contingency plan for handling spills.

In Boston, Amtrak plans to lower the tracks a maximum of five inches and install catenary in the area between the Tremont/Arlington Overhead Bridge and South station, known as the "MUD Section". The MBTA is concerned that these activities could damage an existing waterproofing membrane and adversely impact the existing groundwater levels in that area. A review and comparison of Amtrak's proposed plans with the existing MUD information indicates that no impact will occur to the existing membrane. Adjustment of the ballast depth will be conducted to avoid damaging the membrane, and the catenary will either be hung from bridges or from arms attached to existing concrete walls.

Although twelve of the facilities sites or bridges fall in the buffer zone of wetlands or surface waters, no direct impacts to these resources are anticipated. Indirect impacts could be avoided by implementing measures to reduce the potential for siltation, sedimentation or contamination from runoff during construction. These include sediment and erosion control measures (hay bales, silt fencing), storage and maintenance of equipment outside the protected areas, preparing a contingency plan for handling spills, and directing runoff from the sites away from the resource areas. Operational impacts from stormwater runoff could be avoided by minimizing the site footprint, reducing the impervious surface area, and grading the surface to drain away from the resource area.

ES.5.2.10 Hazardous and Solid Waste. There is a potential for encountering hazardous wastes during construction of eight of the proposed electrification facilities and modification of one bridge. Contamination associated with disturbance of these materials during construction could be avoided by initiating investigations, such as subsurface soil and water analysis, prior to construction of the electrification facilities. Likewise, prior to construction, samples could be taken from the bridge and analyzed for lead concentration. Construction on any bridges found to contain lead should be conducted in compliance with appropriate Federal and state laws. Any hazardous materials identified would have to be handled, removed, transported and disposed of in compliance with appropriate Federal and state laws.

Solid wastes are expected to be generated from undercutting operations, and bridge and facility site construction, and should be disposed in accordance with Federal, state and local requirements for handling and disposal.

CHAPTER 1
INTRODUCTION, PURPOSE AND NEED

1.1 PURPOSE AND NEED FOR THE EIS AND EIR

Congress has appropriated funds to the Federal Railroad Administration (FRA) for transfer to the National Railroad Passenger Corporation (Amtrak) for the purpose of extending electric traction power to Amtrak's Northeast Corridor (NEC) main line between New Haven, CT, and Boston, MA. FRA has determined that the transfer of these funds would constitute a "major Federal action" within the meaning of the National Environmental Policy Act of 1969 (NEPA). Pursuant to the regulations of the President's Council on Environmental Quality (CEQ), which sets out the procedures for implementing NEPA (40 CFR Parts 1500-1508) and FRA's Procedures for Considering Environmental Impacts (FR Vol. 45 page 40854), FRA has prepared this environmental impact statement (EIS) to evaluate Amtrak's proposed action.

This EIS has also been prepared in accordance with the procedures for implementing the Massachusetts Environmental Policy Act (MEPA) set out in 301 CMR 11.00 and in a certificate issued by the Massachusetts Secretary of Environmental Affairs on September 9, 1992. This document will also serve as the Environmental Impact Report (EIR), as required in the Secretary's certificate, for a joint EIS/R.

This EIS/R supplements the Final Programmatic Environmental Impact Statement (PEIS) on the Northeast Corridor Improvement Project (NECIP), published by the Federal Railroad Administration in 1978. The PEIS was an evaluation of alternatives associated with possible investments by the Federal Government necessary to improve intercity ground transportation between Washington, DC, and Boston. Based in part on the PEIS, the FRA made a decision to undertake a comprehensive program of improvements to the NEC main line now known as NECIP. (The history of NECIP is discussed in section 1.4.) Included as part of this program was the extension of electric traction (electrification) between New Haven and Boston. The electrification between New Haven and Boston was addressed in a general way in the PEIS and it was determined that a more detailed, site specific, environmental analysis would be prepared prior to release of Federal funds needed to implement the electrification project.

1.2 PURPOSE AND NEED FOR THE PROPOSED ACTION

The proposed extension of electric traction between New Haven and Boston is part of the continuing program of improvements to the main line of the Northeast Corridor designed to improve rail passenger service through reduced travel times and increased reliability.

Reductions in travel time and increased reliability would increase the attractiveness of rail travel over alternate means - primarily private automobile and commercial airline. There are attendant benefits to the potential diversion of traffic from both of these modes. These include reduced vehicular traffic on major highways in the northeast and on surface roads around the region's major airports. Air quality improvements would result from reduced air and vehicular traffic, as well as from the replacement of diesel locomotives with electric locomotives. To some extent, improved rail service and resulting increases in intercity rail ridership would lessen the growth in air traffic. This, in turn, may result in improved air traffic conditions and may delay or eliminate the need for new or expanded airport facilities.

The proposed electrification of the route segment between New Haven and Boston, the only remaining segment on the NEC main line which is not electrified, would help achieve the program goal of reduced travel times and increased reliability in two ways. First, electric powered trains have operating characteristics (e.g. maximum speed, acceleration and deceleration rates, reliability and cost of maintenance) which make them superior to the diesel-electric trains currently serving the NEC between

New Haven and Boston. Also, because the segment south of New Haven is electrified while the segment north of New Haven is not, trains traveling the full length of the corridor must change locomotives, typically at Union Station in New Haven, CT. This locomotive change takes approximately 10-20 minutes. Eliminating the need for this change would further reduce the travel time between Boston and New York City.

1.3 DESCRIPTION OF THE PROPOSED ACTION

Amtrak proposes to install a constant tension, simple catenary system, comprised of one messenger wire, one electrical contact wire, and one negative return wire, which would deliver 25,000 volts (25 kV) at 60 cycles per second (60 hz) to the electric locomotive unit or units. Four traction power substations would be installed along the railroad route which would receive power via a 115 kV-60 hz current, step down the current to 25 kV-60 Hz and transmit the power to the catenary contact wire. Each substation would require a site of approximately 0.5 acre. Power would be supplied to the substations from the closest private utilities, over lines funded under this project. Switching stations would be constructed on sites of approximately 0.25 acre in area, at three locations between the traction power stations. Finally, 18 paralleling stations would be constructed along the railroad right-of-way and would each require an area of approximately 0.15 acre. A more detailed description of these facilities is provided in Chapter 2 of this document.

The catenary would be supported by poles erected on both sides of the tracks within the railroad property line. The poles would be installed approximately 200 feet apart on tangent sections and at shorter intervals on curved track. Each pole would have a cantilever arm assembly extending over the track which would position the contact wire 20 feet above the rail. Where necessary, the vertical clearance at overhead roadway bridges would be increased by undercutting (lowering) the track, by raising the bridge structure, by special treatment of the catenary assembly, or by some combination of these three actions. The 20-foot clearance would be reduced on a site-specific basis, within tunnels and in critical overhead bridge areas, for example, within the parameters of governing design guidelines.

Amtrak proposes to increase the frequency of operations between New York City and Boston from the 10 trains per day in each direction it presently operates between these points, to an estimated 26 trains per day in each direction in 2010. This service would include a mixture of express and conventional trains. Express service would be provided by new, electric powered equipment presently being acquired by Amtrak which would provide service over the entire Boston to Washington route. Other service on the corridor would most likely use, for the next several years, the types of electric locomotives and equipment presently used by Amtrak south of New Haven.

1.4 PROJECT BACKGROUND

This section describes both the history of the NEC and the history and status of NECIP.

1.4.1 History and Status of the Northeast Corridor

The Northeast rail corridor evolved from a number of independently constructed and operated railroads prior to the American Civil War to a unified system organized under the Pennsylvania Railroad Company (between New York and Washington) and the New Haven Railroad Company (between New York and Boston) by the turn of the century. The New Haven to Boston Shore Line, which is the subject of this EIS/R, came under the unified control of the New Haven Railroad Company in 1893.

In the first decade of the twentieth century the railroad tunnel under the Hudson River was completed to link the Pennsylvania system with Manhattan Island and Long Island. The Hell Gate high level railroad bridge, constructed in 1917, enabled passengers to travel between Boston and Washington on a "one seat ride", although until 1970, most of the New Haven intercity passenger service and all commuter passenger service terminated at Grand Central Station in New York City. Amtrak rerouted all Boston to New York City trains to Pennsylvania Station in the 1970s permitting through service from one end of the NEC to the other.

Following an accident in the Grand Central Station tunnel in the early 1900s, the railroads operating into this station were required to convert from steam locomotives to electric power. The New Haven Railroad installed an overhead catenary system from New York City to Stamford, CT by 1909 and extended this system to New Haven by 1914. The route between Washington and New York City was electrified between 1928 and 1935.

After 1935 the Pennsylvania and New Haven railroads cooperated in the operation of electrically-powered passenger service, although each railroad used its own electric locomotive to and from Pennsylvania Station. Except for a brief period of prosperity during World War II, the New Haven Railroad experienced a long decline in both freight and passenger volumes as a result of changes in the southern New England economic base, the creation of the Interstate Highway System, and the expansion of aggressive airline competition. After entering into bankruptcy in 1961, it remained under court supervision until it was incorporated into the Penn Central Railroad system in 1969. After the merger of the two railroads, Penn Central electric locomotives hauled passenger trains, without a change of locomotive units, between New Haven and Washington.

1.4.2 History of the Northeast Corridor Improvement Project

The extension of electrification to the corridor between New Haven and Boston has long been viewed as a means of improving passenger service travel time in the NEC. Following the completion of the catenary system to New Haven in 1914, action by the New Haven Railroad to extend electrification east of New Haven was precluded by World War I, the Great Depression, and, in the 1950s, economic troubles on the part of the railroad. It was only with the involvement of the Department of Commerce in high speed ground transportation research in 1963 that the interest in electrification reemerged. From the early 1960s to the present day, public officials have investigated the decline of intercity passenger service and sought ways to improve service and increase ridership.

Passenger losses to airlines and highway travel, combined with the inability of the railroads to make the levels of investment necessary to maintain adequate passenger service prompted the Congress to establish an NEC Project Office within the Department of Commerce in 1963. A program was developed to gather data about travel needs, the condition of the rail facilities, and the "state-of-the-art" of modern railroad equipment for corridor operations. Through the High Speed Ground Transportation Act of 1965 (HSGTA), the Office of High Speed Ground Transportation (OHSGT) and the NEC Transportation Project were established.

The major aim of the HSGTA was to sponsor research, development, and demonstration of possible high-speed ground transportation. As a result, Metroliner equipment was successfully deployed along the New York City to Washington route and the turbotrain operations were introduced in the Empire Corridor between New York City and Albany. The OHSGT was transferred to the Department of Transportation (DOT) following the Department's creation in 1966 and was incorporated as part of the FRA.

The Rail Passenger Service Act (RPSA) was passed in 1970 to prevent further deterioration of intercity passenger rail service, facilitate an upgrade of passenger service and improve the potential viability of passenger service between major population centers. The RPSA created the National Railroad Passenger

Corporation (Amtrak), which assumed the responsibility for providing intercity rail passenger service in the U.S.

In 1971 the Secretary of Transportation made recommendations to address critical problems with intercity transportation. The report concluded that high speed rail represented one of the best alternatives for short- and long-term future transportation needs in the NEC. A 1973 update of the report proposed to implement passenger service improvements in the NEC. Specific improvements, an organization, a financial plan, and a schedule for implementation were recommended.

In 1973 the Regional Rail Reorganization Act (3R) was enacted. While the 3R Act was concerned primarily with rail freight transportation, it also directed the Secretary to begin engineering studies necessary to implement improved rail passenger service within the NEC. As a result, most of the NEC main line was designated for acquisition by Amtrak as part of the reorganization of the northeast railroads.

The Railroad Revitalization and Regulatory Reform Act of 1976 (4R) authorized a $1.75 billion program to implement faster, more frequent, more reliable, and more attractive intercity passenger service along the NEC. This authorization was subsequently increased by Congress to $2.5 billion. The FRA was designated as the program manager for NECIP and undertook the required environmental analysis. In June 1978, the Final Programmatic Environmental Impact Statement (PEIS) was issued, which detailed a preferred system of projects that would achieve the reduced travel time goals for NEC passenger operations. Included in that program was extension of electrification between New Haven and Boston.

Following the Federal environmental review and approvals, the FRA embarked upon a comprehensive construction program, which by 1990 had resulted in the expenditure of the $2.5 billion authorization. Construction carried out between 1978 and 1990, under this program, included: laying 481 miles of continuously welded rail; installation of 2 million new crossties; undercutting of 504 miles of track; elimination of 49 grade crossings; installation of 22 miles of fence; construction or rehabilitation of 13 passenger stations; upgrade and rehabilitation of power, communications, and signal systems, and railroad bridges; creation, improvement, or expansion of nine rolling stock and maintenance of way facilities; and creation, rehabilitation, or removal of over 100 interlockings. Beginning in 1982, the appropriations made available for NECIP declined rapidly. Adequate funds were not available to proceed with electrification and a decision was made to defer this project.

In 1980, the Congress directed FRA to transfer to Amtrak all authority and responsibility for NECIP effective September 30, 1985. Presently, funds for NECIP improvements are appropriated to FRA and transferred to Amtrak pursuant to a grant agreement.

1.4.3 Current Status of the Northeast Corridor Improvement Project

In the late 1980s, a number of groups, most notably the Coalition of Northeastern Governors (CONEG), promoted renewed interest in faster railroad passenger service between Boston and New York City. In response to this increased interest, Congress increased the appropriations for NECIP beginning in fiscal year 1991 primarily for the purpose of improving the NEC north of New York City. Since 1991, Congress has appropriated $448 million for this purpose, including $233 million earmarked for the proposed electrification project.

1.4.4 Other Proposed Site-Specific NECIP Projects

Amtrak also proposes to undertake or participate in the development of other parts of the NECIP program which have not yet been completed, in addition to the proposed electrification project. These include track improvements, construction of a rail grade separation or flyover at New Rochelle, New York, station and tunnel improvements in New York City, station improvements to be undertaken in conjunction with the Connecticut Department of Transportation at Stamford and New Haven, station improvements to be undertaken in conjunction with the MBTA at the Route 128 Station, and expansion of the deck of the Canton Viaduct to be undertaken in conjunction with the MBTA.

The projects identified above are separate and distinct from the electrification project that is the subject of this EIS/R. Other than the track improvements, which were addressed in the PEIS, these projects will be the subject of separate environmental reviews to be prepared by FRA or by the Federal Transit Administration.

1.4.4.1 Northeast Corridor Program Master Plan. In addition to Amtrak's intercity rail passenger service, the NEC main line between New York City and Boston is also used extensively to provide commuter rail service and to support freight service in Connecticut, Rhode Island, and Massachusetts. Recognizing the multiple uses and interests in the main line and the potential for conflicts between projects planned as part of NECIP and projects planned for other rail users of the NEC main line, the Congress, in section 4 of the Amtrak Authorization and Development Act (Pub. L. 102-533, October 27, 1992), directed FRA to prepare a Program Master Plan for the NEC main line between New York City and Boston.

The purpose of the Master Plan is to develop a strategy to coordinate the improvements necessary to permit regularly scheduled, safe and reliable rail service between New York City and Boston in three hours or less, with the needs of other rail operations over the NEC main line. This plan is currently under development and will be submitted to the Congress by the end of October 1993. To the extent that the Program Master Plan would recommend any significant change to the current NECIP program plan, such changes will be the subject of future environmental evaluation and documentation.

1.4.4.2 Northeast Corridor Rail At-Grade Crossings. There are presently fourteen highway and one pedestrian authorized at-grade crossings of the NEC, all located between New Haven and Boston. The Congress, in section 2 of the Amtrak Authorization and Development Act (Pub. L. 102-533, October 27, 1992), directed FRA to prepare a plan for the elimination of all highway at-grade crossings by December 31, 1997. This plan may provide that the elimination of a highway at-grade crossing not be required if eliminating such crossing is impracticable or unnecessary and the use of the crossing will be consistent with such conditions as the Secretary of Transportation considers appropriate to ensure safety.

FRA is in the process of developing this plan, which will be completed by the end of October 1993. Section 2 does not direct FRA to implement the plan once it is completed. In the past, public highway crossings of the NEC have been eliminated by the appropriate state departments of transportation according to the procedures that apply in that state for elimination of highway at-grade crossings. It is expected that this will continue to be the case. Decisions to eliminate highway at-grade crossings are separate and distinct from the electrification project. Any environmental evaluation and documentation required for a specific at-grade crossing elimination will be prepared in connection with decisions on whether to implement the at-grade crossing elimination plan.

1.4.4.3 Coastal America/Corps of Engineers Study of Tidal Coves in Connecticut. Under the auspices of Coastal America, an interagency group coordinating Federal policy in coastal areas, the U.S. Army Corps of Engineers is presently undertaking a study of eight severely degraded tidal wetlands and coves along the Connecticut coast. Their objectives are to determine the source of the degradation - either the NEC embankment, an adjacent roadway, or upstream runoff - and assist in obtaining funds for restoration under existing authorities and programs. Although this study evaluates a situation that would not be impacted by the proposed action (and therefore not considered in this EIS/R), coordination between

Amtrak and Coastal America is anticipated to help restore tidal coves and wetlands degraded by the NEC. The tidal wetland restoration study is nearly complete with a report expected to be published in the fall of 1993.

1.5 RELEVANT PARTIES

There are several parties that are participating in the design and environmental analysis of the proposed Northeast Corridor Electrification Project, each of which is described below:

The Federal Railroad Administration (FRA) is an operating administration within the U.S. Department of Transportation (DOT) vested with the primary responsibility for national railroad policies and programs. Federal funds for Amtrak capital improvement projects such as the NECIP, and for operating expense subsidies of the Amtrak railroad network are appropriated to FRA which transfers these funds in the form of grants to Amtrak.

FRA is responsible for preparation and approval of this EIS/R. FRA may release Federal funds to finance construction activities for the electrification project only after completion of the EIS/R.

Volpe National Transportation Systems Center (Volpe Center) is part of the Research and Special Programs Administration of the DOT. The Volpe Center is providing technical support to the FRA in the preparation of the EIS/R for the proposed electrification project.

Daniel, Mann, Johnson, and Mendenhall, Inc. and Frederic R. Harris, Inc.(DMJM/Harris) is a joint venture of two planning, engineering, and environmental analysis firms, engaged by the Volpe Center to assist in the analysis of the electrification project and to prepare the EIS/R.

National Railroad Passenger Corporation (Amtrak) is a private corporation, created by Congress and charged with the operation of the national network of intercity railroad passenger service, including the NEC. In recognition of the substantial and continuing financial support provided to the Corporation, the Federal Government appoints the Corporation's Board of Directors. Amtrak is responsible for the design and construction of the electrification project.

Morrison Knudsen Corporation, L.K. Comstock Corporation and the Spie Group (MK) is a joint venture of three engineering and construction firms contracted by Amtrak to design and install all railroad electric power system components necessary to operate high speed electric locomotive-hauled passenger trains between Boston and New Haven.

1.6 DESCRIPTION OF THE CORRIDOR

The NEC main line is the railroad route connecting South Station in Boston, MA with Union Station in Washington, DC, serving the most densely populated area of the United States and carrying the greatest intercity passenger volumes of any route within the nation. The route is approximately 457 miles in length. The 156 mile segment between New Haven, CT and Boston, MA is also known as the "Shore Line".

The Shore Line contains a diversity of land uses and geographical features. In Connecticut, the route generally follows the narrow and irregular coastal plain bordering Long Island Sound, meandering along an alignment between the coastline and a distance of two to three miles inland. The desire to follow the most favorable topography is evident in the numerous curves and water crossings within the alignment. Similarly, the alignment crosses tidal basins and wetlands in an effort to avoid tunnel and open cut excavations that would have been necessitated by routes further inland.

The route departs from the coastal plain on the segment between the Rhode Island border and East Greenwich, RI. The horizontal curves in this area are less severe and the route transitions to longer tangent sections in the woodland and farm areas. The line continues as a relatively tangential route through Warwick and Cranston, where it abuts the cove areas of Narragansett Bay. The route through Providence, Pawtucket, and Central Falls bisects urban neighborhoods and becomes increasingly curved, necessitating slower train speeds in these cities. The alignment improves again in Massachusetts as it passes through outer suburban and rural land uses. The route continues along a mildly curved alignment as it enters Boston at Hyde Park. The alignment then enters a deep cut section, known as the Southwest Corridor, through the Jamaica Plain, South End, and Back Bay neighborhoods before terminating at the Boston South Station Terminal Building in the City's center.

The Shore Line is a two track system for all but the northernmost nine miles which are comprised of three tracks and a short, four track segment within the Providence Station area. The entire alignment would be electrified, including much of the track within the Southhampton Yard, in South Boston, which is the maintenance, storage, service, and turnaround facility for Amtrak's operations on the NEC.

There are 225 roadway bridges over the tracks, five moveable railroad bridges over the Connecticut River, the Niantic River, Shaws Cove, the Thames River, and the Mystic River and 220 railroad bridges over roads, railroads, walkways, and watercourses. The moveable bridges over Shaws Cove and the Mystic River are less than fifteen years old. The structures over the Connecticut River and Thames River underwent rehabilitation during the past fifteen years. The moveable bridge over the Niantic River has been identified as needing replacement. The fixed track bridges vary in age and condition; several were constructed during the 19th century, including the historic Canton Viaduct which opened in 1835; others were constructed more recently. Thirty-eight open deck structures are programmed for conversion to ballasted deck bridges as part of the NECIP.

Amtrak, Massachusetts Bay Transit Authority (MBTA), and Connecticut Department of Transportation (Conn DOT) operate passenger train service along the Northeast Corridor in the study area. Amtrak service between New Haven and Boston takes between two hours and twenty-four minutes and three hours and six minutes. MBTA funds commuter train operations between South Station in Boston and Union Station in Providence, through a contract with Amtrak, for five trips in each direction on each weekday. In 1990, ConnDOT contracted with Amtrak to run commuter service comprised of six trains southbound and eight trains northbound along the 33-mile segment between New Haven and Old Saybrook.

The Consolidated Rail Corporation (Conrail) and the Providence and Worcester Railroad Company (P&W) operate freight service along the corridor. Conrail, successor to the Penn Central Railroad, serves customers as part of the agreement that transferred the NEC rail line in Massachusetts to the MBTA. P&W conducts freight operations within Rhode Island and Connecticut. In accordance with normal railroad practice, passenger train operations have scheduling priority over freight trains.

CHAPTER 2
DEVELOPMENT AND DESCRIPTION OF ALTERNATIVES

2.1 INTRODUCTION

Planning for the proposed electrification of the Northeast Corridor (NEC) between New Haven and Boston began in 1976 when the Federal Railroad Administration (FRA) initiated a Programmatic Environmental Impact Statement (PEIS) to identify a capital program for improving operating conditions along the NEC. From the initiation of that study in 1978 to the publication of this Draft Environmental Impact Statement/Report (DEIS/R), various alternatives have been evaluated for providing high speed passenger rail service between Boston, Massachusetts and Washington, D.C.

Alternatives analyzed in this DEIS/R are: 1) a no build option consisting of minor increases in existing Amtrak NEC operations to respond to projected demand, and 2) electrification of the NEC main line between New Haven, CT and South Station in Boston, MA using an overhead 25,000 volt-60 hertz (25 kV-60 Hz) single phase catenary system. This chapter describes the evolution of the project including alternatives considered in the PEIS, alternatives raised in National Environmental Policy Act (NEPA) and Massachusetts Environmental Policy Act (MEPA) scoping sessions for this DEIS/R and alternatives that emerged from the scoping process to be fully analyzed in this document.

2.2 SUMMARY OF THE 1978 PROGRAMMATIC ENVIRONMENTAL IMPACT STATEMENT (PEIS)

The PEIS evaluated a wide range of potential alternatives to the proposed action as well as alternate forms of electrification. These alternatives varied by mode, technology, traction power system, route and level of service. Whether an alternative offered a significant improvement over existing travel time along the NEC, and if so, whether the technology required would be available in the time frame necessary for project operation, were critical criteria early in the screening process. Other alternatives were raised and subsequently dropped from further analysis in the PEIS due to economic or environmental considerations. The PEIS concluded that electrification of the NEC mainline north of New Haven was part of the preferred approach for upgrading intercity passenger service between Boston and Washington but that a site-specific environmental impact analysis would be needed prior to project implementation. The following sections describe the four categories of alternatives evaluated in the PEIS.

2.2.1 Non-Rail Alternatives

Non-rail alternatives analyzed included:

- A no action alternative that would entail no public investment in the NEC beyond routine maintenance.
- Investment in other modes of transport only, such as expanded highway, intercity bus and airport capacity.
- Continued investment in all transportation modes at current (1978) levels.

The do nothing alternative was not considered a prudent or feasible alternative from an economic standpoint because disinvestment in the NEC would result in deterioration of the right of way (ROW) and thus threaten existing passenger, freight and commuter rail operations. This disruption of the corridor could in turn, adversely impact the regional economy. Investment in modes other than rail was viewed as similarly undesirable because of the social, environmental and economic costs associated with the land acquisition that would be required for new airports or highway lanes. Finally, investment in all modes at 1978 levels would result in socioeconomic and other environmental impacts similar to those associated with investment in non-rail alternatives.

2.2.2 New Technologies

Several new technologies were raised, evaluated and subsequently eliminated from further consideration in the PEIS due to cost and environmental considerations. These technologies included advanced high-speed rail (HSR) at 200 mph, similar in technology to the Japanese bullet trains; underground tube vehicles; tracked air cushion vehicles (TACV); and magnetic levitation vehicles (Maglev). The underground tube system would have required an enormous public investment due to the exorbitant costs of acquiring and constructing a 456 mile-long underground tunnel. The HSR, TACV and Maglev technologies would have all required a new ROW with minimum route curvature. Assembly of a new ROW through the heavily developed and densely populated region of the NEC would have involved excessive cost, as well as undesirable socioeconomic and environmental impacts, such as dislocation of residences and businesses and disruption of sensitive ecosystems.

2.2.3 Traction Power Alternatives

Five alternative traction power systems were assessed in the PEIS. Of the five systems, four were subsequently eliminated from further consideration:

- Retention of the existing dual traction system; (diesel-electric north of New Haven, electrification south of New Haven);
- Conversion to an all gas-turbine operation from Washington to Boston;
- Conversion to a full diesel-electric locomotive operation (continuation of the Boston-New Haven system south to Washington);
- Conversion to a direct current (DC) power system (either third rail or catenary); and
- Full electrification of the NEC with either a 11 kV-25 Hz or 25 kV-60 Hz system.

While retention of the existing dual traction system between Boston and Washington would have required no major capital investment, it had several operational and environmental flaws noted in the PEIS. Specifically, the existing system offered no improvement in travel time savings relative to other alternatives due to: 1) lower achievable operating speeds; 2) the need to switch from diesel to electric locomotives in New Haven; and 3) poor acceleration and deceleration capabilities. Further, unlike several other proposed power systems, it offered no environmental benefits. Diesel pollutant emissions and noise would have risen as intercity service expanded to accommodate projected growth in passenger demand.

Abandonment of the existing electrification south of New Haven in favor of a gas turbine operation in which locomotives would be powered by a gas turbine engine was also dropped from further analysis because of cost, environmental and operational shortcomings. In addition, conversion to gas turbine locomotives would have required: 1) a large capital outlay for rolling stock; 2) construction of major new fuel depots between Boston and Washington; 3) major retraining of Amtrak maintenance personnel; and 4) significantly increased diesel fuel consumption. Accordingly, this alternative was not subject to detailed analysis in the PEIS.

Extension of the diesel-electric locomotive system from New Haven to the NEC terminus in Washington, would have required abandonment of the existing electrification south of New Haven. The PEIS noted that while this alternative would have avoided the capital expense of electrification north of New Haven and maintenance of the existing catenary system south of New Haven, it would have had adverse environmental consequences, as well as capital costs attendant with dismantling the existing catenary system. Noise and air quality conditions south of New Haven would have deteriorated because of the additional emissions that would have resulted from a full diesel locomotive operation along the entire NEC. In addition, the acceleration capabilities of this equipment were inferior to electric locomotives and their use would have degraded rather than improved operating conditions along the corridor. Therefore, this alternative was also not the subject of extensive analysis in the PEIS.

Conversion of the existing dual traction system to direct current (DC) power using third rail or catenary would have required a substantially greater number of substations along the entire NEC than Amtrak's proposal, and would have required conversion of AC current to DC current, adding equipment and weight to the train, thereby decreasing rather than increasing operating speeds along the corridor. The third-rail DC alternative would have required the placement of live lethal voltages along the entire 456-mile ROW and therefore would have presented an unacceptable public safety hazard even with additional fencing. For these reasons, the alternative was dropped from further consideration in the PEIS.

The final power traction alternative, electrification of the entire NEC at 25 kV-60 Hz, was recommended for further analysis because, of the five alternatives, it offered the greatest operational and environmental benefits at the least cost. The principal operational benefits of electrification included superior acceleration and deceleration capabilities, higher achievable operating speeds and the elimination of the locomotive change at New Haven. Due to these operational benefits, travel time along the corridor between Boston and New York City -- the primary performance criterion -- was projected to decrease significantly. In addition, air quality and noise improvements would result from reduced air traffic along the NEC as well as the replacement of diesel locomotives with electric locomotives.

2.2.4 Route Alternatives

The PEIS investigated two route alternatives for proposed high speed rail service including the Shore Line Route between Boston and New Haven that runs adjacent to the Rhode Island and Connecticut coasts, and the southern New England inland route between New Haven and Boston via Hartford, Springfield and Worcester. The Shore Line Route was found to be superior to the inland route because of its superior travel time reduction potential; fewer freight operations, hence reduced potential for passenger-freight conflicts; fewer grade crossings; and superior vertical alignment. Other proposed alignments were eliminated from consideration in the PEIS due to the same environmental, socioeconomic and cost considerations associated with airport and highway expansion and alternate fixed guideway technologies, as described in sections 2.2.1 and 2.2.2.

In 1991, prior to scoping for this DEIS/R, a separate study conducted for Amtrak assessed the feasibility of a new high speed rail alignment along the Interstate-95 corridor between Old Saybrook, CT and East Greenwich, RI. The study concluded that this alternate alignment could have been operational in approximately 8 to 14 years and would have cost between $1.5 and $1.9 billion, in addition to the estimated cost of upgrading the existing NEC ROW between New Haven and Old Saybrook, and between East Greenwich and Boston. It would have required an additional $1.3 to $1.7 billion investment over the projected cost of electrifying the existing main line north of New Haven (1991 dollars) and would have resulted in travel time savings of approximately 20 minutes. Due to the relatively low cost to benefit performance of this alignment, it was not carried forward into this DEIS/R.

2.2.5 PEIS Conclusion

The PEIS recommended a specific program of improvements for meeting NECIP statutory goals of improving intercity rail passenger service between Washington, D.C. and Boston, MA. These included route realignments, upgrading of tracks, overhead bridges, tunnels, signals, traffic control and communications systems, fencing and station and maintenance facilities, elimination of grade crossings, as well as the electrification of the NEC mainline north of New Haven. To date, $2.7 billion has been expended to implement this program. Since 1991, Congress has appropriated $233 million to implement the proposed electrification project. However, federal funding for the project could not be released without completion of a site specific EIS on that proposed element of the NECIP program in compliance with NEPA.

2.3 ALTERNATIVES RAISED IN THIS SITE SPECIFIC DEIS/R SCOPING PROCESS

Following appropriation of funds for the project by Congress, FRA initiated the DEIS/R in 1991 pursuant to the requirements of NEPA and MEPA. A Notice of Intent (NOI) describing the project and soliciting comment on the environmental study was published in the Federal Register on October 21, 1991, and Federal scoping sessions were held in November 1991. A project Environmental Notification Form (ENF) was published in the Massachusetts Environmental Monitor on August 7, 1992 and a state scoping session was held on August 21, 1992 in accordance with MEPA requirements. As a result of the state scoping process, the FRA was authorized by the Secretary of the Massachusetts Executive Office of Environmental Affairs to prepare a combined DEIS/R. Appendix C provides a detailed description of the scoping process and the broader public involvement program for the project.

The preliminary list of alternatives proposed for evaluation in this DEIS/R included those raised at MEPA and NEPA scoping sessions by the public, the railroad industry, and environmental or transportation agencies; and those identified by members of FRA staff and other experts in the railroad industry. Trade publications and other relevant literature were also reviewed in order to identify potential alternatives.

A total of 11 alternatives were identified as possibilities. These include two basic types: alternate power systems (other than electric) but with the capacity for electric operation through New York City (6 alternatives), and alternate forms of electrification (5 alternatives). The following sections describe these alternatives and the screening criteria that were applied to select those alternatives that would be the subject of detailed analysis in this document. Alternatives that could not meet one or more of the following four screening criteria were eliminated from further consideration in the DEIS/R.

2.3.1 Screening Criteria

Alternatives raised in the scoping process for this DEIS/R were evaluated according to the following criteria:

1. Travel Time Savings: the extent to which the alternative achieved the primary goal of NECIP - a significant improvement in travel time along the corridor over the existing condition between Boston and New York City.

2. Technological Feasibility: the maturity of the technology proposed for attaining improved travel time and whether the technology would be available for project implementation.

3. Environmental or Financial Costs: the anticipated construction related and long-term environmental impacts of the alternative, the financial investment required for implementation, and whether these costs were excessive in comparison to travel time savings and other benefits.

4. Minimize Redundancy: the degree to which a proposed alternative has alignment, power system, or operating and service characteristics that are similar to another alternative such that these two alternatives can be considered in one representative alternative for the purposes of the detailed analysis.

2.3.2 Non-Electrification Alternatives

Two categories of alternate power systems (non electric) were identified: 1) those that required a locomotive change at New Haven to permit non-electric operation between New Haven and Boston, and 2) those that operated with a dual mode locomotive thus eliminating the need for a locomotive change at New Haven.

2.3.2.1 Change of Locomotives at New Haven. Two alternatives were identified that involved a change in locomotives at New Haven.

Diesel-Electric Locomotive with Locomotive Change at New Haven. This alternative is analogous to the existing Amtrak operation between Boston and New Haven. Amtrak trains operating along this segment of the NEC are pulled by diesel-electric locomotives. At Union Station in New Haven, the diesel-electric locomotives are removed and replaced with electric locomotives for the remainder of the trip to New York City (or on to Washington). The locomotive change at New Haven accounts for approximately 10 to 20 minutes of the overall travel time between Boston and NYC.

This alternative was carried forward into DEIS/R as the "No-Build" alternative to serve as the environmental baseline.

Gas Turbine Locomotive with Locomotive Change at New Haven. This alternative was a variant of the existing operation between Boston and New Haven utilizing instead a gas turbine locomotive. At New Haven, the gas turbine locomotive would be replaced by an electric locomotive to permit electric operation through New York City and points south.

This alternative was eliminated from further analysis in the DEIS/R because it failed screening criteria one and four. Operations of this type would offer no significant improvement in travel time over the current operation, since currently available gas turbine locomotives have operating characteristics that are similar to diesel-electric locomotives. In addition, Amtrak's experience with this type of locomotive on its Empire Corridor indicate that the maintenance costs are considerably higher than for a service provided with diesel-electric locomotive. Finally, the environmental and related impacts for a gas turbine locomotive are not expected to be appreciably different from those associated with diesel-electric operations. Hence under the fourth screening criteria, consideration of the no-build scenario will effectively address the gas turbine locomotive with locomotive change at New Haven option as well.

2.3.2.2 Dual-Powered Diesel-Electric or Gas Turbine Locomotives with Electric Capability. Four alternatives were identified that were based on using a locomotive that would operate in a diesel-electric or gas turbine mode between Boston and New Haven and would have the ability to convert to electric power to avoid the present change in locomotives at New Haven. All four of these locomotives failed to meet one or more of the screening criteria and were eliminated from further analysis in the DEIS/R. The four alternatives and the reasons they were eliminated were:

Diesel-Electric Locomotive with Third Rail Electric Capability. This alternative would consist of a traditional diesel-electric locomotive with the addition of train power pickup and conversion capabilities to permit electric operation over third rail. This type of locomotive is presently operated by Metro North Commuter Railroad between Poughkeepsie and New York City. The locomotive would operate in the diesel-electric mode between Boston and New York City then shift to electric operation in the Pennsylvania Station tunnel.

The *Diesel-Electric Locomotive with Third Rail Electric Capability* failed screening criteria one. It would offer no improvement in trip times over the present service between New Haven and Boston because the travel time savings resulting from the elimination of the locomotive change at New Haven would be offset by the inferior performance capabilities of this locomotive (slower acceleration and deceleration) relative to electric locomotives on the New Haven to New York portion of the NEC. In addition, a locomotive change would be required in heavily congested Pennsylvania Station for trains going on to Washington, D.C. Not only would this create operating problems for Amtrak and the commuter railroads using this station, and likely reduce the limited capacity of this station to handle additional trains, it would continue the locomotive change delay for passengers going to destinations south of New York.

Diesel-Electric Locomotive with Catenary Electric Capability. This alternative would consist of a traditional diesel-electric locomotive with the addition of train power pickup and conversion capabilities to permit electric operation under catenary between New Haven and New York City.

The *Diesel-Electric Locomotive with Catenary Electric Capability* failed screening criteria one and two. This type of operation would theoretically save more travel time than the operation discussed above (diesel-electric locomotive with third rail electric capability) because the locomotive change at New Haven would be eliminated. However, this option still could not match the performance of an all electric service with its higher top speed and greater acceleration and deceleration characteristics. Finally, this alternative fails screening criteria two because the technology for this type of locomotive is not currently available and it is doubtful that it could be fully developed for implementation in the foreseeable future.

Liquid Natural Gas (LNG) Locomotive with Third Rail Electric Capability. This alternative would use a locomotive that burns LNG instead of traditional diesel fuel. The basic engine design would be a diesel engine; therefore, the performance would be similar to the diesel-electric alternative described above.

The *Liquid Natural Gas Locomotive with Third Rail Electric Capability* was eliminated from consideration because it fails screening criteria one. An operation of this type would offer no improvement in trip times over the present service between New Haven and Boston. The trip times savings that could be expected due to the elimination of the locomotive change at New Haven would be offset by the inferior acceleration and deceleration that would be expected from this locomotive in comparison to an all electric locomotive. In addition, as with the Diesel-Electric Locomotive with Third Rail Electric Capability alternative, a locomotive change would be required in heavily congested Pennsylvania Station for trains going on to Washington, D.C. Not only would this create operating problems for Amtrak and the commuter railroads using this station, and likely reduce the limited capacity of this station to handle additional trains, it would continue the locomotive change delay for passengers going to destinations south of New York.

Gas Turbine Locomotive with Third Rail Electric Capability. This alternative would consist of a gas turbine locomotive with the addition of train power pickup and conversion capabilities to permit electric operation over third rail. This locomotive is similar to the RTL Turboliner, currently in operation on the Empire Corridor between Albany, NY and Pennsylvania Station.

The *Gas Turbine Locomotive With Third Rail Electric Capability* was eliminated because it fails screening criteria one and three. Its performance capabilities would be very similar to the diesel-electric locomotive with third rail electric capability discussed above and would not match those of the electric locomotive. While the time savings associated with eliminating the change of locomotives at New Haven would be realized under this alternative, the gas turbine locomotive does not have the acceleration and deceleration capabilities that are found with the all electric locomotive. As a result, a significant improvement in trip times could not be realized. In addition, as with the Diesel-Electric Locomotive with Third Rail Electric Capability alternative, a locomotive change would be required in heavily congested Pennsylvania Station for trains going on to Washington, D.C. Not only would this create operating problems for Amtrak and the commuter railroads using this station, and likely reduce the limited capacity of this station to handle additional trains, it would continue the locomotive change delay for passengers going to destinations south of New York.

2.3.3 Electrification Alternatives

Two alternatives were identified for electrifying the NEC between Boston and New Haven: 1) a catenary system using overhead cable of varying voltage and frequency, and 2) an electrified rail, hereafter referred to as third rail, running along the tracks. Each of these alternatives is described below.

2.3.3.1 Alternative Catenary Systems. Catenary systems typically consist of an overhead catenary wire for train power pickup. Three alternative catenary supply systems were identified: 1) a 11.5kV-25 Hz system as currently operates between New York City and Washington, 2) a 12.5 kV-60Hz system similar to that between New Haven and New York City, and 3) a 2 x 25 kV-60 Hz system similar to that in use by modern high-speed rail systems abroad. The 2 x 25 kV-60 Hz supply system is viewed as superior to the other systems because it is considered the standard for catenary systems world wide and would require fewer transmission lines, substations and switching stations, hence reduced potential environmental impacts in comparison with other systems. Accordingly, this alternative is evaluated in detail in the DEIS/R as Amtrak's proposed project. The other two alternative catenary systems failed to pass screening criteria four in that they can effectively be represented by the 2 x 25 kV-60 Hz system.

2.3.3.2 Electric Third Rail. Two alternatives were identified involving the use of electric third rail (installation of a 600 to 750 volt DC traction feed system from Boston to New Haven similar to that used by the Long Island Railroad, British Rail, and most urban subway systems). These alternatives are:

Third Rail Electric Locomotive with Locomotive Change in New Haven. This alternative would involve the installation of electric third rail between Boston and New Haven with a change in locomotives in New Haven to allow operation under the existing overhead catenary AC system between New Haven and New York City and points south.

The *Third Rail Electric Locomotive With Locomotive Change in New Haven* fails screening criterion one. It would not provide any significant time savings over the existing operation since third rail electric locomotives do not have top speeds significantly better than diesel-electric locomotives, and the locomotive change at New Haven would continue to take between 10 and 20 minutes. In addition, as noted in the discussion with regards to the PEIS in section 2.2.3, this alternative would require the presence of lethal voltages within the NEC trackbed which would present a significant public safety hazard even with additional fencing.

Third Rail Electric Locomotive with Catenary Electric Capability. This alternative would also require placement of electric third rail between Boston and New Haven. The locomotive would operate under the third rail from Boston to New Haven and under the existing catenary from New Haven to New York and points south. Furthermore, this type of locomotive does not currently exist in the United States or abroad.

The *Third Rail Electric Locomotive With Catenary Electric Capability* would fail to meet screening criteria one, two and three. Operations of this type would not provide any significant time savings over the existing operation since the time saved as a result of the elimination of the locomotive change in New Haven would be eaten up as a result of certain performance capabilities that would be expected with this type of locomotive (the conversion from AC to DC current would add equipment and hence weight to the locomotive and would reduce operating speeds). In addition, a greater number of substations would be required adding to cost and potentially environmental impacts.

2.4 ALTERNATIVES ANALYZED IN THE DEIS/R

Two alternatives were carried forward into the DEIS/R for detailed analysis. Each of these is described below.

2.4.1 No-Build Alternative

The no-build alternative would consist of continuation of the existing operation of diesel-electric trains between Boston and New Haven with a switch at New Haven to an electric locomotive for the trip to New York City. It is estimated that a slight increase in ridership demand would develop under this alternative necessitating the two additional daily trips in each direction by the year 2010. This alternative would involve twelve trains in each direction on an average weekday between Boston and New York. Amtrak would continue to offer three hour and fifty five minute express service between New York's Pennsylvania Station and Boston's South Station with stops at Back Bay, Route 128, Providence and New Haven stations. Regular service would operate on a schedule of approximately five hours and include several additional stops. Included within these schedules is the 10 to 20 minutes required to change locomotives at New Haven.

The diesel locomotives which currently power the trains, known as the F-40, would be replaced with General Electric AMD-103 locomotives currently being delivered to Amtrak. The top speed of these locomotives is 103 mph. Although of contemporary design and easier to maintain, the performance characteristics of these locomotives as they would affect the environment will closely resemble the locomotives they replace.

This alternative would not require construction of any new facilities; however, maintenance and upgrades of existing facilities might be required. In addition, certain of the other improvements to the Northeast Corridor main line as described in section 1.4.4 may also be undertaken subject to completion of future environmental reviews.

2.4.2 Amtrak's Proposed Electrification Project

Amtrak's proposed electrified railroad system consists of two parts: the power supply system (utility power line connections, the traction power supply substations, switching stations, and paralleling stations); and the power distribution system (the overhead catenary). Figure 2.4-1 is a photograph of a catenary system similar to the one proposed for the Northeast Corridor between New Haven and Boston. Figures 2.4-2 and 2.4-3 show the proposed electrification facilities sites and bridge modification locations in each state.

The electric locomotives on the electrified railroad system would operate in a manner similar to electric trolley cars - electric power is taken by the locomotive from a contact wire, which is part of the overhead power distribution system known as the overhead catenary system or OCS. This OCS is typically energized at a voltage of about 12 kV or 25 kV AC, measured contact wire to rail. This contrasts to some trolley systems energized at 600 or 2,400 volts DC. This higher voltage is necessary to effectively move larger and heavier trains at higher speeds.

Electric power from the OCS is collected by the locomotive pantograph, which maintains contact through uplift forces as the train moves. The pantograph is a collapsible frame extending from the locomotive roof. The power is supplied to the locomotive main transformer primary. Once in the locomotive, the transformer secondary supplies power through various control devices, which in turn provide power to the traction motors mounted on or near the locomotive's axles. A small amount of power is also used for train lighting, heating, air conditioning and other auxiliary purposes.

2.4.2.1 Electric Power Locomotives. Since the early 1980s, Amtrak has employed a fleet of electric locomotives known as the AEM-7 to haul passenger trains between Washington and New Haven where a continuous overhead catenary system has existed since the mid 1930s. These locomotives operate at a maximum speed of 125 mph where track conditions permit. As noted above, Amtrak's new diesel locomotives, the AMD-103 operate at a maximum speed of 103 mph.

The electrification alternative also contemplates that Amtrak would purchase new electric locomotives for use along the NEC route between Boston and Washington. These locomotives would be capable of 150 mph operation, have quicker acceleration and deceleration characteristics and be able to traverse curves at higher speeds than the existing AEM-7 locomotives. Such locomotives would be similar to equipment currently in operation in several European countries. This alternative also assumes that Amtrak would employ the new locomotives as express service trains. The present

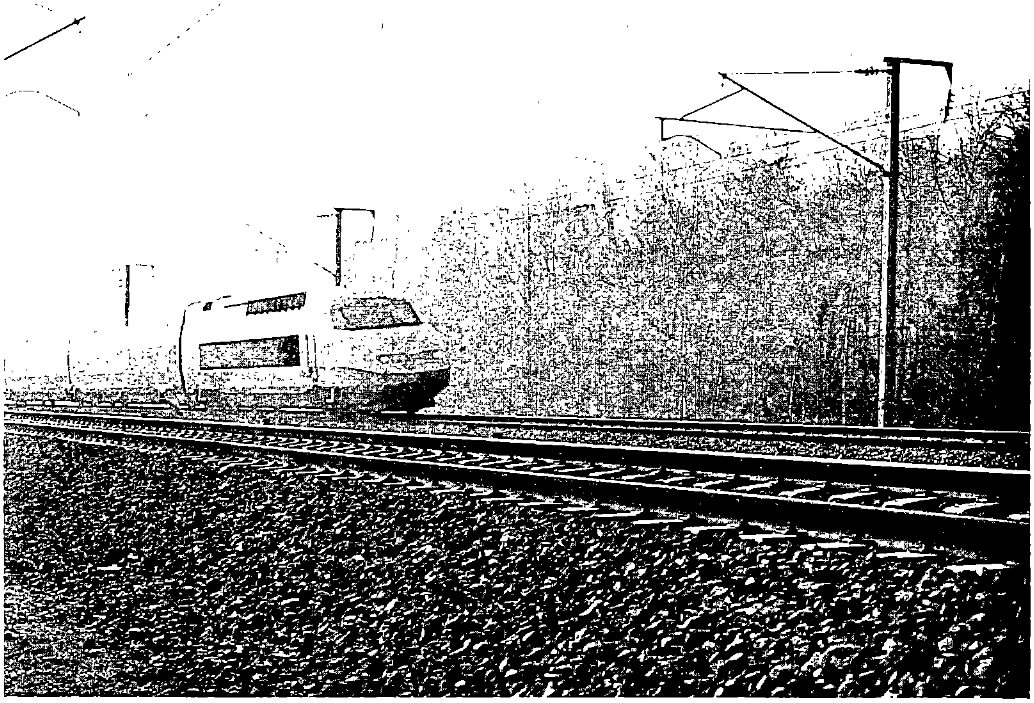

FIGURE 2.4-1. VIEW OF A TYPICAL CATENARY SYSTEM SIMILAR TO THE ONE PROPOSED FOR THE NEC

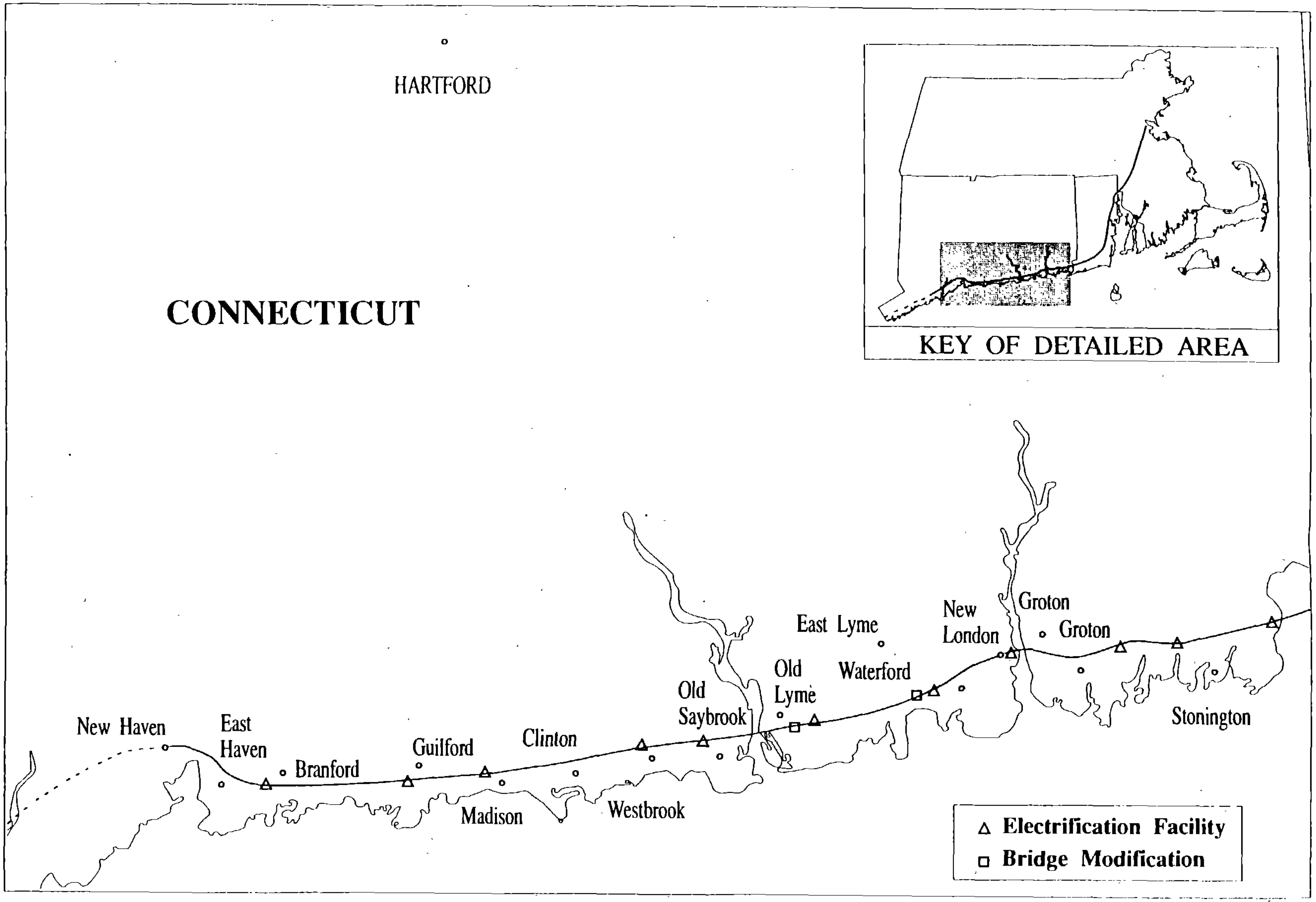

FIGURE 2.4-2. CONNECTICUT FACILITY AND BRIDGE MODIFICATION SITES

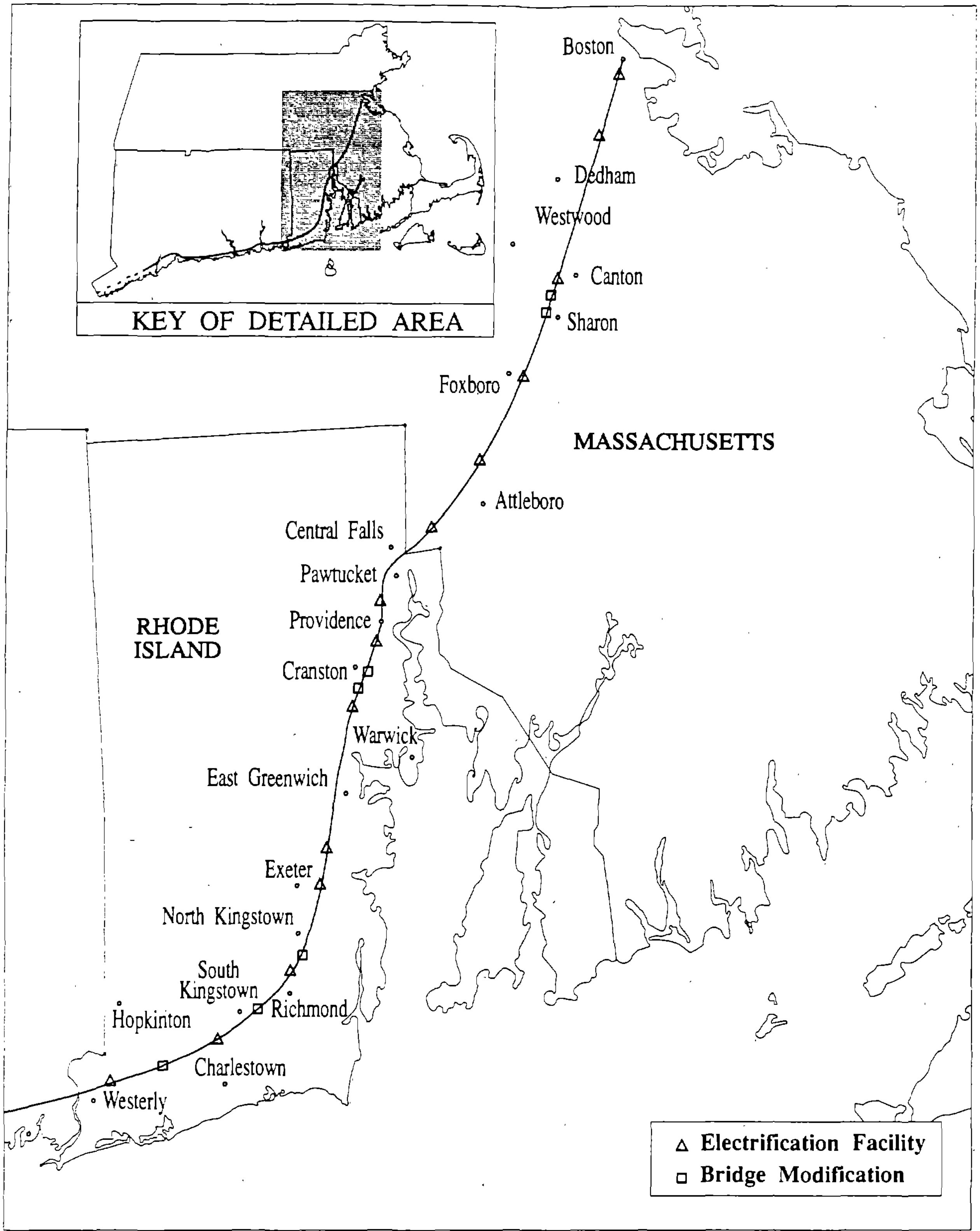

FIGURE 2.4-3. RHODE ISLAND AND MASSACHUSETTS FACILITY AND BRIDGE MODIFICATION SITES

AEM-7 locomotives, which possess a significant remaining useful life, would likely be employed on the somewhat slower conventional trains along the corridor.

2.4.2.2 Catenary Installation. The OCS consists of wires suspended over the railroad tracks supported by steel poles approximately 28 feet high. The poles, which would support a cantilevered arm from which the wires are suspended, are wide flange (WF) beams or reinforced WF beam with 8-inch or 10-inch flange widths and would be spaced in pairs on either side of the tracks. Each set of poles would be spaced approximately 200 feet from the next pair tangent along the track. Pole locations require a closer interval for curved sections of track.

The overhead catenary is not electrically continuous along the entire route; rather, it is subdivided into electrical sections of 40 to 55 miles in length, with an isolating section called a phase break between each section. Each electrical section is fed by separate substations (described in detail below). Each of the substations receives power from the local utility company which serves the area. Under normal operating conditions, each substation feeds its own electrical catenary section, which extends approximately 20 to 30 miles from the substation in each direction along the rail corridor. The catenary sections are separated by phase breaks, which insulate and isolate catenary sections from one another, but allow a train to pass between them. If a substation loses power, switching can be performed to isolate the disabled substation and restore power to the affected catenary section from adjacent sections.

2.4.2.3 Substations and Utility Supply. Railroad power requirements are much like that of a large industry. Electricity from the local utility company is delivered to the substation via a tie-in from the utility's transmissions network. The utility tie-in consists of either overhead or underground wires from local transmission lines to the new substation. Typically, the voltage on the utility's transmission lines is 115,000 volts (115 kV) and is "stepped down" or converted to the 25 kV levels by a transformer at the substation. The 25 kV feed is then connected to the catenary and feeder systems for use by the locomotive. Overhead or underground wires from the substation would supply the stepped down power to the overhead catenary and feeder systems.

Each substation site consists of a fenced area of approximately 0.5 acres. The transformers, as well as circuit breakers, remotely controlled switches and control monitoring equipment, would be contained in this fenced area. Some of these facilities would be located inside a small control building (approximately 750 square feet), which is also located in the fenced area.

The proposed traction power supply system for the NEC includes four substations spaced approximately 44 to 53 miles apart, which receive power from the local utilities at 115 kV. Each substation, which is sited in proximity to the ROW, would contain transformers which step down the 115 kV to supply the catenary and feeder at 25 kV. The substation locations (shown in Appendix A, Figures A-1 through A-4) are listed in Table 2.4-1.

2.4.2.4 The 2 x 25 kV Supply System. The traction power system proposed by Amtrak is known as a 2 x 25 kV or autotransformer system. It includes in the overhead both a contact wire and a feeder each of which is energized at 25 kV AC. The voltage between the catenary and feeder is twice that of each alone, or 50 kV AC. This effectively creates a 50 kV supply for the system.

2.4.2.5 Switching Stations and Paralleling Stations. The feeder allows intermediate power supply points for the OCS to be installed along the route. These intermediate supplies are smaller than substations and are called switching stations and paralleling stations. These facilities contain small transformers (autotransformers) that connect the feeder to the catenary. By employing the feeder and these smaller facilities, fewer utility supply points (substations and tie-ins) are needed, since power can be carried farther down the rail line than if no feeder and intermediate supply points are used.

Paralleling station sites can vary in size, with a maximum fenced area of approximately 6,300 square feet or 0.15 acres. The 18 paralleling stations, which would be located along the electrical catenary sections served by each substation, would each consist of an autotransformer and switch gear to equalize voltage between the two tracks, along with a small control building (approximately 600 square feet). The paralleling station sites are in or directly adjacent to the ROW, as shown in Appendix A, Figures A-5 through A-22; and listed in Table 2.4-1.

A switching station site consists of a fenced area of approximately 0.25 acres. Each of the three switching stations would contain a concrete pad on which would be located a small building (approximately 600 square feet). Also, included within the fenced area would be what is effectively two paralleling stations (two autotransformers and switchgears).

The phase breaks between the electrical catenary sections would be located at the switching stations, which contain the switchgear necessary to connect across them. They provide flexibility in feeding the catenary sections from an adjacent section, should a section's normal supply suffer an outage. The switching station sites are located in or directly adjacent to the ROW (shown in Appendix A, Figures A-23 through A-25) and listed in Table 2.4-1.

2.4.2.6 Bridge Modifications. Installation of the OCS would limit the vertical clearance available over the railroad tracks. In some areas of the NEC, overhead structures, such as roadway and pedestrian bridges, currently restrict vertical clearance over the tracks. Where such structures exist, clearance requirements between the overhead structure and the catenary wires, and between the catenary wires and the train, could further reduce the available vertical clearance (see Figure 2.4-4).

Amtrak has proposed to maintain sufficient vertical clearances between the track and catenary so that all passenger and freight operations currently operating on the NEC can continue. In order to do so, two measures may be undertaken: either the existing railroad track would be lowered or the overhead structure would be raised (in some cases, some combination of both measures may be proposed). Lowering the railroad tracks is preferred to raising the overhead structure for a number of reasons: 1) the cost is usually lower; 2) no disruption or detouring of roadway or pedestrian traffic is required; and 3) the potential for environmental impacts is usually less because all activity would take place in the existing rail bed. Lowering the tracks is accomplished by undercutting under the tracks, removing an appropriate thickness of the ballast material, and tamping the track into its lower position using a rail tamping machine, which rides along the tracks. The entire operation is performed at a rate of approximately 200 to 300 linear feet of track per five hour shift. The tracks would be lowered at 27 locations along the corridor.

Raising or replacing an overhead structure is frequently more complicated and more expensive and is required where track lowering alone is not sufficient or other factors prohibit lowering the track enough to attain adequate clearance. Where an overhead bridge is to be raised, some or all of the following activities would be required:

TABLE 2.4-1. ELECTRIFICATION FACILITY SITES

FACILITY	MILEPOST	TOWN
Substations		
Branford	79.26	Branford, CT
New London	123.55	New London, CT
Warwick	176.91	Warwick, RI
Roxbury Crossing	226.02	Boston, MA
Switching Stations		
Westbrook	103.53	Old Saybrook, CT
Richmond	150.35	Richmond, RI
Norton	198.99	Attleboro, MA
Paralleling Stations		
Leetes Island	85.99	Guilford, CT
Madison	92.41	Madison, CT
Grove Beach	99.11	Westbrook, CT
Old Lyme	109.50	Old Lyme, CT
Millstone	117.56	Waterford, CT
Noank	129.46	Groton, CT
Stonington	134.65	Stonington, CT
State Line	139.93	Stonington, CT
Bradford	145.19	Westerly, RI
Kingston	157.11	South Kingstown, RI
Exeter	161.78	Exeter, RI
East Greenwich	169.80	North Kingstown, RI
Elmwood	181.70	Providence, RI
Providence	187.55	Pawtucket, RI
Attleboro	193.40	Attleboro, MA
East Foxboro	205.70	Foxboro, MA
Canton	212.40	Sharon, MA
Readville	219.10	Boston, MA

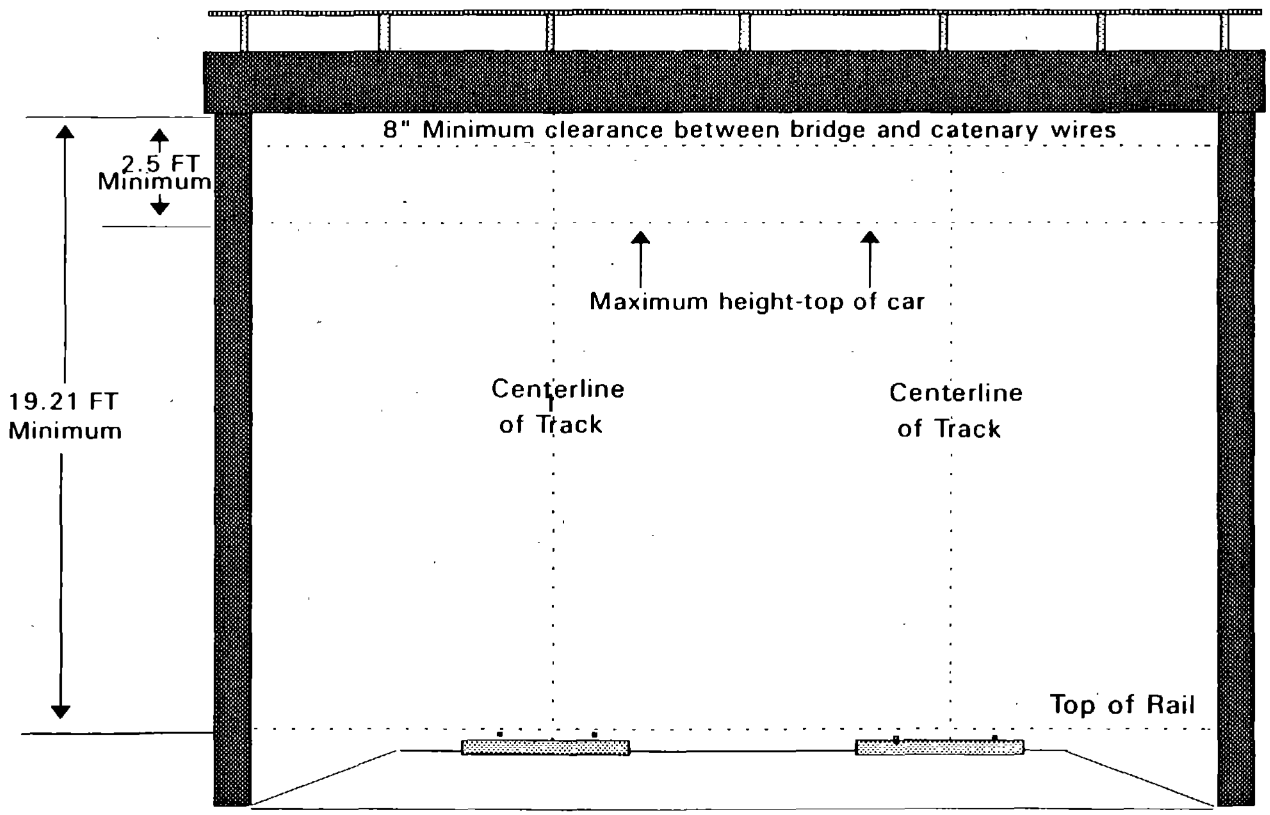

FIGURE 2.4-4. CLEARANCE REQUIREMENTS

- Raising the bridge superstructure;
- Demolition and reconstruction of the bridge superstructure;
- Substructure modifications;
- Approach roadway reconstruction;
- Regrading of embankments; and
- Extension of guardrail and curbing.

The duration of construction on the nine bridges to be modified would range from one month for Johnnycake Hill Road Bridge in Old Lyme to nine months for the Depot Street Bridge in Sharon, MA. As shown in Table 2.4-2, however, for a majority of the bridges the duration of construction would be two to four months. The effect of the construction on pedestrian or vehicular traffic would vary substantially depending upon the duration and staging of construction, as well as the availability or difficulty of detour or alternative routes. Area maps of the bridges are shown in Appendix A.

2.4.2.7 Operating Characteristics. Amtrak's objective is to reduce the travel time of intercity service rail between New York City's Pennsylvania Station and Boston's South Station from nearly 4 hours to less than 3 hours for express service and to under 3 hours and 40 minutes for conventional service. The proposed high speed trains would travel at a maximum speed of 150 mph; with an average increase at any single location of approximately 10 to 50 mph. Table 4.8-3 in Chapter 4 presents the proposed increase in speed at each of the grade crossings on the NEC, which range from 10 to 30 mph.

TABLE 2.4-2. BRIDGE MODIFICATIONS

BRIDGE	MILEPOST	TOWN	DURATION OF CONSTRUCTION (in months)
Johnnycake Hill Road	106.51	Old Lyme, CT	1
Millstone Point Rd.	117.31	Waterford, CT	2.5
Burdickville Rd.	148.41	Charlestown, RI	4
Kenyon School Rd.	154.04	Richmond, RI	3
RI Rte. 138 (Main St.)	158.32	S. Kingstown, RI	3
Pettaconsett Ave.	178.46	Warwick, RI	4.5
Park Ave.	180.29	Cranston, RI	4
Depot St.	211.04	Sharon, MA	9
Maskwonicut St.	211.62	Sharon, MA	3

Amtrak's proposed express service would consist of 16 trains in each direction between Boston and New York on a typical weekday. The express service would make stops at New Haven, CT; Providence, RI; Route 128 Station in Dedham, MA; and Back Bay Station in Boston, MA, before terminating at South Station in Boston, MA. Conventional service would continue to serve those stations currently served, with ten trains in each direction on an average weekday. In addition to those stations served by the express service, the conventional train stops in the study area would be at Old Saybrook, New London and Mystic, CT and Westerly and Kingston, RI, although not all such trains would make all such stops.

2.5 ASSESSMENT OF SERVICE ALTERNATIVES RAISED IN THE EIR SCOPE

In the Certificate issued by the Massachusetts Executive Office of Environmental Affairs, reference was made to a request by the Conservation Law Foundation to assess the NEC electrification project in the context of the following service scenarios:

- A base case of electrification of the existing line from New Haven to Boston, with use of the current rolling stock, and including service from North Station to Portland, Maine;
- A series of high speed service scenarios, assuming a range of different equipment and associated speeds;
- A high speed frequency scenario, where trains are run on a more frequent basis than currently envisioned, including any conflict with freight, local or commuter service which would have to be addressed;
- A service scenario based on completion of a North to South Station link though downtown Boston; and
- A service scenario which included a South Station to Logan Airport link with continuing service to destinations in Northern New England, or termination at Logan Airport.

NECIP improvements described in this document would do nothing to preclude any of these, and in fact may enhance the viability of other transportation initiatives such as the North Station to South Station link through downtown Boston. However, Amtrak has not proposed and no Federal funding currently exits to carry forward any of these scenarios. Accordingly, it is outside the scope of this document to address these scenarios. Certainly, should a proposal and Federal funding become available at a future date, appropriate environmental analysis under NEPA and MEPA can be carried out at that time.

CHAPTER 3
AFFECTED ENVIRONMENT

A knowledge of the existing (1993) physical conditions in the project area is the basis from which the projection of benefits and impacts from the no-build and electrification alternatives are compared. Twelve potential impact areas are evaluated including land use, socioeconomics, historic resources, noise and vibration, electromagnetic fields and interference, energy, archaeology, public safety, transportation and traffic, air quality, visual and aesthetic resources, and natural resources. The following sections provide a description of resources as they occur in the project study area, in addition to the relevant regulations for land use, historic and archaeological resources, noise and vibration, and air quality. Tables referred to in this chapter can be found in Appendix B of this document.

3.1 LAND USE

This section describes the existing land use in the NEC, including identification of sensitive receptors, those land uses that may be particularly sensitive to the impacts of the proposed project.

3.1.1 Regulatory Setting

3.1.1.1 Applicable Federal Regulations, Policies and Guidelines

Federal Farmland Protection Policy Act (11 USC 590 a-f). This act requires Federal agencies to evaluate adverse effects of Federal actions on the preservation of farmland and to consider alternative actions that could lessen such effects. Farmland as defined by this act includes four categories of agricultural land: prime farmland, unique farmland, farmland of statewide importance, and farmland of local importance. Land is classified into these categories by the U.S. Department of Agriculture's Soil Conservation Service (SCS) based on soil type.

Federal Coastal Zone Management Act (43 USC 1241). The Coastal Zone Management Act (CZMA) of 1972 provides states with the authority to establish policies for the protection and use of the coastal zone. The Act is designed to encourage the protection of natural resources in coastal areas, including wetlands, floodplains, and fish and wildlife. States with approved programs must review all Federal funding, permitting, construction, or other actions proposed within the coastal zone for consistency with the state's coastal policies. Connecticut, Rhode Island and Massachusetts each have such an approved program, which is described in the appropriate sections below.

Section 4(f) of the Department of Transportation Act of 1966 (49 USC 303(c)). Section 4(f), as it is commonly known, prohibits the use of land from a significant publicly-owned park, recreation area, wildlife or waterfowl refuge, or any significant historic site unless: 1) there is no feasible and prudent alternative to the use of the land; and 2) the proposed action includes all possible planning to minimize harm to the property from such use.

3.1.1.2 Applicable Connecticut Regulations, Policies and Guidelines

Connecticut Coastal Management Act. This act regulates activities in all areas 1000 feet inland from coastal wetlands. Any proposed action or project within this area is subject to coastal site plan review and evaluation for consistency with the policies of the Act.

Conservation and Development Policies Plan. This plan is the state's comprehensive plan. One relevant goal of the plan is to provide an integrated, efficient, and economical transportation system which provides mobility, convenience, and safety, and which meets the needs of all citizens, including transit-dependent individuals. The plan specifically states that high-speed passenger rail service between Boston and New York with stops in Connecticut is desirable and is feasible through track improvements and electrification.

Environment 2000 Plan. This plan reflects the environmental concerns of the state and the goals, objectives, and strategies for each area of interest. Relevant goals of the plan include protecting public health from harmful exposure to electric and magnetic fields, and from the adverse effects of air pollutants. It also includes the objective of promoting the utilization of vehicles with low level emissions, and transportation which reduces reliance on single-occupant vehicles.

3.1.1.3 Applicable Rhode Island Regulations, Policies and Guidelines

State Guide Plan. The Rhode Island State Guide Plan acts as the comprehensive plan for the state. Element 611 includes improving existing transportation facilities and services. Element 661 includes the goals of promoting reliable and frequent high-speed NEC passenger rail service.

Coastal Zone Management Program. As authorized by the Federal Coastal Zone Management Act (CZMA) this program, operated by the Coastal Resources Management Council (CRMC), has regulation and permitting power for any activities taking place within the 200-foot contiguous area landward of all coastal features.

3.1.1.4 Applicable Massachusetts Regulations, Policies and Guidelines

Massachusetts Coastal Zone Management Act. The Massachusetts Office of Coastal Zone Management administers the Federal CZMA and requires preparation by the proponent of a Federal Consistency Concurrence for projects involving Federal action (permitting, funding) or for which an EIR is being prepared under MEPA, that are located within the designated coastal zone.

3.1.2 Existing Land Use

This section discusses four areas with respect to land use: existing land use, prime and important farmland, special protected areas, and expected land use changes. The first category describes the physical type and extent of development on the land, the next two are Federal jurisdictional categories in which certain development restrictions apply, and the last discusses the possible development pressures which could be created by the project.

The Northeast Corridor traverses a broad range of land uses. Within one-half mile on either side of the right-of-way (ROW) are 96,313 acres of land with the following distribution:

Land Use	Percent
Open/Undeveloped	33.68%
Residential	27.93%
Wetlands	8.95%
Commercial	6.44%
Transportation	6.41%
Industrial	5.85%
Agricultural	4.99%
Water	3.92%
Parks & Recreational	1.83%
TOTAL	100.00%

The land uses within each of the 36 municipal jurisdictions through which the NEC passes are described in Table 3.1-1 in Appendix B. The sensitive receptors - land uses most likely to be affected by the electrification of the mainline tracks or construction of the switching, paralleling, substations, or improvements to bridges - are also identified.

3.1.3 Prime and Important Farmland

As directed by the Federal Farmland Protection Policy Act (11 USC 590 a-f), the effects of this proposed action on farmland must be evaluated. Prime and other farmland of statewide and local importance are lands on which the soil types possess high agricultural value or lands which are of value because of dependence on them for agriculture. The Soil Conservation Service (SCS) defines prime farmland as the land that is best suited to produce food, feed, forage, fiber, and oilseed crops. It also has the soil quality, growing season, and moisture supply needed to produce a sustained high yield of crops; requires minimal amounts of energy and economic resources; and farming it results in the least damage to the environment. For an area to be identified as prime farmland it must be used for producing food or fiber or be available for those uses. Thus, urban and built-up land and water areas are not classified as prime farmland. Table 3.1-2 in Appendix B identifies those proposed switching, paralleling, or substation sites and/or corresponding utility corridors which contain prime or important farmland, or land which has the potential for agricultural use according to the SCS.

3.1.4 Special Protected Areas

3.1.4.1 Coastal Zones. The majority of the corridor between Branford, CT and Westerly, RI, as well as the area around South Station in Boston, MA, falls within the coastal zone. The coastal zone designation is made by each state in accordance with the Federal Coastal Zone Management Act (CZMA). In Connecticut, the coastal zone encompasses areas 1,000 feet inland from coastal features as designated by the Office of the Long Island Sound Program (LISP). In Rhode Island, the coastal zone encompasses areas 200 feet inland of the coastal features as designated by the Coastal Resources Management Council. The coastal zone in Massachusetts consists of all areas inland of coastal features up to the first major transportation route plus 100 feet, as designated by the Massachusetts CZMA.

While portions of the NEC fall into the coastal zone in all three states, only in Connecticut are project facilities and bridges located in the coastal zone. These include the New London substation site, all of the paralleling station sites in Connecticut, with the exception of Madison, and the Millstone Point Road Bridge. Of these facilities, the Leetes Island and Noank paralleling stations are designated as coastal flood hazard areas and the remainder of the sites are classified as shorelands, which is the coastal zone designation for uplands. In addition, all five moveable bridges are located in the coastal zone, and are in coastal flood hazard areas as they are sited in rivers. The Shaws Cove, Thames River and Mystic River Bridges are also partially located in developed shorefront areas and the latter two are also partially located in areas classified as estuarine embayment. The Connecticut River Bridge is located partially in estuarine embayment and a portion of the Niantic River Bridge area is classified as beaches and dunes.

3.1.4.2 Other Protected Areas. There are many protected parcels of land located in the NEC study area. These include conservation areas, land trusts, state parks, dedicated open spaces, local parks, and other protected areas. The major parcels are listed below:

Name	Location in Corridor
• Salt Meadow National Wildlife Refuge	Westbrook, CT
• Rocky Neck State Park	East Lyme, CT
• Haley Farm State Park	Groton, CT
• Bluff Point State Park	Groton, CT
• Burlingame State Park	Westerly and Charlestown, RI
• Great Swamp Management Area	Richmond, Charlestown, and S. Kingstown, RI
• Goddard State Park	E. Greenwich, RI
• Canoe River Area of Critical Environmental Concern (ACEC)	Mansfield, Foxboro, and Sharon, MA
• Fowl Meadow and Ponkapoag Bog ACEC and Neponset River Reservation	Canton, Dedham, and Boston, MA

3.1.5 Secondary Development

The study corridor currently contains an operating intercity railroad. No major alignment, right-of-way, or infrastructure modifications are considered under any alternatives proposed in this DEIS/R. Therefore, secondary development stimulated by the project would be confined to those that might occur in the vicinity of the five express passenger stations within the corridor. The following paragraphs describe the areas where there is potential for land use changes resulting from the implementation of this project.

South Station is currently a major interchange for many transportation modes and a major business center. All of the land surrounding the station is developed precluding new development.

Back Bay Station is also located in a developed area with little remaining vacant land. Some commercial opportunities do exist however. The Pavilion at Park Plaza, a center for commercial services has been considered at a site to the northwest of the station. The area bordered by Clarendon Street, Columbus Avenue, and the former Greyhound bus station on Saint James Street are two parcels which currently serve as ground level parking. Redevelopment of these sites is also possible.

Route 128 Station is surrounded by considerable amounts of vacant land. Some potentially developable areas exist in Westwood, MA, although a large portion of these areas are protected from development by the Fowl Meadow Area of Critical Environmental Concern or are undevelopable because they are wetlands. Most of this area is already regulated by a strict water resource protection district but an industrial park is located south of the station off of University Avenue. One parcel and a few of the existing buildings within the park are vacant and have the potential to be commercially developed. No immediate opportunities exist in Dedham because those areas not protected are zoned for residential development. In the future, much or all of the area may be included within a water resource protection district when new town wells are drilled nearby.

Providence Station is located within a highly urbanized area which contains many commercial services. Nevertheless, some expansion of commercial services is possible. The CIC complex, located south of the station between I-95, Promenade Street, West River, and Bath Street, is a former manufacturing complex which is a candidate for a regional mall development. South of the station, at the present site of the University of Rhode Island's Providence Campus (Hayes Street), Providence Place is a potential site for a retail development. Finally, a wholesale food and produce center could be developed between I-95, Killingly Street, and Dean Street, south of the station.

New Haven Station is located in close proximity to some vacant commercial land parcels. Some commercial development proposals are currently being considered including the Ninth Square Project, the Downtown South Project, and the Air Rights Super Regional Mall.

3.2 SOCIOECONOMICS

The NEC passes through a generally well-established, densely populated area. The proposed project has the potential to increase noise and vibration, electromagnetic fields, visual intrusions, and generate secondary development. Consequently, it could have an impact upon land values, tax revenues, employment, income, tourism, and minority populations. This section describes the existing land values, tax revenues, employment levels and income levels in the NEC region, as well as the contribution made by tourism to the local economy.

3.2.1 Land Values and Tax Revenues

Real estate taxes are assessed for each property in a community and are based on the assessed value of the land plus any structures located on it. Real estate assessments are not performed yearly and therefore do not always reflect current values. However, they provide a good indication of the value of the land and improvements and form the basis for assessing real estate taxes. The current real estate values for the property and total tax revenues in communities in each state through which the NEC passes are shown below:

State	Real Estate Value	Real Estate Tax Revenues
Connecticut	$17,401,293,860	$172,432,883
Rhode Island	$16,771,759,740	$372,748,978
Massachusetts	$37,743,520,993	$639,312,200
TOTAL	$71,916,574,593	$1,184,494,061

3.2.2 Employment

The proposed project may have an effect on employment within the project corridor both during construction and during operation of service. Permanent and temporary employment opportunities would be created; community employment characteristics would play a part in the ability of the communities within the study area to supply workers. Table 3.2-1 in Appendix B shows the distribution of employment by industrial sector for each of the states within the project corridor.

3.2.3 Income

Median household income is a general measure of the income characteristics of the population. The lowest and highest median incomes for the municipalities within the study corridor are shown below:

State	Lowest Municipal Median Income	Highest Municipal Median Income
Connecticut	$25,811	$61,871
Rhode Island	$18,617	$50,896
Massachusetts	$29,180	$61,692

3.2.4 Tourism

Tourism generates personal income, tax revenues, and creates employment opportunities. The physical attractiveness of an area is a key factor in its ability to lure tourists. Any reduction in aesthetics could affect both the business and tax revenues, as well as the employment and individual income of the area's population. Tourism usually generates a demand for goods and services from the following industries: public transportation, auto transportation, lodging, food service, entertainment, recreation, and general retail trade. The project is more likely to affect tourism in Connecticut because the NEC travels through most of its coastal boundary, an area that attracts many visitors and seasonal residents. Revenue for travel and tourism for the counties in each state through which the NEC passes is shown below:

State	Tourism Revenue in NEC Counties ($ millions)
Connecticut	$553
Rhode Island	$878
Massachusetts	$125
TOTAL	$1,556

3.2.5 Minority Populations

The proposed project could have a disproportionate effect on minority populations if electrification facilities are placed, or other project activities occur, in minority neighborhoods. Review of the NEC show that the cities of New Haven, Providence, and Boston contain the highest concentrations of minority populations. In New Haven, the NEC runs through two minority neighborhoods, Hill and Fair Haven. The Providence section of the NEC runs through industrial areas, except for a small section of multi-family residences where the railroad is depressed. The Boston portion of the NEC runs through three minority neighborhoods: Roxbury, Jamaica Plain and Hyde Park. The Roxbury Crossing substation, located in the minority neighborhood of Roxbury in Boston, is one of two substations proposed in close proximity to residential areas; the other is in the Noank section of Groton, CT.

3.3 HISTORIC RESOURCES

This section provides an inventory of historic resources along the study corridor. Historic resources are those buildings, districts, structures, objects, and sites that are listed on or eligible for listing on the National Register of Historic Places (National Register).

3.3.1 Regulatory Setting

Section 106 of the National Historic Preservation Act of 1966 (16 USC 470 et seq.) and the Advisory Council on Historic Preservation's implementing regulations require Federal agencies to inventory historic resources that may be affected by a proposed action, assess impacts based on the Acts "criteria of effect" and mitigate effects that are adverse.

3.3.2 Affected Environment

Tables 3.3-1 (Connecticut), 3.3-2 (Rhode Island) and 3.3-3 (Massachusetts) in Appendix B provide an inventory of historic resources listed or eligible for listing on the National Register, as well as the location, and National Register status of each resource. Historic resources within sight of the NEC right-of-way or proposed electrification facilities were considered within the zone of potential impact for the project. The survey team consulted all relevant sources of pre-existing information on historic properties, including the National Register of Historic Places listings, determinations of National Register eligibility, local historic districts, state surveys of historic resources by town, state inventories of historic highway bridges, and historic resource reports prepared in 1978 for the PEIS. The inventory identifies 36 historic railroad bridges, 10 historic roadway or pedestrian bridges, 132 individual historic properties and 33 historic districts, listed or eligible for listing on the National Register.

3.4 NOISE AND VIBRATION

The proposed project has the potential to affect noise and vibration along the NEC. The primary source of noise would be the locomotive-hauled train operations. Secondary sources of noise include motor vehicle traffic at train stations, fixed facility noise (e.g. substations) and noise from construction. For vibration, the primary source would be the interaction of the train wheels on the tracks. Secondary sources would include vibration from construction of facilities sites and bridges. The predominate noise- and vibration-sensitive land uses are residential, and additional sensitive receptors include schools, churches and other institutional buildings.

The following sections provide the existing noise and vibration environment including measurements at sensitive receptor sites. That discussion is preceded by a listing of the relevant Federal and state regulations.

3.4.1 Regulatory Setting

There are no noise and vibration standards directly applicable to high speed rail. Nor are there any relevant Rhode Island regulations. However, the following Federal regulations have been applied as guidelines in this DEIS/R. The regulations listed below also include thresholds for increased traffic, fixed facility noise, and noise from construction.

3.4.1.1 Federal Regulations

Environmental Protection Agency (EPA) Railroad Noise Emission Standards (40 CFR Part 201) and FRA Railroad Noise Emission Compliance Regulations (49 CFR Part 210). Pursuant to the Noise Control Act of 1972 (42 USC 4910), EPA has issued noise emission standards for specific types of railroad equipment. FRA has adopted these regulations for the purpose of enforcement. The standards provide specific noise limits for stationary and moving locomotives, moving railroad cars, active retarders, car coupling and locomotive load cell test stands in terms of A-weighted sound level at a specified measurement location. This regulation is preemptive; and thus, states and local governments cannot set more stringent limits for railroad equipment than these Federal regulations require.

3.4.1.2 Other Relevant Regulations. Other relevant Federal regulations governing this project include:

HUD Standards (24 CFR Part 51). The U.S. Department of Housing and Urban Development (HUD) has developed noise standards for the acceptability of sites for projects it funds. The purpose of these standards is to encourage the development of land uses which are compatible with the surrounding noise environment. The criteria, expressed in terms of L_{dn}, define levels not exceeding 65 dBA as "acceptable," levels above 65 dBA but not above 75 dBA as "normally unacceptable," and levels above 75 dBA as "unacceptable" for residential areas.

Federal Transit Administration Guidelines. Noise impact criteria for transit projects are included in Urban Mass Transit Administration Circular C 5620.1 issued by the Federal Transit Administration (FTA, formerly the Urban Mass Transit Administration). These criteria are based on noise increase in terms of either L_{eq} or L_{dn}. The criteria consider noise increases of 3 dBA or less to be "generally not significant," noise increases of 4 or 5 dBA to be "possibly significant," and noise increases of more than 5 dBA to be "generally significant."

FTA is currently developing a "Guidance Manual for Transit Noise and Vibration Impact Assessment" which includes new criteria for noise and vibration impact evaluation. These are described in section 4.4 of this DEIS/R. For noise, the criteria limit the noise increase due to the project, based on the existing ambient noise level, in terms of L_{eq} or L_{dn}. These criteria reflect an equivalent increase in noise annoyance depending on the existing noise, allowing less of an increase at locations where existing noise levels are higher. The proposed FTA vibration criteria include impact thresholds based on land use and event frequency, in terms of the rms ground vibration velocity level (V_{dB}, in dB re 1 micro-in./sec).

Bureau of Mines Guidelines. Researchers at the U.S. Bureau of Mines (BOM) have identified a ground vibration peak particle velocity of 2.0 in./sec as a safe blasting limit to avoid major damage to residential structures, but recommend lower levels to minimize complaints (Nicholls, 1971). They have also identified a ground vibration peak particle velocity of 0.5 in./sec as the approximate threshold for minor cosmetic damage to buildings.

3.4.1.3 Connecticut Regulations. The State of Connecticut Noise Control Regulations contain specific noise limits based on source and receiver land use category as well as time of day of exposure to the noise. Although noise generators such as safety devices, mobile sources and construction equipment are excluded or exempt from the regulations, the regulations would generally apply to fixed sources such as electric substation facilities. With regard to substation noise, the most stringent, relevant limits govern noise transmitted from industrial land to residential property. For this case, the applicable limits at the residential property line are 61 dBA during the daytime (7:00 a.m. to 10:00 p.m.) and 51 dBA at night (10:00 p.m. to 7:00 a.m.). These levels are to be reduced by 5 dBA if the intruding noise has audible, discrete tones (e.g., transformer noise). The regulations also specify that if the background noise is measured to exceed the standards, then the noise limit shall be set at a level 5 dBA above the background level. The regulations define background noise in statistical terms as the noise level exceeded 90 percent of the time (denoted as L_{90}). Connecticut has no vibration control regulations.

3.4.1.4 Massachusetts Regulations. Specific guidelines for enforcing the Massachusetts Noise Regulation (310 CMR 7.10) have been developed by the DEP Division of Air Quality Control (DAQC). The guidelines, contained in DAQC Policy 90-001, state that a source of sound will be considered to be violating the Department's noise regulation if the source (1) increases the broadband sound level by more than 10 dBA above ambient (L_{90}), or (2) produces a "pure tone" condition (e.g. from transformers).

With regard to ground vibration, blasting limits are included in Board of Fire Prevention Regulations (527 CMR 13.11). These limits are essentially equivalent to a peak particle velocity of 1.9 in./sec, which is slightly more conservative than the U.S. Bureau of Mines criterion of 2.0 in./sec for structural damage.

3.4.2 Affected Environment

The existing noise and vibration environment along the NEC, between New Haven and Boston, is dominated by diesel locomotive-hauled railroad train operations; primarily intercity and commuter passenger train traffic, but it also includes a limited number of freight operations. Secondary sources of noise along the corridor include motor vehicle traffic on nearby roadways, aircraft overflights in some areas and general community activities. Other than train operations, there are no significant sources of ground-borne vibration along the corridor.

The major sources of existing train noise along the corridor are: (1) the diesel locomotive engines; (2) the rolling interaction of the train wheels on the track rails; and (3) the locomotive horns that are sounded near the few remaining rail-highway grade crossings. The major source of existing ground-borne vibration from trains is the rolling interaction of the rail vehicle wheels on the rails. Although the track features continuous welded rail (CWR) along most of the corridor, there is increased noise and vibration from wheel/rail impacts where there are jointed rails. These locations are primarily where there are special track configurations such as switches and crossovers.

The predominant noise and vibration-sensitive land use along the corridor is residential. Additional sensitive receptors include schools, churches and other institutional buildings.

3.4.2.1 Measures of Noise and Vibration

Noise Descriptors. The most commonly used measure of noise is the A-weighted sound level, expressed as dBA. The A-weighted sound level is a single-number measure of sound intensity with weighted frequency characteristics that correspond to human subjective response to noise. It is widely accepted by acousticians as a proper unit for describing environmental noise.

Because environmental noise fluctuates from moment to moment, it is common practice to condense all this information into a single number, called the "equivalent" or "energy-average" sound level (L_{eq}). Because many surveys show that the L_{eq} properly predicts annoyance, this descriptor is commonly used for noise impact assessment. L_{eq} can be thought of as the steady sound level that represents the same sound energy as the varying sound levels over a specified time period. Commonly used equivalent noise descriptors are the $L_{eq}(h)$, measured over a 1-hour period, and the $L_{eq}(24)$, measured over a 24-hour period.

One of the most widely accepted measures of cumulative noise exposure in residential areas is the Day-Night Sound Level, abbreviated as L_{dn}. The L_{dn} is the A-weighted equivalent sound level for a 24-hour period with an additional 10-decibel weighting imposed on noise that occurs during the nighttime hours (between 10:00 p.m. and 7:00 a.m.).

Environmental noise can also be viewed on a statistical basis using percentile sound levels, L_n, which refer to the sound level exceeded "n" percent of the time. For example, the sound level exceeded 90 percent of the time (L_{90}) is often considered to represent the "background" noise in a community. Similarly, the sound level exceeded 33 percent of the time (L_{33}) is often used to approximate the L_{eq} from traffic in the absence of sporadic events such as aircraft overflights and train passages.

Vibration Descriptors. Vibration is an oscillatory motion of an object about some equilibrium position which can be described in terms of displacement, velocity or acceleration. The response of humans, buildings and equipment to vibration is more accurately described using velocity or acceleration. Because vibration velocity amplitude within the low frequency range is of most concern for environmental vibration (roughly 5 to 100 Hz), vibration velocity is used in this analysis to describe ground-borne vibration from train operations.

The descriptor used in this analysis for the assessment of ground-borne vibration is the rms vibration velocity level, V_{dB}, expressed in decibels relative to one micro-inch per second. The rms amplitude is defined as the average of the squared amplitude of the signal, and is typically evaluated over a one-second period of time.

3.4.2.2 Existing Noise Measurements. Measurements were conducted at 11 noise and vibration-sensitive sites distributed along the corridor between New Haven and Boston. The sites were chosen to be representative of a range of community environments (urban, suburban, or rural) and types of train operations (acceleration, deceleration, or cruising). The 11 sites characterize the full range of combinations of community environment and train operations that would be experienced over the entire 156-mile corridor and therefore fully illustrate the existing and future noise impacts of the proposed project. A summary of the existing noise measurement results is shown in Table 3.4-1 in Appendix B.

The noise measurement results indicate L_{dn} ranging from 68 to 77 dBA at the monitoring sites located 25 to 105 feet from the near track. The $L_{eq}(24)$ were 4 to 7 dBA lower than the L_{dn}, and the maximum $L_{eq}(h)$ ranged from 67 to 74 dBA. These levels were dominated by trains, with maximum noise levels ranging from 72 to 112 dBA, with the highest levels cause by train horns. Minimum background noise levels (L_{90}) ranged from 25 to 47 dBA.

The train vibration measurement results shown in Table 3.4-2 in Appendix B indicate maximum vertical ground vibration velocity levels (V_{dB}) of 60 to 95 dB at the monitoring sites, located 25 to 119 feet from the near track. These levels range from just below the approximate threshold for human perception of vibration to the approximate threshold for cosmetic damage to historic or fragile buildings.

3.5 ELECTROMAGNETIC FIELDS AND INTERFERENCE

Electromagnetic fields (EMFs) are present whenever electricity is used or transported and, therefore, would be generated by electric-powered trains and facilities. The electromagnetic fields that would be generated would have frequencies at the low end of the electromagnetic spectrum, typically between 3 and 3,000 Hertz (Hz or cycles per second), including the 60 Hz frequency at which the alternating current for this project is provided, and are known as extremely-low-frequency (ELF) electromagnetic fields. Unlike the earth's magnetic field which maintains a generally constant intensity over time, the intensity of EMF from electrified devices typically varies with time. Recent public attention has prompted the need for additional evaluation and research to consider the possibility that time-fluctuating EMF poses a health risk with long-term exposure. This area of environmental review focuses on the potential health effects of EMFs associated with the electrification of the NEC, and also considers the effects of the system on communications systems in the form of electromagnetic interference (EMI).

3.5.1 Affected Environment

This section describes both the types and locations of persons that may be potentially exposed to higher than background levels of EMFs as a result of the electrification project and the existing background EMF in the NEC area.

3.5.1.1 Categories of Persons Potentially Exposed to EMF Emissions. The following persons have the potential to be exposed to EMF emissions from the electrification project:

- Residents in the vicinity of the ROW and utility tie-lines;
- Persons working in the vicinity of the ROW;
- Persons using recreational areas or other public facilities in the vicinity of the ROW; and
- Rail passengers.

EMF intensity decreases with increased distance from its source. Based upon field measurements of existing electrified tracks and power supply systems, EMF intensities from the proposed electrical systems are projected to drop to background levels approximately 150 feet from their sources. In order to estimate populations and the EMF intensities to which these populations are exposed, this study identifies three equally-spaced zones along the length of the ROW extending outward to a distance of 150 feet from the source. These zones are as follows:

- Zone 1 - from the track edge to a distance of 50 feet from the edge of the tracks;
- Zone 2 - from 50 feet to 100 feet; and
- Zone 3 - from 100 feet to 150 feet.

Populations beyond 150 feet of the EMF source are not considered to be affected since no incremental EMF exposure is expected beyond this distance.

The centerline of the tracks typically coincides with the centerline of the ROW; thus, a buffer zone exists between the edge of the tracks and the edge of the ROW. The typical ROW width is 80 to 100 feet and a dual track occupies approximately 20 feet (outside rail to outside rail). This results in a separation of 30 feet or more between the edge of tracks and the abutting properties. Therefore, when assessing general population exposure, only populations within 20 feet of the edge of the ROW have been considered to be within Zone 1.

There are several categories of population that would potentially be exposed to EMF from the electrification project. These categories differ by location and type of exposure. Although there is insufficient scientific evidence to relate a particular combination of EMF exposure level and duration of exposure to a health effect, it is of interest to distinguish between long-term exposures, as would occur in a residential location along the ROW, and short-term or occasional exposures, as would occur for riders on the trains.

There is also a distinction between voluntary and involuntary exposures, because of the fact that the train passenger (voluntary exposure) has alternatives modes of travel and chooses to ride the train rather than use one of the alternatives. Therefore, three broad categories of exposure duration are defined: environmental, occupational, and occasional. Environmental exposure refers to exposures resulting from occupancy of a residence and of the three exposures is the longest in term. Occupational exposures are those that result from working along the ROW or on electrified trains and are the second longest in term. Although the term occupational is used, it should not be confused with workers (e.g. electrical line workers) who would normally be exposed to EMFs and protected under specific occupational safety regulations. Rather, the occupational EMF exposures in this evaluation is defined as an environmental exposure to railroad workers and other employees in proximity to the ROW.

Occasional exposures are those exposures that arise from short-term occupancy of one of the defined exposure zones, such as passengers on platforms or in trains. The types of populations analyzed, their category of exposure, and their physical attributes are summarized in Table 3.5-1 in Appendix B.

3.5.1.2 Background EMF. People have been exposed to man-made EMF emissions over the past 100 years. Today, virtually every person is exposed to EMF of varying frequencies and intensities and this exposure is essentially continuous. The magnetic field component associated with the average home is typically less than four milligauss (mG). Other ranges of potential exposure near specific sources include:

Source	Exposure
Electrical appliances	5 to 3,000 mG
Residential distribution lines	1 to 10 mG
Electric blankets	5 to 13 mG
Under high voltage transmission lines	12 to 200 mG

Urban background EMF intensities were measured in the street during a 6-mile drive through the city of Providence, RI and its outskirts to characterize the existing street-side EMF environment. The following conclusions were drawn from the data:

- The recorded EMF ranges from 0 to 26 mG;
- The highest sustained ratings are in the range of 10 mG; readings higher than 10 mG occur as instantaneous "spikes": indicative of a narrow source such as a power line; and
- The average of the data appears to be about four mG.

It would appear that through normal daily activities in a relatively urban area a person would be exposed to EMF on a continuous basis averaging about three to four mG and within a range of one to seven mG. Persons may be exposed to EMF up to 10 mG on a brief basis and would be exposed to EMF of a considerably higher level if operating an electric device (up to 3,000 mG) or passing under a power line (up to 200 mG).

Additional sampling efforts were taken in two relatively rural, non-electrified areas along the ROW. These two locations are Stony Creek in Branford, CT and Rocky Neck State Park in East Lyme, Connecticut. Measurements were taken of peak EMF field strengths at three distances from the outside rail on each side, with the following results:

Location	Maximum Magnetic Field Intensity (mG)
Stony Creek, Branford	
15 feet from rail	0.390
60 feet from rail	0.032
150 feet from rail	0.025
Rocky Neck State Park	
15 feet from rail	1.430
60 feet from rail	0.026
150 feet from rail	0.005

These measurements indicate a lower level of magnetic field intensity in rural areas than in urban areas (as described by the data from Providence, RI).

3.6 ENERGY

This section describes the existing energy use of the current Amtrak operation between Boston and New Haven. The affected environment with respect to energy assessment is the current consumption of fuel by diesel locomotives.

3.6.1 Affected Environment

At the present time, service between New Haven and Boston operates as follows:

- 10 trips per day, Monday through Thursday;
- 12 trips on Friday (including one Metroliner trip);
- 8 trips on Saturday; and
- 9 trips on Sunday.

The schedule for service between Boston and New Haven, the reverse direction, is 10 trips per day. Adding these numbers there are 69 trips per week between New Haven and Boston and 70 trips per week between Boston and New Haven - a total of 139 one-way trips over this portion of the corridor. The Montrealer, which operates between New Haven and New London, as well as service between Boston and New Haven which operates on the Inland Route, would continue to operate diesel locomotives regardless of the alternative implemented. Therefore, these trips are not included in the energy analysis.

For the trips described above, approximately 2,453,516 gallons of diesel fuel are consumed annually, or 345.9 billion British thermal units (Btu). Based on information obtained from Amtrak on NEC ridership, it is estimated that the total number of passenger-miles traveled in 1992 was approximately 182,630,600. The energy consumption for the existing operation is then estimated at 1,894 Btus per passenger mile.

3.7 ARCHAEOLOGY

This section provides an assessment of the historic and prehistoric archaeological sensitivity of the areas affected by the proposed action. These include the sites proposed for switching, paralleling and substations, utility corridors, and areas where bridges would be raised or replaced. The archaeological assessment consisted of documentary research and field survey.

3.7.1 Methods for Assessing Archaeological Sensitivity

Information on previously known or reported archaeological sites was obtained from the site files of the Connecticut Historical Commission, Connecticut Office of State Archaeology (COSA), the Rhode Island Historical Preservation Commission (RIHPC) and the Massachusetts Historic Commission (MHC). In addition, the survey team consulted the National Register of Historic Places to identify any National Register-listed sites within or adjacent to project areas, as well as archaeological assessment reports associated with the NECIP Programmatic Environmental Impact Statement (PEIS).

In each state the archaeological survey was conducted according to varying state regulations, but the methods and goals of the survey were the same: to assess the site's potential for containing buried cultural remains through documentary research and a field inspection.

Archaeological sensitivity is defined as the likelihood for prehistoric and/or historic cultural resources to be present within the project area. Based on project-specific environmental factors and information on known cultural resources and human land-use patterns, portions of the study corridor were stratified as having a high, moderate, or low potential for prehistoric and/or historic resources. The evaluation of the prehistoric archaeological sensitivity of the project area considered the following information: 1) the presence of known prehistoric sites within or in close proximity to the project area; 2) the level of ground disturbance to the project area; and 3) the environmental characteristics and available natural resources of the area, as described in Table 3.7-1 in Appendix B. The evaluation of the historic archaeological sensitivity of the project area considered the following information: 1) the inventory of known historic sites and/or districts within or in close proximity of the project area; 2) developmental history, historical demography and geography; 3) the level of ground disturbance to the project area; and 4) the environmental attributes of the project area, as shown in Table 3.7-2 in Appendix B.

3.7.2 Existing Environment

Archaeological surveys were conducted at 34 areas to be affected by the proposed action, including the 25 electrification facility sites and associated utility corridors and nine bridge modification sites. Sites with moderate or high potential are discussed in some detail below, while Table 3.7-3 in Appendix B provides a brief summary of the archaeological sensitivity of all project sites.

3.7.2.1 Substation Sites. The Warwick and New London substations sites and utility corridors have low potential for containing archaeological resources, based on the criteria described above.

While the Branford substation site has low potential for containing archaeological resources, the proposed 1,200-foot utility corridor to the site from the existing transmission line and the feeders from the substation site to the catenary have low to moderate potential to contain either prehistoric or historic period resources, due primarily to favorable environmental factors, as described in Tables 3.7-1 and 3.7-2 in Appendix B.

While the Roxbury Crossing substation site appears to have been substantially disturbed by construction and land modification activities, historical research and the nearby presence of historic bridges and structures might indicate that this site could contain historic period resources. Therefore, this site is considered to have moderate potential for containing archaeological resources. The proposed utility corridor over existing MBTA tracks appears to have been previously disturbed and has low potential for containing archaeological resources.

3.7.2.2 Switching Stations. None of the three proposed switching station sites appear to have the potential for containing intact cultural remains. Therefore, each of them can be classified as having low potential for archaeological resources.

3.7.2.3 Paralleling Stations. The eighteen paralleling station sites were studied, and nine were found to be archaeologically sensitive as shown in Table 3.7-3 and discussed below. The other nine were determined to be of low archaeological sensitivity. If however, the disturbance at the Kenyon School Road Bridge exceeds the immediate area of the bridge, the surrounding area has a moderate to high potential for archaeological sensitivity.

Leetes Island Paralleling Station. Although this site has been superficially disturbed by previous construction, this site has a moderate to high potential for prehistoric or historic archaeological sensitivity based on the presence of known sites in the surrounding area.

Madison Paralleling Station. There are a number of factors that support a designation of this site as having high potential for prehistoric or historic archaeological sensitivity. In the area outside the ROW the soils are relatively undisturbed. Environmental conditions, including the presence of nearby wetlands and fresh water ponds and of prehistoric archaeological sites across the Hammonassett River in Clinton indicate a high potential for prehistoric sites. Finally, approximately 10 meters outside of the ROW are a well and foundation, suggesting a historic period site in the vicinity.

Old Lyme Paralleling Station. Because this site may be previously undisturbed and it lies within a 5-mile prehistoric archaeological zone (as indicated in the PEIS) containing numerous sites, this site has high potential for prehistoric or historic period archaeological sensitivity.

Stonington Paralleling Station. Environmental resources including the presence nearby of fresh and saltwater, as well as the presence of old stone walls parallel to each side of the ROW in this area and a relatively undisturbed site, indicates that this site has a high potential for prehistoric or historic period archaeological sensitivity.

State Line Parallelling Station. Although this sites appears to have been somewhat disturbed, there is some indication of known archaeological sites or structures in the immediate area, but no systematic work has been done in the area. Therefore this site has moderate to high potential for prehistoric or historic period archaeological sensitivity.

Kingston Paralleling Station. Although this site lies on the edge of the Great Swamp Wildlife Reservation, the site itself has been disturbed by previous construction and has low potential for archaeological sensitivity. However, the approximately 80-foot accessway between Great Neck Road and the ROW is potentially moderately archaeologically sensitive due to the extensive resources afforded by the surrounding Great Swamp and the presence in the area of two sites that on the National Register of Historic Places (the Kingston Station and the Ministerial Road Site).

Elmwood Paralleling Station. This site is considered to be moderately to highly archaeologically sensitive due to the presence of a burial site and a undated prehistoric site and several historic structures and districts that have been recommended as eligible for the National Register in nearby areas.

Attleboro Paralleling Station. This exhibits a moderate to high potential for prehistoric or historic archaeological sensitivity due to environmental factors: its location in an open field, on a gentle slope, with well-drained soils and less than 150 meters from the Seven Mile River. In addition, two known prehistoric sites are less than one kilometer from the project area and there are many historic structures in the area.

East Foxboro Paralleling Station. This site has moderate to high potential for prehistoric and historic archaeological sensitivity due to the presence of known prehistoric sites and environmental factors, including the nearby Rumford and Canoe Rivers, the Glue Factory and Beaumont Ponds, and the fact that the site is gently sloping and elevated.

3.7.2.4 Bridges to be Modified. Of the nine bridge modification sites, only three appear to have potential for archaeological sensitivity, as described below.

Johnnycake Hill Road Bridge. This footbridge will be reconstructed in place. Although the immediate area surrounding the bridge has been disturbed by rail construction, this site has moderate to high potential for prehistoric or historic archaeological sensitivity based on known site information as well as nearby wetland, river and coastal resources.

Burdickville Road Bridge. While road and rail construction has previously disturbed the immediate area of this bridge, significant widening of the existing road may encounter areas that have high potential for archaeological sensitivity, due to reports of prehistoric sites in the vicinity of the bridge and the existence of wetlands and rivers nearby.

Kenyon School Road Bridge. Previous rail, bridge and road construction has significantly reduced the potential for archaeological sensitivity within the immediate area of this bridge. The area immediately outside the bridge superstructure, however, has a moderate to high potential for archaeological sensitivity due to the presence of historic districts and structures in the general vicinity of the bridge. Thus, construction outside the existing superstructure may affect this more sensitive area.

3.8 PUBLIC SAFETY

Rail operations within the NEC present the potential for collisions between trains and both vehicles and pedestrians crossing the tracks. The danger of accidents involving motor vehicles is largely limited to at-grade rail-highway grade crossings. Collisions involving pedestrians could occur at established at-grade crossings, at illegal paths across or along the railroad ROW, and at railroad stations with at-grade crossings.

Within the 156-mile corridor are 14 at-grade intersections of streets with the rail mainline. The existing risk of a collision at these locations could be increased by the proposed action as: the number of trains traveling the corridor increases, the average operating speed of the trains increases, and the volume of vehicular traffic increases. Conversely, improvements in traffic control and warning devices at each of these crossings, or the closing of crossings, could reduce or eliminate the risk of collisions between train and vehicular traffic.

Pedestrian crossings of the rail corridor were identified at 36 locations; the 14 at-grade rail-highway crossings and 22 illegal locations. Increases in the number of trains traveling the corridor, the average operating speed of the trains, and the number of pedestrians increase the potential for rail-pedestrian accidents. However, as previously stated, improvements in traffic control and warning devices at crossings and the elimination of crossings would reduce risks. Improved warning devices and barriers to pedestrians crossings would also reduce the likelihood of rail-pedestrian accidents.

3.8.1 Affected Environment

This section identifies existing conditions with respect to train operations, traffic volumes passing through the at-grade crossings, the number of existing at-grade crossings, the types of traffic warning and control devices at those crossings, and accommodations for pedestrian movements both within established crossings and elsewhere along the corridor. Historical accident data was analyzed to form a baseline condition from which impacts from the alternatives can be compared.

3.8.1.1 Rail-Highway Safety. There are 14 rail-highway grade crossings within the NEC between Boston and New Haven. Grade crossings are of two basic types: public and private. Public crossings are those which are under the control and jurisdiction of a public agency; private crossings are those where access across tracks is restricted to certain property owners. Table 3.8-1 in Appendix B lists all grade crossings within the study corridor as well as their locations, presence of traffic control devices, daily traffic, accident history, setting (urban, suburban, or rural), and the existing train speed. The FRA maintains records on vehicular grade crossing accidents; no grade crossing accidents have been reported since 1985.

3.8.1.2 Pedestrian Safety. Records maintained by FRA for the past five years indicate an average of two people per year are struck by trains, both at station areas and along the NEC. Pedestrian crossings were identified through interviews with local police, Amtrak security patrol, state, and local officials; on-site surveys; letters from concerned citizens; and information offered at public meetings. Tables 3.8-2 through 3.8-4 in Appendix B identify the major crossings within the NEC for Connecticut, Rhode Island, and Massachusetts, respectively.

There are 22 stations between New Haven and Boston that are served by Amtrak and commuter rail. Pedestrians cross the tracks at 10 stations to access a platform while the remaining stations have either overpasses or underpasses. Amtrak's express service does not stop at any of the stations with pedestrian crossings and Amtrak's conventional service stops at only three of these stations. Table 3.8-5 in Appendix B lists the pedestrian crossings within the Amtrak and commuter rail stations.

3.9 TRAFFIC, TRANSPORTATION AND CIRCULATION

This section describes the existing transportation and traffic conditions which may be affected by the proposed electrification project. There are a number of ways in which the proposed electrification project may affect transportation and traffic patterns in the Northeast Corridor. The increased train traffic with longer trains operating at higher speeds could: 1) increase traffic at the stations as a result of increased ridership; 2) increase parking demand at these stations; 3) impact freight and commuter rail service; 4) impact motor vehicle trips by a change in the period of delay at highway-railroad grade crossings; and 5) impact motor vehicle trips from detours during modification of overhead highway bridges.

3.9.1 Affected Environment

This section describes existing intercity passenger service and ridership; existing traffic conditions around the proposed express railroad stations; existing use of the rail line; the highway-railroad grade crossings and the nine bridges to be modified.

3.9.1.1 Existing Intercity Passenger Service. Eighteen million intercity trips - between New York City, New Haven, Providence, and Boston - are made annually within the NEC. An overwhelming proportion of these trips (74.5 percent) are made by private automobile (13.4 million trips) and nearly all of the remaining trips are made by aircraft (19.6 percent). Approximately 1 million (5.9 percent) trips are made by Amtrak's intercity train (Volpe, 1992a). Table 3.9-1 in Appendix B shows the intercity trips for these modes.

Existing Amtrak Service and Ridership. Ten Amtrak trains travel daily, in each direction, between Boston's South Station and New Haven, CT. Two are express trains, of which one makes intermediate stops only at Back Bay, Route 128 and Providence stations while the second express trains also stops at New London. The remaining trains make all of the express service stops as well as providing service to stations at Kingston and Westerly, RI, and Mystic and Old Saybrook, CT; however, not all such trains make all intermediate stops between Boston and New Haven.

Amtrak intercity service is provided with stops at ten stations, however, approximately 80 percent of intercity ridership is generated at the express stations shown in Table 3.9-2 in Appendix B. Six of the ten Amtrak stations are also served by commuter rail. Ninety-eight percent of the commuters who board and alight at Amtrak stations use the express stations listed above. Over 16 million passengers board and alight trains at these stations annually, including nearly 1.8 million Amtrak passengers and 14.2 million commuters (Table 3.9-2 in Appendix B).

Other Existing Intercity Travel Modes. There are three other available modes of travel in the NEC: intercity bus, intercity aircraft, and automobiles. Intercity bus travel is not addressed herein because it is not anticipated to be affected by the proposed project. As the most time consuming mode of travel, intercity bus riders are not time sensitive, which is the primary attractiveness of the proposed action. Conversely, aircraft and automobile users are more likely to be affected by the proposed electrification project because these riders are typically sensitive to travel time. The existing use of auto and air modes is discussed below.

Existing Air Passenger Service and Ridership. As described above, approximately 3.5 million trips were made by air. Air passenger service in the NEC is provided between Boston and New York, Boston and Providence, Providence and New Haven, and Providence and New York. There is no direct commercial airline service available between Boston and New Haven (*January 1993 Official Airline Guide for North America*). Airline service between Providence and Boston is not addressed in this DEIS/R because air travel between this city pair is not expected to be affected by the proposed action. The service between the remaining city pairs is discussed below.

There are 81 scheduled daily departures in each direction between Boston and the three New York airports (LaGuardia, John F. Kennedy, and Newark). Six commercial airlines provide service between Boston and New York starting at approximately 6:00 a.m. and lasting until approximately 10:30 p.m., daily. Generally, service is available every half hour during this period.

There are 48 scheduled flights in each direction between Providence and New York during the hours of 6:30 a.m. and 10:40 p.m.. Five airlines provide this service.

Existing Automobile Travel. Automobiles provide the largest share of all modes for passenger transportation in this corridor. Of approximately 18 million intercity trips in the NEC in 1988, 13.4 million trips were made by automobile. The approximate distance and vehicular travel time between the proposed express service cities in the NEC are shown below:

	Distance (miles)	Travel Time
Boston - Providence	48	50 minutes
Boston - New Haven	148	2 hours and 40 minutes
Boston - New York	225	4 hours
Providence - New Haven	104	2 hours
Providence - New York	181	3 hours and 20 minutes
New Haven - New York	77	1 hour and 25 minutes

The existing annual vehicle miles of travel (VMT) between major express service city pairs is as follows:

	Existing Total VMT (in millions)
Boston - New Haven	278
Boston - New York	1,760
Providence - New Haven	29
Providence - New York	593

3.9.1.2 Other Existing Rail Operations Using the NEC Rail Line. Two freight companies and two commuter rail authorities operate on portions of the NEC between New Haven and Boston. A description of the operations of each of these is provided below.

Existing Freight Operations and Requirements. For many years, the NEC segment from Boston to New Haven was a major freight service corridor. However, all long haul freight trains have been routed away from the Boston to New Haven route and local service freight train operations have been substantially reduced. Today, two freight railroads operate within the NEC: the Consolidated Rail Corporation (Conrail) and the Providence and Worcester Railroad (P&W). Conrail operates freight service along NEC route segments in Massachusetts and P&W operates along NEC route segments in Connecticut and Rhode Island. Table 3.9-3 in Appendix B shows a typical daily pattern of freight service operations on various segments of the rail line between New Haven and Boston.

Freight Service Clearance Requirements. Currently, freight service on the NEC is constrained by the existing height and width restrictions in tunnels and at numerous overhead bridges. Although some improvements have been made in recent times, the normal clearance envelope is currently 15 feet-6 inches to 17 feet in height (from top of rail) and 11 feet-7 inches in width. Loads exceeding these limits may be moved along the corridor with the approval of Amtrak's Clearance Engineer. Any authorization specifies the routing, weight, and speed restrictions of the load and requirements for passing trains on adjacent tracks. Absolute clearance limits exist within certain sections of the corridor, due primarily to restrictions in overhead bridge clearances. The current maximum allowable normal height within the corridor is as follows:

Segment	Current Max. Height
New Haven to Providence	15' 9"
Providence to Lawn (MP189.3)	17' 0"
Lawn to South Station	15' 9"

These vertical clearances preclude the movement of double stack and enclosed tri-level automobile cars on these segments.

Existing Commuter Rail Operations. Commuter rail operations occur at two separate segments on the Northeast Corridor. Table 3.9-2 shows the existing commuter rail boardings and alightings at each Amtrak express station. Amtrak operates commuter rail service between Boston and Providence under contract with the MBTA. At the present time, the daily one-way frequency of commuter trains ranges from 5 along the Providence-Attleboro segment to 65 trains along the Forest Hills-South Station (MP 223.65 to MP 229.30) segment.

In 1990, the Connecticut Department of Transportation (ConnDOT) contracted with Amtrak to operate a new commuter passenger service between Old Saybrook and New Haven with five intermediate stops. This service is known as Shore Line East and consists of the operation of 8 southbound and 10 northbound trains per day. Currently, no commuter passenger trains operate on the NEC segment between Old Saybrook and Providence. However, the Rhode Island Department of Transportation is considering plans to reinstitute passenger service south of Providence to Kingston. No specific program has been approved at this time.

3.9.1.3 Existing Automobile Traffic Operations in the Northeast Corridor. This section discusses existing traffic conditions at the five railroad stations designated by Amtrak for express service and at the bridges proposed for modification.

Existing Traffic and Parking at Express Railroad Passenger Stations. Of the ten railroad stations currently served by Amtrak, five will also be served by the proposed more frequent express service, which is likely to generate significantly increased ridership. These include New Haven, CT; Providence, RI; and Route 128, Back Bay and South Stations in Massachusetts. New London, CT may eventually also be served by the high-speed express trains, depending upon future needs.

At each of the express stations, those signalized and unsignalized roadway intersections which are most directly impacted by traffic to and from the passenger stations were identified, existing traffic volumes and intersection configuration determined, and existing morning and evening peak hour operations characterized. The peak hours generally fall somewhere between 7:00 to 9:00 a.m. and 4:00 to 6:00 p.m., although it may vary at different locations.

Traffic operations were evaluated in the vicinity of the express passenger stations through an analysis of level-of-service (LOS) at the critical intersections. LOS is a measure used to quantitatively express the quality or efficiency of the traffic flow at a particular location or intersection. Included in the expression of operating conditions are travel time, speed, and freedom to maneuver, which are collectively known as driver comfort. Factors included in the determination of operating conditions include the physical attributes of the road, such as width, grade, horizontal curvature, and traffic control; and vehicle volume and mix (e.g., the proportion of cars and trucks) LOS is expressed in letters from A (the best, free-flowing conditions) to F (the worse, forced-flow conditions).

Table 3.9-4 in Appendix B summarizes the results of the existing peak hour traffic LOS analysis. At South Station, the key intersection operates at failure (LOS F) in both the a.m. and p.m. peak periods. Both intersections analyzed at Route 128 station show operation at LOS D. One of the two intersections analyzed at Providence Station operates at LOS F and the other operates at LOS B. No traffic volumes or studies were available for New Haven Station, although no traffic congestion was observed on local streets during evening peak hours. No LOS analysis was performed at Back Bay station because only a minor increase in traffic is expected due to the electrification project at this location. The availability of existing parking at these stations is shown in Table 3.9-5 in Appendix B.

Existing Traffic Patterns at Overhead Bridges. In many cases, the existing vertical distance (clearance) between the existing rail line and overhead structures is not sufficient to accommodate the proposed catenary system.

As part of their proposal, Amtrak plans to undercut the tracks rather than raise the bridges wherever feasible. At nine of the bridges, however, undercutting alone will not achieve the required clearance, and Amtrak proposes to raise or replace these bridges. At these bridges, which are listed below, traffic patterns and flows may be affected during the proposed construction, as may traffic patterns on detours routes. Table 3.9-6 in Appendix B lists the affected bridges and shows the existing traffic carried by the bridge, as well as whether a detour is required.

Bridge	Location
Johnnycake Hill Road	Old Lyme, CT
Millstone Point Road	Waterford, CT
Burdickville Road	Charlestown, RI
Kenyon School Road	Richmond, RI
RI Route 138	South Kingstown, RI
Pettaconsett Avenue	Warwick, RI
Park Avenue	Cranston, RI
Depot Street	Sharon, MA
Maskwonicut Street	Sharon, MA

3.9.1.4 Existing Delay at Grade Crossings. Changes in intercity operations by Amtrak may affect the frequency and duration of gate closures, and therefore delays experienced by motorists at highway-railroad grade crossings. Over the years, state and local agencies have cooperated with Amtrak in closing most grade crossings or replacing them with overpasses or underpasses. There are currently 14 highway-railroad grade crossings between New Haven and Boston; these include both public and private crossings. Of these, 12 have gates; these crossings are listed in Table 3.9-7 in Appendix B, which also provides information on the existing train speeds and frequency, the delay per train event and the average delay per vehicle for each train event, and a description of the existing characteristics of the roadway and the surrounding type of development.

3.10 AIR QUALITY

Transportation sources produce pollutants of the following types: carbon monoxide (CO), oxides of nitrogen (NO_x), and hydrocarbons, (also known as volatile organic compounds or VOCs) which are a precursor to ozone. Particulate matter ten microns or smaller in diameter (PM10), have health implications because of their potential to penetrate deep into the human respiratory system. PM10s are emitted primarily by stationary fuel-burning sources - power plants and industrial sources - and to a smaller extent by transportation sources. The description of existing conditions, therefore, also includes a discussion of the PM10 concentrations.

3.10.1 Regulatory Setting

This section describes the applicable regulations that govern air quality in the project corridor at both the Federal and State levels. This section also describes the procedures that will be needed to demonstrate compliance with these regulations and related criteria.

3.10.1.1 Federal Regulations

National Ambient Air Quality Standards (40 CFR Part 50). Under the authority of the Clean Air Act and the 1990 Clean Air Act Amendments (CAAA), a set of Ambient Air Quality standards for various criteria pollutants was established. These standards, shown in Table 3.10-1 in Appendix B, are intended to protect the public health and welfare. When levels of pollutants do not exceed the annual average standards and do not exceed the short-term (1,3,8 and 24-hour) standards more than once per year, an area is considered in attainment of the NAAQS. The standards that are particularly relevant to transportation sources include CO, ozone, and NO_x.

Clean Air Act Amendments - Title I. Title I of the CAAA addresses nonattainment issues related to ozone and CO. It classifies nonattainment areas and specifies compliance deadline for these areas. Within the project corridor, New Haven, Providence, and Boston were classified as serious nonattainment areas for ozone. With this classification, each of these areas must demonstrate a total net reduction in VOC emissions of 15 percent by 1996 when compared to their corresponding baseline emission in 1990. These same areas must also reduce VOC emissions by 3 percent per year following the 1996 deadline.

Boston and New Haven have been classified as a moderate CO nonattainment area. With this classification, this area will be required to establish transportation controls (for instance, Transportation System Measures/Transportation Demand Measures or TSM/TDM), and implement an oxygenated fuel program. Providence has not been classified as nonattainment for CO.

Clean Air Act Amendments - Title II. Title II of the CAAA addresses mobile sources and stipulates more stringent emission standards for cars, trucks, and buses. This title also regulates fuel quality (such as gasoline volatility and diesel sulfur content); requires reformation gasoline in the worst ozone areas and oxygenated fuels in the worst CO areas; and requires clean-fueled vehicles for certain fleets and other pilot programs.

3.10.1.2 Connecticut Regulations

Connecticut Ambient Air Quality Standards. Connecticut's Ambient Air Quality Standards, as given in its Regulation Section 22a-174-24, are identical to the Federal standards for CO, ozone, and NO_2 shown in Table 3.10-1.

State Implementation Plan Provisions. The nonattainment provisions in Connecticut's State Implementation Plan (SIP) Section 6-B requires that a transportation project must not result in an increase in VOC emissions when compared to the no-build alternative both short and long term. The proposed project must also not result in any violations of the air quality standards. The SIP also requires compliance with the Regional Transportation Plan, the Regional Transportation Improvement Program, and the State Master Transportation Plan. The Connecticut SIP for transportation projects is currently being revised for submittal to EPA in November 1993, and the revision is expected to include significant emissions reduction requirements for the transportation sector and for new transportation projects.

Indirect Source Permit. Projects that are expected to result in traffic generation or in changes in traffic demands and patterns are required to be permitted. The permitting process involves a detailed modeling analysis of CO concentrations in areas of high traffic congestion. This process will insure compliance with the state CO standards by requiring mitigation measures in areas with anticipated excessive CO levels. This indirect source permit process is being revamped, and it appears that the permit process will be restricted to highway sources.

Demonstrating Compliance. To demonstrate consistency with the state's SIP provisions for attainment and maintenance of the ozone standard, the VOC emissions for the proposed project must be less than the corresponding no-build alternative for both the long- and short-term bases. To estimate the emissions, a project-affected study area must be defined and agreed upon by the appropriate state and Federal oversight agencies. These agencies should also be consulted to reach concurrence in the analysis methods, data bases, and modeling assumptions. VOC emissions are then estimated for the project completion year (the long-term base). If the project appears to be inconsistent with the SIP provisions, then mitigation measures must be evaluated to achieve this consistency by reducing emissions.

Demonstrating consistency with the CO provisions follows a similar process, except that dispersion modeling is used to estimate both 1- and 8-hour CO concentrations. If the project entails Federal review; the EPA Region I, which includes Connecticut, Rhode Island and Massachusetts, would require a more stringent threshold to include mitigation measures. This lower threshold is set at 10 percent of the CO standards.

3.10.1.3 Rhode Island Regulations

Rhode Island Ambient Air Quality Standards. As stated in Rhode Island's Regulation 9, the state's Ambient Air Quality Standards are the same as the Federal standards shown in Table 3.10-1.

Provisions. The ozone nonattainment provisions of Rhode Island's SIP requires that the proposed project will not result in an increase in VOC emissions over the no-action alternative for both the short and long term. For CO, the SIP requires that the project must not lend to a new violation of the CO standards or exacerbate an existing violation. The SIP also requires consistency with the state. The revised Rhode Island SIP is expected to include significant emissions reduction for the transportation sector.

Demonstrating Compliance. Consistency with the state's SIP for ozone is demonstrated by ensuring that the VOC emissions associated with the proposed project are less than the corresponding emissions from the no-action alternative in both the short and long term. Consistency with the SIP for CO is demonstrated by estimating 1- and 8-hour CO concentrations and ensuring that no new violations are created or existing violations are made worse.

3.10.1.4 Massachusetts Regulations

Massachusetts Ambient Air Quality Standards. The Massachusetts Ambient Air Quality Standards, as described in Section 310 CMR 6.00 for CO, ozone, and annual NO_2 are identical to the Federal standards in Table 3.10-1. The state also has a 1-hour NO_2 policy level (320 $\mu g/m^3$) which has been used to evaluate impacts from transportation and power generation projects.

SIP Provisions. The SIP provisions for Massachusetts are very similar to those of Connecticut and Rhode Island. Specifically, for ozone standard compliance, the Massachusetts SIP requires that the VOC emissions from the proposed project must be less than the corresponding emissions from the no-action alternative for both the short and long term. For CO standards compliance, the SIP requires that the project must not result in any new violations or exacerbate an existing violation. The state is in the process of revising its SIP. The revisions are expected to include an enhanced Inspection and Maintenance Program for Motor Vehicles, and increasing emphasis in TMS/TDM for all Transportation Projects.

<u>Demonstrating Compliance.</u> Similar to the Connecticut and Rhode Island cases, consistency with the Massachusetts SIP for ozone is accomplished by ensuring that the VOC emissions from the proposed project are less than the emissions from the no-action alternative. Consistency with the SIP for CO is demonstrated by ensuring that there are no new CO standards violations, and that existing violations are not made worse.

3.10.2 Affected Environment

Potential air quality impacts of the proposed electrification project include: 1) changes in rail-related emissions due to the switch from diesel-fueled to electric-powered locomotives, 2) changes in the overall emissions from transportation sources, and 3) changes in local or microscale ambient air quality concentrations. This last impact includes potential changes around railroad stations due to increased traffic resulting from increased ridership and changes from locomotive passbys. In this section ambient, or existing air quality conditions and emissions in the corridor and at particular locations are identified.

3.10.2.1 Ambient Air Quality in the Northeast Corridor. Each of the states along the project corridor (Connecticut, Rhode Island, and Massachusetts) maintains a network of monitoring stations which sample ambient air concentrations and provide data to assess the impact of control strategies. The pollutants of concern are those pollutants which are primarily emitted from transportation sources. These include NO_2, VOCs, NOx and PM10. In this section, the most recent information available from the monitoring stations for a full year (1991) is presented and compared to the Federal and state air quality standards presented in Table 3.10-1. This information is summarized in Table 3.10-2 in Appendix B.

<u>Connecticut.</u> This area of Connecticut is presently classified as a non-attainment area for CO due to violations in the recent past. It is also classified as non-attainment for PM10 and serious nonattainment for ozone. It is presently classified as in attainment for NO_2.

<u>Rhode Island.</u> Rhode Island is in attainment for CO, NO_2, and PM10 throughout the state. The state is presently classified as a serious ozone non-attainment area due to violations of the ozone standard in the past.

<u>Massachusetts</u>. Portions of Massachusetts are in attainment for CO and PM10. Although there are currently no violations of the CO standard in this area of Massachusetts, the region is still classified as a non-attainment area for CO due to violations in the recent past. Massachusetts is also presently classified as in attainment for NO_2 and also has a 1-hour NO_2 policy level of 0.17 parts per million (ppm). This level is not a standard that mandates compliance; rather, it is a health guideline or criterion that is used to assess the impact of both transportation and stationary source projects. This area of Massachusetts is presently classified as a serious ozone non-attainment area.

3.10.2.2 Total Existing Emissions in the Northeast Corridor. There are four general sources of emissions in the region. These include: mobile (transportation); point (identifiable, non-mobile sources such as power plants); area (non-point and other sources); and biogenic (or natural) sources. Table 3.10-3 in Appendix B summarizes the emissions by source for VOCs, NOx and CO, respectively.

3.10.2.3 Inventory of Existing Transportation Emissions in the Northeast Corridor. Emissions inventories are quantities of pollutants emitted over a given time period, which provide information about contributions from various sources. They are estimated by multiplying emissions factors (e.g., a single locomotive trip from Boston to New Haven) by source activity (number of trips in one day). Emissions presented here are for one 24-hour day based on U.S. EPA emissions factor methodologies on a typical summer day. The sources taken into account include those listed below.

Railroad Locomotives. Emissions from existing diesel-powered Amtrak locomotives, other diesel-powered passenger service locomotives and diesel-powered freight locomotives were used to characterize the existing emissions in this section, as well as to characterize the 2010 no-build condition in section 4.10.4.3. Locomotive emissions were determined based on the procedures and data in EPA's Procedures for Emission Inventory Preparation, Volume IV: Mobile Sources.

Motor Vehicle Sources. Emissions were calculated based on vehicle miles traveled (VMTs) for automobiles and intercity buses in the Northeast Corridor. Emissions from automobiles in each of the three states were determined separately, using the state specific MOBILE5A inputs agreed to in discussions with the three state agencies involved.

Aircraft Sources. Emissions were determined based on the procedures and data in EPA's Procedures for Emission Inventory Preparation, Volume IV: Mobile Sources.

Existing VOC Transportation Emissions. As shown in Table 3.10-4 in Appendix B, automobiles account for the overwhelming proportion of VOCs attributable to intercity transportation sources (83.8 percent corridor-wide), with aircraft responsible for the second largest proportion (12.7 percent corridor-wide), particularly in the Massachusetts portion of the NEC. Amtrak, other trains and intercity buses are responsible for approximately one percent each corridor-wide and in each state. In Connecticut and Rhode Island, automobiles are responsible for nearly all transportation VOCs in the NEC (93 percent in each state). In Massachusetts, the only state with a major airport in the corridor, aircraft (35 percent) and automobiles (59 percent) total approximately the same proportion as only automobiles in other states.

Existing NOx Transportation Emissions. Automobiles account for nearly half of all project-related NOx emissions in the total corridor, and for over 60 percent each in Connecticut and Rhode Island (Table 3.10-5 in Appendix B). Amtrak trains are responsible for the second largest proportion of NOx in Connecticut and Rhode Island (19 and 30 percent respectively), where commuter rail operations are minor. In Massachusetts, where a significant commuter rail system exists, trains other than Amtrak's account for the largest share of NOx (40 percent), with automobiles accountable for the second largest proportion (24 percent). As a whole, trains other than Amtrak, and Amtrak trains are responsible for 39 percent of corridor-wide NOx emissions from project-related transportation sources.

Existing CO Transportation Emissions. In all three states and corridor-wide, automobiles are responsible for the overwhelming majority of project-related CO emissions, as shown in Table 3.10-6 in Appendix B. Only in Massachusetts are other sources responsible for more than 3 percent. Again, this is due to the presence of a major airport in Boston, making aircraft responsible for 13 percent of CO emissions.

3.10.2.4 Existing Ambient Concentrations at Selected Sites. This section provides the existing or ambient conditions used in the dispersion modeling analysis in section 4.10. Ambient concentrations analysis is a microscale assessment for a particular small-scale area. Two different types of evaluations are made in this study. The first is a microscale CO concentration assessment for two intersections in the vicinity of the Route 128 express station in Dedham, MA, anticipated to be the most congested express station in terms of project-generated automobile traffic. The second is an assessment of the impact of locomotive passbys at three representative sections along the NEC. This section provides the estimated existing ambient concentrations in order to provide a basis for evaluation for each of these factors.

Evaluation of Existing Ambient Concentrations. Two intersections near the Route 128 express station were modeled: University Avenue/Blue Hill Road, and Blue Hill Road/Route 128 South ramps. These intersections were modeled because the areas surrounding Route 128 Station are expected to be most affected by the proposed project. This is because of expansion capabilities and the rural character of the station's surrounding areas. Figure 3.10-1 shows the location of these two intersections. Estimated eight-hour CO concentrations for 1992 are shown in Table 3.10-7 in Appendix B for the intersection of University Avenue/Blue Hill Road, and in Table 3.10-8 for the intersection of Blue Hill Road/Route 128 South ramps. With the exception of some sidewalk receptors on Blue Hill Road/University Avenue, 8-hour CO concentrations in 1992 were estimated to be less than the 9-ppm standard. At some of the sidewalk receptors on Blue Hill Road/Route 128 ramps, eight-hour CO concentrations were estimated to be slightly over the standard.

Maximum existing one-hour CO concentrations were estimated from the eight-hour results by the use of an inverse persistence factor. The one-hour results for the intersections of University Avenue and Blue Hill Road, and Blue Hill Road/Route 128 ramps are shown in Table 3.10-7 and 3.10-8, respectively. No violations of the one-hour standard of 35 ppm were encountered.

Existing Air Quality Effect of Locomotive Passbys. The purpose of this information is to demonstrate the effect of existing diesel locomotive passbys on air quality so that it can be compared to the impacts of the project alternatives. Three prototypical sections along the NEC were identified and selected for the modeling analysis. The selection was based on evaluating combinations of train operating characteristics (for example, power settings and train speeds) and the density of nearby sensitive receptors. One section of the NEC was analyzed in each of the three states for peak, instantaneous CO and NO_2 concentrations associated with a single, locomotive passby. The areas analyzed were located in Clinton, CT, North Kingstown, RI, and Sharon, MA, and were selected because of their close proximity to sensitive receptors. As shown below, the peak concentrations for locomotive passbys modeled in these three areas showed minimal increases from background levels and none exceeded existing emissions standards listed in Table 3.10-1.

	Peak Concentrations	
Location	CO	NO_2
Clinton, CT	0.00025 ppm	0.1 μg/m
North Kingstown, RI	0.03 ppm	41.0 μg/m
Sharon, MA	0.003 ppm	8.0 μg/m

3.11 VISUAL AND AESTHETIC RESOURCES

There are two types of environments in the NEC study area that may be visually affected by the proposed project: existing views of the waterfront or other scenic areas and developed areas in which facilities sites are proposed. First, areas with existing views of the waterfront or other scenic areas are identified and visually sensitive receptors (VSRs) located within these areas are identified. VSRs are those residences, historic structures or districts, and parks, roadways or other public locations with existing views or vistas of the waterfront or other scenic areas.

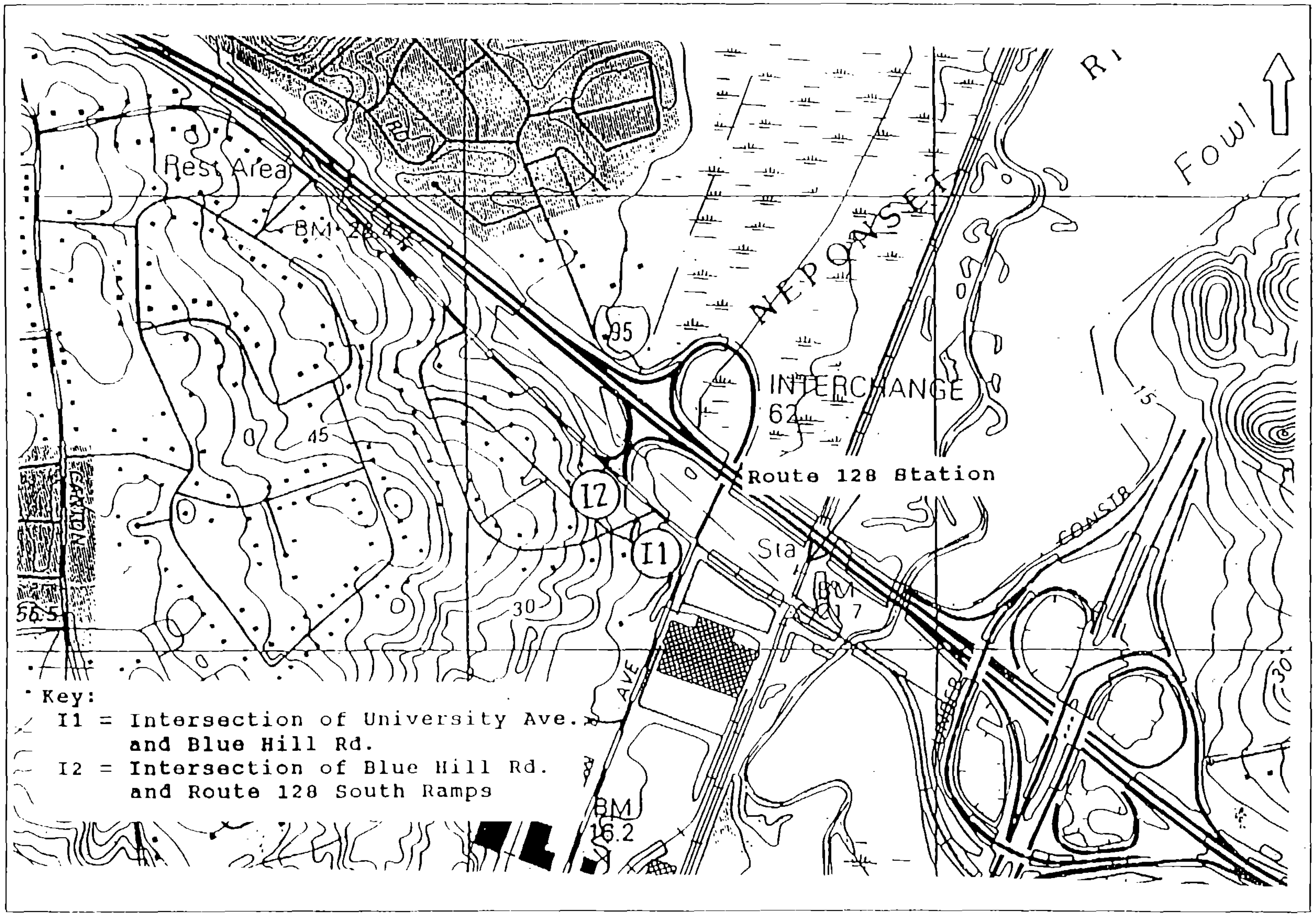

FIGURE 3.10-1. LOCATIONS OF MODELED INTERSECTIONS IN THE VICINITY OF ROUTE 128 STATION

Second, developed areas in which facility sites would be located are identified and a determination is made whether each facility would be located in an area considered architecturally sensitive. Architecturally sensitive areas (ASAs) are those areas in which the proposed facility may be significantly out of scale in height or mass, or out of character in style or substance, from existing structures of the neighborhood.

3.11.1 Visually Sensitive Receptors (VSRs)

Two major steps, desktop analysis and field verification, were used to identify VSRs. Desktop analysis included evaluation of U.S.Geological Survey topographic sheets and aerial photographs taken in April 1992 (scale: 1 inch = 200 feet). Two criteria were used to conservatively identify potential VSRs. It was determined that potential VSRs are those residences, parks and other public locations: 1) with a direct line of sight to the waterfront or other scenic view; and 2) located within approximately 1500 feet of the ROW, which is the distance at which it is estimated that poles similar to those proposed for use to support the catenary are no longer significant in the view. As a result of the desktop analysis, approximately 200 potential VSRs were identified and marked on maps for field verification.

Field verification of the potential VSRs occurred in early spring of 1993. Views were evaluated from the yards or decks of each residential potential VSR and from various locations along the roads or in the parks for nonresidential potential VSRs. Two criteria were utilized in identifying VSRs: 1) the existence of a view of the waterfront or other scenic area from the potential VSR; and 2) location of the ROW in the view. Any location that met both these criteria was determined to be a VSR. Of the nearly 200 potential VSRs, 51 were determined to be VSRs and are listed in Table 3.11-1 in Appendix B. Photographs were used to record the existing views from each of the VSRs.

The field survey was used to identify another factor that is relevant in the evaluation of visual impacts, the visual complexity of the skyline in the view. The visual complexity (VC) of the skyline refers to the "busy-ness" of the fore- and background in a view. VC is rated high, moderate or low. High VC is indicative of a busy view and a view thus rated may include dense vegetation, the presence of industrial equipment or utility poles or dense, varied development. Low VC is indicative of a relatively uninterrupted view and is primarily used here to describe an uninterrupted and uncomplicated seascape. A view with low visual complexity would be more susceptible to adverse impact as a result of the addition of the project components to the view than a view with high visual complexity. The VC of the view from each of the VSRs is shown in Table 3.11-1.

In order to demonstrate the visual impacts of the proposed electrification project, views from several of the VSRs are shown in photographs in Figures 3.11-1 through 3.11-5. In section 4.11, these photographs are altered to show the visual effects of the proposed action. These views represent a variety of types of sensitive views in the corridor, as described below:

Figure #	Location	Distance from Track	View	Visual Complexity
3.11-1	76 Thimble Island Rd. Branford, CT	350 ft.	L.I. Sound	High
3.11-2	211 Seneca Dr. Groton, CT	360 ft.	Jordan Cove	Moderate
3.11-3	162 Wilcox Ave. Stonington, CT	480 ft.	L.I. Sound	Low
3.11-4	13 Lambert's La. Stonington, CT	880 ft.	Stonington Harbor	Moderate
3.11-5	4490 Boston Post Rd. Warwick, RI (Harborwatch Condominiums)	50 ft.	Greenwich Bay	Low

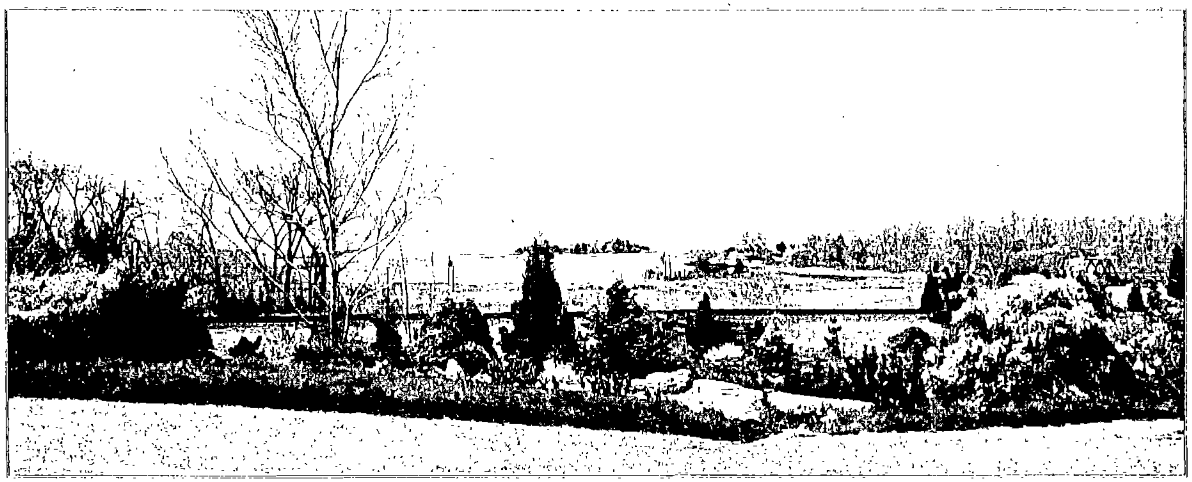

FIGURE 3.11-1. EXISTING VIEW FROM RESIDENCE AT 76 THIMBLE ISLAND ROAD IN STONY CREEK SECTION OF BRANFORD, CT.

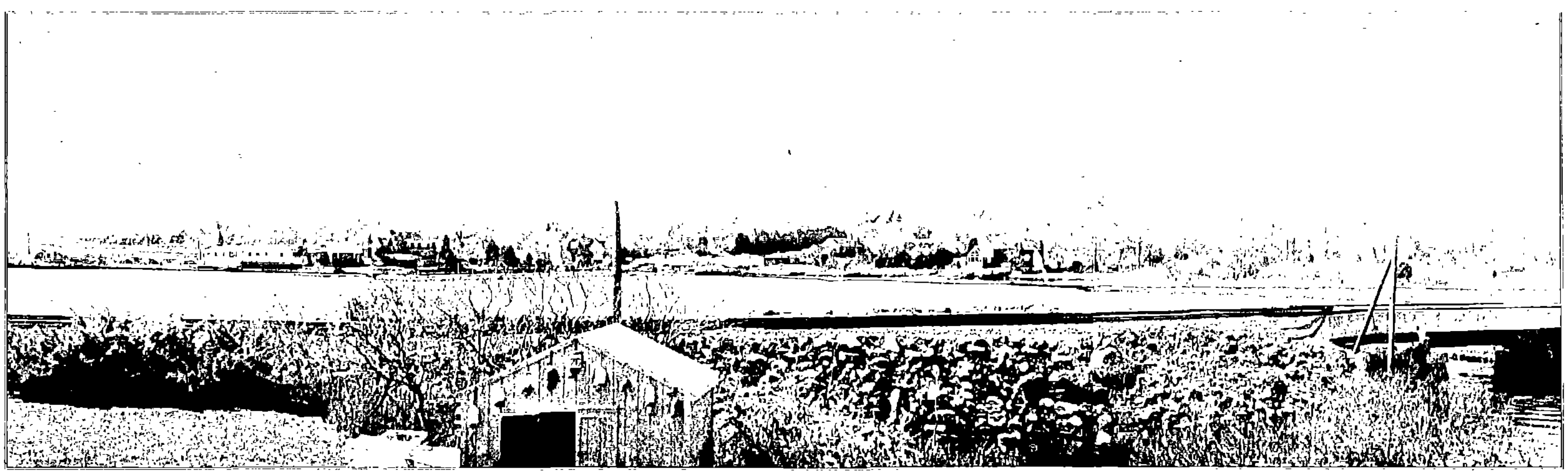

FIGURE 3.11-2. EXISTING VIEW FROM RESIDENCE AT 211 SENECA DRIVE IN NOANK SECTION OF GROTON, CT.

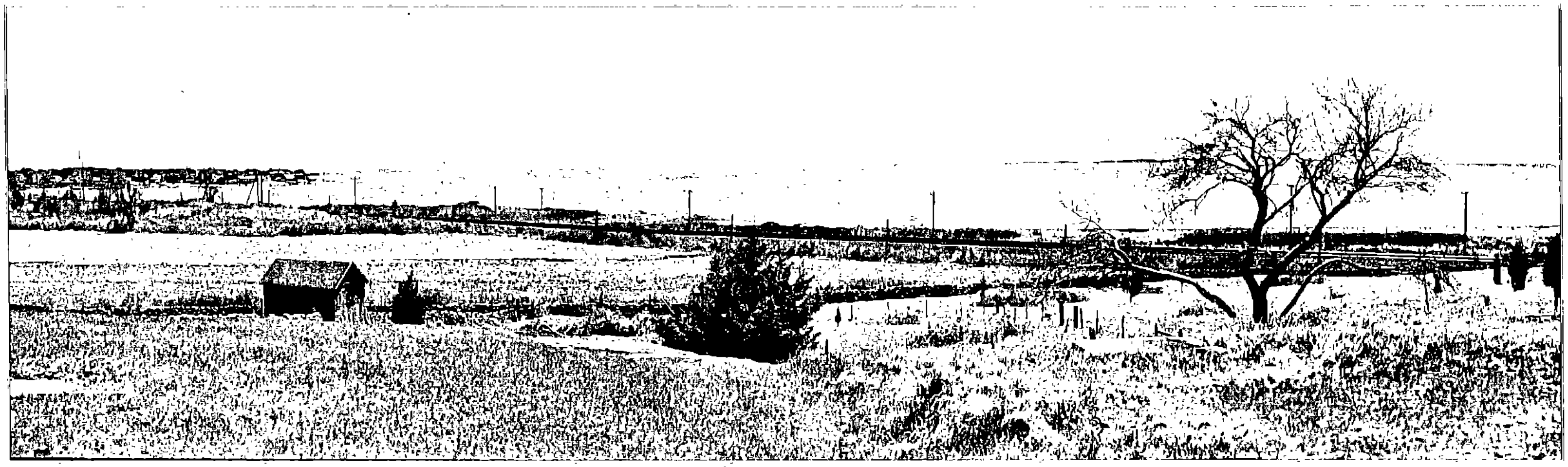

FIGURE 3.11-3. EXISTING VIEW FROM RESIDENCE AT 162 WILCOX AVENUE IN STONINGTON, CT.

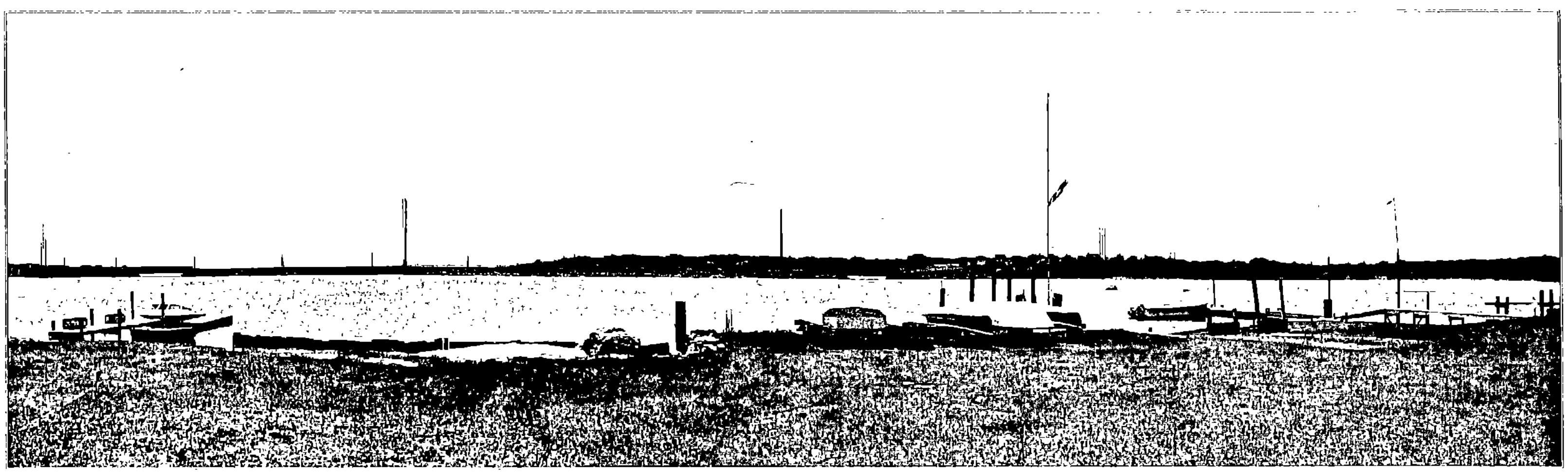

FIGURE 3.11-4. EXISTING VIEW FROM RESIDENCE AT 13 LAMBERT'S LANE IN STONINGTON, CT.

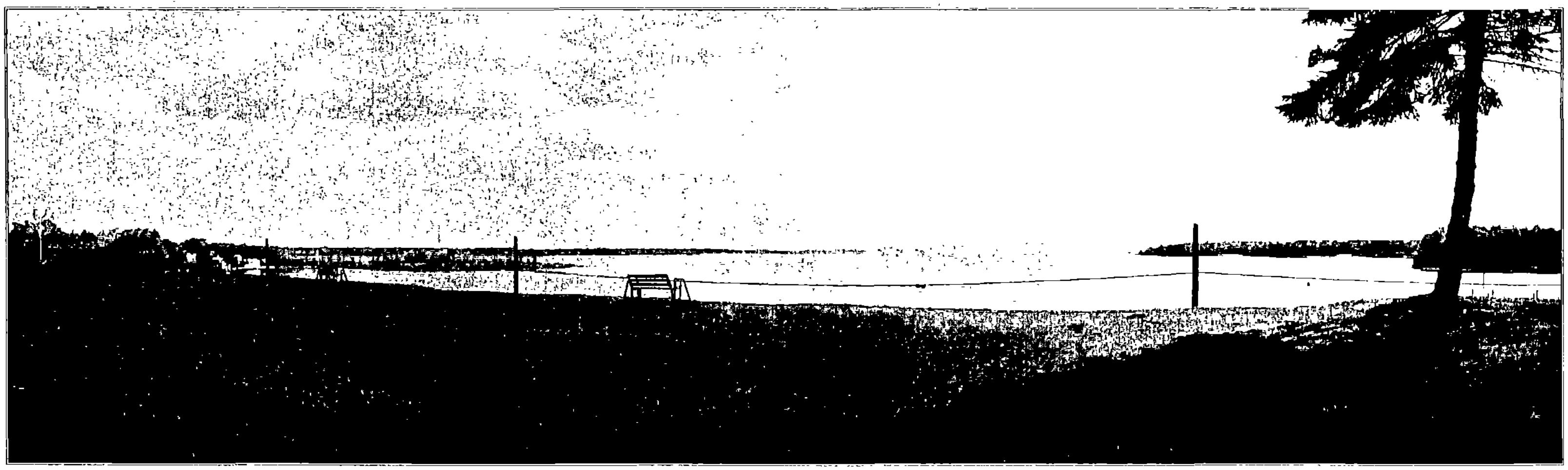

FIGURE 3.11-5. EXISTING VIEW FROM HABORWATCH CONDOMINIUMS AT 4496 BOSTON POST ROAD IN WARWICK, RI

3.11.2 Architecturally Sensitive Areas (ASAs)

Both desktop analysis and field verification were used to identify ASAs in the NEC project area. Existing land use information was evaluated to determine which of the project facilities are proposed for potential ASAs - commercial or residential areas. This information was then field-verified by visiting the site locations. In addition, the field survey was used to estimate the potential of the facilities to be out of character with the surrounding development. The proposed Roxbury Crossing substation is in an area of mixed commercial and residential character. The proposed Noank paralleling station site is in an area that is primarily residential in character. The neighborhoods surrounding both these sites can be characterized as an ASA. None of the other proposed facility sites can be characterized as an ASA.

3.12 NATURAL RESOURCES

Natural resources were identified at each of the substations, switching station, paralleling stations, and bridges which would be modified.

3.12.1 Affected Environment

This section identifies natural resources that occur at or within the immediate vicinity of the proposed project facilities, as well as special protected areas that occur elsewhere in the corridor. These resources include wetlands, critical wildlife habitats, endangered species, floodplains, coastal resources, and water resources. Summaries of the resources present at each of the proposed facilities sites can be found in Tables 3.12-1 through 3.12-5 (in Appendix B) for the substations, switching stations, paralleling stations, bridges to be raised and moveable bridges, respectively. The methods for identifying these resources are described below.

3.12.1.1 Methods of Analysis

Wetlands. Wetlands within the study area were identified by the interpretation of available data including National Wetlands Inventory (NWI) maps prepared by the U.S. Fish and Wildlife Service (USFWS); Soil Conservation Service Soil Surveys; state and local wetlands and soil maps; and through field verification of the presence of wetlands during site walks of the proposed project sites.

Wildlife Habitat. Fish and wildlife resources in the NEC project study area include amphibians, reptiles, birds, and mammals. Previous studies, contact with government agencies, and existing and project-specific field review data were utilized to make determinations of whether species or habitat types occur in the study area.

Threatened and Endangered Species. Species, communities, and natural resource areas that are considered threatened or endangered are protected by the Endangered Species Act of 1973. Protected species are defined as species which are currently listed as endangered, threatened or a species of special concern. The USFWS has been delegated the responsibility for administering the Endangered Species Act and maintains a list of species which are: endangered, that is, in danger of extinction throughout all or a significant portion of its range; or threatened - any species which is likely to become an endangered species within the foreseeable future throughout all or a significant part of its range.

Floodplains. The study area crosses a variety of floodplains associated with rivers, streams, and surface waters. Since the proposed project may impact some portion of the floodplain, an evaluation of potential effects to the floodplains is required pursuant to the provision of Executive Order 11988 (Floodplain Management), 23 CFR 650A, and the National Flood Insurance Program. The Federal Emergency Management Agency (FEMA), which is charged with the administration of floodplain requirements, has mandated that local and state agencies be notified prior to the commencement of work in any area that would be inundated by a 100-year storm event. A 100-year storm is defined as a storm having a one percent chance of occurring in any given year. Data for the floodplain section of this report was taken from flood insurance studies conducted for the FEMA and the Department of Housing and Urban Development.

Coastal Resources. Coastal resources include coastal waters, related marine and wildlife habitat and adjacent shorelands, which together constitute an ecosystem of both terrestrial and estuarine environments. Examples of these resources include coastal bluffs, shorefronts, beaches and dunes, intertidal flats, tidal wetlands, adjacent freshwater wetlands, estuarine embayments, coastal hazard areas, developed shorefront, nearshore waters, islands, shorelands, and shellfish concentration areas. All coastal resources were identified, delineated, and classified according to accepted methods.

Ground and Surface Water Resources. The construction of railroad improvements and associated structures such as those proposed for this project has the potential to adversely impact groundwater quality during the construction phase by the alteration of the terrain and the staging of construction equipment and supplies, and subsequently by increased urban runoff from paved areas. Shallow sand and gravel aquifers are susceptible to contamination by water quality contaminants in runoff. While less susceptible than consolidated aquifers, bedrock aquifers are also subject to contamination by polluted recharge. The addition of impervious surfaces and the potential for localized diversion of runoff may have some impact upon groundwater recharge.

Surface water (ocean, lake, pond, river, and stream) is an important resource not only for human and wildlife consumption, but also for recreation. Each of the three states provide water quality standards for evaluating impacts from activities (particularly dredge and fill) that may affect such resources.

Special Protected Areas. The NEC passes through two land areas identified as areas of critical environmental concern (ACECs) by the Massachusetts Department of Environmental Protection (MDEP). These are the Fowl Meadow/Ponkapoag Bog and Canoe River ACECs. These areas are considered to be unique clusters with natural and human resource values worthy of a high level of concern and protection. Additional efforts are made to preserve and restore these areas and all Massachusetts Executive Office of Environmental Affairs (EOEA) agencies are directed to evaluate actions with this in mind. Apart from Massachusetts, there are other protected areas in the corridor, most notably the Great Swamp in Rhode Island.

3.12.1.2 Identification of Resources. This section identifies those natural resources present at each of the facilities sites. Only those resources that occur at a site are discussed in the sections below. Tables 3.12-1 through 3.12-5 summarize the occurrence of natural resources at each project site.

Substations. There are no natural resources of concern present at the proposed Warwick and Roxbury Crossing substation sites. The proposed New London substation is sited in an area designated as a 100-year floodplain. There are three private wells on the north side of the proposed Branford site, including one in proximity to the utility corridor.

Switching Stations. The proposed Westbrook site is located across a road, but in the buffer of the wetland. The proposed Richmond site is within the 200-foot buffer zone of the Pawcatuck River, and the 100-year floodplain. The site falls within the watershed of the Wood and Pawcatuck Rivers, which has been designated a Sole Source Aquifer area by the U.S. Environmental Protection Agency (EPA). The Sole Source Aquifer provision of the Federal Safe Drinking Water Act gives the EPA the authority to designate and protect aquifers that provide the principal or sole source of drinking water in an area as a Sole Source Aquifer. Prior to the commitment of Federal funds to a project, the EPA must make a finding that the project will not adversely affect the aquifer. The Norton site is located within the Bungay River Water Resource Protection District and the buffer zone of adjacent wetlands.

Paralleling Station Sites. Natural resources occurring at the paralleling station sites are discussed for each site below. There are no significant natural resources at the Madison, Elmwood, Providence, Canton and Readville sites. Several of the sites are in coastal resource areas designated as shorelands; however this designation indicates uplands and is not considered sensitive.

Leetes Island. This site falls within the 100-year floodplain, but no other resources are present at this location.

Grove Beach. This site is within 50 feet of freshwater wetlands.

Old Lyme. This site occurs in an area designated to have moderate wildlife value because it is located at the edge of a forested community with a large scrub-shrub wetland across the tracks and an isolated wetland southeast of the site which may provide vernal pool habitat. The variety of habitats in the vicinity, as well as the vegetative diversity of the surroundings, would provide moderate wildlife habitat values. The presence of recent deer browse on shrubs in the area is evidence of wildlife use.

Millstone. This site is located within the buffer zone of a narrow drainage channel, which occurs across the railroad tracks within 50 feet of the site and eventually empties into a tidal marsh approximately 500 feet away. As part of a vegetative community which provides forest openings as well as edge habitat, the site would provide moderate wildlife habitat values to many species, especially songbirds which can utilize the shrubs (such as mockingbirds), rodents, and aerial predators such as the red-tailed hawk (*Buteo jamaicensis*).

Noank. This site lies within the buffer zone of a narrow, steep-sided stream connected to Palmer Cove (west) and a tidal marsh (east of Long Point Road), as well as within the 100-year flood boundary.

Stonington. This site has moderate wildlife habitat value, provides habitat to a state-listed endangered species and falls within the 100-year floodplain. Habitat characteristics include a predominately open area with a large ledge outcropping and a dense growth of greenbriar dominating the western half of the site. Located in an oak forest with a variety of habitats, including wetlands, available in the surrounding area and development around the site limited, this site would be expected to provide wildlife habitat in the form of nesting and cover for small mammals and birds. A state-listed endangered species, the American bittern (*Botaurus lentiginosus*) has been recorded within close proximity of the project area.

State Line. This site lies within the Wood and Pawcatuck Rivers watershed, which is designated a Sole Source Aquifer Area by the EPA.

Bradford. This site is located within the wetlands buffer zone, as well as the Wood and Pawcatuck Rivers watershed, designated a Sole Source Aquifer Area by the EPA. The site is also located within the areas designated by the RI Department of Environmental Management as a critical recharge area for local groundwater, and public wells lie 1,500 feet east and 3,000 feet south of the site.

Kingston. This site provides critical wildlife habitat, primarily due to the variety of available habitat types and the presence of one very large (over 48 inch diameter) white oak on the site, which has numerous cavities. Numerous deer tracks and songbirds were noted in the proposed site, confirming the area's habitat value. This site is also located in the Wood and Pawcatuck Rivers watershed, which has been designated a Sole Source Aquifer area by the EPA.

Exeter. This site is designated as moderate wildlife habitat and is in an area designated a Sole Source Aquifer area by the EPA. The area surrounding the site provides a variety of habitats (turf fields, open water) which contribute to its wildlife value.

East Greenwich. This site is located within locally protected wellhead protection and groundwater recharge areas, as well as the Hunt-Annaquatucket-Pettaquamscott Sole Source Aquifer, as designated by the EPA.

East Foxboro. This site, which is considered of moderate wildlife value, also lies within the edge of an ACEC, although there are no critical resources near the site. The site lies outside any protection areas for the ACEC's principal resource, the Canoe River Aquifer. The proposed site is mostly forested with a mixed hardwood/softwood overstory and vegetative diversity. Wildlife habitation was indicated by the presence of numerous songbirds and tracks from rabbits, gray squirrels and deer.

CHAPTER 4
ENVIRONMENTAL CONSEQUENCES

This chapter describes both the benefits and impacts of the alternatives on the natural and manmade environment. First, the effects of the no-build alternative are briefly summarized, followed by a detailed description of the benefits and impacts of the proposed electrification.

The effects of the no-build alternative are measured as the increment of change between 1992-1993 conditions (also known as the "existing baseline"), which are documented in Chapter 3 of this document, and the conditions that would be present in 2010 (the "future baseline"). For most of the impact areas discussed in Chapter 3, these conditions would remain the same over this period. As the no-build alternative includes an increase in Amtrak service of two trains in each direction daily (due to projected demand) and no other project activity, effects of this alternative are limited to the increase in noise, vibration, energy use and air quality that would be generated by four additional train trips, as well as the natural growth in all travel modes that would be fueled by population growth over the 17-year period between now and 2010. The change in noise over existing conditions (67 residences impacted) would be minor. The change in vibration and energy use would be slightly greater, with vibration effects on 360 residences and one school, and increased diesel fuel consumption of 508,000 gallons per year. Natural growth in automobile use, projected to increase by 20 percent by 2010, will likely result in increased congestion on the region's highways, and could require the construction of additional highway lanes, which would have substantial environmental and social implications. Natural growth in air passenger demand could be accommodated in the existing schedule, using larger aircraft, however, congestion at the airports would increase.

Although the total vehicle miles traveled in NEC are anticipated to increase between 1992 and 2010 and the number of aircraft flights will remain relatively stable, the levels of volatile organic compounds (VOC) and carbon monoxide (CO) emissions from these two sources are anticipated to decrease significantly for two reasons. First, the Federal Motor Vehicle Emissions Control Program (FMVCP) and the state Inspection and Maintenance (I/M) programs, which will require significantly reduced automotive emissions, are anticipated to be implemented during this period. Second, even though the number of aircraft flights are not expected to significantly change, the future aircraft fleet is expected to have more efficient engines, which emit lower levels of VOC, higher levels of oxides of nitrogen (NOx) and similar levels of CO. Thus, between now and 2010, corridor-wide transportation-related VOC emissions are expected to decrease by 41 percent, NOx emissions to increase by 25 percent and CO emissions to decrease by 50 percent.

The impacts of the proposed electrification alternative are measured as the increment between the no-build alternative, which represents the future baseline conditions, and the conditions that would result from construction and operation of the proposed action. The proposed electrification would result in a range of changes from the 2010 baseline condition, as described in section 4.1 through 4.13 of this chapter. These include both benefits and impacts and include changes in the natural environment (noise and vibration, energy, air quality, aesthetics, natural resources and hazardous materials); changes in the social environment (land use, socioeconomics and public safety); effects on historic and archeological resources; and changes in traffic and circulation, which would result from proposed increases in Amtrak service and projected increases in ridership. This section discusses both short-term effects of the construction period and long-term effects of the proposed electrified service.

Each of the following sections addresses one of the impact areas listed above and contains: 1) a summary of the potential benefits and impacts evaluated; 2) the qualitative and quantitative criteria that are used to determine whether such impacts merit mitigation (evaluation criteria); 3) potential benefits of the project; 4) potential impacts that would not require mitigation; and 5) impacts that exceed the thresholds of the criteria and therefore would likely require mitigation. Mitigation measures for impacts exceeding thresholds are addressed in Chapter 5. With the exceptions of the visual and aesthetic and hazardous waste evaluations which are detailed in this chapter, a detailed description of the methods of analysis and evaluation processes for each impact can be found in the technical studies in Volume III of this DEIS/R. Volume II and Volume III are available at the public depositories listed in Appendix E, including the main public library in each of the communities in the study area.

4.1 LAND USE

Four types of land use benefits and impacts are evaluated. These include: consistency of the proposed project with Federal and state land use policies, plans and programs, including coastal zone policies and the Federal Farmland Protection Policy Act; limitations on access to recreational facilities; displacement of residences or businesses; and project-induced secondary growth and development.

4.1.1 Evaluation Criteria

Although there are no quantifiable measures for assessing land use impacts, the qualitative criteria shown in Table 4.1-1 were applied to evaluate potential project impacts and benefits.

4.1.2 Benefits of the Proposed Electrification

Project-induced secondary development could occur in areas around the five express railroad stations. Although developable land and vacant commercial space around these stations is limited as described in section 3.1.5, some commercial growth is expected as a result of project-generated increases in ridership at these stations, which are described in section 4.9 of this chapter.

4.1.3 Land Use Impacts

The proposed electrification is not expected to result in conflicts with any of the Federal or state land use policies, plans and programs described in section 3.1.1 of this report, including coastal zone policies and the Federal Farmland Protection Policy Act.

The proposed electrification could result in limitations on access to one recreational facility and displacement of one residence and one business along the 156 mile NEC. These impacts would result from the placement of three of the twenty five proposed electrification facilities sites. No land use impacts are expected as a result of the siting of the remaining 22 facilities, the majority of which will be placed on existing Amtrak property or unused public land.

The site of the proposed Noank paralleling station in Groton, CT currently serves as the parking lot for Esker Point Beach, a town recreational facility. As currently proposed, this facility would require taking nearly all of the lot, which is generally filled to capacity most summer days. Currently, there is no other parking available, and therefore, vehicular access to the beach would be restricted. Section 4(f) of the Department of Transportation Act of 1966 (49 U.S.C. 303(c)) provides that the department may not approve a project that involves the use of any publicly owned land from a public park, recreation area or wildlife and waterfowl refuge of national, state or local significance or any land from an historic site of national, state or local significance unless there is no prudent or feasible alternative to such use and the project includes all possible planning to minimize harm resulting from the use.

TABLE 4.1-1
LAND USE EVALUATION CRITERIA

IMPACT CRITERIA	MEASURE
Consistency with local, state, or Federal land use policies, regulations, and programs.	Conflicts with local, state, or Federal land use policies.
Secondary growth or development impacts.	Project induced changes in land use or growth patterns.
Severe limitations on access to recreational facilities.	Change in accessibility or attractiveness of recreational areas and facilities.
Displacement of existing residences or businesses.	Number and type of uses to be relocated.

Location of the paralleling station in the recreational facility parking lot would constitute a use within the meaning of section 4(f). The Federal Railroad Administration has contacted Amtrak regarding the applicability of section 4(f) to this project element and suggested that the paralleling station site be relocated. If it is found that it is not feasible or prudent to relocate this site outside this recreation area, the Final EIS/R will include a section 4(f) determination and will document the analysis required to make the necessary findings.

4.2 SOCIOECONOMICS

This section provides a summary of the evaluation of five types of potential socioeconomic impacts and benefits, including the project's effects on local property values, local tax revenues, regional tourism patterns, employment and minority populations.

4.2.1 Evaluation Criteria

Although there are no regulatory standards against which to measure socioeconomic impacts, qualitative criteria shown in Table 4.2-1 were established to evaluate potential project impacts and benefits.

4.2.2 Benefits of the Proposed Electrification

The proposed electrification project would have a small beneficial effect on employment and income in the region, with the total long.and short-term employment created by the project generating an increase in regional employment of approximately 0.1 percent over existing levels. As presented in Table 4.2-2, Amtrak anticipates that an additional 269 to 279 permanent positions will be created, including 24 train and engine crew positions in either New York or Boston. In addition to the 24 train and engine crew positions that would be newly created, 51 others would consist of current train and engine crews that would be transferred from New Haven. In addition to long-term employment, design and construction of the electrification facilities would generate between 600 and 700 temporary jobs over a three year period.

4.2.3 Socioeconomic Impacts

The potential impacts of the proposed electrification on local property values and tax revenues, regional tourism patterns, and minority populations are described in this section. As described below, no impacts to tourism or minority populations were identified. It was found that there may be some potential impact on property values, and subsequently on municipal tax revenues, as a result of the proposed electrification, but such impacts could not be quantified.

4.2.3.1 Tourism. A literature search of several environmental, economic and general databases was conducted to determine whether there would be any benefits or impacts on tourism as a result of the proposed electrification, particularly in Connecticut, where the corridor lies in proximity to the some of the state's most significant tourist attractions. Such effects could include benefits associated with improved access or impacts associated with potentially increased noise. However, no studies were found that addressed the effects of improved rail passenger service or its potential externalities (noise, air quality improvements, and alterations of views) on the surrounding environment. The proposed project involves the upgrade of an existing, major transportation facility that has been in place for over a century. It is unlikely that there would be a significant change in tourist impressions of these attractions.

4.2.3.2 Minority Populations. Most of the proposed electrification facilities (substations, switching and paralleling stations) are located in the undeveloped, sparsely populated or non-minority neighborhoods that comprise the majority of the NEC. However, three facilities are proposed for construction in more densely populated residential neighborhoods: Noank (Groton), CT; Warwick, RI and Roxbury, MA. Of these three communities, only Roxbury is considered a minority community, therefore minority populations are not disproportionately affected by the project.

4.2.3.3 Property Values and Tax Revenue. While it is possible that the potential external effects of the proposed electrification, such as noise or diminished views, may have a localized effect on property values, mitigation of such externalities could reduce or eliminate the potential for property value and subsequent tax revenue effects. As described in section 4.4 and 4.11 of this report respectively, a total of approximately 800 residences may experience increased noise levels or effects on sensitive views, which could indirectly affect property values. It is expected, however, that most potential impacts can be substantially reduced or eliminated through measures described in Chapter 5.

Section 4.5 documents that EMF levels from the proposed project are expected to be hundreds to thousands of times lower than guidelines recommended by several states and the international scientific community. Recent media attention to this issue has created public concern which may, in turn, affect property values.

A literature search was conducted of several environmental, energy and general databases, but no studies were found that addressed the effects on property values due to railroad electrification. Some literature was found on the property value effect of utility transmission lines and although these facilities are far more visually intrusive and have more powerful magnetic field strengths than the proposed catenary, some inferences can be drawn from these studies.

The results of the transmission line studies were generally evenly split between those that concluded transmissions lines do and do not affect property values. Likewise, some of the studies with each view were found by independent reviewers to be flawed. Other studies noted that environmental factors are usually not major determinants in the price differential of properties. The major determinants of residential property values are house quality and size, lot size, and characteristics of the community, including tax rate and the quality of services such as schools. Thus, the only valid conclusion that can be drawn is that if effects on sensitive views and noise levels can not be mitigated, and if public perceptions regarding EMFs do not change, there may be a small effect on property values. If, however, noise and visual effects can be substantially mitigated using the options presented in Chapter 5, this effect would be reduced. Likewise the effect of the project on tax revenues would be minimal.

TABLE 4.2-1
SOCIOECONOMIC EVALUATION CRITERIA

IMPACT CRITERIA	MEASURE
Effect on property values.	Demonstrated change in property values from similar projects.
Effect on tax revenues/tax base.	Demonstrated change in property values from similar projects.
Effect on tourism patterns.	Demonstrated change in tourism-based trips, revenues, or attractiveness from similar projects
Effect on employment and income generated by construction and operation.	Change in employment or income.
Disproportionate effect on minority communities.	Greater impacts on minority communities than on non-minority communities.

TABLE 4.2-2 ESTIMATED NUMBER OF PERMANENT AMTRAK POSITIONS RESULTING FROM THE PROPOSED ELECTRIFICATION

CATEGORY	LOCATION	NO. OF POSITIONS CREATED
On-board Service Support	Boston	12
On-board Service Crews	Boston, New York City Washington, D.C	59
Station Staffing	South Station Back-Bay Route 128 Providence New London New Haven	9 7 5 10 4 7
Train and Engine Crews	Boston, New York	24[1]
Maintenance of Way Personnel	Boston or New Haven	12
Maintenance of Equipment Personnel	Boston or New Haven	120-130
TOTAL		269-279

[1] Fifty-one additional existing positions would be transferred from New Haven to either New York or Boston.

Source: Amtrak, 1993

4.2.3.4 Employment. Amtrak proposes to transfer 51 train and engine crew positions from New Haven to either New York or Boston. Individuals presently holding these positions would be offered similar positions in New York or Boston. This transfer would have a minor affect on the employment base of New Haven, It could, however, involve a significant dislocation for the individuals involved.

4.3 HISTORIC RESOURCES

This section summarizes potential effects, as defined in Section 106 of the National Historic Preservation Act of 1966 (NHPA), on resources listed or eligible for listing on the National Register of Historic Places (National Register). Impacts to historic resources could result from four activities associated with the proposed electrification. These include installation of the catenary on railroad bridges, installation of protective barriers on roadway bridges, alteration or replacement of roadway bridges, and installation of the catenary on the ROW within sight of historic properties.

An inventory of historic properties along the corridor was conducted and is documented in section 3.3 of the DEIS/R. The inventory, summarized in Table 3.3-1, through 3.3-3 in Appendix B, identified historic resources listed or eligible for listing on the National Register in the project area. After consultation with the State Historic Preservation Office (SHPO) in each state, it was determined that all listed or eligible properties adjacent to or within sight of the ROW or proposed electrification facilities would be considered within the zone of potential project impact.

The results of the impact assessment and relevant evaluation criteria are described below.

4.3.1 Evaluation Criteria

The potential for project effects to historic properties listed or eligible for listing on the National Register was evaluated in accordance with the NHPA Section 106 impact criteria of effect and adverse effect, as described in Table 4.3-1.

TABLE 4.3-1. HISTORIC RESOURCES EVALUATION CRITERIA

IMPACT CRITERIA	MEASURE	SIGNIFICANCE THRESHOLD
Alteration of the characteristics of a property that contribute to its significance.	Effect on characteristics of a property that contribute to its significance and eligibility to the National Register.	Effect on characteristics of property is adverse[1]

[1] As defined in Section 106 of the National Historic Preservation Act of 1966, an effect is adverse when the effect on a historic property may diminish the integrity of the property's location, design setting, materials, workmanship, feeling or association. Adverse effects include but are not limited to 1) physical damage or destruction of all or part of the property; 2) isolation of the property or alteration of the character of the property's setting, when that character contributes to the property's qualification for the National Register; 3) introduction of visual, audible, or atmospheric elements that are out of character with the property or alter its setting; 4) neglect of a property resulting in its deterioration or destruction; and 5) transfer, lease or sale of the property without adequate restriction or conditions included to ensure preservation of the property's significant historic features.

4.3.2 Historic Resource Impacts

4.3.2.1 Historic Railroad Bridges. Thirty-six railroad bridges that are listed or eligible for listing on the National Register were identified in the potential impact area. The proposed project would require the attachment of catenary wires over these bridges. While the installation of overhead catenary may affect the appearance of railroad bridges, in most cases the effect is not expected to be adverse. Because the span of most of these bridges is less than the proposed distance between catenary poles (200 feet), installation of poles on the bridges should not be necessary. At seven of the bridges, however, the bridge span exceeds 200 feet. Installation of the catenary support poles on these bridges would be necessary and may create a potential adverse visual or structural effect. Project effects to these sites and those noted below will be evaluated by the FRA on an individual basis in consultation with the SHPO in each state. Table 4.3-2 provides a listing of these bridges along the NEC, identified by name, municipality, milepost, National Register status.

4.3.2.2 Historic Overhead Roadway and Pedestrian Bridges. Ten historic roadway or pedestrian bridges that pass over the tracks are listed or eligible for National Register listing (Table 4.3-3). As a part of the electrification project, Amtrak proposes to attach the catenary to the underside of these bridges and to erect barriers along the entire length of the bridges to prevent the public from touching the wires. These barriers are proposed to be solid, eight feet high and located the full length of either side of the bridges to provide maximum protection.

The catenary system alone is expected to have a minor impact on historic roadway bridges due to other modern elements already present in the visual landscape, such as transmission lines, street lights and adjacent properties. However, the proposed protective barriers may result in substantial visual and structural alteration to the historic characteristics of nine of the bridges, thereby creating a potential adverse effect. The tenth bridge, Grand Avenue in New Haven, already has barriers.

4.3.2.3 Other Modifications to Roadway Bridges. The electrification project would require the raising of the historic Main Street Bridge along Route 138 in South Kingston, Rhode Island. The Main Street Bridge is the only National Register listed or eligible bridge of the nine roadway bridges along the corridor that are scheduled to be raised or replaced to provide adequate vertical clearance for the overhead catenary system. The proposed raising of this bridge may adversely affect railings and other historic features of the bridge.

4.3.2.4 Settings of Historic Properties. The field study identified 132 individual historic properties and 33 historic districts along the corridor listed or eligible for listing on the National Register. The project will require the installation of overhead catenary and 12,000 catenary poles at approximately 200 foot intervals along the 156-mile ROW. The visual setting of certain historic properties may be affected by the catenary and supports, although for most properties this impact is expected to be modest because: 1) of the intrusion of other modern elements and railroad structures, such as tracks, signals and utility lines; 2) poles will be spaced as far apart as possible; 3) a modern system of catenary will be employed that is far less visually intrusive than the existing system south of New Haven; and 4) in most instances the rail corridor passes by the rear elevation of the resource, thus diminishing the visual impact of the catenary. At the following two historic sites, catenary poles may introduce a discordant modern element to the historic landscape, thereby creating a potential adverse effect: Haley Farm Historic Rural District (MP 129.30) in Groton, CT, and Wilcox Road Historic District (MP 133.77) in Stonington, CT.

TABLE 4.3-2. HISTORIC RAILROAD BRIDGES IN THE PROJECT CORRIDOR POTENTIALLY ADVERSELY AFFECTED

NAME OF RESOURCE	LOCATION	MILE POST	NATIONAL REGISTER STATUS[1]	PROJECT ACTION
Connecticut River Bridge	Old Saybrook, CT	106.89	Listed	Catenary & poles
Niantic River Bridge	East Lyme, CT	116.74	Listed	Catenary & poles
Central Vermont Bridge	New London, CT	123.80	Recommended eligible	Catenary
Thames River Bridge	New London, CT	124.09	Listed	Catenary & poles
Pawtuxet River Bridge	Cranston, RI	179.16	Recommended eligible	Catenary & poles
Blackstone River Bridge	Pawtucket, RI	190.55	Recommended eligible	Catenary & poles
Canton Viaduct	Canton, MA	213.74	Listed	Catenary & poles

[1] Listed - previously listed on the National Register of Historic Places; Recommended eligible - recommended as a result of evaluations associated with the DEIS/R; Determined eligible - determined eligible in association with evaluations conducted prior to this DEIS/R by SHPO.

TABLE 4.3-3 OVERHEAD ROADWAY AND PEDESTRIAN BRIDGES IN THE PROJECT AREA POTENTIALLY ADVERSELY AFFECTED

NAME OF RESOURCE	LOCATION	MILE POST	NATIONAL REGISTER STATUS[1]	PROJECT ACTION
Olive Street Bridge (Bridge No. 3752)	New Haven, CT	73.08	Determined eligible	Protective barrier
Ferry Street Bridge (Bridge No. 3998)	New Haven, CT	74.38	Determined eligible	Protective barrier
Rocky Neck Park Trail Bridge	Old Lyme, CT	112.74	Listed	Protective barrier
West Street Bridge (RIDOT No. 401)	Westerly, RI	141.67	Determined eligible	Barrier
Main Street Bridge (RI Route 138 Bridge) (RIDOT No. 372)	South Kingston, RI	158.32	Recommended eligible	Raised
Hunt's River Road Bridge (RIDOT No. 7)	North Kingston, RI	169.79	Recommended eligible	Barrier
Greenwood (Railroad) Bridge	Warwick, RI	175.70	Recommended eligible	Barrier
Central Street Pedestrian Viaduct	Central Falls, RI	190.00	Recommended eligible	Barrier
Mt. Hope Footbridge	Boston, MA	223.31	Recommended eligible	Barrier

[1] Listed - previously listed on the National Register of Historic Places
Recommended eligible - recommended eligible as a result of evaluations associated with the DEIS/R
Determined eligible - previously determined eligible by SHPO in association with evaluations conducted prior to this DEIS/R.

4.4 NOISE AND VIBRATION

This section contains a summary of results of the noise and vibration evaluations performed for this project.

4.4.1 Evaluation Criteria

Noise and vibration impacts are assessed using criteria that are specific to six types of impacts. Each of these is discussed separately and a summary of the criteria is presented in Table 4.4-1.

4.4.1.1 Train Noise Criteria. Train noise impacts were evaluated based on projected noise increases relative to existing conditions at noise sensitive locations. Depending upon the land use, this increase was measured in terms of either the 24-hour equivalent sound level $L_{eq}(24)$, or the day-night sound level L_{dn}. Both these measurements represent the total dose of noise energy at a given outdoor location over a 24-hour period in terms of the A-weighted sound level dBA. $L_{eq}(24)$ is applied for noise sensitive land uses where sensitivity does not depend on the time of occurrence, such as schools, places of worship and recreational areas. L_{dn} includes an added 10-decibel weighting imposed on sound levels occurring during the nighttime and is applied for residences, hospitals and other buildings where people sleep. Section 3.4.2.1 provides more information on these descriptors.

Evaluation criteria for train noise impact are based on those currently proposed for adoption by the Federal Transit Administration (FTA). These criteria, presented in Table 4.4-2, are based on Federal noise standards and well-documented criteria and research into human response to noise.

4.4.1.2 Traffic Noise Criteria. Evaluation criteria for traffic noise impact are based on existing FTA guidelines, which identify a noise level increase of greater than five dBA as an impact threshold.

4.4.1.3 Electrification Facility Noise Criteria. Noise impacts from electrification facilities were assessed based on the projected A-weighted sound level and tonal characteristics at the property line of nearby noise-sensitive receptors, as well as on the type of receptor and existing background noise. The evaluation criteria are based on a review of state regulations applicable to such facilities and are shown in Table 4.4-1.

4.4.1.4 Construction Noise Criteria. Noise impacts from construction were evaluated based on the predicted day-night sound level (L_{dn}) as described in section 4.4.1.1. Based on the standards established by the Department of Housing and Urban Development, an L_{dn} greater than 75 dBA for long-term residential use would likely require mitigation. However, to account for the limited duration of construction, impact is assessed only when the activity will occur for 30 days or more at a given location.

4.4.1.5 Vibration Criteria. Vibration impacts from train operations on the corridor were evaluated based on the projected root-mean-square (rms) ground vibration velocity level (V_{dB}), expressed in decibels relative to a reference velocity of one μin. per second. The criteria are given in terms of velocity because the sensitivity of humans, buildings and equipment to vibration has typically been found to correspond to a constant level of vibration velocity amplitude within the low-frequency range of most concern for environmental vibration (roughly 5 to 100 Hz). Criteria for ground-borne vibration impact are based on those currently being proposed for adoption by the FTA and presented in Table 4.4-3. Vibration impacts for construction were evaluated based on these same criteria with the added criterion that activity of less than 30 days duration is not an adverse impact.

TABLE 4.4-1. NOISE AND VIBRATION EVALUATION CRITERIA

IMPACT CRITERIA	MEASURE	SIGNIFICANCE THRESHOLD
Train noise at noise-sensitive receivers.	Projected increase in $L_{eq(24)}$ or L_{dn} compared with existing conditions.	Proposed FTA Criteria (see Table 4.4-2)
Traffic noise from railroad stations at noise-sensitive receivers.	Projected increase in peak-hour L_{eq} compared with existing conditions.	Increase greater than: 5 dBA (Current FTA Criteria)
Substation noise at property line of noise-sensitive land use.	Projected A-weighted substation sound level compared with existing conditions.	Projected level exceeds minimum hourly L_{90} by more than 5 dBA, and is: >55 dBA (daytime use) >50 dBA (daytime and nighttime use; 5 dBA lower if tonal
Construction noise at noise-sensitive land use.	Projected L_{dn} from construction.	Projected L_{dn} > 75 dBA
Train-induced ground vibration at vibration-sensitive land use.	Project rms ground vibration velocity level, existing level, and number of events.	Exceedance of Proposed FTA Criteria, by land use category (see Table 4.4-3) & $\geq$ 25% increase or 2 times number events
Ground vibration from construction at vibration-sensitive land use.	Projected rms ground vibration velocity level.	Exceedance of Proposed FTA Criteria

TABLE 4-4.2. PROPOSED FTA NOISE IMPACT CRITERIA

EXISTING NOISE LEVEL (dBA) [L_{dn} or L_{eq}(24)]	LIMIT FOR NOISE LEVEL INCREASE (dBA)		EXISTING NOISE LEVEL (dBA) [L_{dn} or L_{eq}(24)]	LIMIT FOR NOISE LEVEL INCREASE (dBA)	
	L_{dn}	L_{eq}(24)		L_{dn}	L_{eq}(24)
<45	15	20	57-58	6	11
45	14	19	59	6	110
46	13	18	60-61	5	10
47-48	12	17	62	5	9
49	11	16	63	4	9
50	10	15	64-66	4	8
51	10	14	67-69	3	7
52	9	14	70-73	3	6
53-54	8	13	74-77	2	5
55	7	12	78-79	2	4
56	7	11	> 79	1	3

Source: FTA, 1990

4.4.2 Methods of Analysis

4.4.2.1 Analysis of Train Noise. To project future train noise for both the no-build alternative and the proposed electrification, a train noise projection model was developed. Source, or existing noise measurements were taken for both the diesel-electric locomotive currently operating on the NEC between New Haven and Boston and the AEM-7, the electric locomotive currently operating on the NEC south of New Haven, which was determined to be a conservative representative of the type of locomotive that would be run in the study area. The measurements were taken to document noise levels for a variety of equipment types, track configurations, distances, and speed conditions. This information was incorporated into the model. The model was tested for observed trains and calibrated to address any differences in actual and projected noise levels. The model was also calibrated to be able to address a variety of conditions in the corridor that could affect the noise levels at farther distances from the tracks, including: 1) intervening terrain and buildings; 2) soil conditions and topography; 3) atmospheric conditions; and 4) track location conditions (e.g. in deep cut, sloped trench, at grade or on embankment).

4.4.2.2 Analysis of Traffic Noise. The potential for noise impact due to project-generated traffic was evaluated for streets near the proposed express stations, where ridership, and therefore traffic, are expected to experience the greatest change. The change in traffic noise was estimated based on the projected change in peak-hour traffic volume.

4.4.2.3 Analysis of Noise from Electrification Facility Sites. The major sources of equipment noise at the project facilities are expected to include outdoor, oil-cooled transformers and ventilation equipment. Baseline noise levels at a distance of 500 feet were calculated for these sources based on their anticipated operating characteristics.

4.4.2.4 Analysis of Construction Noise. Construction noise impacts were evaluated based on: 1) the type of construction machinery likely to be used for catenary installation, construction of electrification facilities, and bridge modifications, and 2) the duration of the construction. Projected construction noise during catenary installation and bridge modifications (including raising, replacement, and undercutting) was based on projections made in the 1978 Programmatic EIS for NECIP. Projected construction noise at the electrification facilities was based on noise levels for the type of equipment used in non-residential construction.

TABLE 4.4-3. PROPOSED FTA CRITERIA FOR VIBRATION IMPACT

LAND USE CATEGORY	GROUND-BORNE VIBRATION LIMITS (rms Vibration Velocity Level in dB re 1 micro-inch/second)	
	Frequent Events[1]	Infrequent Events[2]
Category 1: Buildings where low ambient vibration is essential for interior operations.	65 dB	65 dB
Category 2: Residences and buildings where people normally sleep.	72 dB	80 dB
Category 3: Institutional land uses with primarily daytime use.	75 dB	83 dB

[1] "Frequent Events" is defined as more than 70 vibration events per day. Most transit systems fall into this category.
[2] "Infrequent Events" is defined as less than 70 vibration events per day. This category includes most commuter and intercity rail systems.

Source: FTA, 1990

4.4.2.5 Analysis of Train Vibration. Train vibration was projected based on a model developed in much the same way as the noise projection model described in section 4.4.2.1. Source vibration measurements were taken at a variety of distances from the track for both the diesel locomotive operating between Boston and New Haven and the electric locomotive operating south of New Haven. The source vibration measurement locations were selected to cover a large geographic area and represent a wide range of soil types, track configurations and operating conditions. These same factors were used in the model in making train noise projections.

4.4.2.6 Analysis of Construction Vibration. Ground-borne vibration from construction was estimated based on equipment source data in the literature and the ground vibration propagation characteristics measured along the NEC. Estimates were made for three classes of equipment: light-duty for catenary installation and bridge undercutting (e.g. post-hole diggers and small earth moving equipment), heavy duty for facility construction and bridge raising and replacement (e.g. heavy trucks and large earth moving equipment), and pile driving equipment (e.g. for overhead bridge replacement).

4.4.3 Benefits of the Proposed Electrification

Because the dominant source of noise at slower speeds - less than 80 miles per hour (mph) - is from the locomotive engine rather than from wheel-rail interaction, the proposed electric locomotives would be much quieter than the existing diesel locomotives at these speeds. This would provide a benefit in areas where the train operates below 80 mph, which generally occurs in more densely developed areas.

4.4.4 Noise and Vibration Impacts

This section describes noise and vibration impacts of the no-build and electrification alternatives which could exceed the evaluation criteria thresholds. Traffic noise in the vicinity of the railroad stations is not expected to exceed the 5 dbA evaluation criteria during the peak hour. Likewise, construction noise and vibration from bridge undercutting and catenary installation is expected to last less than four days at any one location and therefore will not exceed the impact threshold. Finally, vibration from the proposed project is not expected to result in any building damage effects to historic or other structures. These impacts are not discussed further herein. Of the remaining three types of potential noise impacts, train noise is expected to have the greatest potential effect, with noise from construction and electrification facilities expected to have substantially less effect along the corridor. Of the two remaining types of vibration impacts, vibration from train movement is expected to have the greatest potential effect, with vibration from bridge modifications expected to have less effect.

4.4.4.1 Train Noise. The noise levels from the no-build alternative are expected to exceed the evaluation criteria thresholds at 67 residences along the NEC (Table 4.4-4). This increase in noise would be caused by the minor increase in intercity train frequency (two additional trips daily) as well as the projected increase in commuter rail operations.

The proposed electrification would result in lower train noise levels at slower speeds because the proposed electric locomotive engines are quieter than the diesel locomotive engines currently operating on the NEC. The proposed action does, however, include higher operating speeds than currently experienced along most of the corridor, and at greater than 80 mph, the major source of train noise is the rolling interaction of the train wheels on the track rail. The noise resulting from this interaction increases with greater speeds. This factor, combined with the increased frequency of the intercity service (from the existing 20 to 52 trains daily), could result in a greater total dose of noise energy at a given location over a 24-hour period. At some receptor locations, noise levels could also be affected by the more frequent sounding of locomotive horns at grade crossings.

TABLE 4.4-4. POTENTIAL TRAIN NOISE IMPACTS

MUNICIPALITY	POTENTIALLY AFFECTED RECEPTORS[3]		POTENTIALLY AFFECTED AREAS (by milepost)	DISTANCE OF IMPACT AREA[2] (in feet)	
	# RESID.	# OTHER[1]		RESID.	INSTIT.
Branford	6		84.5	100	25
Guilford	4		87.8, 88.0	75	25
Madison	6		91.5	100	25
			92.5, 92.8	75	25
Clinton	11		96.9, 97.4, 98.2, 98.6	100	25
Westbrook	2		101.1, 101.8	75	25
Old Saybrook	2		103.6	75	25
Old Lyme	18		108.7	100	40
			109.2	125	45
			110.5-111.2	100	25
East Lyme	24		114.5, 114.8-115.5	100	25
Waterford	2		117.7	75	25
New London	3	1R	121.5-122.3, 122.4, 123.2	75	25
			123.2	25	25
Groton	6	1R	124.8	100	25
			131.3-131.8	50	25
			132.5	500	25
Stonington	71	1C	133.2-133.5	400	25
			134.5	75	25
			135.8-136.5	75	25
			136.5-137.2	400	25
			137.2-137.4	125	40
			139.8-140.0	100	25
			140.0-141.0	200	25
TOTAL CT	155	1C+2R			
Westerly	23		141.0-141.6, 146.1	100	25
			142.5	75	25
Charlestown	6				
Richmond	7		152.5, 153.0	100	40
			154	75	25
South Kingstown	27 (17)		158.0	125	40
			160.1	1,700	25
Exeter	1		162.2	150	50
North Kingstown	68 (7)		162.2-162.8	150	50
			165.3, 165.5, 165.7, 168.3, 169.3-169.7	200	50
			170.6	100	40
East Greenwich	31 (3)		171.7	100	40
			171.8-172.1	150	40
Warwick	203 (40)		172.4, 172.9	150	40
			173.0-173.7	100	40
			173.7-174.6	150	40
			174.6-174.8	125	40
			176.5-177.7	150	40
			178.2-178.7	125	40
Providence	5		181.2	100	25

TABLE 4.4-4. POTENTIAL TRAIN NOISE IMPACTS (continued)

MUNICIPALITY	POTENTIALLY AFFECTED RECEPTORS[3]		POTENTIALLY AFFECTED AREAS (by milepost)	DISTANCE OF IMPACT AREA[2] (in feet)	
	# RESID.	# OTHER[1]		RESID.	INSTIT.
Pawtucket	12		189.1-189.7	25	25
			190.5	50	25
Central Falls	2		190.6-190.8	75	25
TOTAL RI	385 (67)				
Attleboro	58	1C	191.2-191.5,	100	40
			193.8, 194.8	75	25
			196.3, 196.7-197.0	125	50
			197.0-198.3	100	40
			199.3	250	25
Mansfield	32		201.4, 203.6, 204.0-204.6	125	40
			202.6	100	25
Foxborough	6		206.3	100	40
Sharon	1		209.5	100	25
Canton	9		213.0-213.5	100	25
Dedham	14		218.5-218.7	75	25
Boston	127		220.0, 220.6-221.1	75	25
			221.1-221.4, 221.7	50	25
			221.8-223.4	75	25
			223.4-223.8	40	25
TOTAL MA	247	1C			
TOTAL CORRIDOR	787 (67)	2C+2R			

[1] "C" denotes Church and "R" denotes a recreational area.
[2] Distance measured from centerline of rail corridor.
[3] Where there are noise impacts from the No-Build alternative, the number of affected receptors are shown in parentheses ( ).

An estimated 100,000 to 200,000 residences are located within one-half mile of the 156-mile NEC tracks (the area shown on the maps in Volume II supporting this DEIS/R). Of these, 787 residences, which are primarily located within 100 feet of the railroad tracks and all of which are located within 500 feet, could experience noise levels that exceed the evaluation criteria thresholds. At these residences, the projected noise levels may exceed the thresholds shown in Table 4.4-2 by a range of one to six dBA, with the great majority of residences experiencing exceedances of less than three dBA. Table 4.4-4 indicates the locations of the affected residences. In addition, four non-residential noise-sensitive receptors may be affected by increased noise. These include Caulkins Park in New London, CT; Bluff Point State Park in Groton, CT; the Family Christian Center in Stonington, CT; and the Second Congregational Church in Attleboro, MA.

4.4.4.2 Electrification Facility Noise. The primary source of noise at the electrification facilities would come from transformers and ventilation equipment. Noise from 13 of the 25 proposed facilities may exceed the impact threshold at a total of 82 residences, as shown in Table 4.4-5.

4.4.4.3 Noise Impact from Construction. In general, the effects of construction noise would occur intermittently and be of limited duration, ranging from one to nine months for the bridge modifications, and from two to four months for the electrification facilities. Such noise would only occur during weekdays and during daylight hours and would exceed the impact thresholds at three of the 25 proposed facility sites and four of the nine proposed bridge modifications. Construction noise from bridge

TABLE 4.4-5. POTENTIAL NOISE IMPACTS FROM ELECTRIFICATION FACILITIES

ELECTRIFICATION FACILITY AND LOCATION	NO. OF RESIDENCES IN POTENTIAL IMPACT ZONE
Branford Substation, Branford, CT	1
Leetes Island Paralleling Station, Leetes Island, CT	1
Grove Beach Paralleling Station, Grove Beach, CT	15
Westbrook Switching Station, Westbrook, CT	3
New London Substation, New London, CT	2
Noank Paralleling Station, Noank, CT	4
State Line Paralleling Station, State Line, CT	5
Warwick Substation, Warwick, RI	34
Attleboro Paralleling Station, Attleboro, MA	2
Norton Switching Station, Norton, MA	1
East Foxboro Paralleling Station, East Foxboro, MA	2
Canton Paralleling Station, Canton, MA	6
Readville Paralleling Station, Readville, MA	6
ALL LOCATIONS	82

undercutting and catenary installation is expected to last less than four days at any one location and therefore will not exceed the impact threshold.

The primary source of construction noise would come from construction equipment, and in the case of the bridge raising and replacements, pile driving. For the electrification facilities, construction machinery will likely include the types of equipment typically used for light industrial construction, such as graders, bulldozers, backhoes, cranes and trucks. For the bridge raising or replacements, machinery will include heavy-duty construction equipment, such as large cranes, trucks, jacks, and material handling equipment. Based on the proposed construction activities and equipment, it was determined that the distance from the construction sites at which the 75 dBA impact criteria would be exceeded would be 180 feet for electrification facilities, 140 feet for bridge raisings, and 280 feet for bridge replacements.

While noise may exceed the thresholds for impact during construction of three of the 25 electrification facility sites and the four bridge replacements, the noise would occur intermittently during weekdays and daylight hours and be of limited duration. As shown in Table 4.4-6, the duration of the noise would last from one to 4.5 months, except at Depot Street, which would last nine months.

4.4.4.4 Train Vibration. The major source of train vibration is the rolling interaction of the train wheels on the track rail and the vibration resulting from this interaction increases with greater speeds. This factor, combined with the increased frequency of the intercity service (from 20 to 52 trains daily), could result in a greater total dose of vibration energy at a given location over a 24-hour period. The train vibration impact areas were delineated using the vibration projection model to estimate future vibration levels on individual segments of the corridor and determine the distances at which the evaluation thresholds would be reached. The number of vibration-sensitive receptors located within the impact area were then counted using land use maps and aerial photographs of the corridor.

TABLE 4.4-6. POTENTIAL CONSTRUCTION NOISE IMPACTS

PROJECT FACILITY OR BRIDGE AND LOCATION	DISTANCE OF IMPACT (in feet)	DURATION OF CONSTRUCTION (in months)	NO. OF RESIDENCES POTENTIALLY AFFECTED
Warwick Substation, Warwick, RI	180	4	5
Leetes Isl. Paralleling Station, Branford, CT	180	2-3	1
Grove Beach Paralleling Station, Branford, CT	180	2-3	2
Johnnycake Hill Road Bridge, Old Lyme, CT	280	1	1
Kenyon School Road Bridge, Richmond, RI	280	3	7
Pettaconsett Avenue Bridge, Warwick, RI	280	4.5	12
Depot Street Bridge, Sharon, MA	280	9	1

Of the 100,000 to 200,000 residences located within one half-mile of the NEC railroad tracks (the areas shown on the maps supporting this DEIS/R), 1,355 could experience vibration levels that exceed the evaluation criteria thresholds. Vibration levels at two churches and one school could also exceed the impact criteria. Table 4.4-7 indicates the location of these affected receptors.

4.4.4.5 Construction Vibration. Project-generated construction vibration impacts are expected to be relatively minor. Catenary installation and bridge undercutting are expected to last no more than a few days at any one location, and therefore construction vibration from these activities will not exceed the impact threshold. Construction-generated vibration that exceeds the impact thresholds would be limited to small areas around one of the 25 proposed electrification facilities and three of the proposed bridge modifications. While a total of 16 residences fall within the impact area for vibration at these sites, the construction would occur intermittently and be of limited duration, ranging from one to 4.5 months at the bridge sites and approximately two to three months at the facility sites. In addition, the construction would be limited to weekday, daylight hours.

The distances from the construction sites at which the vibration impact criteria would be exceeded were calculated based on the proposed construction activities and equipment and are shown in Table 4.4-8 for different facility site and bridge modification activities. Based on these distances, it was determined that 16 residences and no institutional uses would fall within the construction vibration impact area, as shown in Table 4.4-9.

4.5 ELECTROMAGNETIC FIELDS AND INTERFERENCE

This section addresses two types of potential effects from electromagnetic fields (EMF): public health effects and interference with local communications systems (e.g. police, fire, television, radio). EMF results from any current travelling through a wire or electrical device. As a result, everyone is almost continuously exposed to EMF, although the intensities of exposure will vary widely over time, depending on proximity to electrical devices and wiring. Only the magnetic field intensity values were evaluated, as, at the frequencies associated with the proposed project, the electric field component of EMFs are

TABLE 4.4-7. POTENTIAL TRAIN VIBRATION IMPACTS

MUNICIPALITY	ELECTRIFICATION ALTERNATIVE[3] # Resid.	ELECTRIFICATION ALTERNATIVE[3] # Other[1]	POTENTIALLY AFFECTED AREAS (by milepost)	DISTANCE OF IMPACT AREA[2] (in feet) RESID.	DISTANCE OF IMPACT AREA[2] (in feet) INSTIT.
New Haven	1	0	73.5	no impact	no impact
Branford	4	0	82.4	118	88
Guilford	5	0	88.5-89.0	137	104
Madison	1	0	90.8	132	100
Old Saybrook	2	0	105.1	85	60
Old Lyme	19	0	107.9, 108.6	123	92
			109.2	119	89
			110.4-110.6	118	88
			110.6-110.8	113	84
			111.9	102	74
East Lyme	36	0	114.0, 114.4-115.0	113	84
			115.0-115.4	113	84
			116.1	94	67
Waterford	9	0	117 6	103	75
			118.8	97	70
New London	10	0	121.3-122.0	79	54
			122.0-122.3	72	49
Groton	8	0	129.3	91	65
			129.8	100	73
			130.2, 130.8, 131.1	103	75
			132.4	66	42
Stonington	67	0	134.1	99	72
			135.5-136.1	91	65
			136.1-136.3	79	54
			137.3	122	91
			139.3	108	79
			139.7-140.0	108	79
			140.0-140.3	108	79
TOTAL CT	162	0			
Westerly	12	0	141.1-141.3	118	88
			141.3-141.5	113	84
			142 0-142.3	108	79
			143.3	113	84
			145.9	113	84
Charlestown	7	1C	152.0	115	86
			153.0	118	88
Richmond	13	0	149.7	118	88
			152.5	116	86
			153.6	118	88
South Kingstown	8 (4)	0	159.8, 160.1	145	111
North Kingstown	92 (59)	0	162.0-162.2	141	108
			165.6	139	106
			167.3, 167.7-168.2	139	106
			169.1-169.4, 170.2-170.3	135	103
			170.3-170.7	132	100

TABLE 4.4-7. POTENTIAL TRAIN VIBRATION IMPACTS (continued)

East Greenwich	33 (32)	0	171.3-171.8	128	96
			171.8-172.1	128	96
Warwick	243 (231)	1S (1S)	172.2-172.3	128	96
			172.3-173.0	129	97
			173.0-173.6	125	94
			174.0-174.1	123	92
			174.1-174.6	126	95
			175.0, 176.2	128	96
			176.5-176.7, 177.2	128	96
			177.8-178.5	128	96
Providence	6 (5)	0	180.9	108	79
Pawtucket	13	0	188.5-189.2, 189.8	79	54
Central Falls	34 (38)	0	189.9-190.2	79	54
			190.2-190 4	85	60
TOTAL RI	461 (369)	1C+1S (1S)			
Attleboro	83	1C	195.9, 196.7, 197.1-197.9	146	112
			196.7	145	111
			197.1-197.9	146	112
Mansfield	3	0	200.4	No impact	No impact
Canton	18	0	214.0	227	182
Dedham	73	0	218.2	257	208
Boston	555	0	227.0-227.5	149	115
			227.5-227.6	No impact	No impact
			227.6-227.7	No impact	No impact
TOTAL MA	732	1C			
TOTAL CORRIDOR	1355 (369)	2C+1S (1S)			

[1] "C" denotes Church and "R" denotes a recreational area.
[2] Distance from measured from centerline of rail corridor.
[3] Where there are vibration impacts of the No-Build alternative the number of affected receptors are shown in parentheses ().

TABLE 4.4-8. CONSTRUCTION VIBRATION IMPACT DISTANCES

LAND USE CATEGORY	APPROX. DISTANCE FROM CONSTRUCTION SITE FOR BUILDING OCCUPANT ANNOYANCE (in feet)[1]		
	CATEGORY 1[2]	CATEGORY 2[2]	CATEGORY 3[2]
Facility Construction, Bridge Raising & Replacement	135	85	70
Pile Driving for Bridge Replacement	320	210	180

[1] No building damage effects are expected.
[2] Category 1 = Buildings where low ambient vibration is essential for operations (e.g. laboratories)
Category 2 = Residences & other uses where people sleep
Category 3 = Institutional uses with primarily daytime use

TABLE 4.4-9. POTENTIAL CONSTRUCTION VIBRATION IMPACTS

PROJECT FACILITY OR BRIDGE AND LOCATION	DISTANCE OF IMPACT[1] (in feet)	DURATION OF CONSTRUCTION (in months)	NO. OF RESIDENCES POTENTIALLY AFFECTED
Grove Beach Paralleling Station, Branford, CT	85	2-3	2
Johnnycake Hill Road Bridge, Old Lyme, CT	85	1	1
Kenyon School Road Bridge, Richmond, RI	85	3	6
Pettaconsett Avenue Bridge, Warwick, RI	85	4.5	7

[1] Category 2 distances are used (Table 4.4-7), since all potentially affected land uses are residences.

shielded and therefore there is little opportunity for long-term exposure to such fields. The EMF guidelines and levels are discussed in milliGauss (mG), which is a unit of measurement of magnetic field intensity. As a point of reference, the intensity of earth's static magnetic field is approximately 500 mG in the northeastern United States.

4.5.1 Summary of Studies and Research Findings

This section provides a brief summary of the detailed evaluation in Technical Study 5 of existing studies and research regarding the potential health effects of EMFs. In studies of residential exposures to EMF, some have reported associations of higher magnetic fields with childhood leukemia and others have found no such associations. In several studies in which EMF exposures are estimated by characterizing the type of utility wiring outside the home and the distance of the line from residences, or by calculating the EMF levels based on the current flowing in nearby power lines, it has been reported that magnetic field exposures of children with leukemia are higher than those in residences of other children. In contrast, other methods of estimating magnetic field exposure based upon field levels actually measured within the child's residence have not yielded any reliable associations with leukemia or other cancers. The shortcomings and contradictory results of these and other studies, however, preclude any definitive interpretation at this time regarding their significance for human health. Studies of adults have not supported the suggested association between cancer and estimated magnetic field exposures.

Epidemiological research has also looked for associations between occupations presumed to have greater than average exposures to magnetic fields and cancer. Workers on electrified railroads overall have not been shown to be at elevated risk for brain cancer, leukemia, or health impairment. No differences in health was found in studies of workers on electrified railroads in Sweden, Japan or Italy. Finally, in laboratory research, which exposes animals or isolated cells or tissue to magnetic fields which are thousands of times higher than those in the environment, no adverse biological effects have been found to occur.

In summary, to date, the consensus of the scientific community is that there is no conclusive evidence that a link between EMF exposures and cancer exists.

4.5.2 Evaluation Criteria

As described above, epidemiological and biological studies undertaken to determine if any link exists between EMF exposure and health impacts have not been conclusive. As a result, regulations regarding EMF exposure have not been promulgated by the Federal government or any states, although some states have established guidelines instead, as described below.

Two states (Florida and New York) have issued guidelines for maximum EMF field intensities associated with transmission lines, and a number of national and international agencies have suggested interim guidelines for EMF exposure. The two state guidelines and the national and international interim guidelines have been adopted as evaluation criteria in this report and are summarized in Table 4.5-1. The two state guidelines are designed to limit emissions from new facilities, but clearly state that they are not based on conclusions regarding the potential health impacts of EMF. There are no applicable evaluation criteria for electromagnetic interference.

4.5.3 EMF Impacts

Since there is no established link between EMF exposure and public health effects, this analysis will estimate the increase in EMF levels likely to be experienced by various categories of potentially impacted persons. These levels will then be compared to the established guidelines.

4.5.3.1 Methods of Analysis. In this analysis, the population potentially exposed to EMF from the NEC electrification project was subdivided into a number of categories, and the level of EMF exposure was estimated for each population category. The population is subdivided in two ways. The first is based on the duration and type of exposure: environmental, occupational and occasional. Environmental exposures are those that are long-term in nature (e.g. associated with living near the ROW). Occupational exposures are those that occur while working (e.g. working along the ROW or on the trains). Occasional exposures represent those that occur intermittently (e.g. from using a park near the ROW). The second set of categories is based on physical location, and includes categories in proximity to the ROW, substations and utility lines, as well as passengers on intercity trains. For some of the locational categories, these were broken down further, into zones, based on distance from the source. Zone 1 was defined as 0 - 50 feet from a source, Zone 2 as 50 - 100 feet, and Zone 3 as 100 - 150 feet from the source. Based on EMF measurements from existing electrified rail systems, the EMF levels drop off to background by 150 feet from a source, so areas beyond this distance were not considered. Table 3.5-1 provides a summary description of the population categories and exposure categories for each type of population.

For each of these population categories, the level of EMF exposure resulting from the NEC electrification was estimated. The estimated values are based on measurements from a number existing electric rail systems and the design of the proposed project. Using this data, it was possible to establish a range of estimated EMF intensities for each population category.

4.5.3.2 Results of the Analysis. Table 4.5-2 shows each of the population categories, including their locational and exposure attributes, the applicable interim guidelines for each category, and the estimated level of EMF exposure. This allows a direct comparison between the interim guidelines and the estimated level of exposure, which shows that none of the categories of population would be exposed to EMF levels higher than the interim guidelines. Rather, in most instances the estimated levels of exposure are one-thousandth to one-hundredth of the interim guidelines, and no estimated exposure level is more than one-tenth of the lowest applicable interim guideline.

TABLE 4.5-1. EVALUATION CRITERIA FOR EMF EMISSIONS

IMPACT CRITERIA	MEASURE	SIGNIFICANCE THRESHOLD
Level of EMF Exposure	Florida DER[1] Guideline for Edge of Right-of-Way of Transmission Line	150 mG[2] for ≤ 230 kV 200 mG for ≤ 500 kV 250 mG for ≤ 500 kV, closed circuit
	New York SPSC[3] Guideline for Edge of Right-of-Way of Transmission Line	200 mG for ≥ 345 kV
	ACGIH[4] Interim Guideline for Occupational Exposure	10,000 mG for 60 Hz
	CDRH/FDA[5] Interim Guideline for General Exposure	5,000 mG for static field
	IRPA/INIRC[6] Interim Guideline for: 24 hr/day Public Exposure Whole Day Occupational Exposure Few Hours Occupational Exposure	1,000 mG for 50-60 Hz 5,000 mG for 50-60 Hz 50,000 mG for 50-60 Hz
	NRPB[7] Interim Guideline for General Exposure	2,000 mG for < 100 Hz
	DIN[8] Interim Guideline for General Exposure	46,000 mG root-mean-square[9] amplitude for 50 Hz 69,000 mG peak amplitude for 50 Hz

[1] Florida Department of Environmental Regulation.
[2] mG - milliGauss
[3] New York State Public Safety Commission.
[4] American Conference of Governmental and Industrial Hygienists.
[5] Center for Devices and Radiologic Health of the Food and Drug Administration.
[6] International Non-Ionizing Radiation Committee of the International Radiation Protection Association.
[7] National Radiological Protection Board (Great Britain).
[8] Deutsche Elektrotechnische Kommission (Germany).
[9] Root-mean-square is a procedure for averaging data.

4.5.4 Electromagnetic Interference

For electromagnetic and radio interference, the potential impacts were assessed by examining previous experience with electrified train lines. In the absence of any relevant evaluation criteria, the Federal Communications Commission and the Communications Division of the U.S. Coast Guard were contacted to determine if the existing electrified section of the NEC has been a source of radio communications interference. The Coast Guard reported that although it uses high frequency (HF), very high frequency (VHF), and ultra high frequency (UHF) communications equipment, it had not experienced any interference as a result of the existing electrified rail line between New York and New Haven (Glidden, 1993). The FCC indicated that it had no knowledge of any interference with radio or television communications resulting from the existing electrified rail line (Reimeham, 1993).

TABLE 4.5-2. COMPARISON OF ESTIMATED EMF EXPOSURE LEVELS WITH INTERIM GUIDELINES

POPULATION TYPE	RESIDENTIAL	COMMERCIAL/ INDUSTRIAL	RECREATIONAL	AMTRAK & CONNDOT EMPLOYEES	MBTA/ FREIGHT EMPLOYEES	RAIL PASSENGERS
Exposure Type	Environmental	Occupational	Occasional	Occupational	Occasional	Occasional
Relevant Interim Guideline (mG)	1,000 - 46,000	5,000 - 50,000	5,000 - 46,000	5,000 - 50,000	5,000 - 46,000	5,000 - 46,000
Location[1]	**Average EMF Exposure (mG)**	**Average EMF Exposure (mG)**	**Average EMF Exposure (mG)**	**Average EMF Exposure (mG)**	**Average EMF Exposure (mG)**	**Average EMF Exposure (mG)**
Wayside						
Zone 1	1.5 - 9.3	1.5 - 9.3	1.5 - 9.3	N/A	N/A	N/A
Zone 2	0.4 - 1.5	0.4 - 1.5	0.4 - 1.5	N/A	N/A	N/A
Zone 3	0.2 - 0.4	0.2 - 0.4	0.2 - 0.4	N/A	N/A	N/A
Substation						
Zone 1	2.2 - 13.5	2.2 - 13.5	N/A	N/A	N/A	N/A
Zone 2	0.5 - 2.2	0.5 - 2.2	N/A	N/A	N/A	N/A
Zone 3	0.2 - 0.5	0.2 - 0.5	N/A	N/A	N/A	N/A
Utility Line						
Zone 1	5.5 - 13.0	5.5 - 13.0	N/A	N/A	N/A	N/A
Zone 2	3.0 - 5.5	3.0 - 5.5	N/A	N/A	N/A	N/A
Zone 3	2.0 -3.0	2.0 -3.0	N/A	N/A	N/A	N/A
Electrified Train						
On-Train (Coach)	N/A	N/A	N/A	2.7 - 26.2	N/A	2.7 - 26.2
On-Train (Loco.)	N/A	N/A	N/A	21.7 - 134	N/A	N/A
Off-Train	N/A	N/A	N/A	4.1 - 37.0	N/A	N/A
Station	N/A	N/A	N/A	16 - 209	N/A	16 - 209
Diesel Train						
On-Train	N/A	N/A	N/A	N/A	4.1 - 37.0	4.1 - 37.0
Off-Train	N/A	N/A	N/A	N/A	4.1 - 37.0	N/A

[1] Zone 1 = 0 - 50 feet from a source; Zone 2 = 50 - 100 feet from a source; and Zone 3 = 100 - 150 feet from a source.
N/A = Not Applicable

4.6 ENERGY

This section provides a summary of the evaluation of the energy benefits and impacts of the proposed alternatives.

4.6.1 Evaluation Criteria

The evaluation criteria for determining the energy impacts and benefits of the project alternatives are shown in Table 4.6-1.

4.6.2 Benefits of the Proposed Electrification

A comparison of Amtrak's proposed electrification with the no-build alternative shows that the proposed project would result in substantial decreases in the consumption of petroleum products for all intercity travel in the NEC. Table 4.6-2 shows that for all transportation modes, the proposed project would result in a decrease in petroleum consumption of nearly ten million gallons in the design year 2010. While nearly seven million gallons will be consumed by power plants generating electricity for the electric locomotives, this is substantially off-set by significant decreases in petroleum consumption due to: 1) the elimination of nearly 3 million gallons consumed by the diesel locomotives which will be replaced with electric locomotives; 2) a decrease in aircraft fuel consumption of 12.5 million gallons due to the use of smaller or fewer aircraft; and 3) a decrease in gasoline consumption by automobiles of 1.5 million gallons. The latter two decreases are the result of shifts in modal choice of intercity travelers from aircraft and automobiles to the proposed intercity passenger rail service. In addition, as shown in Table 4.6-3, the proposed electrification would result in lower total energy expended (16,609 billion Btu's per year), than the no-build alternative (17,074 billion Btu's per year), for all modes of intercity travel in the NEC.

Forty-one percent of all petroleum products consumed in the United States are imported. Thus, the net decrease in the use of petroleum products resulting from the proposed project would result in a decrease in American dependence upon foreign oil of 4.1 million gallons annually. While the electrification would also result in an increase in natural gas imports of 89.7 million cubic feet annually (based on a nine percent national import rate), the net effect of the electrification project would be a 419 billion Btu per year decrease in energy imports.

TABLE 4.6-1. EVALUATION CRITERIA FOR ENERGY IMPACTS

IMPACT CRITERIA	MEASURE	SIGNIFICANCE THRESHOLD
Energy requirements and conservation potential.	Comparison of total and per passenger energy use for all modes of travel under each alternative.	None
Production or consumption of energy.	Comparison of energy use for all modes of transportation with energy generating capacity within the NEC under each alternative.	Energy requirements exceed production capacity.
Use of petroleum or natural gas.	Comparison of fuel type used for all modes of transportation under each alternative.	None

TABLE 4.6-2. TOTAL PETROLEUM CONSUMPTION FOR ALL MODES OF INTERCITY TRAVEL IN THE NEC

PROJECT ALTERNATIVE	PETROLEUM (MILLION GAL/YR)					NATURAL GAS (BILLION CU FT/YR)
	TRAIN (DIESEL)	AIRCRAFT (JET FUEL)	POWER PLANT (FUEL OIL)	AUTOMOBILE (GASOLINE)	TOTAL PETROLEUM	
No-Build	2.95	38.72	0	71.89	113.56	0
Build	0	26.25	6.88[1]	70.44	103.57	.996
Difference	-2.95	-12.47	+6.88	-1.45	-9.99	.996

[1] Based on discussions with the region's utilities, it is assumed that one-half of the electricity capacity in 2010 would be generated by fuel oil, one-half by natural gas.

TABLE 4.6-3. TOTAL ENERGY CONSUMPTION FOR ALL MODES OF INTERCITY TRAVEL IN THE NEC

PROJECT ALTERNATIVE	TOTAL PETROLEUM (GALLONS/YR)	NATURAL GAS (BILLION CU FT/YR)	TOTAL ENERGY CONSUMPTION (BILLION BTU/YR)[2]
No-Build	113.56	0	17,074
Electrification	103.57[1]	0.996	16,609
Difference	-9.99	+0.996	-465

[1] Based on discussions with the region's utilities, it is assumed that one-half of the electricity capacity in 2010 would be generated by fuel oil, one-half by natural gas.
[2] Based on 150,357 Btu/gallon of petroleum and 1039 Btu/cubic foot of natural gas.

4.6.3 Energy Impacts

This section summarizes the results of a comparison between the energy use of the intercity trains under the two project alternatives, as well as a comparison between the energy use of each alternative and the energy-generating capacity of the region's electrical utilities. No electricity is required for the no-build alternative, therefore, the latter comparison is made only for the proposed electrification.

The total energy consumption for the electrification (2,069 billion Btu's/year) is higher than for the no-build alternative (416 billion Btu's/year) primarily due to the increase from 10 to 26 trains per day in each direction (7,300 to 18,980 train trips annually) and the increase in the size of trains. The existing service consists of four to seven cars per trip and the electrification would result in eight to eighteen cars per trip.

Even under heavy Amtrak demand conditions of 100 to 200 megawatts (Mw), the total demand created by the entire electrified rail system would be less than one percent of the total summer peak demand projected in 2007 for the entire New England power pool (known as NEPOOL) region. The energy that would need to be generated to satisfy the Amtrak proposal, about 204,000 megawatt-hours (MwH) per year for 2010, is less than 0.2 percent of the total sales projection of 137,349,000 to 148,331,000 MwH for NEPOOL as a whole in 2007.

4.7 ARCHAEOLOGY

An archaeological assessment was conducted for this DEIS/R to determine the potential for each facility site or bridge modification area to contain buried cultural remains, described herein as "archaeologically sensitive."

4.7.1 Evaluation Criteria

The impacts on archaeological resources were evaluated in accordance with the criteria described in Table 4.7-1.

4.7.2 Archaeological Sensitivity Analysis

Of the 25 electrification facility sites, all or part of one substation, one utility corridor and nine paralleling station sites were determined to have the potential to contain intact buried cultural remains (referred to as "archaeologically sensitive"). The remaining 13 sites, including all three switching station sites, were not found to be sensitive. Three of the nine bridge modifications sites have been identified as archaeologically sensitive. Consultations will be undertaken with the SHPOs in each state to confirm these findings. The sites found to be sensitive are listed below:

- Branford Substation: utility corridor only
- Roxbury Crossing: substation site only
- Paralleling Station sites: Leetes Island, Madison, Old Lyme, Stonington, State Line, Kingston, Elmwood, Attleboro and East Foxboro
- Bridges to be Modified: Johnnycake Hill Road, Burdickville Road and Kenyon School Road

FRA will determine whether additional work would be required at any of these locations in consultation with the SHPOs in each state.

4.8 PUBLIC SAFETY

This section provides a summary of the evaluation of public safety impacts of the proposed electrification. It addresses two types of potential public safety impacts: the potential for increased vehicular-train collisions and the potential for increased pedestrian-train collisions.

4.8.1 Evaluation Criteria

Evaluation criteria for assessing public safety impacts are shown in Table 4.8-1.

TABLE 4.7-1. EVALUATION CRITERIA FOR IMPACTS ON ARCHAEOLOGICAL RESOURCES

IMPACT CRITERIA	MEASURE	SIGNIFICANCE THRESHOLD
Potential for direct disturbance to sites or structures listed on or eligible to the National Register of Historic Places.	Likelihood of intact buried cultural resource sites in areas to be disturbed.	Moderate or high probability of sites or structures being present that meet one of the criteria for National Register significance.

4.8.2 Public Safety Impacts

4.8.2.1 Vehicular Collisions. The probability of a vehicular-train collision at each grade crossing was computed using the *Railroad-Highway Grade Crossings Resource Allocation Procedure-Users Guide* (FRA/DOT, 1987). This procedure incorporates the physical and operating characteristics, as well as accident history at each location, into the accident prediction model. Table 4.8-2 summarizes the results of the accident prediction model in predicting the number of vehicular-train collisions per year and number of years between collisions, respectively (e.g. 0.024 collisions per year is the same as one collision every 42 years). This table shows the predicted number of collisions for the existing (1992) conditions, and the 2010 no-build and the proposed electrification alternatives.

A total of 0.208 collisions between Amtrak trains and highway vehicles were predicted in 1992 at nine public crossings, or one collision every five years under existing conditions. This is a conservative estimate given there have been no reported collisions at any of these crossings since 1985. A total of 0.284 Amtrak-vehicle collisions were predicted for the 2010 no-build alternative and 0.307 collisions were predicted for the proposed electrification, or one every four and three years, respectively. These should also be considered very conservative estimates since the model over-predicts given the conditions on the NEC. The predicted increase in total collisions between the existing conditions and the 2010 no-build conditions is primarily due to increases in vehicular traffic at grade crossings. All other conditions are anticipated to remain unchanged. The projected increase in total collisions from the no-build conditions to the electrification is very small (0.023 accidents per year, representing a change from one every four to one every three years) and is the result of the proposed increase in train speed.

The risk of a collision between a train and vehicle would be eliminated by elimination of the 14 at-grade crossings on the corridor. The 1992 "Amtrak Authorization and Development Act" (Public Law 102-533) directs the Secretary of Transportation to develop a plan by September 30, 1993 for the elimination of all grade crossings by December 31, 1997 on the NEC between Boston and New Haven. If implemented, closure of these crossings would eliminate the potential for vehicular-train collisions.

4.8.2.2 Pedestrian Collisions. The potential for pedestrian-train collisions was evaluated at railroad stations, grade crossings and other, illegal, crossing points along the NEC, as indicated by worn paths and other evidence of pedestrian activity. In general, Amtrak speeds are proposed to increase by between fifteen and fifty-five mph, as shown in Table 4.8-2. The proposed increase in train speeds could reduce the amount of time for pedestrians crossing the tracks to respond to an approaching train.

There are 22 railroad stations in the study corridor. As presented in section 3.8, pedestrians must cross tracks at 10 of these stations because there are no grade separated pedestrian ways. The proposed increase in Amtrak service (20 to 52 trains daily) and speed (from 50-100 mph to 65-150 mph) could increase the potential pedestrian-train collision risk to the passengers boarding, alighting and waiting at these stations. In addition, seven other stations (Westerly, RI; and South Attleboro, Attleboro, Mansfield, Sharon, Route 128 and Hyde Park, MA) are served by low level platforms. Although these stations have grade separated pedestrian crossings, the low level platforms allow easier access to the tracks which may place individuals in closer proximity to trains than stations with high level platforms.

Illegal pedestrian crossings were identified at 22 locations along the ROW and are listed in Tables 3.8-2 through 3.8-4 in Appendix B of this document. An average of two fatalities per year involving illegal pedestrian crossings have been reported along the NEC. Amtrak's proposed increases in speed and frequency may increase the number of pedestrian-train collisions.

TABLE 4.8-1. EVALUATION CRITERIA FOR PUBLIC SAFETY IMPACTS

IMPACT CRITERIA	MEASURE
Effect of increase of train speed and frequency on vehicular safety.	Comparison of probability of vehicular accidents with current accident rates.
Effect of increase of train speed and frequency on pedestrian safety.	Comparison of probability of pedestrian accidents with current accident rate.

TABLE 4.8-2. PROBABILITY OF RAIL-VEHICULAR COLLISIONS AT GRADE CROSSINGS (in collisions per year)

CROSSING	ANNUAL NUMBER OF COLLISIONS PREDICTED			TRAIN SPEED LIMIT (MPH)	
	EXISTING	NO-BUILD	BUILD	EXISTING AND NO-BUILD	BUILD
Chapman's Crossing[1]	N/A	N/A	N/A	70	75
Miner Lane	0.024	0.034	0.036	60	80
Bank Street	0.017	0.026	0.028	25	35
State Street	0.021	0.029	0.031	25	35
Governor Winthrop Blvd.	0.031	0.040	0.043	25	35
School Street	0.024	0.032	0.035	70	85
Broadway Extension	0.026	0.034	0.037	50	80
Latimer Point	0.019	0.027	0.030	70	85
Wampassuc	0.018	0.026	0.028	70	80
Walker's Dock[1]	N/A	N/A	N/A	70	100
Freeman's[1]	N/A	N/A	N/A	70	100
Palmer Street	0.028	0.036	0.039	80	100
Wolf Rocks Road[2]	N/A	N/A	N/A	100	140
Lazy Lady Farm[1]	N/A	N/A	N/A	95	150
TOTAL	0.208	0.284	0.307	n/a	n/a

[1] This crossing is private. Consequently, no traffic data is available. However, there have been no reported collisions at this location in the past five years. This trend is not anticipated to change under either future alternative.

[2] Crossing is programmed for closure.

4.9 TRANSPORTATION, TRAFFIC AND CIRCULATION

This section documents proposed changes in Amtrak service and projected ridership associated with the proposed electrification and summarizes the potential benefits and impacts on transportation, traffic and circulation patterns.

4.9.1 Projected 2010 Intercity Service and Ridership

4.9.1.1 Proposed Service. The proposed electrification will generate no change in the frequency of Amtrak's conventional service (10 trains per day in each direction) but the number of cars per train will increase on this service from seven to 18. The express service is proposed to increase to 16 trains per day in each direction with eight cars per train from the existing two trains per day with five cars per train. As a result of proposed increased speeds, the elimination of the locomotive switch at New Haven and improved acceleration and deceleration characteristics of the electric locomotives, travel time between Boston and New York City is expected to decrease from 3 hours-55 minutes to less than 3 hours for express trains.

4.9.1.2 Projected Ridership. A multimodal choice model was used to forecast 2010 Amtrak ridership, including the diversion from automobiles and aircraft. The model first forecast total corridor travel using 2010 estimates of population, employment and per capita personal income in each metropolitan area (New York, New Haven, Providence and Boston). Next, the model forecast 2010 Amtrak ridership through a two-step mode choice model which considered available modes, and travel factors such as: travel time, travel cost, frequency of service, ground access/egress time and cost and passenger processing time. The travel factors were derived from research conducted into the travel behavior in the Washington to New York segment of the Northeast Corridor and from a recent high speed rail study.

Implementation of the electrification project is not anticipated to have any meaningful effect on total intercity travel in the NEC. Instead, the project is expected to create significant shifts in choices made by travelers regarding their mode of travel, as shown below:

(in millions)

	Existing (1993)		No-Build (2010)		Electrification (2010)	
Mode	Number	Percent	Number	Percent	Number	Percent
Auto	13.418	74.5	15.919	73.8	15.595	72.3
Air	3.529	19.6	3.781	17.5	2.351	10.9
Rail	1.053	5.9	1.871	8.7	3.627	16.8
TOTAL	18.00	100.0	21.571	100.0	21.571	100.0

Implementation of the electrification project will have a limited effect on automobile traffic because the factors that make automobile travel more attractive than rail will remain in place: These factors include the conveniences of individualized schedule and direct origin and destination travel, as well the lower cost per passenger for more than one passenger, relative to air and Amtrak service.

Substantial shifts will be made, however, from air to Amtrak service in the New York City to Boston market. With the electrification project in place in 2010, nearly twice as many travelers are expected to choose Amtrak for their intercity travel than without the electrification, and nearly all of these riders would use air service if the improved Amtrak service was not available. A benefit of providing the high speed rail service is that the limited capacity of the airports in Boston and New York City could be used for longer distance trips where rail is not competitive and which offer greater economic opportunities for air carriers. Also, by lessening the need to use their limited capacity for New York City to Boston service, the demand for additional airport capacity (and the environmental impacts associated with providing that capacity) in the two cities would be lessened. As a point of reference, presently 14 percent of the flights that originate from Logan Airport are destined for one of the New York City airports.

Several factors incorporated into the model are responsible for this shift. Some of it is due to the attractiveness of intercity rail relative to other modes as those modes become more congested. This is evidenced by the increased rail ridership for the no-build alternative (80 percent over 20 years compared to 8.4 percent for air). However, the primary factors are the proposed significant improvements in Amtrak's travel time and service. First, by reducing the express travel time from Boston or Providence to New York City, intercity rail becomes substantially more competitive with the air market. Second, although flight time between the major airports of these cities is approximately one hour, many of these airports are located outside the city centers and access to and from the airports is inconvenient and unpredictable.

4.9.2 Evaluation Criteria

The evaluation criteria employed to assess the impacts of the alternatives upon the transportation system within the NEC are shown in Table 4.9-1.

4.9.3 Benefits of the Proposed Electrification

The projected decrease in air passengers that would result from the proposed electrification (1.2 million passengers annually), would result in some improvement to vehicular traffic around the airport. Of all Logan passengers, 64.8 percent make their trips to and from the airport by some type of automobile (personal, taxi or limousine). Assuming the same percentage for the proposed 1.2 million Boston-New York passengers expected to shift to intercity trains, 765,936 vehicle trips annually or 2,553 on a typical weekday will be saved due to the electrification. This represents two percent of Logan's average weekday traffic of 132,408 vehicles (LOGIC, 1993). A similar benefit would likely be experienced at Providence's T.F. Green Airport, where 250,000 air passengers are anticipated to shift to intercity trains. The effect at the three airports in New York is not expected to be perceptible.

Although the reduction in automobile travel attributable to the proposed electrification would be barely perceptible on the region's highways (less than two percent), this reduction would result in a measurable improvement to regional air quality, as detailed in Section 4.10 of this report.

4.9.4 Transportation Impacts

The effects of the proposed electrification on vehicle delay at individual grade crossings are minor, with increases ranges from 2.5 seconds at Walker's Dock, Freeman's Crossing and Palmer Street to 5 seconds at Bank Street, State Street and Governor Winthrop's Boulevard. These effects would not require mitigation and therefore are not discussed further herein. No adverse effects are anticipated on existing and planned commuter rail or Conrail freight operations. Project-generated traffic at the railroad stations will not result in changes from the 2010 future baseline or no-build levels of service (LOS), with the exception of Providence Station (Table 4.9-2) which will change from LOS C to LOS D, which is considered acceptable in an urban area. Therefore, since impacts in these areas will not exceed the evaluation thresholds, they are not discussed further herein. The remainder of this section focuses on potential impacts associated with increased parking demand at railroad stations, operational and construction effects on one of the freight railroads, and on traffic patterns and operations during bridge modifications.

TABLE 4.9-1. EVALUATION CRITERIA FOR TRANSPORTATION, TRAFFIC AND CIRCULATION IMPACTS

IMPACT CRITERIA	MEASURE	SIGNIFICANCE THRESHOLD
Effect of increase in train speed and frequency on vehicle delay at grade crossings.	Comparison of project- generated delay at crossings with existing delay.	None
Effect of project-generated traffic at train stations on existing traffic patterns.	Comparison of project- generated traffic with existing flows.	Decline in peak hour LOS, below LOS D, at key intersections.
Effect of project-generated intercity train ridership on aircraft and automobile traffic.	Project-generated reduction in aircraft use.	None.
	Project-generated reduction in vehicle miles of travel.	None.
Effect of bridge modifications on traffic flow pattern.	Temporary change in traffic flow pattern and/or vehicle delay.	Decline in peak hour LOS, below LOS C in rural areas and LOS D in urban areas, at key intersections along alternate routes.
Effect on other NEC railroad operations (commuter, freight)	Adverse operating or economic effects	None
Effect of change in project-generated traffic on parking capacity at train stations.	Change in parking demand at each train station.	None

4.9.4.1 Parking at Railroad Stations. Projected increase in Amtrak ridership will occur primarily with express service and would generate additional parking demand at all express stations. The existing, no-build and electrification parking demand created by Amtrak service, along with existing parking supply, is shown in Table 3.9-5 in Appendix B. This demand is created by Amtrak service only and additional parking spaces would be needed for commuter rail service.

Except for the New Haven Station, electrification-generated parking demand would exceed the existing supply. At Back Bay and South Stations in Boston, no parking is available and the City of Boston parking freeze does not permit the provision of additional parking spaces. At Providence Station, electrification-generated parking demand is nearly double the existing parking supply, without including commuter demand, generating a substantial need for additional parking. Likewise, at Route 128 station, the electrification-generated parking demand alone exceeds by 50 percent the existing available parking, and there is substantial commuter-generated parking demand at this station.

It is estimated that intercity plus commuter rail parking demand at all express stations would far exceed the existing supply in 2010. Additional parking would be required to accommodate the increased ridership at all express stations. Lack of adequate off-street parking could discourage ridership and would be contrary to the goal of attracting passengers to Amtrak service. Amtrak is currently discussing station and parking improvements at Route 128 station with the MBTA.

TABLE 4.9–2
EXPRESS STATION INTERSECTION ANALYSIS

Table 4.9–2A
Unsignalized Intersections (AM Peak)

Intersection/Approach	Location	1993 Existing RC	1993 Existing Demand	1993 Existing LOS	2010 No–Build RC	2010 No–Build Demand	2010 No–Build LOS	With Electrification RC	With Electrification Demand	With Electrification LOS
Blue Hill Dr/Rt 128	Boston, MA									
LT Form 128 Ramp		198	457	D	–175	669	F	–264	730	F
LT From Blue Hill Dr		1016	35	A	876	51	A	846	51	A
Blue Hill Dr/Univ Av	Boston, MA									
LT From Univ Av		491	184	A	See Table 4.9–2 C			See Table 4.9–2 C		
All Moves From Blue Hill		–199	550	F						
Smith/Gaspee/State	Providence, RI									
LT From WB Smith		472	319	A	See Table 4.9–2 C			See Table 4.9–2 C		
All From Gaspee		–278	500	F						
All From State		34	52	E						

Table 4.9–2B
Unsignalized Intersections (PM Peak)

Intersection/Approach	Location	1993 Existing RC	1993 Existing Demand	1993 Existing LOS	2010 No–Build RC	2010 No–Build Demand	2010 No–Build LOS	With Electrification RC	With Electrification Demand	With Electrification LOS
Blue Hill Dr/Rt 128	Boston, MA									
LT Form 128 Ramp		327	89	B	–45	165	F	–124	179	F
LT From Blue Hill Dr		447	52	A	89	96	E	39	97	E
Blue Hill Dr/Univ Av	Boston, MA									
LT From Univ Av		167	717	D	See Table 4.9–2 D			See Table 4.9–2 D		
All From Blue Hill		–133	201	F						
Smith/Gaspee/State	Providence, RI									
LT From WB Smith		181	386	D	See Table 4.9–2 D			See Table 4.9–2 D		
All From Gaspee		–390	410	F						
All From State		–179	197	F						

RC = Available Reserve Capacity LOS = Level–of–Service

TABLE 4.9–2 (continued)
EXPRESS STATION INTERSECTION ANALYSIS

Table 4.9–2C
Signalized Intersections (AM Peak)

Intersection/Approach	Location	1993 Existing			2010 No–Build			With Electrification		
		V/C	Delay	LOS	V/C	Delay	LOS	V/C	Delay	LOS
Summer/Atlantic	Boston, MA									
Overall		1.03	105	F	0.76	19	C	0.76	19	C
Blue Hill/Univ Av	Boston, MA	See Table 4.9–2 A								
Overall					0.55	11	B	0.59	12	B
Smith/Gaspee/State	Providence, RI	See Table 4.9–2 A								
Overall					0.9	24	C	0.93	27	D
Francis/Gaspee	Providence, RI									
Overall		0.42	5	A	0.88	17	C	0.95	21	C

Table 4.9–2D
Signalized Intersections (PM Peak)

Intersection/Approach	Location	1993 Existing			2010 No–Build			With Electrification		
		V/C	Delay	LOS	V/C	Delay	LOS	V/C	Delay	LOS
Summer St/Atlantic Av	Boston, MA									
Overall		1.28	154	F	1.11	67	F	1.16	71	F
Blue Hill/Univ Av	Boston, MA	See Table 4.9–2 B			0.69	12	B	0.78	15	B
Overall										
Smith/Gaspee/State	Providence, RI	See Table 4.9–2 B								
Overall					0.7	19	C	0.72	20	C
Francis/Gaspee	Providence, RI									
Overall		0.56	9	B	0.9	22	C	0.94	31	D

LOS=Level–of–Service V/C = Volume to Capacity Ratio Delay = Average Delay Per Vehicle in Seconds

4.9.4.2 Operational Impacts on Freight Rail. Providence & Worcester (P&W) and Conrail are the two freight rail operators in the NEC. These companies project that freight rail operations on the NEC in the study area will increase from the existing 32 daily movements to 49 daily movements in 2010. The line segments of the NEC used for freight service and the current and projected (2010) level of train movements are presented in Table 3.9-3 in Appendix B.

Freight trains on the NEC receive a lower priority for scheduling than passenger trains and increased frequency of passenger trains could affect the freight train operations. Rail operation simulations performed by Amtrak indicate that the proposed Amtrak 2010 passenger train schedule would reduce the time available for freight movements, especially in the daytime. As stated previously, no operational impacts are expected for Conrail movements. However, it is estimated that two of the three existing P&W local freight trains in Connecticut and Rhode Island would require an additional 1.5 to 2 hours to perform the same amount of work, and that the third local would require an additional 3 to 3.5 hours. In addition, any new freight service would be restricted to nighttime operation.

The scheduling of the planned Amtrak service would impact freight service in two ways. First, by requiring additional time to accomplish the same amount of work, the cost of providing freight service would increase. Second, requiring shippers to receive or deliver freight shipments outside normal business hours would be inconvenient and likely increase shippers' costs.

Amtrak plans to maintain the current published vertical clearances under the numerous overhead bridges on the NEC. The presence of catenary, however, could increase the cost of any future program to increase clearances to accommodate double stack and tri-level cars. Because of the amount of space required for the catenary and associated connections and insulators, a freight clearance program could require certain bridges to be raised with the electrification alternative that would not be required under the no-build alternative. In addition, the bridges that would be raised by Amtrak as part of the electrification project might have to be raised again for a freight clearance program. Furthermore, with increased passenger train frequencies and speed, any future work on the NEC will become more complex. There are presently no plans to undertake a program to increase bridge clearances for freight operations. However, the P&W is concerned that the increased cost and complexity of any freight clearance program undertaken after the electrification project is completed could actually preclude the undertaking of such a program and permanently limit freight service to its present height limitations.

Freight cars requiring higher clearances, such as double stack cars and tri-level auto carriers, are rapidly becoming the industry standard. By not being able to offer its customers the most efficient type of equipment, the freight railroads on this part of the NEC would be placed at a competitive disadvantage in a highly competitive transportation market.

The combination of added costs, inconvenience, and limitations of the type of freight rail cars that can be used could have a serious impact on existing and future freight rail movement. Some existing shippers may divert shipments to other transportation modes and some potential shippers may locate in other areas with more favorable transportation services. This latter impact has implications for the State of Rhode Island's plans to develop a commercial port to be served by the P&W at Quonset Point in North Kingstown. This port would be in competition with port facilities in Boston, the New York City area, and other east coast ports which have service via rail lines that can accommodate the larger dimension rail cars.

According to the estimates developed by the P&W, the additional operating costs and potential loss of new business related to schedule and height restrictions could result in an annual revenue loss of $900,000 to P&W and could cause P&W to cease operations on the NEC (P&W General Counsel letter to FRA dated January 12, 1993).

4.9.4.3 Construction Impacts on Freight Rail. Construction of the overhead catenary system would require the removal of between five and fifteen miles of mainline tracks from service at various times throughout the construction period. Most of this work would occur in the evening. Currently, most (28 out of 32 movements) of the regular freight operations occur during daylight hours and therefore would not be affected by the construction. However, some regular nighttime movements could be affected by the construction, and projected extra movements or excess dimension (high and wide) movements, made almost exclusively at night, may be affected to a greater degree. In addition, regular local freight, if unduly delayed during its daylight operation, could be affected by the scheduled removal of one main track during late afternoon hours.

4.9.4.4 Traffic Patterns and Operations During Bridge Modifications. In order to obtain adequate clearance for the installation of the catenary, seventeen overhead roadway bridges would be raised or replaced. Of these, eight are programmed for replacement or reconstruction by the states (Old Clinton Road, Westbrook, CT; Mason Island Road, Stonington, CT; Main Street, Westerly, RI; Carolina Street, Charlestown, RI; Maintonomi Rt 2, Richmond, RI; Roger Williams, Providence, RI; Conant Street, Pawtucket, RI; and Thatcher Street, Attleboro, MA) and are being evaluated in other environmental documents. As described in section 3.9, nine bridges would be modified as part of this project. Of these, one bridge (Johnnycake Hill Road) is a pedestrian crossing and as such, its modification would not have any effect on vehicular traffic. The duration of construction at the remaining eight bridges will range from 2.5 to nine months.

Construction on three bridges would be staged so that vehicular traffic will be maintained during construction, generally through one-way traffic flow with traffic signals at either end of the bridge to regulate the flow. At any given time, only one way traffic would be permitted on the bridge. As shown below, traffic volumes on these bridges is relatively light and any impacts will be minor and of short duration (2.5 to 4 months):

	Traffic Volumes		
Bridge	Daily	AM Peak	PM Peak
Millstone Point Road	4,287	874	793
Burdickville Road	151	13	10
Main Street	4,315	962	982

Construction at the remaining five bridges would range in duration from two to nine months and cannot be staged to keep part of the bridge open. Therefore, alternative traffic routes would be required for the duration of construction. An alternative route or detour to which traffic would be diverted during construction has been identified for each of the five bridges. These detour routes are shown in Figures 4.9-1 through 4.9-5. Traffic operations at 14 intersections along these detour routes were analyzed to determine the effects of the diverted traffic on traffic operations. Results of this analysis are summarized in Table 4.9-3. The diversion of traffic associated with the Kenyon School Road and Maskwonicut Street Bridges would generate no change in LOS. The Pettaconsett Avenue detour will be analyzed in the FEIS/R due to a late release of information on the proposed detour route for this bridge.

Two intersections along the Park Avenue bridge detour route were analyzed. As shown in Table 4.9-3, the LOS would improve from LOS C to LOS B at the Park Avenue/Elmwood Avenue intersection and would degrade from LOS D to LOS E at the Park Avenue/Reservoir Avenue intersection. The level of service would be degraded by the detour traffic at both intersections analyzed along the Depot Street Bridge detour route. At Depot Street/Upland Avenue/N. Main Street intersection the conditions would

TABLE 4.9-3. DETOUR INTERSECTION ANALYSIS

BRIDGE	AFFECTED INTERSECTION	AFFECTED MOVEMENT	LEVELS OF SERVICE (Existing/Detour)
Kenyon School Rd. Richmond, RI	Kenyon School Rd./Route 2	eastbound right	A/A
		eastbound left	A/A
		northbound left	A/A
	Main St./Route 2	southbound right	A/A
		southbound left	A/A
		eastbound left	A/A
Park Ave. Cranston, RI	Park Ave./Elmwood Ave.	all	C/B
	Park Ave./Reservoir Ave.	all	D/E
Depot St. Sharon, MA	Depot St./Upland Ave./N. Main St.	all	B/C
	Maskwonicut St./N. Main St.	eastbound right	A/D
		northbound left	A/B
Maskwonicut St. Sharon, MA	Maskwonicut St./N. Main St.	eastbound right	A/A
		northbound left	A/A
	Depot St./Upland St./N. Main St.	all	B/B

degrade from LOS B to LOS C, which is acceptable for the duration of the construction. At the Maskwonicut Avenue/N. Main Street intersection the service level would degrade from LOS A to LOS D.

According to the local fire chiefs, there will be no adverse effect on emergency response times or services as a result of the temporary detours for the Kenyon School Road, Pettaconsett Avenue, and Maskwonicut Street bridges (Grimes, 1993; Noble, 1993; Polito, 1993). The detours at Park Avenue and Depot Street, however, would adversely affect emergency response time and services. At Park Avenue, approximately 1.5 miles and at least five minutes would be added to any response on either side of the railroad (Wayles, 1993). For Depot Street, the recommended detour, Maskwonicut Street, is very narrow, limiting emergency vehicle speeds, and the equipment exceeds the detour bridge's weight limits. The fire engine ladder does not fit under the bridge at Canton Street, the other potential detour.

4.10 AIR QUALITY

This section describes the benefits and impacts of the proposed electrification on air quality in the NEC region.

4.10.1 Evaluation Criteria

Air quality benefits and impacts are assessed using criteria summarized in Table 4.10-1.

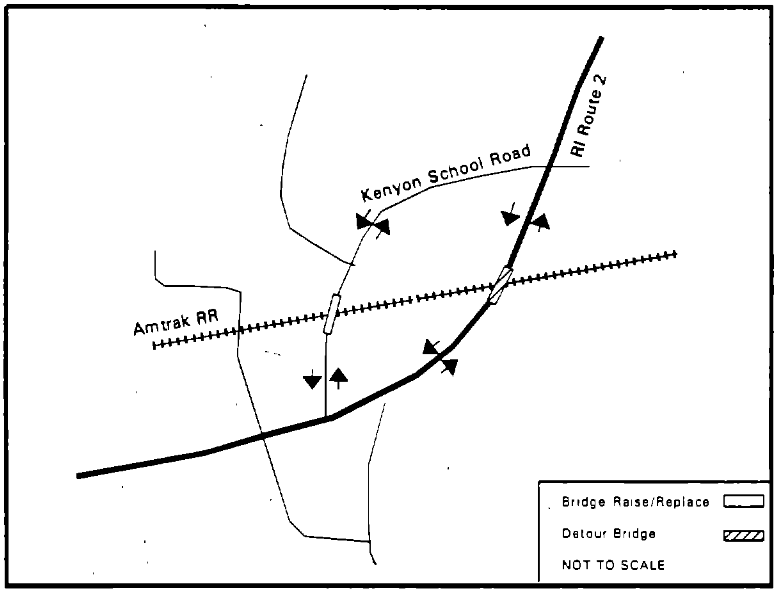

FIGURE 4.9-1. KENYON SCHOOL ROAD DETOUR

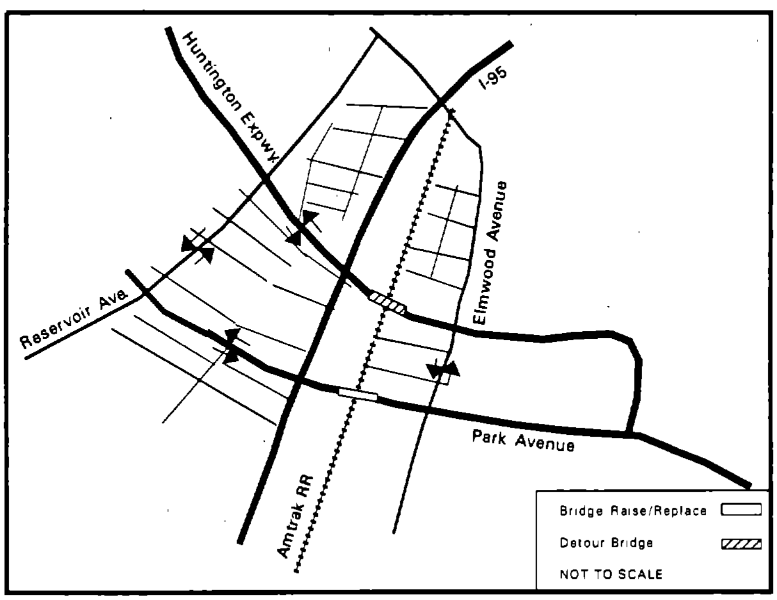

FIGURE 4.9-2. PARK AVENUE DETOUR

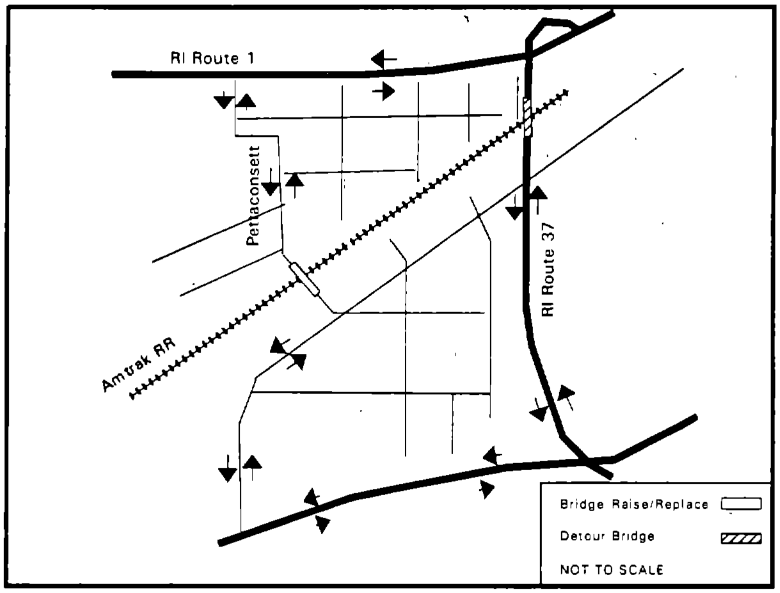

FIGURE 4.9-3. PETTACONSETT AVENUE DETOUR

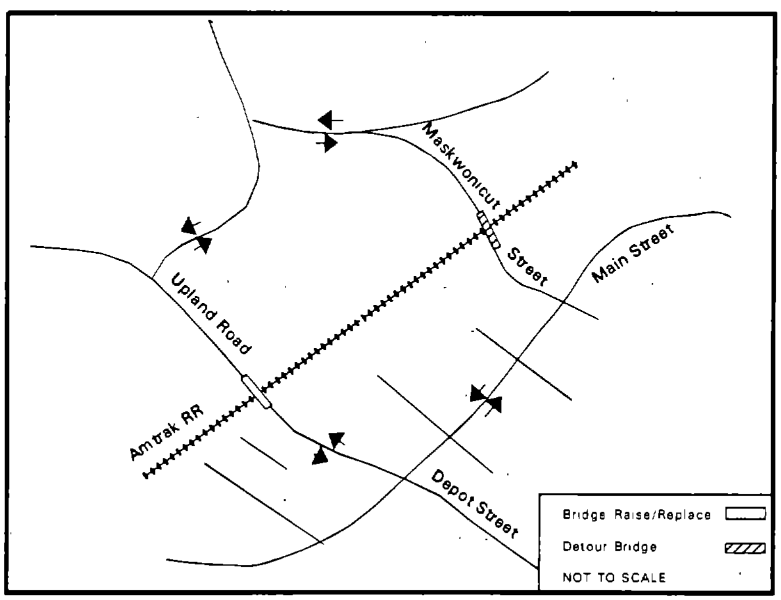

FIGURE 4.9-4. DEPOT STREET DETOUR

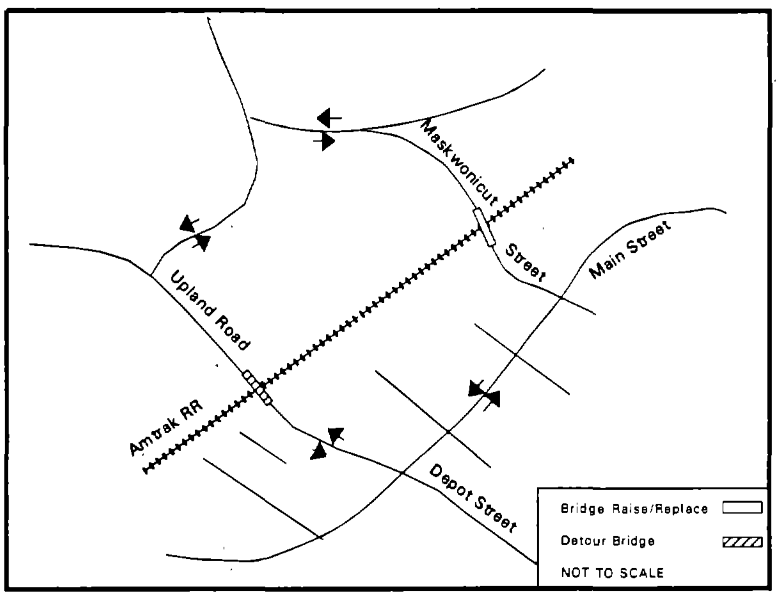

FIGURE 4.9-5. MASKWONICUT STREET DETOUR

TABLE 4.10-1. AIR QUALITY EVALUATION CRITERIA

IMPACT CRITERIA	MEASURE	SIGNIFICANCE THRESHOLD
Project-generated change in train emissions, automobile emissions at train stations, and auto and aircraft emissions due to modal shifts.	Change in levels of criteria pollutants and levels of pollutant mass emissions.	Exceedance of state or Federal standards for criteria pollutants. Exceedance of State SIP Emissions Limits and percentage reduction impacts.
Project-generated emissions from electrical power plants.	Comparison of the project generated emissions to existing emissions.	None
Construction impacts due to site preparation.	Levels of criteria pollutants below state and Federal standards.	Exceedance of state or Federal standards for criteria pollutants.

4.10.2 Benefits of the Proposed Electrification

The mesoscale (regional) analysis found that the proposed electrification would result in significant reductions in annual mobile source emissions of volatile organic compounds (VOCs), oxides of nitrogen (NOx) and carbon monoxide (CO). There are three sources of such reductions: 1) elimination of emissions from the Amtrak trains as a result of replacing the diesel locomotives with electric locomotives; 2) lower emissions from aircraft over the no-build alternative due to diversion from airplanes to intercity rail; and 3) shifts from automobiles to intercity passenger rail. While the proposed electrification would introduce additional VOC emissions from power generation, the emissions of this source are far outweighed by the reductions in the former sources, as described below.

Reductions in VOC emissions are attributable approximately equally to all three sources described above, while reductions in NOx emissions are due primarily to the switch to electric locomotives and secondarily to changes in aircraft use. Reductions in CO can be attributed approximately equally to changes in aircraft use and shifts from automobiles to intercity rail. The total reductions are shown in Tables 4.10-2, 4.10-3 and 4.10-4, respectively. Table 4.10-2 also shows the increased VOCs attributable to power generation for the proposed project, which are more than offset by project-generated reductions. The net emissions reductions due to electrification can be summarized as follows:

- 174 kilograms per day (Kg/day) for VOCs (seven percent);
- 1,658 Kg/day for NOx (thirteen percent); and
- 1,038 KG/day for CO (four percent).

Finally, the microscale (local) analysis of locomotive pass-bys at three locations along the NEC found that replacement of the diesel locomotive with electric locomotives would completely eliminate any air quality effects of the pass-bys.

As these represent improvements towards attaining and/or maintaining the Federal and state ambient air quality standards, each of these improvements is consistent with both the Federal Clean Air Act and its amendments, and the provisions of the current state implementation plans (SIPs) in each of the three project states (as described in Section 3.10 of this document).

TABLE 4.10-2. COMPARISON OF ESTIMATED ANNUAL MOBILE SOURCE VOC EMISSIONS BY MODE OF TRAVEL

SOURCE	1992 EXISTING (Kg/day)	2010 NO-BUILD (Kg/day)	2010 WITH ELECTRIFICATION	
			Kg/day	% CHANGE[1]
Auto	3,778	2,110[2]	2,068	-2
Aircraft	679	328[2]	256	-22
Amtrak	60	68	0	-100
Other Trains	66	154	154	0
Buses	32	22[2]	22	0
Power Generation	0	0	8	N/A
TOTAL	4,737	2,682	2,508	-7

[1] Percent Change is change from no-build to electrification.
[2] Improvements from 1992 due to Federal Motor Vehicle Emissions Control Program (FMVCP) and the state Inspection and Maintenance (I/M) programs

TABLE 4.10-3. COMPARISON OF ESTIMATED ANNUAL MOBILE SOURCE NOX EMISSIONS BY MODE OF TRAVEL

SOURCE	1992 EXISTING (Kg/day)	2010 NO-BUILD (Kg/day)	2010 WITH ELECTRIFICATION	
			Kg/day	% CHANGE[1]
Auto	5,117	3,815[2]	3,739	-2
Aircraft	821	1,925	1,310	-32
Amtrak	1,954	2,221	0	-100
Other Trains	2,153	5,041	5,041	0
Buses	517	196[1]	196	0
Power Generation	0	0	1,254	N/A
TOTAL	10,562	13,198	11,540	-13

[1] Percent Change is change from no-build to electrification.
[2] Improvements from 1992 due to Federal Motor Vehicle Emissions Control Program (FMVCP) and the state Inspection and Maintenance (I/M) programs

TABLE 4.10-4. COMPARISON OF ESTIMATED ANNUAL MOBILE SOURCE CO EMISSIONS BY MODE OF TRAVEL

SOURCE	1992 EXISTING (Kg/day)	2010 NO BUILD (Kg/day)	2010 WITH ELECTRIFICATION	
			Kg/day	% CHANGE[1]
Auto	47,468	22,230[2]	21,781	-2
Aircraft	1,820	1,665[2]	1,180	-29
Amtrak	172	196	0	-100
Other Trains	190	442	442	0
Buses	151	129[2]	129	0
Power Generation	0	0	92	N/A
TOTAL	49,801	24,662	23,624	-4

[1] Percent Change is change from no-build to electrification.
[2] Improvements from 1992 due to Federal Motor Vehicle Emissions Control Program (FMVCP) and the state Inspection and Maintenance (I/M) programs.

4.10.3 Air Quality Impacts

This section describes air quality impacts of the proposed electrification which could exceed the evaluation criteria thresholds. Emissions generated by increased traffic at the express railroad are not expected to exceed the impact thresholds and emissions from power plants supplying electricity to the proposed project would be substantially offset by project-generated reductions, as described in section 4.10.2. Therefore, no further discussion of such effects is included herein. This section discusses the third potential microscale effect, short-term, air quality effects associated with construction.

Construction-related activities can result in short-term impacts on ambient air quality in the vicinity of the construction site. These potential impacts include fugitive dust emissions, direct emissions from construction equipment and truck exhausts, and increased emissions and dust from construction vehicles on the streets. Six of the 25 proposed electrification facility sites and five of the nine proposed bridge modification sites are located close to residences and other sensitive receptors that may be affected by construction-related air quality impacts. These include: Roxbury substation; Westbrook switching station; Madison, Grove Beach, Noank and East Foxboro paralleling stations; and Millstone Point Road, Kenyon School Road, Main Street, Pettaconsett Avenue, and Maskwonicut Street bridges.

4.11 VISUAL AND AESTHETIC EFFECTS

This section provides an evaluation of the potential effects of the proposed electrification on visually and architecturally sensitive areas in the Northeast Corridor. As described in section 3.11, the objectives of this evaluation are to determine the visual effect of the proposed electrification project on views from visually sensitive receptors (VSRs) and to determine the compatibility of proposed electrification facilities with the character of architecturally sensitive areas (ASAs). Both of these terms are defined in Section 3.11-3. As demonstrated in that section and listed in Table 3.11-1 in Appendix B, VSRs are comprised primarily of residences in the coastal areas of Connecticut and Rhode Island where the rail line abuts the

Long Island Sound and Greenwich Bay, respectively. Electrification facilities proposed in architecturally sensitive areas include the Roxbury Crossing substation and the Noank paralleling station.

4.11.1 Evaluation Criteria

Table 4.11-1 describes the criteria, measures of impact and thresholds for determining visual and architectural impacts that may require mitigation.

4.11.2 Visually Sensitive Receptors Impacts

This section describes the methodology used to assess impacts to Visually Sensitive Receptors (VSRs) and presents the results of the evaluations.

4.11.2.1 Methods of Analysis. There are three steps in evaluating the impacts of the proposed project on VSRs: identification of the area of potential impact, line of sight analysis and identification of effect. Each of these is described below.

Identification of the Area of Potential Impact. This step was completed as part of the inventory presented in Section 3.11.1 of this DEIS/R. It was determined that from each of the VSRs listed in Table 3.11-1 in Appendix B the following holds true: 1) the existing view is visually sensitive; and 2) no intervening factors (structures, topography, vegetation) exist which would clearly screen or buffer the electrification project in the view from the VSR.

Line of Sight Analysis. The purpose of this analysis is to determine whether and how much of the project components would likely be visible from each VSR. Once this was determined, a visual modification classification (VMC) from one to four was assigned for each VSR, based upon the projected dominance of the project components in the view. The VMC considers both the distance of the project components from the VSR and the existing visual complexity (VC) of the skyline, as described in section 3.11.1. The four VMC classifications are as follows:

- VMC 1 indicates that the electrification components would not be visible from the VSR unless pointed out;
- VMC 2 indicates that the electrification components would be visible, but would be subordinate to other features within the view from the VSR;
- VMC 3 indicates that the electrification components would be co-dominant with other features in the view from the VSR;
- VMC 4 indicates that the project components would be dominant within the view from the VSR.

As described in Section 4.11.1, VMC 1 and 2 would not impact visual resources, while VMC 3 and 4 could impact these resources.

In order to determine whether and how much of the project components would likely be visible from each VSR, and thus, the potential visual modification classification for each of the VSRs, the five representative sites depicted in Figures 3.11-1 through 3.11-5 were altered to represent conditions resulting from the no-build and electrification alternatives. As the signal poles and wires clearly visible

TABLE 4.11-1 EVALUATION CRITERIA FOR VISUAL AND ARCHITECTURAL IMPACTS

IMPACT CRITERIA	MEASURE	SIGNIFICANCE THRESHOLD
Project-generated effect on visually sensitive receptors (VSRs)	Existing views of waterfront or scenic area would be permanently impaired or diminished	Visual Modification Classification of 3 or 4
Project-generated effect on architecturally sensitive receptors (ASAs)	New structure would be out of scale in height or mass, or out of character in style or substance from existing neighborhood	None

in Figures 3.11-2 and 3.11-5 will be removed over the next several years as part of a separate project, the view for the 2010 no-build alternative is different than the existing views shown in Chapter 3. Each of the projected no-build views from the representative VSRs are shown followed immediately by the projected view with the proposed electrification in Figures 4.11-1 through 4.11-10 at the end of this section.

Based on these projected views, visual modification classifications have been assigned to each of the representations as shown below:

Location	Distance from Track	View	Visual Complexity	Visual Modification Classification
76 Thimble Island Rd. Branford, CT	350 ft.	L.I. Sound	High	2
211 Seneca Dr. Groton, CT	360 ft.	Jordan Cove	Moderate	4
162 Wilcox Ave. Stonington, CT	480 ft.	L.I. Sound	Low	2
13 Lambert's La. Stonington, CT	880 ft.	Stonington Harbor	Moderate	1
4490 Boston Post Rd. Warwick, RI (Harborwatch Condominiums)	50 ft.	Greenwich Bay	Low	4

As shown above, great distance and high visual complexity of the existing skyline generally contribute to minimal or no impact on the existing view (VMC 1 or 2). Conversely, shorter distances and low visual complexity generally result in adverse effects (VMC 3 or 4).

4.11.2.2 Results of the Analysis. With the exception of the Noank paralleling station in Groton, CT, the project components that may affect views are primarily the overhead catenary supports and wires. Based on the altered representative views and methodology presented in the previous section, a VMC has been determined for each one of the VSRs listed in Table 3.11-1 in Appendix B. The project may impact 34 of the 51 identified VSRs (those with a VMC of 3 or 4). This is less than 17 percent of the 200 potential VSRs identified at the start of this study.

Based on the VMC methodology described above, it is likely that the Noank paralleling station would impact the VSR located at 235 Seneca Road in Groton, with a VMC of 4.

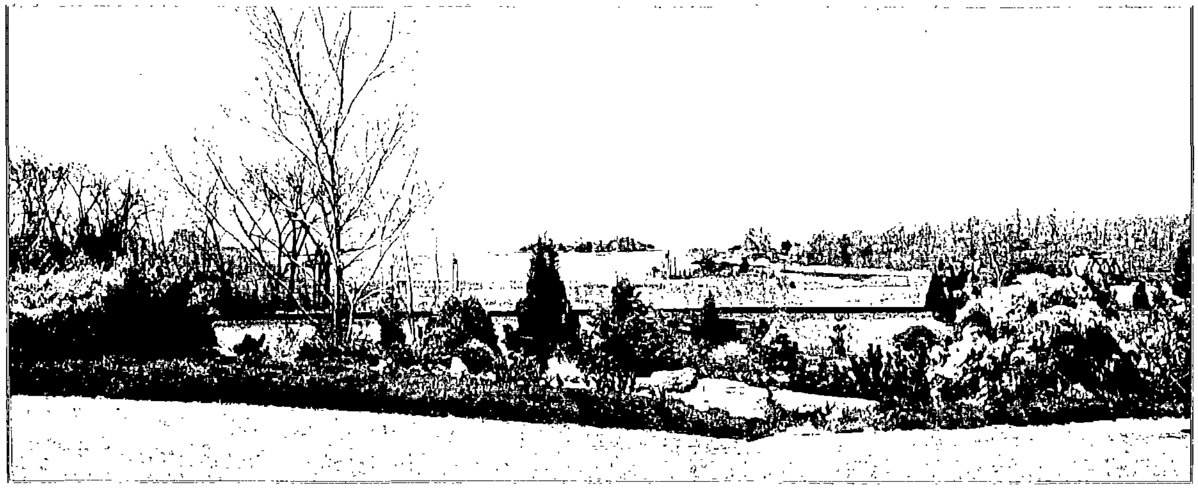

FIGURE 4.11-1. 2010 NO-BUILD ALTERNATIVE VIEW FROM RESIDENCE AT 76 THIMBLE ISLAND ROAD IN STONY CREEK SECTION OF BRANFORD, CT.

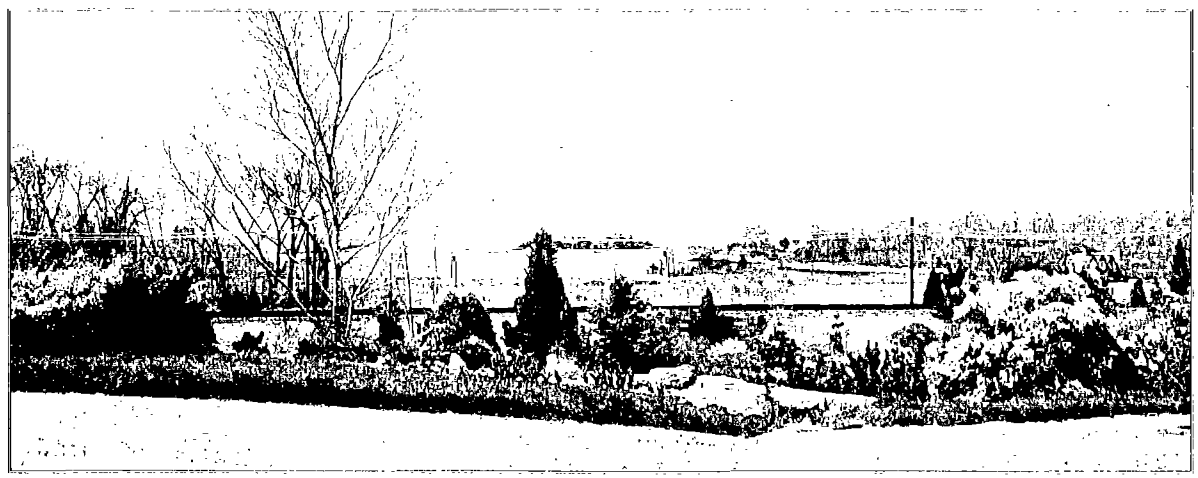

FIGURE 4.11-2. VIEW WITH PROPOSED ELECTRIFICATION FROM RESIDENCE AT 76 THIMBLE ISLAND ROAD IN STONY CREEK SECTION OF BRANFORD, CT.

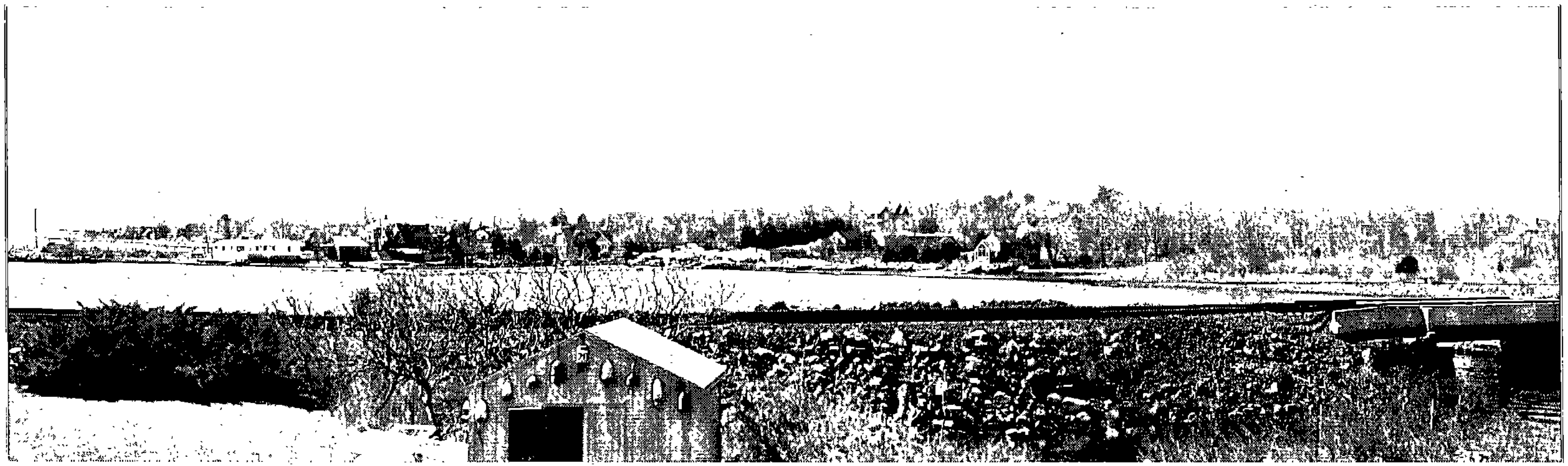

FIGURE 4.11-3. 2010 NO-BUILD ALTERNATIVE VIEW FROM RESIDENCE AT 211 SENECA DRIVE IN NOANK SECTION OF GROTON, CT.

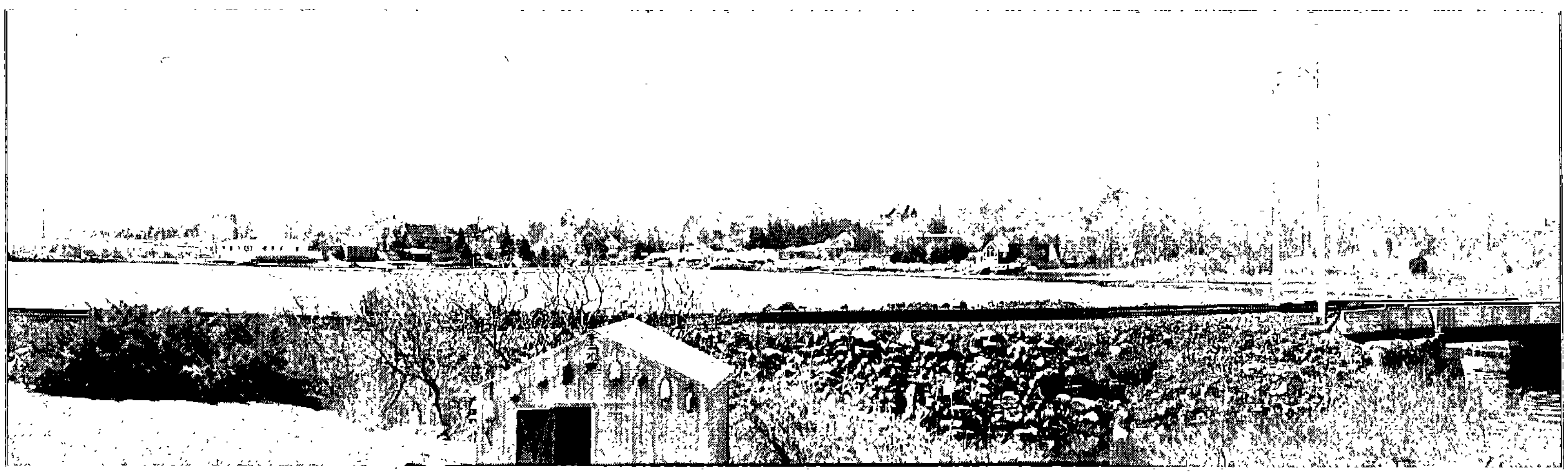

FIGURE 4.11-4. VIEW WITH PROPOSED ELECTRIFICATION FROM RESIDENCE AT 211 SENECA DRIVE IN NOANK SECTION OF GROTON, CT.

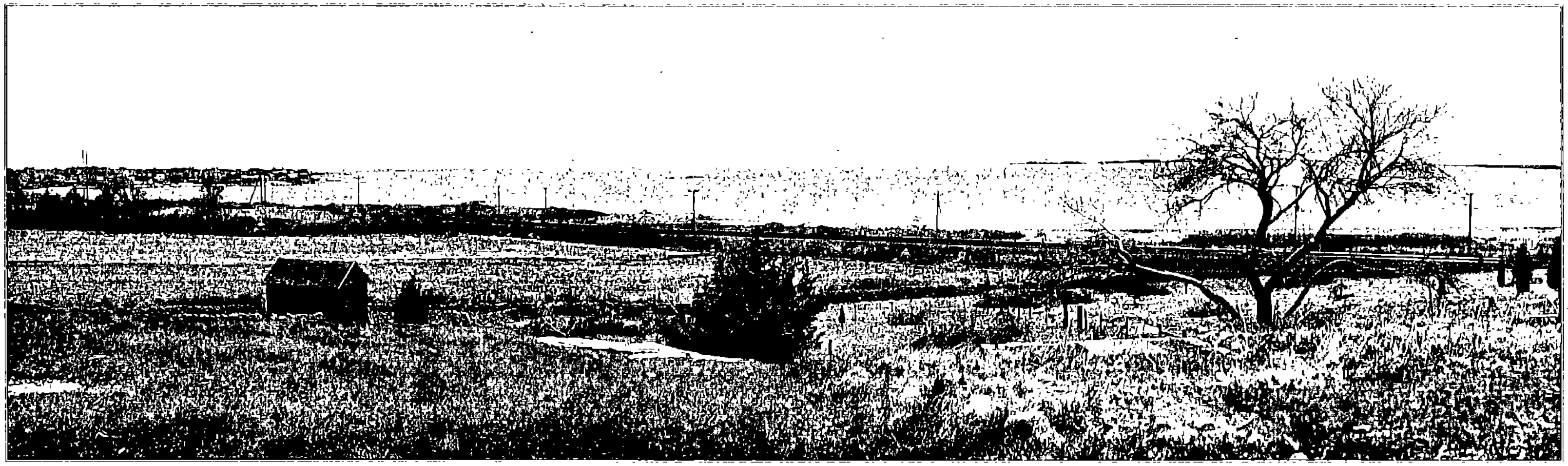

FIGURE 4.11-5. 2010 NO-BUILD ALTERNATIVE VIEW FROM RESIDENCE AT 162 WILCOX AVENUE IN STONINGTON, CT.

FIGURE 4.11-6. VIEW WITH PROPOSED ELECTRIFICATION FROM RESIDENCE AT 162 WILCOX AVENUE IN STONINGTON, CT.

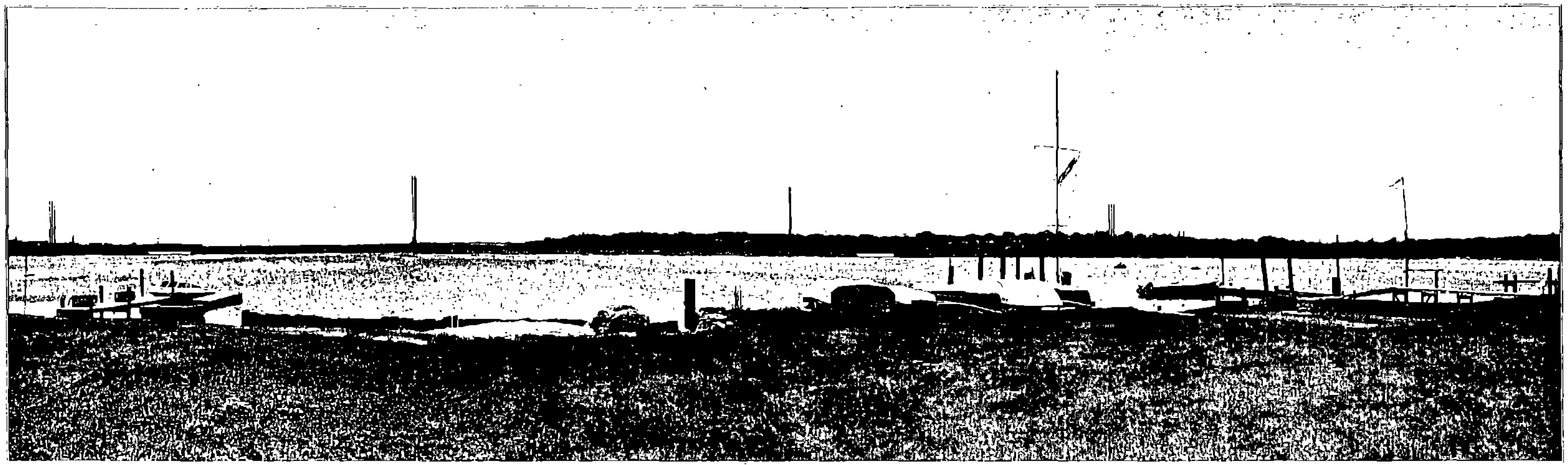

FIGURE 4.11-7. 2010 NO-BUILD ALTERNATIVE VIEW FROM RESIDENCE AT 13 LAMBERT'S LANE IN STONINGTON, CT.

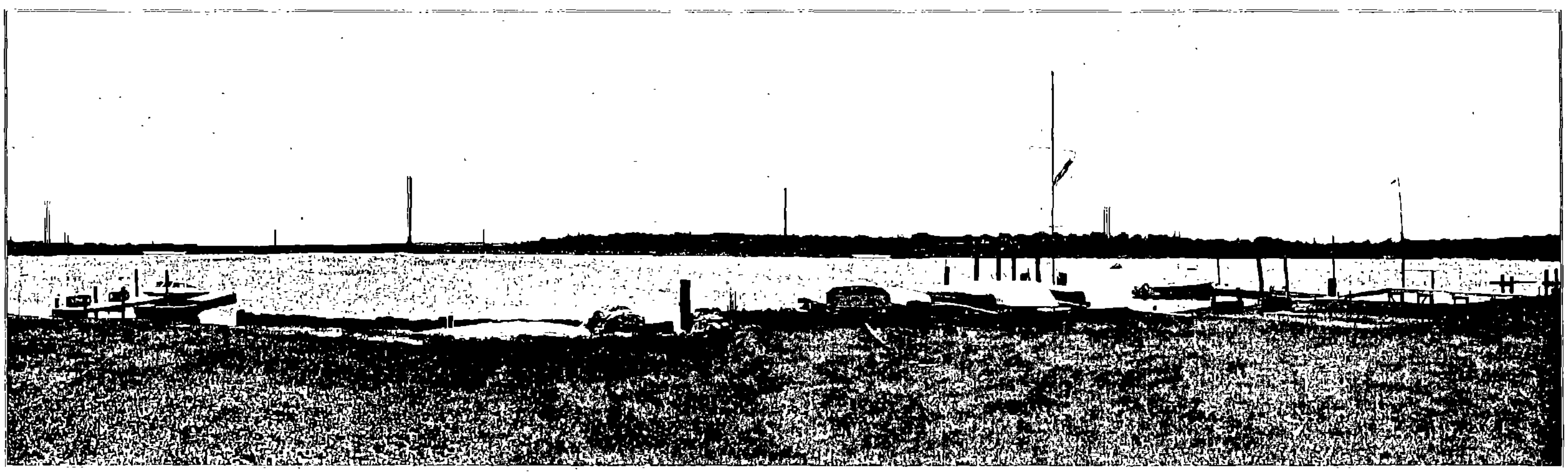

FIGURE 4.11-8. VIEW WITH PROPOSED ELECTIFICATION FROM RESIDENCE AT 13 LAMBERT'S LANE IN STONINGTON, CT

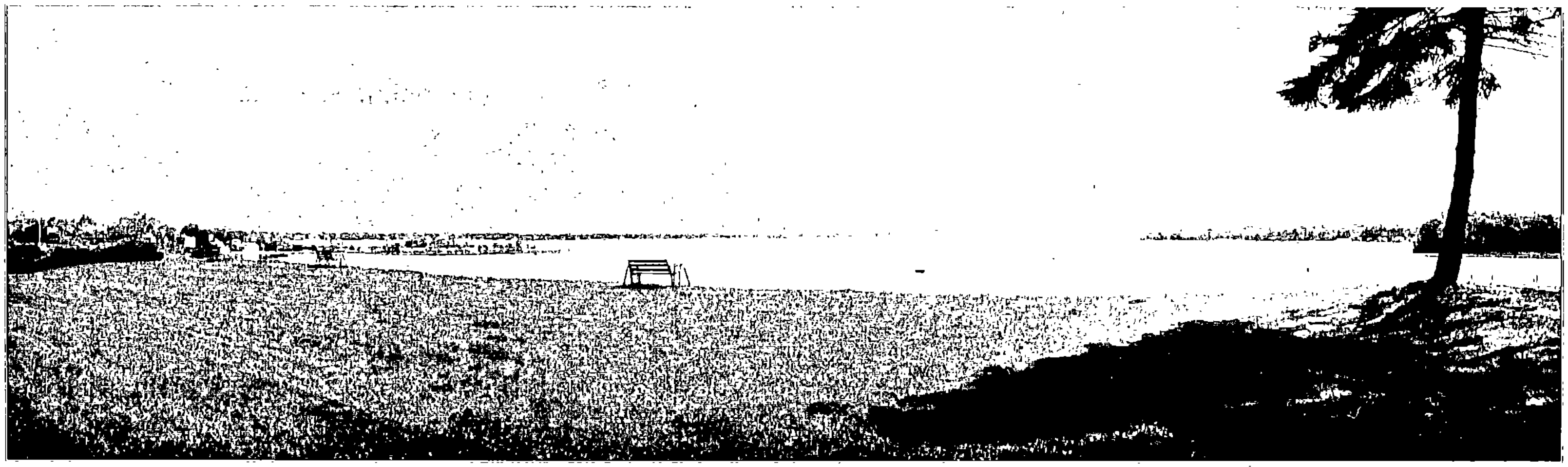

FIGURE 4.11-9. 2010 NO-BUILD ALTERNATIVE VIEW FROM HABORWATCH CONDOMINIUMS AT 4496 BOSTON POST ROAD IN WARWICK, RI.

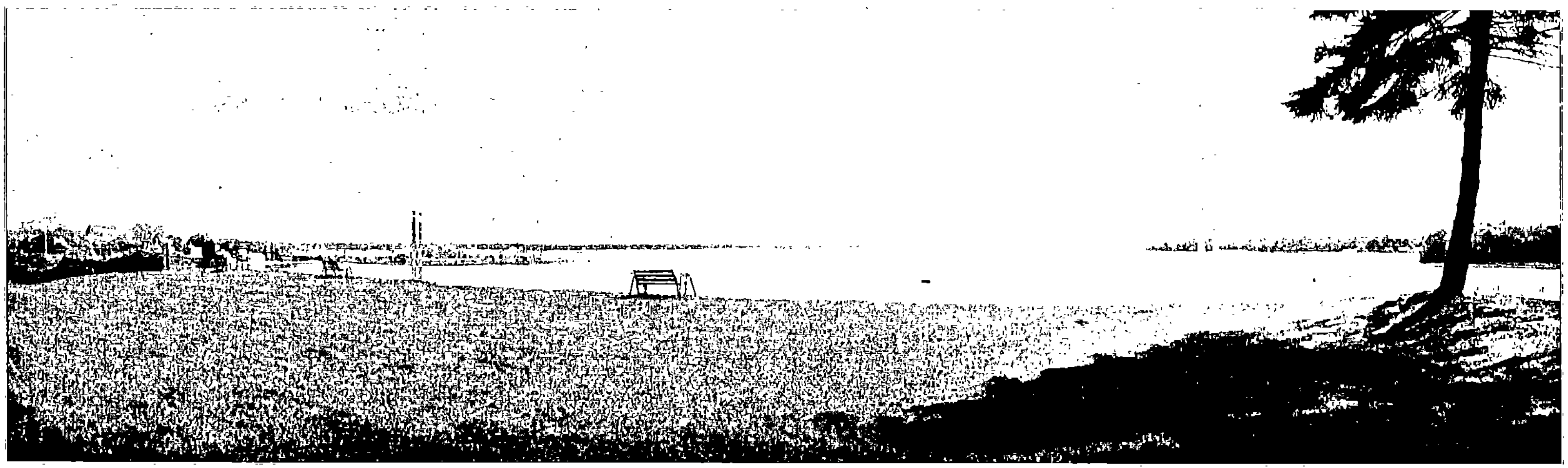

FIGURE 4.11-10. VIEW WITH PROPOSED ELECTRIFICATION FROM HABORWATCH CONDOMINIUMS AT 4496 BOSTON POST ROAD IN WARWICK, RI.

4.11.3 Architecturally Sensitive Areas

There are two steps in evaluating the impacts of the proposed electrification project on Architecturally Sensitive Areas (ASAs): identification of the area of potential impact, and assessment of architectural compatibility. The areas of potential impact were identified as part of the inventory presented in Section 3.11.3.2 of this report. These include the areas around the Roxbury Crossing substation and the Noank Paralleling station. All of the other 23 electrification facilities are sited in undeveloped areas or areas in which they are not incompatible with the existing development (railroad yards, industrial areas). The Roxbury Crossing facility is proposed for an urban area of mixed commercial and residential development and the Noank station is in a suburban residential area. In both cases, the proposed facilities are potentially out of scale and character with the surrounding development and would be an anomaly in the landscape.

4.12 NATURAL RESOURCES

This section summarizes the anticipated effects of the proposed electrification upon the natural environment within the NEC. The focus of this analysis was the construction and operation of the proposed 25 electrification facilities, and the construction activities associated with nine bridge modifications, and installation of the catenary at the five moveable bridges. This section includes an assessment of the projected stormwater runoff from the project and its potential effects on surface water resources, as well as a discussion of the existing drainage situation in the portion of the NEC in Boston between the Arlington/Tremont Street Overhead Bridge and South Station.

4.12.1 Evaluation Criteria

The criteria used to evaluate the project impacts on natural resources are summarized in Table 4.12-1.

4.12.2 Methods of Analysis

4.12.2.1 Wetlands. Two types of wetlands impacts were considered in this analysis. Direct impacts on wetlands are identified by the encroachment into an area identified as wetlands according to Federal and state regulations, as described in Section 3.12 of this document. Any activity, including dredging, filling or any alteration of a wetland would be considered to have a direct impact. Potential indirect impacts on wetlands include siltation and sedimentation, as well as runoff of contaminants. Potential indirect impacts on wetlands are identified by location of any activity in the state-regulated buffer zone of a designated wetland. The buffer zone in Massachusetts is 100 feet and in Rhode Island the buffer zone is 50 feet. In Connecticut, local jurisdictions regulate inland wetlands and designate the buffer zone which varies from locality to locality, while ConnDEP regulates coastal wetlands and does not set buffer zones. For the purposes of this analysis, a 100-foot buffer zone is utilized to identify potential indirect impact to wetlands in Connecticut.

4.12.2.2 Critical Wildlife Habitat. For the purpose of this evaluation, any activity, including the construction of facilities, that would result in degradation to wildlife habitat considered to be of high value will be considered a potential impact on critical habitat.

4.12.2.3 Endangered Species. Any activity located in the habitat of a Federal or state-listed threatened or endangered species may affect the species. Project components proposed for such locations are identified as having a potential impact on the species, with additional consultations with appropriate agencies to be undertaken as part of the Final EIS/R.

TABLE 4.12-1. EVALUATION CRITERIA FOR IMPACTS TO NATURAL RESOURCES

IMPACT CRITERIA	MEASURE	SIGNIFICANCE THRESHOLD
Alteration[1] or destruction of wetland or resource area[2], including dredge or fill.	Volume or area of wetland or resource area altered or destroyed by the project; change in flow of water into or from a wetland.	Violation of Federal or state limitations
Effect of project on functional value[1] of wetlands or resource area[2].	Potential for altering character of wetland; project-generated change in functional value of wetland.	None
Effect of project on wildlife habitat (including wetlands), resources, migration and critical life stages (breeding, nesting, spawning and migration).	Amount, functional value and regional scarcity of wildlife habitat; project-generated change of carrying capacity of wildlife habitat; project activity during critical life stages.	Predicted long-term displacement of wildlife or blockage of migratory routes. Predicted long-term change in habitat incompatible with the existence of wildlife.
Effect of project on habitat or local population of threatened or endangered species and species of general concern.	Project-generated change in carrying capacity of habitat; project activity during critical life stages.	Any predicted change in habitat or blockage of migratory routes. Any action that jeopardizes threatened and endangered species or species of special concern.
Effect on human health and safety and property downstream.	Project-generated change in flood storage volume.	Net reduction in flood-storage capacity
Effect on natural beneficial values of floodplain.	same as above.	same as above.
Stormwater runoff effects during and after construction.	Amount, duration and extent of project-generated increase in runoff and contaminant or sediment transport.	Potential for violation of Federal or state water quality criteria and standards; Sedimentation of wetlands or surface water
Effect of project on Special Protected Areas.	Change in qualities or characteristics that make area eligible for special protection.	None

[1] As defined in Federal and state regulations.
[2] As defined in Federal and state regulations.

4.12.2.4 Floodplains/Coastal Flood Hazard Area. Any construction of new facilities proposed within the boundary of the 100-year floodplain will be considered a potential impact to the flood storage capacity.

4.12.2.5 Water Resources. Two types of sensitive water resources may be affected by the proposed project: groundwater and surface water. Groundwater include sole source aquifers, locally protected water resource or recharge protection areas, and water supply wells. Groundwater is susceptible to contamination, particularly from accidental spills or releases of contaminants, normal leakage from construction equipment or trucks and stormwater runoff.

Surface waters, which include rivers, streams, lakes, ponds, bays and oceans, are susceptible to contamination, as described above, as well as to siltation and sedimentation, particularly during construction. To address long-term impacts to surface water resources, a drainage analysis was performed at all electrification facilities sites. Stormwater runoff rates were calculated for the 10, 25 and 100 year storm events using storm intensity curves provided by the National Weather Bureau. Sites adjacent to wetlands or surface water resources were then examined for potential impacts.

For the purpose of the study, any construction (including bridge modifications) over or within the immediate vicinity of locally protected groundwater supplies or recharge areas, sole source aquifers (designated by the U.S. Environmental Protection Agency), or water supply wells will be considered to have the potential for affecting such resources. Any facilities sited within the buffer zones (as described in Section 4.12.2.1 for wetlands) of surface water supplies will be considered to have the potential for affecting such resources.

4.12.3 Natural Resources Impacts

4.12.3.1 Wetlands. There are no direct impacts on wetlands as a result of this project. The proposed Old Lyme and State Line paralleling stations are proposed for areas identified on state soil maps as hydric soils, which would be classified as wetlands. Field inspections of these sites, however, indicate that these particular locations are not wetlands, and Amtrak will have to provide information to document this and petition the local authorities for a change in designation. Potential indirect impacts on wetlands include siltation and sedimentation, as well as runoff of contaminants. Potential operational impacts include stormwater runoff from the adjacent facilities sites.

The proposed electrification may result in indirect impacts to wetlands (siltation, sedimentation,and contamination) at seven of the 25 electrification facility sites and three of the nine bridges to be modified. These include the following:

Facility Sites	Bridges
Leetes Island PS	Burdickville Rd.
Madison PS	Depot St.
Grove Beach PS	Maskwonicut St.
Old Lyme PS	
Bradford PS	
Richmond SwS	
Norton SwS	

4.12.3.2 Critical Wildlife Habitat. The Kingston paralleling station is proposed for a site of high wildlife value, and siting of this facility could have an impact.

The Connecticut River is also a critical wildlife habitat and the effects of burying electrical cable under the moveable portion of the Connecticut River Bridge may affect the characteristics of the habitat that give it its high value. A preliminary assessment of impacts indicates that there may be temporary impacts, including turbidity and disturbance of marine sediments, that may temporarily affect marine estuarine and anadromous fish (those fish that swim from the sea to fresh water for breeding purposes), especially during migration and spawning seasons. Further consultation with the U.S. Fish and Wildlife Service, the National Marine Fisheries Service and the appropriate divisions of ConnDEP will be undertaken as part of the FEIS/R.

4.12.3.3 Endangered Species. One Federally-listed endangered species, the short-nosed sturgeon, migrates into the Connecticut River in the area of the moveable bridge. There may be temporary impacts, including turbidity and disturbance of marine sediments, that may affect this species, especially during migration and spawning seasons. These impacts will be evaluated in consultation with the U.S. Fish and Wildlife Service, the National Marine Fisheries Service and the appropriate divisions of ConnDEP.

A state-listed endangered species, the American bittern, has been recorded within close proximity to the proposed Stonington paralleling station site. Indirect impacts to this species may occur as a result of activity associated with the site, including disturbance during the nesting season, if the species is found near the site. Consultation with the Connecticut Natural Diversity Database and the Connecticut Valley Wildlife Division of DEP will be initiated to ascertain the presence of this species and identify mitigation measures, should they be required.

Four Massachusetts-listed endangered species, the Spotted and Blandings turtles, the Least bittern and the Elderberry longhorn beetle, may be present in the Fowl Meadow Area of Critical Environmental Concern (ACEC). Although no electrification facilities are proposed for this area, the catenary installation may affect these species. Consultation with the Massachusetts Natural Heritage Program and the Massachusetts DEP will be initiated to identify mitigation measures, should they be required.

4.12.3.4 Floodplains/Coastal Flood Hazard Area. Five of the electrification facilities are proposed for sites located within the 100-year flood boundary. These are the Leetes Island, Noank and Stonington paralleling stations, and the New London and Richmond substations. All of these facilities would be located on sites of less than one-quarter acre, which would have a minor effect on flood storage capacity and would not likely require creation of compensatory storage.

4.12.3.5 Water Resources. The electrification facilities sites and bridge modifications may affect both groundwater and surface water resources. The potential impacts on such resources are discussed below. The proposed project will not, however, affect the existing track drainage system along the railroad ROW. Consequently, there are no anticipated changes in the quantity of stormwater flow from the trackbed. The quality of the stormwater runoff should improve as a result of the elimination of the use of diesel-powered locomotives which occasionally leak fuel.

<u>Groundwater Resources.</u> Groundwater supplies include sole source aquifers, locally designated groundwater and recharge protection districts, and water supply wells. Proposed electrification facility sites and bridge modification locations proposed for siting over the aquifers or groundwater/recharge protection areas or in the immediate vicinity of water supply wells are as follows:

Facility or Bridge	Sole Source Aquifer	Groundwater/ Recharge Protect. Dist.	Water Supply Wells
Branford SS			x
State Line PS	x		
Bradford PS	x		x
Richmond SwS	x		
Kingston PS	x		
Exeter PS	x		
E. Greenwich PS	x		x
Burdickville Rd Br.	x		
Kenyon School Rd. Br.	x		
RI Route 138 Br.	x	x	
Norton SwS		x	
Depot St. Br.		x	x
Maskwonicut St. Br.		x	x

Potential impacts to groundwater include contamination that would reach the water resource through the soil, particularly from accidental spills or releases of contaminants during construction, normal leakage from construction equipment or trucks and stormwater runoff.

The MBTA has expressed a special concern relative to Amtrak proposals to lower the present track profile under bridge structures between Back Bay Station and South Station in Boston. During the decade of the 1980s, MBTA managed the construction of Southwest Corridor Project (SWCP) which involved reconstruction of the Northeast Corridor Route from a point east of Back Bay Station to a point west of Forest Hills (approximately 4.7 miles). This project involved placement of three high speed railroad tracks in a depressed alignment to replace the previous ground level and embankment line segment. For most of the length of this project, a "U" shape, reinforced concrete structure, supported by prestressed 100 foot long concrete piles, was installed. This structural configuration is commonly called a "boat section."

Concurrently with construction of the SWCP, the FRA determined to improve the track structure between the east end of the SWCP and the South Station as part of NECIP. This track segment improvement activity became known as "Project MUD." For this segment, a membrane was placed upon the subbase and then rock ballast and the track assembly installed over the membrane. Both the SWCP and Project MUD were designed so as to avoid adverse changes to the drainage patterns and the water table level within the two project areas.

Despite the drainage work constructed as part of Project MUD, and inspections verifying that the drainage improvements are functioning as designed, changes in the water table in the Back Bay area apparently continue. It is unclear what is the cause of such changes. MBTA is concerned that activities to add additional clearance under bridges in the Project MUD area could adversely impact the ground water levels in the area.

Amtrak plans to lower the three tracks at the Arlington/Tremont Streets Overhead Bridge (MP 228.13) and at the Albany/Broadway Overhead Bridge (MP 228. 51) within the Project MUD area to provide adequate clearance for the catenary. To accomplish this, Amtrak plans to remove a maximum of 5 inches of ballast in an area where the current depth of ballast under the ties ranges between 14 and 33 inches. The catenary will be either hung from bridges or from arms attached to existing concrete walls. Amtrak's proposal for increasing clearances and installing the catenary in the Project MUD area will not affect, either positively or negatively, the drainage system in this area or ground water levels.

Adjusting the depth of ballast section should not have any impact on the ground water levels. A ballast section is designed to allow for maximum drainage and ground water levels do not regularly extend into the ballast section. Amtrak also proposes construction techniques to avoid damaging the membrane. Amtrak does not plan to use the undercutters in this area; instead it will use front end loaders and similar construction equipment. (In a previous inspection of the membrane, all of the ballast was removed using the same procedures, with no damage to the membrane.)

The installation of catenary also should not have any impact on the ground water levels since no poles will be used in the Project MUD area. By eliminating the need for catenary poles and their foundations in this area, the membrane or adjacent ballast will not be disturbed.

Surface Water Resources. Two of the 25 proposed facilities sites and two of the nine bridges to be modified are located within the buffer of surface waters. These include the following:

Facility or Bridge	Surface Water
Noank PS	unnamed stream
Richmond SwS	Pawcatuck River*
Dept St. Bridge	Beaver Brook
Maskwonicut St. Bridge	Beaver Brook

* RI buffer zone is 200 feet for large rivers, including this one.

Potential short-term indirect impacts of the proposed facilities on surface waters include siltation and sedimentation, as well as runoff of contaminants. Potential long-term impacts to water resources from the Noank paralleling station and the Richmond switching station include stormwater runoff.

4.13 HAZARDOUS AND SOLID WASTE

This section evaluates the potential for disturbance of hazardous waste on bridges to be modified (e.g. lead paint) and the potential for disturbance of hazardous waste on sites to be disturbed by construction. It also addresses the issue of the disposal of solid waste generated by project construction.

4.13.1 Methods of Analysis

Hazardous waste is generally defined as a material that, because of its quantity, concentration, chemical corrosive, caustic, toxic, radioactive, reactive or infectious characteristics, constitutes a potential threat to human health, safety and welfare, or to the environment when improperly stored, treated, transported, disposed of, used, or otherwise managed.

4.13.1.1 Amtrak-owned Properties. Of the 25 proposed electrification facility sites, eight are located on Amtrak property and the remainder would be sited on public or private property to be acquired by Amtrak. Sites located adjacent to the ROW could contain chemical contamination typically associated with diesel locomotive systems such as diesel fuel and grease, but are less likely to be contaminated than sites within rail yards or stations where trains are more likely to sit idle.

4.13.1.2 Properties not Owned by Amtrak. On the 17 sites Amtrak proposes to acquire, ownership histories and database searches provided by Amtrak (property deed) were examined to determine whether the properties have the potential to contain chemical contamination onsite which could be disturbed during construction. The ownership history was evaluated to determine whether former land use activities on the site may have involved a release of hazardous waste (e.g. chemical or manufacturing companies). The computer search of several databases was examined for historical information regarding contamination on the proposed sites. The depth of the history varied, depending upon the availability of information. In reviewing this data, it was assumed that individual names indicated residential use and company names or titles indicated commercial or industrial use. In some cases, the company name is indicative of the general type of activity (e.g. Sun Chemical Corporation), which adds to the accuracy of the evaluation.

Amtrak also conducted a computer search of several environmental databases to determine whether any of the properties to be acquired had a history of contamination or had been reported for a release of hazardous materials into the environment. This computer search included a review of eight Federal and state environmental databases, including Federal and state superfund sites, state hazardous waste sites, and underground storage tank sites. The number of listed sites in the databases ranged from 1,200 in the National Priorities List to 34,000 in the Superfund database. Of the properties searched, only the Elmwood paralleling station site was listed in one of the databases. However, the record also indicated that the Environmental Protection Agency conducted a preliminary assessment of this site and had determined that no further action was necessary since no hazardous materials were found. No additional information indicating contamination was identified for any site as a result of the database review.

4.13.1.3 Bridge Modifications. Lead is typically found on most steel bridges due to the favorable performance characteristics of lead-based paint and the widespread use of this paint until the 1960s. This substance would likely be disturbed during bridge raising or replacement. Bridges constructed of concrete or timber are not likely to be painted, but steel bridges are and this characteristic was used to determine the likelihood of the presence of lead-based paint.

4.13.2 Hazardous Waste Impacts

Seventeen of the 25 proposed facilities sites have a low potential for containing hazardous materials. The Leetes Island, Madison, Old Lyme, Millstone, Bradford, and Exeter sites would be located along the ROW owned by Amtrak and therefore have minimal potential for containing hazardous waste. The Grove Beach, Stonington, Attleboro, Norton and East Foxboro sites appear to have a solid history of residential use and therefore minimal potential for containing hazardous waste. The Warwick, Kingston, Noank and East Greenwich sites appear to have supported a mix of residential, commercial or governmental ownership which would indicate a minimal potential for hazardous waste. While the Canton site is a former railroad property, it was not a rail yard, and therefore has a minimal potential for containing hazardous waste. As discussed above, the Elmwood site also has a low potential for containing hazardous materials.

Eight sites have a moderate or high potential for contamination. Four of the sites, (the proposed Westbrook, CT, Providence, RI, New London, CT, and Readville, MA facilities sites), would be located in existing or former rail yards, stations or sidings and therefore have a higher potential for containing contaminated waste. The four remaining sites show moderate to high potential for contamination based on existing or previous land use. These are:

Site Location	Likely Ownership Sources of Contamination
Branford, CT	Connecticut Waste Authority (1942-1958)
Richmond, RI	Various chemical companies (1946-1971)
State Line, CT	Emmett Oil Company (1959-1983)
Roxbury, MA	Electric utility company (1955-1975) and transit agency (1975-present)

Of the nine overhead roadway bridges Amtrak proposes to raise or replace, only one bridge, Park Avenue, is constructed of steel and is likely to contain some concentration of lead in the paint. Disposal of lead in concentrations above 5 parts per million (0.0005 percent) is regulated by Federal and state agencies.

4.13.3 Solid Waste Assessment

The proposed electrification project is expected to generate solid waste during construction, particularly during installation of the electrification facilities sites and undercutting at bridges. The potential types of solid waste include: 1) ballast from undercutting operations at 27 bridges, 2) cleared vegetation and excavated soil and rock from 25 electrification facilities sites, and 3) construction debris from the nine bridge modification projects. Amtrak proposes to dispose of solid wastes from this project in compliance with state and local regulations for waste disposal.

CHAPTER 5
SUMMARY OF IMPACTS, MITIGATION AND PERMIT REQUIREMENTS

The evaluation of the no build alternative and Amtrak's proposed electrification of the Northeast Corridor (NEC) and the no-build alternative involve the collection, organization and analysis of an abundance of technical information, much of which is presented in the previous chapters of this DEIS/R. This chapter synthesizes this information in order to assist decision-makers and the public in assessing each alternative. This information includes:

- A summary of the project benefits;
- The identification of potential impacts of the proposed project and alternatives for mitigating them;
- Outstanding issues to be addressed further:
- Short-term use of the environment versus long-term productivity;
- Irreversible and irretrievable commitment of resources; and
- Required Federal and state environmental permits.

Sections 5.1 through 5.6 of this chapter discuss each of these factors, respectively.

5.1 ENVIRONMENTAL AND SOCIAL BENEFITS OF THE PROPOSED PROJECT

Although discreet elements of the proposed electrification project could result in potentially adverse impacts, others would provide environmental benefits or improvements. Specifically, there are economic, transportation, air quality and energy benefits of the project. Approximately 330 permanent and 600-700 temporary (construction) jobs would be created by the proposed electrification. This represents an increase of approximately 0.1 percent of total employment in the affected communities. Each of the region's airports would experience an improvement in ground traffic congestion, with the greatest improvement, a two percent reduction in average weekday traffic, occurring at Logan International in Boston.

The greatest environmental benefits derived as a result of the proposed electrification would come in the area of air quality. Reductions would occur in total transportation-related emissions in the region and emissions along the corridor from diesel locomotives in intercity passenger service would be eliminated. The proposed electrification would result in a net reduction of total volatile organic compounds (VOCs) in the NEC of 166 kg/day; a savings of 7 percent over the 2010 background (no-build) emissions of 2,682 kg/day. This reduction would be due in part to the elimination of the Amtrak diesel locomotives and in part to modal shifts from aircraft and automobiles to rail, as shown in Table 4.10-2.

The proposed electrification would eliminate over 2,220 kg/day of oxides of nitrogen (NOx) emissions in the NEC due to a switch by Amtrak from diesel-powered to the proposed electrically-powered locomotives. Another 691 kg/day reduction would occur due to diversion from automobiles and aircraft travelers to the intercity train (Table 4.10-3). These savings, however, would be partially offset by a new source of emissions from power generation. Compared with the corresponding no-build emissions, Nox emissions in the NEC with the build scenario are approximately 1,658 kg/day or 13 percent lower.

The proposed projected is expected to result in a reduction in the total carbon monoxide (CO) emissions in the NEC of 1,038 kg/day. This reduction would be due in part to the elimination of the Amtrak diesel locomotives (saving 196 kg/day) and in part to the projected diversion from automobiles (saving 449 kg/day) and aircraft (savings of 485 kg/day). The proposed electrification will, however, introduce a new source of CO associated with power generation. The new emissions of 92 kg/day from power generation, however, represent less than one percent of the total NEC emissions under the electrification alternative, with a net reduction of 946 kg/day over the background level attributable to the proposed electrification (Table 4.10-4).

Finally, while generation of electricity for the proposed project would require greater petroleum use to power the 26 intercity trains in each direction with electricity under the proposed alternative than the 12 diesel trains under the no action alternative, the proposed electrification would result in a net reduction of petroleum by all travel modes in the NEC of nearly ten million gallons annually, which represents a reduction of 8.8 percent. There would also be associated with electric generation under the proposed project a net increase in natural gas usage of 1.0 billion cubic feet annually, which represents an overall significant decrease in dependence upon foreign sources of energy (petroleum) in favor of an increased dependence upon domestic products (natural gas).

5.2 SUMMARY OF ADVERSE IMPACTS AND POTENTIAL MITIGATION

5.2.1 No-Build Alternative

Amtrak ridership is anticipated to increase by 832,000 or 80% percent between 1992 and 2010, without the proposed electrification. However, no facilities would be constructed. Therefore, no adverse impacts are expected to result from the no-build alternative in the areas of land use, socioeconomics, historic and archaeological resources, electromagnetic fields and interference, public safety, transportation and traffic, visual and architectural effects and natural resources. Under this alternative, 67 residences would experience train noise levels and 360 residences and one school would experience train vibration levels that exceed the impact criteria thresholds. The energy and air quality impacts of this alternative are described below.

The no-build alternative will result in a 20 percent increase in diesel fuel consumption in 2010 over the present condition, due to the projected addition of two intercity passenger trains daily in each direction. However, the number of intercity passenger miles traveled is anticipated to increase by 55 percent, resulting in a lower consumption of fuel per passenger mile in 2010 (1,254 Btus) than in 1992 (1,446 Btus). This is due to the greater number of intercity passengers anticipated in 2010, which will be accommodated not only by the four additional trains per day, but also by filling currently unused seats on existing trains.

Although the total vehicle miles traveled in the NEC are anticipated to increase between 1992 and 2010 and the number of aircraft flights will remain relatively stable, the levels of VOC and CO emissions from these two sources are anticipated to decrease significantly for two reasons. First, the Federal Motor Vehicle Emissions Control Program (FMVCP) and the state Inspection and Maintenance (I/M) programs, which will require significantly reduced automobile and bus emissions, are anticipated to be implemented during this period. Second, even though aircraft flights are not expected to significantly change, the future aircraft fleet is expected to have more efficient engines, which emit lower levels of VOC, higher levels of NOx and similar levels of CO. Thus, without the electrification, corridor-wide transportation-related VOC emissions are expected to decrease by 41 percent, NOx emissions to increase by 25 percent and CO emissions to decrease by 50 percent between 1992 and 2010. Each of these represents a significant change from current conditions.

The FMVCP and I/M programs will also result in decreases in CO concentrations (as a result of decreased automobile CO emissions) around the passenger rail stations, even though ridership is anticipated to increase by approximately three percent annually during the 18 year-period from 1992 to 2010.

5.2.2 Amtrak's Proposed Electrification Project

Due to the large geographic area of the project corridor (156 miles) and the multitude of project components (25 electrification facility sites, 9 bridges to be raised or replaced, 27 bridges to be undercut, 17 bridges to be otherwise altered, 14 grade crossings, and 22 railroad stations), the following discussion of adverse impacts and mitigation has been divided into five parts, corresponding to the six major project elements:

- **Electrification Facilities and Roadway, Pedestrian and Railroad Bridges to be Modified:** Impacts are identified by facility site or bridge, including land use, historic, noise and vibration from construction and facility operation, archaeology, traffic, air quality, architectural and natural resources impacts.

- **Railroad Stations:** Traffic, parking and traffic-generated noise and air quality impacts, as well as pedestrian hazards, are discussed by station.

- **Grade Crossings:** Public safety impacts and changes in delay at grade crossings are identified by crossing.

- **Corridor Segments:** Impacts at specific sites along the corridor not addressed above, or along specific segments of the corridor or the entire corridor are discussed, including: 1) socioeconomic impacts, 2) effects on historic districts and properties, 3) train noise and vibration, 4) electromagnetic fields 5) pedestrian hazards along the corridor, 6) effects on other NEC rail operations, and 7) visual impacts.

- **Corridor-wide or Regional Impacts:** Regional and other significant effects that have impacts beyond the corridor segments, including socioeconomic, electromagnetic interference and energy impacts.

This material is presented in this way in order to provide a comprehensive picture of all of the impacts at a particular site or location.

5.2.2.1 Impacts at the Electrification Facilities Sites and Bridge Modifications. Impacts that may require mitigation may result from the construction or operation of many of the electrification facilities and modified bridges. Table 5.2-1 summarizes all of the impacts at each of the affected locations. A brief description of these impacts and associated potential mitigation measures are discussed below. No adverse impacts are anticipated from the proposed activities at the Millstone or Providence paralleling stations.

Land Use. The Norton switching station is proposed for the site of an existing residence and the Warwick substation is proposed for the site of an existing business. In order to mitigate the effects of these takings, relocation assistance will be provided in accordance with the Federal Uniform Relocation Assistance Act of 1970.

Modification of Historic Bridges. Ten bridges that are listed or eligible for listing on the National Register of Historic Places (National Register) may be adversely affected by the proposed electrification project. These determinations of eligibility and effect are to be confirmed in consultation with the state historic preservation officers (SHPOs) in each state.

Amtrak proposes to raise the bridge at Rhode Island Route 138 (Main Street), which is likely eligible for listing on the National Register. In addition, eight-foot high solid barriers are proposed for the entire length of each side of the bridge. These activities will require a determination of effect by the FRA in consultation with the Rhode Island SHPO. Potential mitigation measures, such as lowering the trackbed rather than raising the bridge, will be discussed as part of the consultation with the SHPO. Should the proposed modifications be the only feasible options, the project could preserve as much of the historic integrity of the bridge as possible, such as the railings of the bridge. If these measures prove infeasible, the bridge could be recorded to the standards of the Historic American Engineering Record (HAER) prior to alteration.

Ten roadway or pedestrian bridges are listed or eligible for listing on the National Register, however, only nine would be affected, as shown in Table 4.3-3. Amtrak proposes to attach the catenary to the underside of these bridges and to erect eight-foot high barriers along both sides of the length of the bridges to prevent pedestrians from touching the wires. The effect of attaching the catenary to the bridges is not expected to be adverse, due to other modern elements already present in the visual landscape, such as transmission lines, street lights and adjacent properties. However, the proposed protective barriers may result in a visual and structural alteration to the historic characteristics of eight roadway and one pedestrian bridge, as indicated in Table 4.3-3 (the tenth bridge is already altered by barriers). The potential adverse visual and structural effects of solid protective barriers could be minimized through a variety of measures ranging from the redesign of the barriers to identification of less intrusive methods for protecting the catenary system. A determination of effect would be made by FRA in consultation with the appropriate SHPOs, and consultations would be held on the adequacy of various mitigation alternatives.

Modification of Historic Railroad Bridges. Thirty-six railroad bridges were identified in the study corridor that are listed on or eligible for listing on the National Register. While the visual intrusion of installing the overhead catenary may affect the appearance of railroad bridges, in most cases the effect is not expected to be adverse because the span of most of these bridges is less than 200 feet - the approximate distance between catenary poles along each side of the corridor (Table 4.3-2). Therefore, installation of catenary support poles on the bridges should not be necessary.

At seven of the railroad bridges, however, the bridge length will require that catenary poles be installed on the bridges, which constitutes an effect. Effects on these structures will be evaluated by FRA on an individual basis in consultation with the SHPO in each state. These bridges include:

Connecticut River Railroad Bridge	Old Saybrook, CT
Niantic River Railroad Bridge	East Lyme, CT,
Central Vermont Railroad Bridge	New London, CT
Thames River Railroad Bridge	New London, CT
Pawtuxet River Railroad Bridge	Cranston, RI
Blackstone River Railroad Bridge	Pawtucket, RI
Canton Viaduct	Canton MA

Noise from Construction. Table 5.2-1 indicates the areas in which residences would be affected by noise during construction of the electrification facilities or raising or replacement of the roadway bridges. Construction noise impacts can be reduced by including specific noise control requirements in the construction contract specifications. The specifications should require contractors to: 1) select the equipment and techniques that generate the lowest noise levels, 2) use equipment with effective mufflers, 3) certify compliance with noise monitoring, and 4) select haul routes that minimize truck noise in residential areas. Noise from undercutting of the track at 27 bridges along the 156 mile corridor would

TABLE 5.2-1. POTENTIAL IMPACTS AND ALTERNATIVES FOR MITIGATION AT FACILITIES SITES AND ROADWAY AND RAILROAD BRIDGES

FACILITY[1] OR BRIDGE/LOCATION	POTENTIAL IMPACT	ALTERNATIVES FOR MITIGATION
Olive St. Bridge New Haven, CT MP 73.08	Solid barrier would obscure &/or physically alter National Register-eligible resource	Redesign barriers or find less intrusive method for protecting public from catenary in consultation with SHPO
Ferry St. Bridge New Haven, CT MP 74.38	Solid barrier would obscure &/or physically alter National Register-eligible resource	Redesign barriers or find less intrusive method for protecting public from catenary in consultation with SHPO
Branford SS Branford, MA MP 79.26	Disturbance of intact buried cultural remains in utility corridor	Consultation with SHPO
	Operational noise at one residence	Sound absorptive barrier walls & quiet fans or fan silencers
	Contamination of private wells	Construction staging, equipment storage & vehicle maintenance outside protected area; develop spill contingency plans for accidental release of contaminants; cut vegetation rather than spraying with herbicide
Leetes Island PS Guilford, CT MP 85.99	Disturbance of intact buried cultural remains	Consultation with SHPO
	Operational noise at 1 residence	Sound absorptive barrier walls & quiet fans or fan silencers
	Construction noise at 1 residence for 2-3 months	Noise control requirements in specifications[2]; keep community informed of work schedule
	Siltation, sedimentation or contamination of wetlands during construction	Erosion & sedimentation control (haybales, silt fencing, etc.) during construction; maximize distance to wetland; minimize footprint; stabilize slopes; stage & repair construction equipment & vehicles off-site
Madison PS Madison, CT MP 92.41	Disturbance of intact buried cultural remains	Consultation with SHPO
	Fugitive dust, truck & equipment exhaust during construction	Wet or chemically treat exposed earth; cover dust producing material during transport; limit construction during high winds; keep trucks clean & route away from residential areas
	Siltation, sedimentation or contamination of wetlands during construction	Erosion & sedimentation control (haybales, silt fencing, etc.) during construction; maximize distance to wetland; minimize footprint; stabilize slopes; stage & repair construction equipment & vehicles off-site

TABLE 5.2-1. POTENTIAL IMPACTS AND ALTERNATIVES FOR MITIGATION AT FACILITIES SITES AND ROADWAY AND RAILROAD BRIDGES (continued)

FACILITY[1] OR BRIDGE/LOCATION	POTENTIAL IMPACT	ALTERNATIVES FOR MITIGATION
Grove Beach PS Westbrook, CT MP 99.11	Operational noise at 15 residences	Sound absorptive barrier walls & quiet fans or fan silencers
	Construction noise at 2 residences for 2-3 months	Noise control requirements in specifications[2]; keep community informed of work schedule
	Construction vibration at 2 residences for 2-3 months	Restrict procedures & times for pile driving; require vibration monitoring to certify compliance with vibration limits; notify residents of duration & hours of construction
	Fugitive dust, truck & equipment exhaust during construction	Wet or chemically treat exposed earth; cover dust producing material during transport; limit construction during high winds; keep trucks clean & route away from residential areas
	Siltation, sedimentation or contamination of wetlands during construction	Erosion & sedimentation control (haybales, silt fencing, etc.) during construction; maximize distance to wetland; minimize footprint; stabilize slopes; stage & repair construction equipment & vehicles off-site
Westbrook SwS, Westbrook, CT MP 103.53	Operational noise at 3 residences	Sound absorptive barrier walls & quiet fans or fan silencers
	Fugitive dust, truck & equipment exhaust during construction	Wet or chemically treat exposed earth; cover dust producing material during transport; limit construction during high winds; keep trucks clean & route away from residential areas
Connecticut River RR Bridge Old Saybrook, CT MP 106.89	Installation of catenary/alteration of National Register-listed resource	Consultation with SHPO
	Disturbance of Federally-listed endangered species & other critical fisheries during construction	Schedule work outside spawning & migrating seasons; compliance with ConnDEP water quality standards & conditions for water quality certificate; consult with NMFS, USF&WS & ConnDEP
Johnnycake Hill Rd. Bridge Old Lyme, CT MP 108.51	Disturbance of intact buried cultural remains	Consultation with SHPO
	Construction noise at 1 residence for 1 month	Noise control requirements in specifications[2]; keep community informed of work schedule
	Construction vibration at 2 residences for 2-3 months	Restrict procedures & times for pile driving; require vibration monitoring to certify compliance with vibration limits; notify residents of duration & hours of construction
Old Lyme PS Old Lyme, CT MP 109.50	Disturbance of intact buried cultural remains	Consultation with SHPO
	Siltation, sedimentation or contamination of wetlands during construction	Erosion & sedimentation control (haybales, silt fencing, etc.) during construction; maximize distance to wetland; minimize footprint; stabilize slopes; stage & repair construction equipment & vehicles off-site.
Rocky Neck Park Trail Br. Old Lyme, CT MP 112.74	Solid barrier would obscure &/or physically alter National Register-listed resource	Redesign barriers or find less intrusive method for protecting public from catenary in consultation with SHPO

TABLE 5.2-1. POTENTIAL IMPACTS AND ALTERNATIVES FOR MITIGATION AT FACILITIES SITES AND ROADWAY AND RAILROAD BRIDGES (continued)

FACILITY[1] OR BRIDGE/LOCATION	POTENTIAL IMPACT	ALTERNATIVES FOR MITIGATION
Niantic R. RR Bridge East Lyme, CT MP 116.74	Installation of catenary/alteration of National Register-listed resource	Consultation with SHPO
Millstone Point Rd. Br. Waterford, CT MP 117.31	Fugitive dust, truck & equipment exhaust during construction	Wet or chemically treat exposed earth; cover dust producing material during transport; limit construction during high winds; keep trucks clean & route away from residential areas
New London SS New London, CT MP 123.55	Operational noise at 2 residences	Sound absorptive barrier walls & quiet fans or fan silencers
Central Vermont RR Bridge New London, CT MP 123.80	Installation of catenary/alteration of National Register-listed resource	Consultation with SHPO
Thames R. RR Br. New London, CT MP 124.09	Installation of catenary/alteration of National Register-listed resource	Consultation with SHPO
Haley Farm Historic Rural Landscape Groton, CT MP 129.30	Installation of catenary/alteration of unique National Register-eligible historic landscape	Consultation with SHPO
Noank PS Groton, CT MP 129.46	Displacement of Esker Beach parking lot	Section 4(f) statement; provide replacement parking nearby or relocate proposed facility
	Operational noise at 4 residences	Sound absorptive barrier walls & quiet fans or fan silencers
	Fugitive dust, truck & equipment exhaust during construction	Wet or chemically treat exposed earth; cover dust producing material during transport; limit construction during high winds; keep trucks clean & route away from residential areas
	Siltation, sedimentation or contamination of stream during construction	Erosion & sedimentation control (haybales, silt fencing, etc.) during construction; maximize distance to stream: stabilize slopes; stage & repair construction equipment & vehicles off-site.
	View of waterfront diminished	Relocate paralleling station
	Station out of scale & character with existing neighborhood	Enclose substation in building or provide screening compatible with neighborhood character
Wilcox Road Rural Historic District Stonington, CT MP 133.77	Installation of catenary/alteration of unique National Register-eligible historic landscape	Consultation with SHPO

TABLE 5.2-1. POTENTIAL IMPACTS AND ALTERNATIVES FOR MITIGATION AT FACILITIES SITES AND ROADWAY AND RAILROAD BRIDGES (continued)

FACILITY[1] OR BRIDGE/LOCATION	POTENTIAL IMPACT	ALTERNATIVES FOR MITIGATION
West St. Bridge Westerly, RI MP 141.67	Solid barrier would obscure &/or physically alter National Register-eligible resource	Redesign barriers or find less intrusive method for protecting public from catenary in consultation with SHPO
Stonington PS Stonington, CT MP 143.65	Disturbance of intact buried cultural remains	Consultation with SHPO
	Disturbance of state-listed endangered species habitat	Consult with Connecticut Wildlife Division & Natural Diversity Database
State Line PS Stonington, CT MP 139.93	Disturbance of intact buried cultural remains	Consultation with SHPO
	Operational noise at 5 residences	Sound absorptive barrier walls & quiet fans or fan silencers
	Contamination of sole source aquifer	Construction staging, equipment storage & vehicle maintenance outside protected area; develop spill contingency plans for accidental release of contaminants; cut vegetation rather than spraying with herbicide
Bradford PS Bradford, RI MP 145.19	Siltation, sedimentation or contamination of wetlands during construction	Erosion & sedimentation control (haybales, silt fencing, etc.) during construction; maximize distance to wetland; minimize footprint; stabilize slopes; stage & repair construction equipment & vehicles off-site
	Contamination of sole source aquifer & water supply wells	Construction staging, equipment storage & vehicle maintenance outside protected area; develop spill contingency plans for accidental release of contaminants; cut vegetation rather than spraying with herbicide
Burdickville Rd. Bridge Charlestown, RI MP 148.41	Disturbance of intact buried cultural remains	Consultation with SHPO
	Siltation, sedimentation or contamination of wetlands during construction	Erosion & sedimentation control (haybales, silt fencing, etc.) during construction; maximize distance to wetland, minimize footprint; stabilize slopes; stage & repair construction equipment & vehicles off-site.
	Contamination of sole source aquifer	Construction staging, equipment storage & vehicle maintenance outside protected area; develop spill contingency plans for accidental release of contaminants; cut vegetation rather than spraying with herbicide

TABLE 5.2-1. POTENTIAL IMPACTS AND ALTERNATIVES FOR MITIGATION AT FACILITIES SITES AND ROADWAY AND RAILROAD BRIDGES (continued)

FACILITY[1] OR BRIDGE/LOCATION	POTENTIAL IMPACT	ALTERNATIVES FOR MITIGATION
Richmond SwS Richmond, RI MP 150.35	Siltation, sedimentation or contamination of wetlands & Pawcatuck River during construction	Erosion & sedimentation control (haybales, silt fencing, etc.) during construction; maximize distance to wetland or river; minimize footprint; stabilize slopes; stage & repair construction equipment & vehicles off-site
	Contamination of sole source aquifer	Construction staging, equipment storage & vehicle maintenance outside protected area; develop spill contingency plans for accidental release of contaminants; cut vegetation rather than spraying with herbicide
Kenyon School Rd. Bridge Richmond, RI MP 154.04	Disturbance of intact buried cultural remains	Consultation with SHPO
	Construction noise at 7 residences for 3 months	Noise control requirements in specifications[2]; keep community informed of work schedule
	Construction vibration at 6 residences for 3 months	Restrict procedures & times for pile driving; require vibration monitoring to certify compliance with vibration limits; notify residents of duration & hours of construction
	Fugitive dust, truck & equipment exhaust during construction	Wet or chemically treat exposed earth; cover dust producing material during transport; limit construction during high winds; keep trucks clean & route away from residential areas
	Contamination of sole source aquifer	Construction staging, equipment storage & vehicle maintenance outside protected area; develop spill contingency plans for accidental release of contaminants; cut vegetation rather than spraying with herbicide
Kingston PS South Kingstown, RI MP 157.11	Disturbance of intact buried cultural remains	Consultation with SHPO
	Diminish quality of high value wildlife habitat	Preserve large oak tree; locate facility as far away as possible from tree; plant native shrub species around facility
	Contamination of sole source aquifer	Construction staging, equipment storage & vehicle maintenance outside protected area, develop spill contingency plans for accidental release of contaminants; cut vegetation rather than spraying with herbicide

TABLE 5.2-1. POTENTIAL IMPACTS AND ALTERNATIVES FOR MITIGATION AT FACILITIES SITES AND ROADWAY AND RAILROAD BRIDGES (continued)

FACILITY[1] OR BRIDGE/LOCATION	POTENTIAL IMPACT	ALTERNATIVES FOR MITIGATION
Main St./RI Route 138 Bridge South Kingstown, RI MP 158.32	Solid barrier would obscure &/or physically alter National Register-eligible resource	Consultation with SHPO
	Raising would alter National Register-eligible resource	Consult with SHPO; lower tracks; preserve significant historic features; record to HAER standards prior to alteration
	Fugitive dust, truck & equipment exhaust during construction	Wet or chemically treat exposed earth; cover dust producing material during transport; limit construction during high winds; keep trucks clean & route away from residential areas
	Contamination of sole source aquifer & protected groundwater	Construction staging, equipment storage & vehicle maintenance outside protected area; develop spill contingency plans for accidental release of contaminants; cut vegetation rather than spraying with herbicide
Exeter PS Exeter, RI MP 161.78	Contamination of sole source aquifer & protected groundwater	Construction staging, equipment storage & vehicle maintenance outside protected area; develop spill contingency plans for accidental release of contaminants; cut vegetation rather than spraying with herbicide
Hunt's River Road Bridge N. Kingstown, RI MP 169.79	Solid barrier would obscure &/or physically alter National Register-eligible resource	Redesign barriers or find less intrusive method for protecting public from catenary in consultation with SHPO
E. Greenwich PS N. Kingstown, RI MP 169.80	Contamination of sole source aquifer & water supply wells	Construction staging, equipment storage & vehicle maintenance outside protected area; develop spill contingency plans for accidental release of contaminants; cut vegetation rather than spraying with herbicide
Greenwood (RR) Bridge Warwick, RI MP 175.70	Installation of catenary/alteration of National Register-eligible historic resource	Redesign barriers or find less intrusive method for protecting public from catenary in consultation with SHPO
Warwick SS Warwick, RI MP 176.91	Displacement of lumber business	Relocation of business in suitable location in accordance with requirements of Federal Uniform Relocation Assistance Act of 1970
	Operational noise at 34 residences	Sound absorptive barrier walls & quiet fans or fan silencers
	Construction noise at 5 residences for 4 months	Noise control requirements in specifications[2]; keep community informed of work schedule

TABLE 5.2-1. POTENTIAL IMPACTS AND ALTERNATIVES FOR MITIGATION AT FACILITIES SITES AND ROADWAY AND RAILROAD BRIDGES (continued)

FACILITY[1] OR BRIDGE/LOCATION	POTENTIAL IMPACT	ALTERNATIVES FOR MITIGATION
Pettaconsett Ave. Bridge Warwick, RI MP 178.46	Construction noise at 12 residences for 4.5 months	Noise control requirements in specifications[2]: keep community informed of work schedule
	Construction vibration at 7 residences for 4.5 months	Restrict procedures & times for pile driving; require vibration monitoring to certify compliance with vibration limits; notify residents of duration & hours of construction.
	Fugitive dust, truck & equipment exhaust during construction	Wet or chemically treat exposed earth; cover dust producing material during transport; limit construction during high winds; keep trucks clean & route away from residential areas
Pawtuxet R. RR Bridge Cranston, RI MP 179.16	Installation of catenary/alteration of National Register-eligible resource	Consultation with SHPO
Park Ave. Bridge Cranston, RI MP 180.29	Degradation of traffic operating conditions during construction, from LOS D to LOS E at Park Ave./ Reservoir Ave. intersection	Temporarily reassign eastbound left turn & through lanes of Park Avenue to left turn only & change signal phasing to support
Elmwood PS Providence, RI MP 181.707	Disturbance of intact buried cultural remains	Consultation with SHPO
Central St. Pedestrian Viaduct Central Falls, RI MP 190.00	Solid barrier would obscure &/or physically alter National Register-eligible resource	Redesign barriers or find less intrusive method for protecting public from catenary in consultation with SHPO
Blackstone R. RR Bridge MP 190.55	Installation of catenary/alteration of National Register-eligible resource	Consultation with SHPO
Attleboro PS Attleboro, MA MP 193.40	Disturbance of intact buried cultural remains	Consultation with SHPO
	Operational noise at 2 residences	Sound absorptive barrier walls & quiet fans or fan silencers
	Siltation, sedimentation or contamination of Ten Mile River during construction	Erosion & sedimentation control (haybales, silt fencing, etc.) during construction; maximize distance to river; stabilize slopes; stage & repair construction equipment & vehicles off-site

TABLE 5.2-1. POTENTIAL IMPACTS AND ALTERNATIVES FOR MITIGATION AT FACILITIES SITES AND ROADWAY AND RAILROAD BRIDGES (continued)

FACILITY[1] OR BRIDGE/LOCATION	POTENTIAL IMPACT	ALTERNATIVES FOR MITIGATION
Norton SwS Attleboro, MA MP 198.99	Displacement of residence	Relocate residents in comparable setting in accordance with requirements of Federal Uniform Relocation Assistance Act of 1970
	Operational noise at 1 residence	Sound absorptive barrier walls & quiet fans or fan silencers
	Siltation, sedimentation or contamination of wetlands during construction	Erosion & sedimentation control (haybales, silt fencing, etc) during construction; maximize distance to wetland; minimize footprint; stabilize slopes; stage & repair construction equipment & vehicles off-site.
	Contamination of protected groundwater	Construction staging, equipment storage & vehicle maintenance outside protected area; develop spill contingency plans for accidental release of contaminants; cut vegetation rather than spraying with herbicide
E. Foxboro PS Foxboro, MA MP 205.70	Disturbance of intact buried cultural remains	Consultation with SHPO
	Operational noise 2 residences	Sound absorptive barrier walls & quiet fans or fan silencers
	Fugitive dust, truck & equipment exhaust during construction	Wet or chemically treat exposed earth; cover dust producing material during transport; limit construction during high winds; keep trucks clean & route away from residential areas
Depot St. Bridge Sharon, MA MP 211.04	Construction noise at 1 residence for 9 months	Noise control requirements in specifications[2]; keep community informed of work schedule
	Degradation of traffic operating conditions during construction, from LOS A to LOS D at Maskwonicut St./N. Main St. intersection	Temporary installation of signal or assignment of traffic officer during peak hours
	Siltation, sedimentation or contamination of wetlands, Beaver Brook & its fisheries, during construction	Erosion & sedimentation control (haybales, silt fencing, etc.) during construction; maximize work limit distance to wetland; minimize footprint; stabilize slopes; stage & repair construction equipment & vehicles off-site
	Contamination of protected groundwater & water supply wells	Construction staging, equipment storage & vehicle maintenance outside protected area; develop spill contingency plans for accidental release of contaminants; cut vegetation rather than spraying with herbicide

TABLE 5.2-1. POTENTIAL IMPACTS AND ALTERNATIVES FOR MITIGATION AT FACILITIES SITES AND ROADWAY AND RAILROAD BRIDGES (continued)

FACILITY[1] OR BRIDGE/LOCATION	POTENTIAL IMPACT	ALTERNATIVES FOR MITIGATION
Maskwonicut St. Bridge Sharon, MA MO 211.62	Fugitive dust, truck & equipment exhaust during construction	Wet or chemically treat exposed earth; cover dust producing material during transport; limit construction during high winds; keep trucks clean & route away from residential areas
	Siltation, sedimentation or contamination of wetlands, Beaver Brook & its fisheries, during construction	Erosion & sedimentation control (haybales, silt fencing, etc.) during construction; maximize work limit distance to wetland; minimize footprint; stabilize slopes; stage & repair construction equipment & vehicles off-site
	Contamination of protected groundwater & water supply wells	Construction staging, equipment storage & vehicle maintenance outside protected area; develop spill contingency plans for accidental release of contaminants; cut vegetation rather than spraying with herbicide
Canton PS Sharon, MA MP 212.40	Operational noise at 6 residences	Sound absorptive barrier walls & quiet fans or fan silencers
Canton Viaduct Canton, MA MP 213.74	Installation of catenary/alteration of National Register-listed resource	Consultation with SHPO
Readville PS Boston, MA MP 219.10	Operational noise at 6 residences	Sound absorptive barrier walls & quiet fans or fan silencers
Mount Hope Footbridge Boston, MA MP 223.31	Solid barrier would obscure &/or physically alter National Register-eligible resource	Redesign barriers or find less intrusive method for protecting public from catenary in consultation with SHPO
Roxbury Crossing SS Boston, MA MP 226.02	Disturbance of intact buried cultural remains on substation site	Consultation with SHPO
	Fugitive dust, truck & equipment exhaust during construction	Wet or chemically treat exposed earth; cover dust producing material during transport; limit construction during high winds; keep trucks clean & route away from residential areas
	Station out of scale & character with existing neighborhood	Enclose substation in building or provide screening compatible with neighborhood character

1 SS = Substation/Utility Corridor; SWS = Switching Station; PS = Paralleling Station; RR = Railroad (bridge)

2 Select equipment & techniques that generate lowest noise levels, use mufflers, certify compliance with noise limits by monitoring, select haul routes that minimize truck noise to surrounding communities.

be limited to approximately four nights at any individual location and therefore would not require mitigation. It should also be noted that construction noise will be intermittent and for limited duration.

Operational Noise from Transformers & Ventilation. Table 5.2-1 indicates the number of residences that would be affected by noise generated by each of the electrification facilities. Incorporation of sound absorptive barrier walls, quiet fans or fan silencers into the facility designs would mitigate these impacts. During final design, such noise control treatments could be incorporated into the project plans and construction contract documents.

Vibration from Construction. Table 5.2-1 indicates the number of residences that would be affected by vibration during construction of the Grove Beach paralleling station and the Johnnycake Hill Road, Kenyon School Road and Pettaconsett Road bridges. These impacts are related to annoyance effects and not to building damage effects, and will occur during the daytime for a period ranging from one month for the Johnnycake Hill Road bridge to 4.5 months for the Pettaconsett Avenue Bridge. Such impacts could be mitigated by restricting the procedures and time permitted for vibration-intensive activities, such as pile-driving and by requiring vibration monitoring to certify compliance with vibration limits. In addition, an active community liaison program could be implemented to ensure residents are kept informed of construction activities and have a means to register complaints. Vibration impacts from undercutting, which will be performed by light-duty construction equipment, are not expected to require mitigation.

Potential Archaeological Resources. Table 5.2-1 indicates the facility sites and bridge locations at which there is a moderate or high potential for the presence of buried cultural remains. FRA will make a determination regarding the need for additional archaeological investigations at these sites in consultation with the SHPOs in each state.

Traffic Conditions During Construction. Of the nine bridges Amtrak proposes to raise or replace to accommodate the catenary system, four will entail phased construction, resulting in no adverse traffic impacts. Of the remaining five, diversion of traffic to the detours described in section 4.9.4.4 of this report will not adversely affect traffic operations at Kenyon School Road or Maskwonicut Avenue - that is, there will be no change in the level of service (LOS). Due to the late addition of the Pettaconsett Avenue Bridge to the project, the effects of this detour will be addressed in the Final EIS/R.

At Park Avenue, the intersection of Park and Reservoir Avenues will experience a potential deterioration in operations, from LOS D to LOS E, during the 4-month construction period. Reassigning the eastbound left turn and through lane of Park Avenue to a left turn only, along with appropriate signal phasing to support this change, would serve to substantially alleviate the congestion created by the detour.

On the detour for the Depot Street Bridge, eastbound right turning movements at the intersection of Maskwonicut Avenue and North Main Street would decrease from LOS A to LOS D, during the 9-month construction period. Installation of a signal or the presence of a police officer to direct traffic during peak periods for the duration of the construction would serve to improve circulation and alleviate congestion from the detour.

Construction Air Quality Impacts. Construction-related activities can result in short-term impacts on ambient air quality. These potential impacts include fugitive dust emissions, direct emissions from construction equipment and truck exhausts, and increased emissions and dust from construction vehicles on the streets. The latter could occur in the vicinity of most of the proposed facility sites.

There are six proposed electrification facility sites and five bridge modification sites located close to residences and other sensitive receptors that may be affected by construction-related air quality impacts. These include: Roxbury substation; Westbrook switching station; Madison, Grove Beach, Noank and East

Foxboro paralleling stations; and Millstone Point Road, Kenyon School Road, Main Street, Pettaconsett Avenue, and Maskwonicut Street bridges.

Fugitive dust would be generated during periods of intense construction activity and would be accentuated by windy and/or dry conditions. Good housekeeping practices, such as wetting or chemically treating exposed earth areas, covering dust-producing materials during transport, and limiting construction activities during high wind conditions, would minimize the dust impacts. Direct emissions from construction equipment and trucks are generally not expected to require mitigation. However, exhaust emissions from diesel-powered trucks are a distinct source of odor and a potential source of fugitive dust emissions. Keeping the trucks clean and routing them away from residential and other sensitive receptor locations would alleviate these impacts. Trucks can be kept cleaner by installing a grating at the entrance and exit ways to the construction site to "shake" loose dust that adheres to the truck surfaces. Watering down the trucks on an as-needed basis will also be effective. Covering trucks or rail cars carrying excavated material will further reduce fugitive dust emissions.

Architectural Impacts. The proposed Roxbury Crossing substation and Noank paralleling station may be architecturally incompatible with the character of the neighborhood surrounding these proposed facilities sites. A possible means of limiting the visual intrusion would be to enclose them in a structure that is compatible in material and style with the surrounding neighborhood.

Potential Disturbance of Wildlife Habitat. The site for the proposed Kingston paralleling station may contain critical wildlife habitat that could be adversely affected by construction of the proposed facility. Preserving the large oak tree on the site, as well as locating the proposed facility as far from it as possible could considerably reduce the impact on the habitat. In addition, planting of shrub species could be incorporated in any landscaping of the site and should include species which would provide food, cover and nesting opportunities for birds and small mammals. Erosion and sedimentation control measures during and after development would also reduce habitat impacts by minimizing effects on adjacent wetland habitats.

A preliminary assessment of burying electrical cables under the moveable portion of the Connecticut River bridge indicates that there may be temporary impacts, including turbidity and disturbance of marine sediments, that may affect marine estuarine and anadromous fish (those fish that swim from the sea to fresh water for breeding purposes), especially during migration and spawning seasons. A Federally-listed endangered species, the short-nosed sturgeon, migrates into the Connecticut River in the area of the moveable bridge. There may be temporary impacts, that may affect this species, especially during migration and spawning seasons. Means to mitigate these potential impacts will be evaluated in consultation with the U.S. Fish and Wildlife Service, the National Marine Fisheries Service and the appropriate divisions of ConnDEP.

Indirect impacts to the American bittern, a state-listed endangered species which has been recorded within close proximity to the proposed Stonington paralleling station site, may occur as a result of activity associated with the site. Consultation of the Connecticut Natural Diversity Database and the Connecticut Valley Wildlife Division of ConnDEP will be initiated to ascertain the presence of this species and identify mitigation measures, should they be required.

Four Massachusetts-listed endangered species may be present in the Fowl Meadow Area of Critical Environmental Concern (ACEC), in the vicinity of the Neposnet River. Although no electrification facilities are proposed for this area, the catenary installation may affect these species. Consultation with the Massachusetts Natural Heritage Program and the Massachusetts DEP can be initiated to identify mitigation measures, should they be required.

Potential Siltation, Sedimentation and Contamination of Wetlands and Water Resources. As a number of the proposed electrification facility sites and bridge modifications are located in the buffer zone or otherwise in close proximity to wetlands, rivers, streams and other water resources, impacts to these resources are possible during construction of the project. Table 5.2-1 indicates the sites at which these impacts are anticipated.

Several measures can be taken to reduce or eliminate the potential for sedimentation, siltation or contamination of wetlands and water resources. Among the most important are utilizing proper erosion and sedimentation control measures, including the use of hay bales, silt fencing and other barrier methods during construction. In addition, maximizing the distance to the water resource, minimizing the footprint of the facility and stabilization of slopes would minimize the potential project effects. Short-term impacts to water quality associated with site development can also be minimized by staging construction equipment and performing any vehicle maintenance off-site.

Potential Contamination of Sole Source Aquifers, Water Supply Wells and Other Protected Groundwater Supplies. As indicated in Table 5.2-1, several of the electrification facility sites are proposed for locations within areas identified as locally protected groundwater or water supply wells, or as sole source aquifers. Sole source aquifers are identified and designated for protection by the U.S. Environmental Protection Agency (EPA). As these resources provide the principal or sole source of drinking water to a particular area, FRA will undertake consultation with the EPA administrator to identify measures that would ensure the protection of this resource.

Mitigation measures for work within these resource areas could include following the Best Management Practices (BMPs) for working in aquifer protection areas. BMPs are structural or non-structural practices that are determined to be the most effective, practical means of preventing or reducing pollution from nonpoint sources (e.g., stormwater runoff and construction development practices) in order to achieve state water quality goals. The steps to be taken during construction could include: 1) staging equipment and construction materials on impervious surfaces or outside protected area; 2) vehicle maintenance and storage outside the protected area; and 3) development of spill contingency plans in case of an accidental release of potential contaminants. Permanent, structural measures that could be taken would include the construction of swales to remove nutrients and suspended material and the construction of infiltration trenches or basins. Upon completion of construction, non-structural measures would include cutting vegetation rather than spraying with herbicides.

Additional Impacts. Siting of the Noank paralleling station in the parking lot of the Esker Beach recreation area would precipitate two adverse impacts. First, the view of the waterfront from residences on Seneca Road could be diminished, as described in Section 4.11.2.2 of this report. Second, taking a portion of the Esker Beach parking lot would limit access to this public recreation area and thereby constitute a "use" under Section 4(f) of the Department of Transportation Act of 1966. Moving the facility to another site would eliminate this use. Construction of replacement parking could mitigate this impact.

5.2.2.2 Impacts at Railroad Stations. This section addresses impacts of the proposed electrification that would occur in the vicinity of railroad stations. These include project-generated traffic due to increased ridership, and the consequent greater demand for parking. Also considered were the potential hazards to pedestrians crossing the tracks at the stations. Traffic-generated changes in noise and air quality are not expected to require mitigation.

Traffic at Railroad Stations. Additional ridership associated with the express service proposed by Amtrak at New Haven, Providence, Route 128, Back Bay and South Stations is projected to increase vehicular traffic around these stations, as described in Section 4.9.4 of this report. As described in that section, project-generated traffic is not expected to adversely affect traffic conditions at key intersections adjacent to the five stations.

Increased Parking Demand at Railroad Stations. To accommodate expected increases in ridership at the express stations, capacity should be expanded as listed below:

	Amtrak-Generated Parking Demand	
Station	Current	Electrification
South Sta.	110	225
Back Bay	15	70
Route 128	170	1,260
Providence	200	665
New Haven	240	470

At Route 128 station, evaluations prepared by the Massachusetts Bay Transportation Authority (MBTA) estimate a projected total need by 2010 of 2,300 spaces for both intercity and rail passengers. Amtrak is currently coordinating the expansion of parking at this station with the MBTA. Likewise, Amtrak should work with the Rhode Island and Connecticut Departments of Transportation (RIDOT and ConnDOT) to develop additional parking at Providence and New Haven stations, as well. In Boston, a citywide parking freeze limits the potential for expanded facilities at Back Bay and South Stations.

Pedestrian Hazards. Ten of the railroad stations along the NEC lack grade-separated pedestrian ways, requiring Amtrak passengers and commuters to cross the tracks. These include stations at Branford, Guilford, Madison, Mystic, Clinton, New London, Westbrook and Old Saybrook, CT; Kingston, RI, and Canton Junction, MA. At an additional seven stations (Westerly, RI; and South Attleboro, Attleboro, Mansfield, Sharon, Route 128, and Hyde Park in Massachusetts), low level platforms permit pedestrians to cross the tracks at grade, even though there are tunnels or bridges which could be used to avoid crossing the tracks at grade. The greater speeds of proposed through trains at these stations pose a potential hazard to pedestrians. The hazards could be substantially reduced by the installation of flashing signals and bells and platform markings. In addition, at the six Connecticut stations, holding commuter trains outside the station as Amtrak through trains pass would provide an additional measure of safety. At Hyde Park station, limitation of Amtrak trains to the center and eastern tracks, respectively, could provide additional protection to pedestrians.

5.2.2.3 Grade Crossings. It is anticipated that there will be no significant change in the potential for train-vehicular collisions or in vehicular delay at grade crossings along the NEC. While the accident prediction model estimated an increase due to the proposed action of 0.08 over the existing rate (a change from one collision every 5 years in 1992 and to one every 3 years in 2010 with electrification), this projection is extremely conservative, as there have been no accidents on the NEC for the past seven years.

As a result of the proposed action, average vehicular delay is anticipated to increase by a range of 2.5 to 5 seconds over the existing and no-build situations at the various grade crossings. While the delay would occur more frequently due to the increased frequency of train service, the increased delay experienced by individual motorists is not expected to require mitigation.

In section 2 of the Amtrak Authorization and Development Act (Pub. L. 102-533, October 27, 1992), the Congress directed FRA to prepare a plan for the elimination of all highway at-grade crossings on the NEC by December 31, 1997. This plan may provide that the elimination of a highway at-grade crossing not be required if eliminating such crossing is impracticable or unnecessary and the use of the crossing will be consistent with such conditions as the Secretary of Transportation considers appropriate to ensure safety.

FRA is in the process of developing this plan, which will be completed by the end of October 1993. Section 2 does not direct FRA to implement the plan once it is completed. In the past, public highway crossings of the NEC have been eliminated by the appropriate state departments of transportation according to the procedures that apply in that state for elimination of highway at-grade crossings. It is expected that this will continue to be the case. Decisions to eliminate highway at-grade crossings are separate and distinct from the electrification project. Any at-grade crossing elimination, however, would reduce the potential for impact.

5.2.2.4 Impacts Along the Northeast Corridor. Additional impacts that occur at specific sites along the corridor and are not addressed in the previous sections of this chapter, or that occur along segments of the corridor or the entire corridor, are discussed in this section. These include: 1) socioeconomic effects on property values 2) effects on historic districts and properties, 3) train noise and vibration, 4) electromagnetic fields, 5) pedestrian hazards along the corridor, 6) effects on other NEC rail operations and 7) effects on sensitive views.

Property Values. It is possible that some of the external effects of the proposed electrification, including increased noise, degradation of sensitive views and public perceptions regarding electromagnetic fields (EMFs), may have an effect on property values, although, as described below, such effects cannot be documented or quantified. As described in section 4.4 and 4.12 of this report respectively, some residential properties will experience elevated noise levels and diminished views. Although section 4.5 concludes that EMF levels from the proposed project are hundreds to thousands of times lower than guidelines recommended by several states and the international scientific community, recent media attention to the possibility of such effects may create the perception that project EMF levels may have adverse health effects and potentially diminish adjacent land values.

A literature search was conducted of several environmental, energy and general databases, but no studies were found that addressed the effects on property values due to railroad electrification. Some literature was found on the property value effect of utility transmission lines and although these facilities are far more visually intrusive and powerful than the proposed catenary, some inferences can be drawn from these studies. The results of such studies were generally evenly split between conclusions that transmissions lines do and do not effect property values. Likewise, some of the studies with each view were found to be flawed by independent reviewers. Thus, it can only be concluded here that the proposed electrification project may adversely affect property values due to effects on sensitive views, increased noise, and public perceptions of the health effects of EMFs. Such properties include those listed as experiencing increased noise in Table 4.4-4 and those listed in Table 4.11-2 as experiencing diminished views as a result of the proposed electrification. In addition, those closest to the right of way and substations are likely to experience the greatest concern regarding EMFs.

Effects on Historic Districts and Properties. The historic resources survey identified 132 historic properties and 33 historic districts along the corridor that are listed on or eligible for listing on the National Register. The project will require the installation of 156 miles of overhead catenary and 12,000 catenary poles at approximately 200-foot intervals along each side of the tracks. The visual setting of certain historic properties may be affected by the catenary and supports, although for most properties this effect is not expected to be adverse due to: (1) the intrusion of other modern elements and railroad structures; (2) the distance between the poles, and (3) the rail corridor passes by the rear elevation of the resource thus diminishing the visual impact of the catenary.

At two historic sites catenary poles may affect the setting of key historic buildings, (despite the optimum placement of supports) or introduce a discordant modern element to the historic landscape, thereby creating a potential impact. These sites include the Haley Farm Historic Rural District in Groton, CT and the Wilcox Road Rural Historic District in Stonington, CT. Should the FRA determine in consultation with the SHPO, that the project will have an adverse affect on these sites or any other historic resource described above, mitigation could be developed by FRA in consultation with the SHPOs.

Train Noise and Vibration. Perceptible levels of increased train noise due to proposed changes in the frequency and speed of trains associated with the proposed electrification would affect residences, churches and schools in all but five of the communities along the NEC, as shown in Table 4.4-6 and Figure 5.1-1. In most communities, less than 20 residences are affected, but the number of residences affected in any single community ranges from one in Sharon, MA to 203 in Warwick, RI. Of the estimated 100,000 to 200,000 residences located within one-half mile of the 156-mile NEC tracks (the area shown on the maps supporting this DEIS/R), 787 residences could experience noise levels that exceed the evaluation criteria thresholds. Most of these residences are located within 100 feet of the railroad tracks and all of them are located within 500 feet. Four non-residential sensitive receptors would also be adversely affected, including Caulkins Park (New London, CT), Bluff Point State Park (Groton, CT), Family Christian Center (Stonington, CT). and Second Congregational Church (Attleboro, MA).

The major source of this noise impact would be the rolling interaction of train wheels on track rails, which is projected to escalate due to increased train frequency, speed, and locomotive horns that are sounded near grade road crossings. Train noise impacts could be mitigated through a variety of measures designed to control noise at its source, transmission path or at the noise sensitive receiver. Each of these is discussed below.

Source controls, the least intrusive to the surrounding area, include equipment and track-related measures, such as an improved track maintenance program, which could include the installation of equipment to detect wheel flats on a continuing basis, as well as periodic wheel truing and rail grinding. The elimination of railroad-highway grade crossings would eliminate horn noise. A master plan currently under development by the FRA for the fall of 1993 will address grade crossing closures.

Path noise control could consist of the installation of 8 to 16-foot tall, solid, wayside noise barriers along the ROW. These barriers, which should be at least 200 feet long and are designed to block the direct sound path between the trains and noise-sensitive sites, would likely be one of the most effective measures to mitigate the projected noise impact. Although noise barriers are the most effective means of blocking noise, they could have adverse secondary impacts on sensitive views, particularly in the coastal regions of Connecticut and Rhode Island, as listed in Table 3.11-1.

Receiver noise control measures could include building sound-insulation treatment. Sound insulation treatment includes additional window glazing, improvements in weather stripping around doors and windows, and sealing any holes in exterior surfaces. One disadvantage of sound-insulation treatment is that it works indoors only when doors and windows are closed and has no effect on noise in exterior areas. However, it may be the best choice for sites where noise barriers are not feasible, and for schools or churches where indoor noise sensitivity is most important.

Adverse levels of vibration from train operations are related to annoyance effects and not to building damage. Such vibration levels would be generated by the proposed project due to changes in frequency and speed of the proposed electrified trains in all but eight of the NEC communities, as shown in Table 4.4-8 of this document.

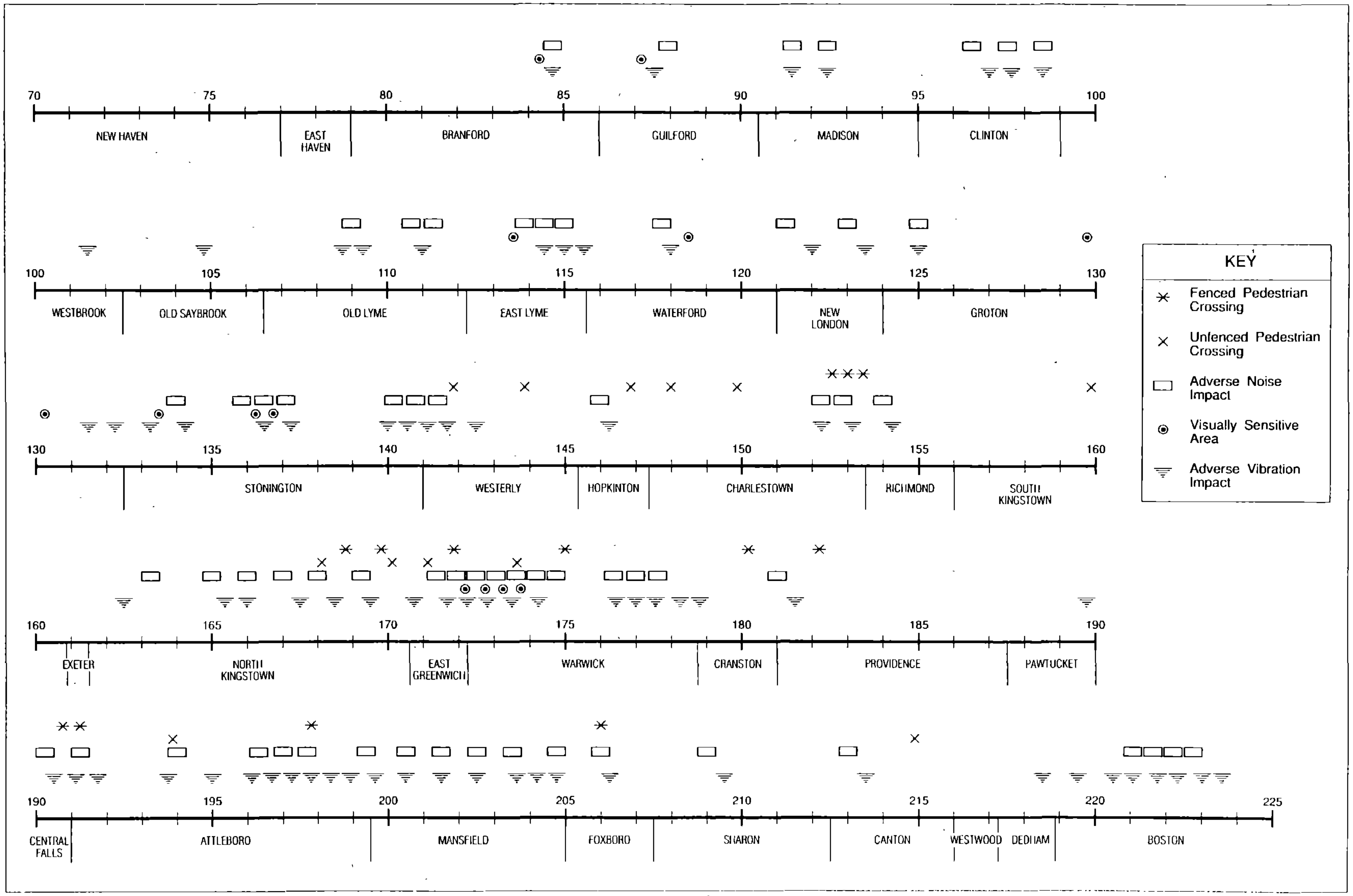

FIGURE 5.2-1. AREAS OF POTENTIAL IMPACT ALONG THE NORTHEAST CORRIDOR

A total of 1,355 residences (of the 100,000 to 200,000 located within one-half mile of the tracks) would be affected, as well as two churches and one school. Since the primary source of ground-borne vibration from trains is wheel/rail contact, an enhanced track and vehicle maintenance program could minimize vibration from wheel/rail interaction. Vibration levels could be further reduced by any of these four measures: 1) installation of ballast mats, 2) installation of floating concrete slabs, 3) switching from concrete to wood ties, or 4) construction of deep trenches parallel to the tracks between the tracks and sensitive receptors. The ballast mats could be installed under the existing ballast at the locations where the greatest vibration impact is expected. These mats have been shown to be effective in Europe and along rapid transit lines in Boston, MA.

Electromagnetic Fields (EMF). An assessment of potential public health effects resulting from magnetic fields emitted by the proposed electrification system evaluated: 1) the levels of EMF exposure resulting from the electrification project in areas of various proximity to the catenary and project facilities; and 2) a comparison of these levels with interim guidelines for EMF exposure recommended by international science and health agencies, as well as interim EMF emissions guidelines promulgated by states. The exposure levels and interim guidelines are presented in detail in section 4.5 of this report. The guidelines are reported in milliGauss (mG), which is a unit of measurement of magnetic field intensity. As a point of reference, the intensity of earth's static magnetic field is about 500 mG in the Northeastern U.S., although it does vary over time.

Only the magnetic field intensity values were evaluated, as at the frequencies associated with this project, the electric field component of EMF are shielded and there is little opportunity for long-term exposure to such fields.

As a result of concerns regarding the potential for health impacts associated with EMF exposure, a number of epidemiological and biological studies have been undertaken over the past 20 years to determine if any link exists between EMF exposure and health impacts. To date, the consensus of the scientific community is that there is not conclusive evidence that such a link exists. As a result, regulations regarding EMF exposure have not been promulgated, and guidelines have been suggested instead. A detailed discussion of these studies is presented in Technical Study 5 in Volume III of this EIS. These guidelines are presented in section 4.5 of this report.

As detailed in section 4.5, the population potentially exposed to EMF from the NECIP electrification project is subdivided into a number of categories, and then the level of EMF exposure is estimated for each population category. The population is subdivided in two ways. The first subcategory is based on the duration and type of exposure: environmental long-term, (e.g. residencies along the ROW); occupational(during work hours) and occasional (intermittent, e.g. those that use a park near the ROW). The second set of categories is based on physical location, and includes categories in proximity to the wayside, substations and utility corridors, as well as passengers and workers on the trains. Based on EMF measurements from existing electrified rail systems, the EMF levels drop off to background by 150 feet from a source, so areas beyond this distance were not covered.

For each of these population categories the level of EMF exposure resulting from the electrification project was estimated, as described in section 4.5, based on measurements of existing electric rail systems. Table 4.5-2 shows the population categories, including their locational and exposure attributes, the applicable interim guidelines for each category, and the estimated level of EMF exposure. In nearly all cases, the estimated levels of exposure are one-thousandth to one-hundredth of the interim guidelines, and no estimated exposure level is more than one-tenth of the lowest applicable interim guideline. Thus, the magnetic field levels projected to result from the proposed project are well below the criteria established by national and international science and health agencies, and as a result, no adverse impacts are anticipated.

Pedestrian Hazards along the Corridor. There are approximately 22 locations at which pedestrians cross the NEC at illegal locations, as listed in tables 3.8-2 through 3.8-4 of this DEIS/R and shown in Figure 5.1-1. The potential for increased hazards at these locations, due to increased speeds and frequency of trains could be mitigated by fencing areas with worn, well established paths, as well as along school yards, playgrounds and other recreational areas. Amtrak could assist in the development of community and school educational programs, in cooperation with local school officials, stressing the potential hazards associated with high speed trains and giving guidance on crossing the tracks at appropriate locations.

Effects on Other NEC Operations. All of the projected 2010 intercity, freight and commuter operations can be accommodated on the corridor, with no adverse impacts to commuter service expected.
The combination of added costs, inconvenience, and limitations of the type of freight rail cars that can be used could have a serious impact on existing and future freight rail movement. Some existing shippers may divert shipments to transportation alternatives and some potential shippers may locate in other areas with more favorable transportation services. This latter impact has implications for the State of Rhode Island's plans to develop a commercial port to be served by the Providence & Worcester Company (P&W) at Quonset Point. This port would be in competition with port facilities in Boston, the New York City area, and other east coast ports which have service via rail lines that can accommodate the larger dimension rail cars. According to estimates developed by the P&W, the additional operating costs and potential loss of new business related to schedule and height restrictions could result in an annual revenue loss of $900,000 to the P&W and could cause P&W to cease operations on the NEC (P&W General Counsel letter to FRA dated January 12, 1993). Section 4 of the Amtrak Authorization and Development Act (Public Law 102-533, October 27, 1992) directs FRA to prepare a Program Master Plan for the NEC between New York City and Boston. The purpose of this master plan is to develop a strategy to coordinate the improvements necessary for Amtrak to achieve a three-hour trip time between New York and Boston while meeting the needs of other rail operators on the NEC Main Line. As part of this master plan, FRA and the Rhode Island DOT are cooperating in an evaluation of the future rail freight needs in Rhode Island and the best means to meet these needs. Should this study identify other needed improvements to the NEC, these improvements will be evaluated in a separate environmental review.

Visual Impacts. Based on the altered representative views shown in Figure 4.11.1 through 4.11.10, and the methodology presented in section 4.11.2.1 of this report, views from a number of visually sensitive receptors (VSRs) will be affected by the proposed catenary system. As the catenary supports or poles are potentially more intrusive than the catenary wires, careful placement of the poles out of or on the edges of the affected views could serve to reduce such impacts. An additional pole containing a pulley system used to maintain catenary wire tension, is proposed by Amtrak to be placed approximately every five miles along the corridor, and these facilities should not be placed in identified sensitive views. One of the electrification facilities, the Noank paralleling station, would substantially block the existing waterfront view from residences on Seneca Road in Groton. Relocation of this facility would eliminate this impact.

5.2.2.5 Regional Impacts of the Electrification Program. Regional effects of the proposed project include those felt outside the immediate area of the Northeast Corridor. These include regional socioeconomic (tourism, employment, effects on sensitive populations), electromagnetic interference and energy effects of the proposed project. The proposed electrification project is not expected to generate any significant adverse impacts on tourism or minority populations, as described in detail in section 4.1 of this DEIS/R. Likewise, as a result of their experience with the electrified portion of the corridor west of New Haven, the Federal Communications Commission and the Communications Division of the U.S. Coast Guard do not anticipate any electromagnetic interference effects to result from the project.

Employment. Although 51 current train and engine crew positions will no longer be needed at New Haven due to elimination of the locomotive switch, Amtrak anticipates that an additional 75 such positions will be created by the electrification in Boston and New York. Therefore, the 51 individuals currently filling these positions at New Haven will be offered similar positions by Amtrak in either New York or Boston.

Increased Use of Energy. The proposed electrification will result in higher use of energy by intercity passenger trains than the no-build alternative, as well as an increased use of petroleum. This is due primarily to the significant increase in daily trains and intercity passengers. Also, electric generating facilities would contribute to energy consumption. However, for all transportation modes, the proposed electrification will result in a net decrease in the use of petroleum products of nearly ten million gallons annually, and a net increase in natural gas usage of 1.0 billion cubic feet annually. This shift represents a decrease in dependence upon foreign sources of energy (petroleum) in favor of an increased dependence upon domestic products (natural gas).

5.3 OUTSTANDING ISSUES

For most of the adverse impacts identified in section 5.2 of this chapter, an array of options for reducing or eliminating such impacts are available. Some of these measures include further investigation and consultation with regulatory agencies (e.g. historic, archaeological, and some natural resources), but it is anticipated that each of these consultations will conclude in the identification of measures to mitigate the adverse impacts that are satisfactory to the FRA, the agencies and the project proponent (Amtrak).

Although alternatives have been identified, the final recommendations for specific mitigation measures for each adverse impact remain to be resolved and public and agency comments on appropriate measures are being sought. In this way, additional investigations and information, as well as comments by the public and appropriate agencies, can be incorporated into the recommendations.

5.4 RELATIONSHIP BETWEEN SHORT-TERM USE OF THE ENVIRONMENT AND LONG-TERM PRODUCTIVITY

This section addresses in general terms the relationship of local short-term impacts and use of resources and long term productivity with the proposed electrification.

The electrification of the NEC and the resultant increased ridership is consistent with state and Federal transportation plans and State Implementation Plans (SIPs) for air quality. Therefore, the short-term use of resources required to implement the project is consistent with the maintenance and enhancement of the long-term productivity of the southern New England region.

The total construction period for the electrification will be approximately three years. In general, construction of the project has been planned to minimize impacts to the environment by maintaining existing Amtrak, commuter and freight operations on the NEC and maintaining or detouring traffic flows on the overhead bridges to be modified. Measures to mitigate other construction impacts are presented in Section 5.2 of this chapter.

This project will also result in economic and environmental benefits, including the creation of jobs, the reduction of vehicular congestion around the region's airports and air quality improvements, as detailed in Section 5.1.

5.5 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

This section discusses in general terms the commitment of resources that would be permanently expended for the proposed electrification project.

The proposed electrification project would require certain irreversible and irretrievable commitments of resources. Irretrievable human resources will be expended for the planning, design, construction and operation of the electrification and the electrified railroad. Planning, design and construction are estimated to require approximately 1.5 million man-hours per year for three years (Gazillo, 1993a). Approximately 280 new full-time permanent positions would be created by the electrification project, consuming approximately 600,000 man-hours annually (Alberstat, 1993).

Approximately 4.5 acres of land would be permanently acquired to site the electrification facilities. This does not include the existing NEC or electrification facility sites that Amtrak currently owns. This will represent an irreversible commitment during the time period that the land is in use for the railroad electrification. Currently, there is no reason to believe that this land could not be converted to another use or that such conversion would be necessary or desirable.

Construction of the proposed electrification would result in the consumption of tangible raw materials including 12,000 steel poles, 1,000 miles of copper wire, and sufficient concrete to secure the footings of the poles (Gazillo, 1993a).

Raw materials, including steel and other metals, plastic and other petroleum-based products, would be consumed in the construction of 26 new trainsets for operation of the electrification. Operation of these trains would consume the equivalent of 2,069 billion British thermal units (Btus) annually, a six-fold increase over the current consumption, due primarily to the substantial increase in both the frequency and size of the trains. Much of the increased energy consumed will be provided by natural gas, resulting in a decrease in the consumption of petroleum products on the order of ten million gallons a year, which is approximately eight percent of existing petroleum consumption. This shift in energy source also represents a reduction in dependence upon foreign (petroleum) energy sources and a shift towards domestic (natural gas) energy sources.

5.6 FEDERAL AND STATE ENVIRONMENTAL PERMITS REQUIRED

Several permits, approvals and consultation processes must be completed before construction of the proposed electrification can be undertaken. After approval of the Final EIS/R by the Federal Railroad Administration (FRA) and the Massachusetts Executive Office of Environmental Affairs (EOEA), the FRA must file a Record of Decision on the FEIS and a Section 61 Finding on the FEIR. These and other state and Federal permits and approvals that may be necessary for project construction are shown in Table 5.6-1.

TABLE 5.6-1. POTENTIAL STATE AND FEDERAL PERMITS AND APPROVALS REQUIRED FOR THE PROPOSED ELECTRIFICATION PROJECT

PERMIT/POLICY/GUIDELINE	REGULATORY AUTHORITY	APPLICABLE LAW OR REGULATION
FEDERAL		
Section 404 (b)(1) Permit	US Army Corps of Engineers	Section 404 of the Safe Drinking Water Act[1] (30 CFR 320-330)
Section 10 Permit	US Army Corps of Engineers	Section 10 of Rivers & Harbors Act of 1899 (33 CFR 320-330)
Section 401 Water Quality Certificate	Issued by states: MDEP; RIDEM, ConnDEP[2]	Section 401 of the Safe Drinking Water Act (314 CMR 9.00; CGL 22qa-426; RIGL 46-12)
Section 7 Consultation - Threatened & Endangered Species	US Fish & Wildlife Service; National Marine Fisheries Service	Section 7(c) of the Endangered Species Act (16 USC 1533) & Section 2 of the Fish & Wildlife Coordination Act (16 USC 661)
Section 106 Consultation - Historic & Archaeological Resources	Advisory Council on Historic Preservation (federal) & State Historic Preservation Offices[3]	Section 106 of the National Historic Preservation Act (36 CFR 800)
Sole Source Aquifer Impact Review	U.S. Environmental Protection Agency	Section 1424 (e) of the Safe Drinking Water Act (30 DFR 320-330)
MASSACHUSETTS		
MEPA Certificate on the DEIR and FEIR	Mass. Executive Office of Environmental Affairs (EOEA) MEPA Unit	310 CMR 11.00
Wetlands Protection Act	Local Conservation Commissions; MDEP Div. of Wetlands & Waterways	310 CMR 10.00
Chapter 91 Tidelands License	MDEP Div. of Wetlands & Waterways	310 CMR 9.00
Coastal Zone Management Program Federal Consistency Concurrence	EOEA Office of Coastal Zone Management	301 CMR 20.00
Section 61 Finding	Mass. Executive Office of Environmental Affairs (EOEA) MEPA Unit	310 CMR 11.00
RHODE ISLAND		
Freshwater Wetlands Permit	RIDEM	RIGL Section 2-1-18 to 24
Coastal Resources Management Council Preliminary Determination &/or Permit	Coastal Resources Management Council	RIGL Section 46-23
CONNECTICUT		
Inland Wetland & Watercourses Permit	ConnDEP Water Resources Protection Division	CGS 22a-36 to 45
Coastal Zone Federal Consistency Concurrence	ConnDEP Long Island Sound Program	CGS Sec. 22a-32 and 22a-29(3)

[1] The Safe Drinking Water Act is commonly known as the Clean Water Act.
[2] MDEP = Massachusetts Department of Environmental Protection; RIDEM = Rhode Island Department of Environmental Management; ConnDEP = Connecticut Department of Environmental Protection
[3] Massachusetts Historic Commission; Rhode Island Historic Preservation Commission; Connecticut Historic Commission.

APPENDIX A
ELECTRIFICATION FACILITIES AND BRIDGE MODIFICATION SITES

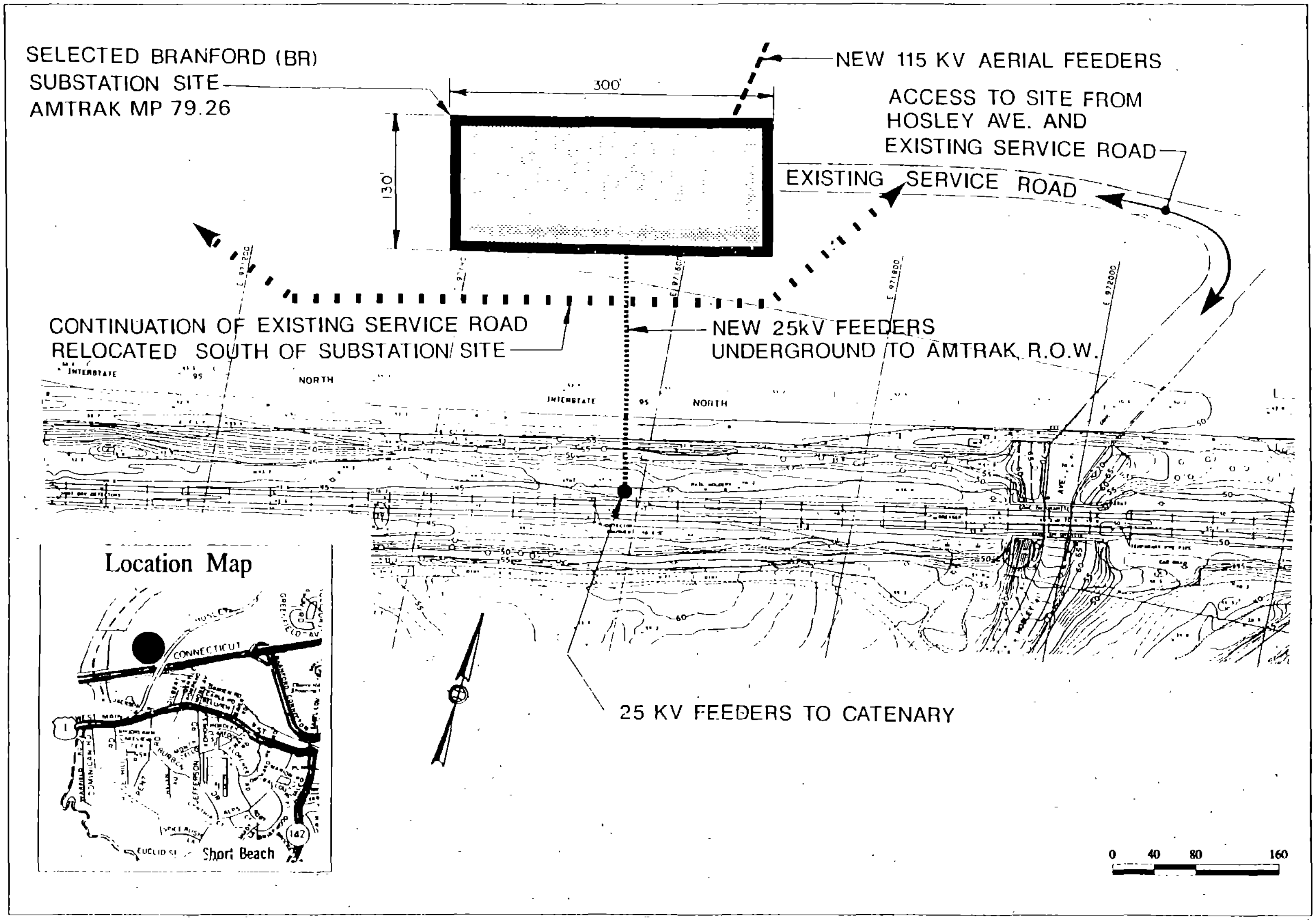

FIGURE A1. BRANFORD SUBSTATION

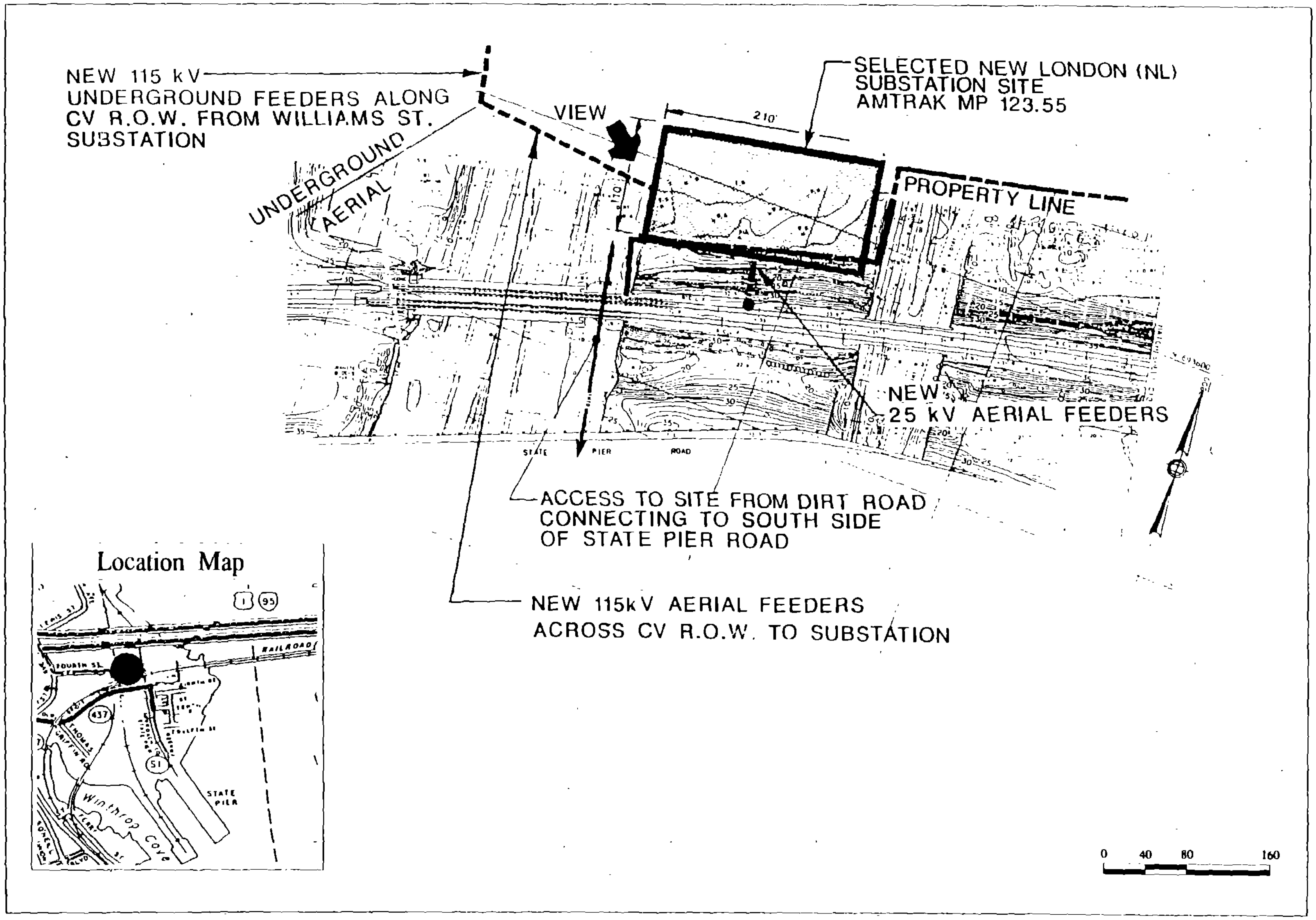

FIGURE A2. NEW LONDON SUBSTATION

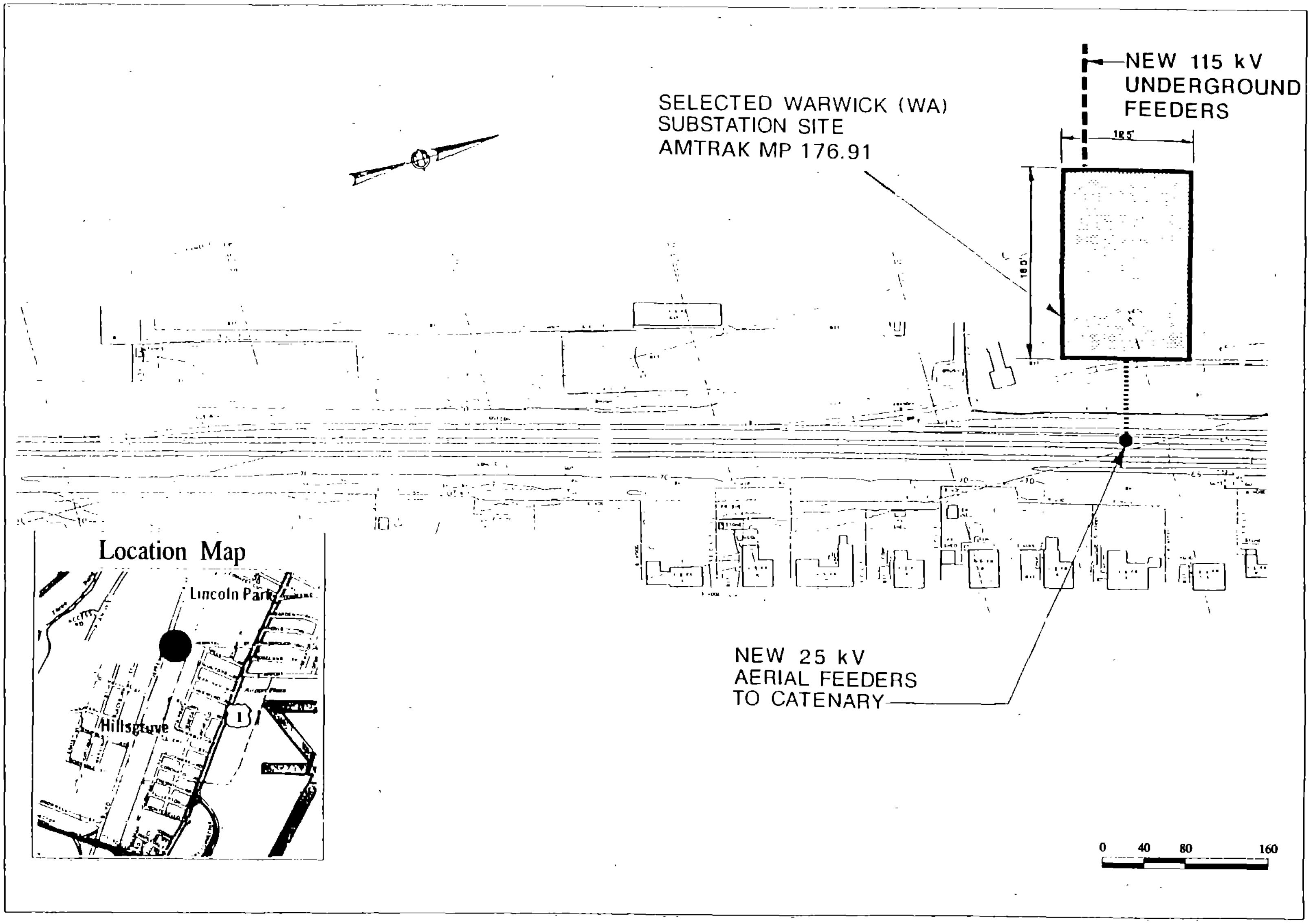

FIGURE A3. WARWICK SUBSTATION

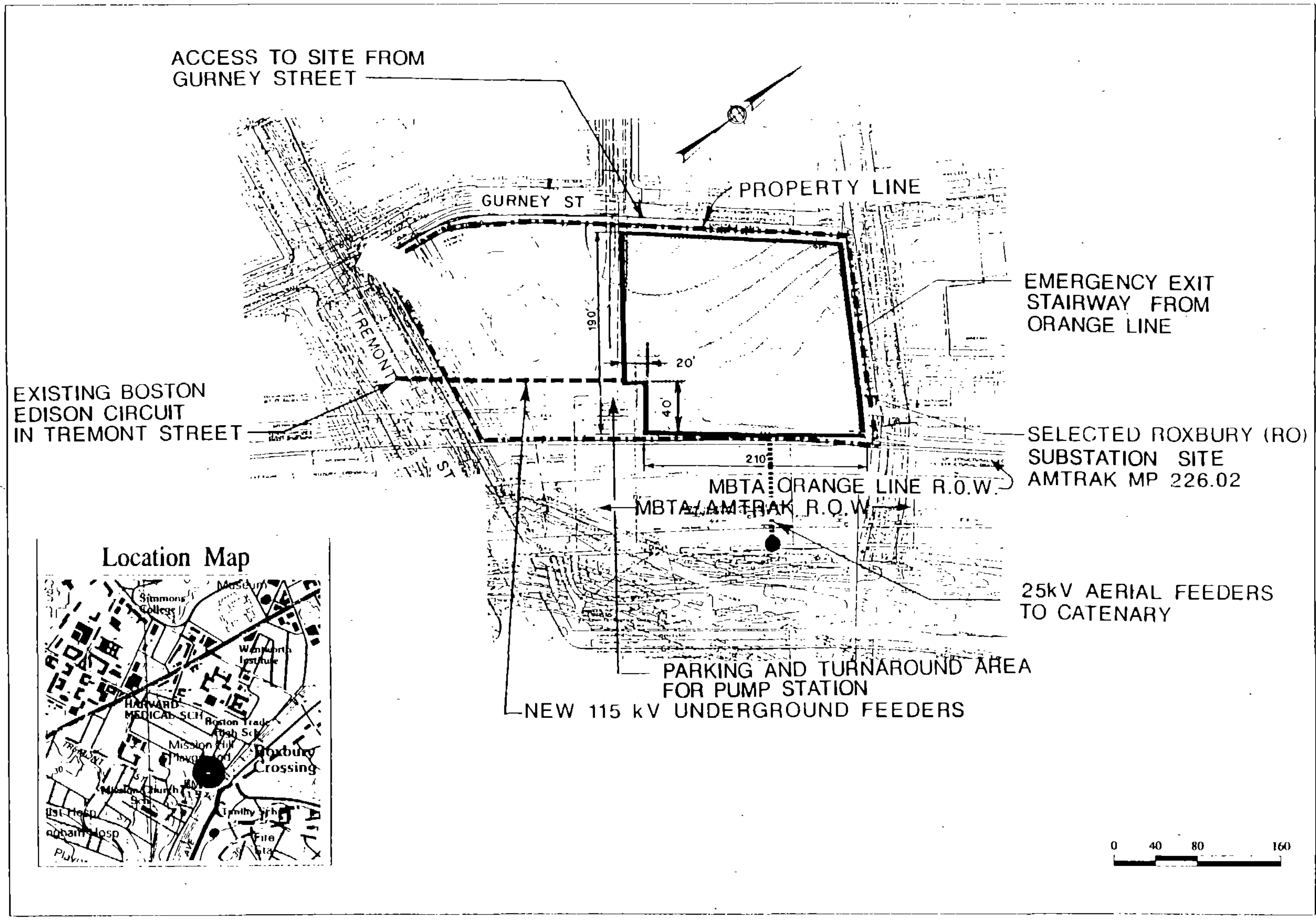

FIGURE A4. ROXBURY CROSSING SUBSTATION

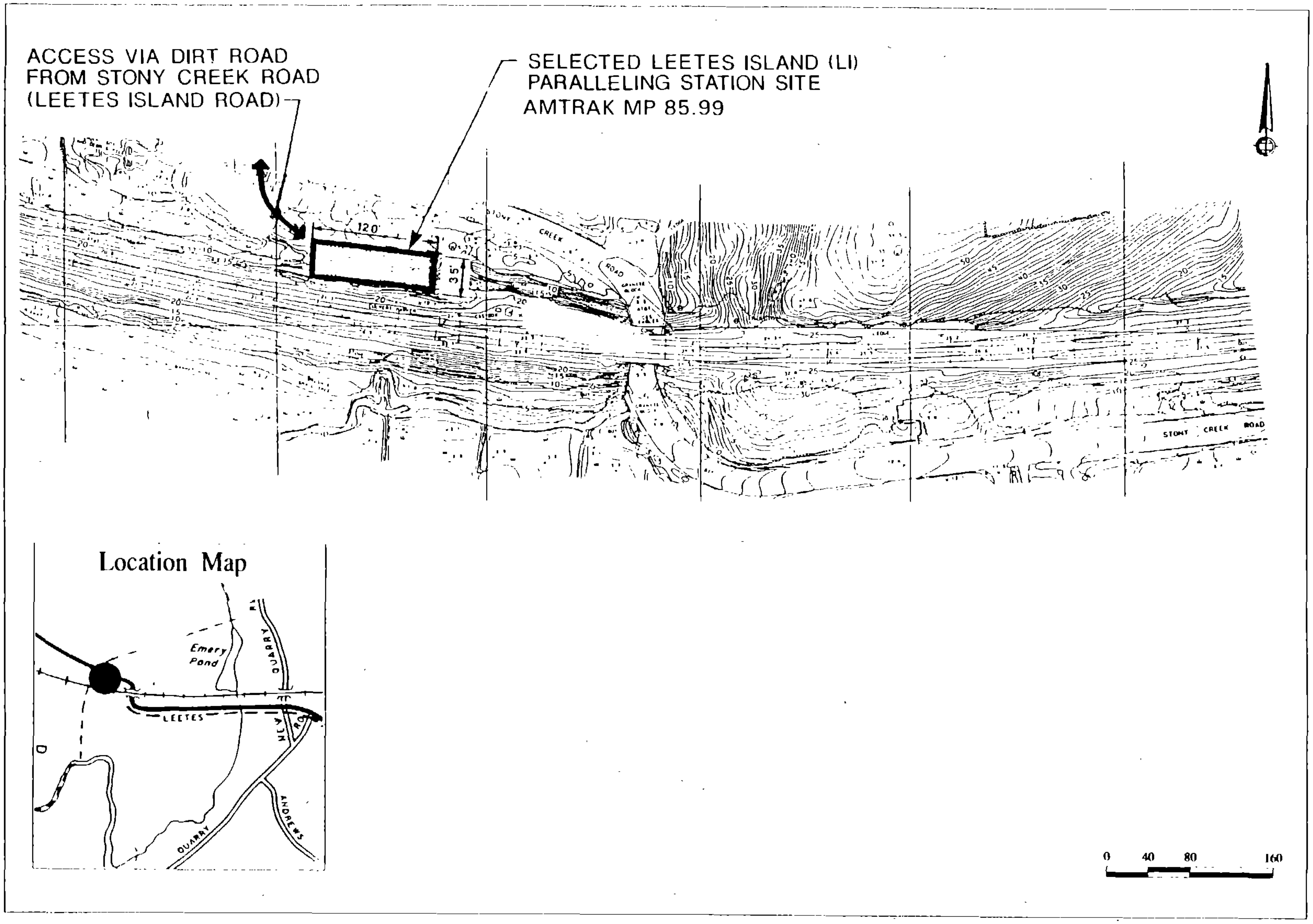

FIGURE A5. LEETES ISLAND PARALLELING STATION

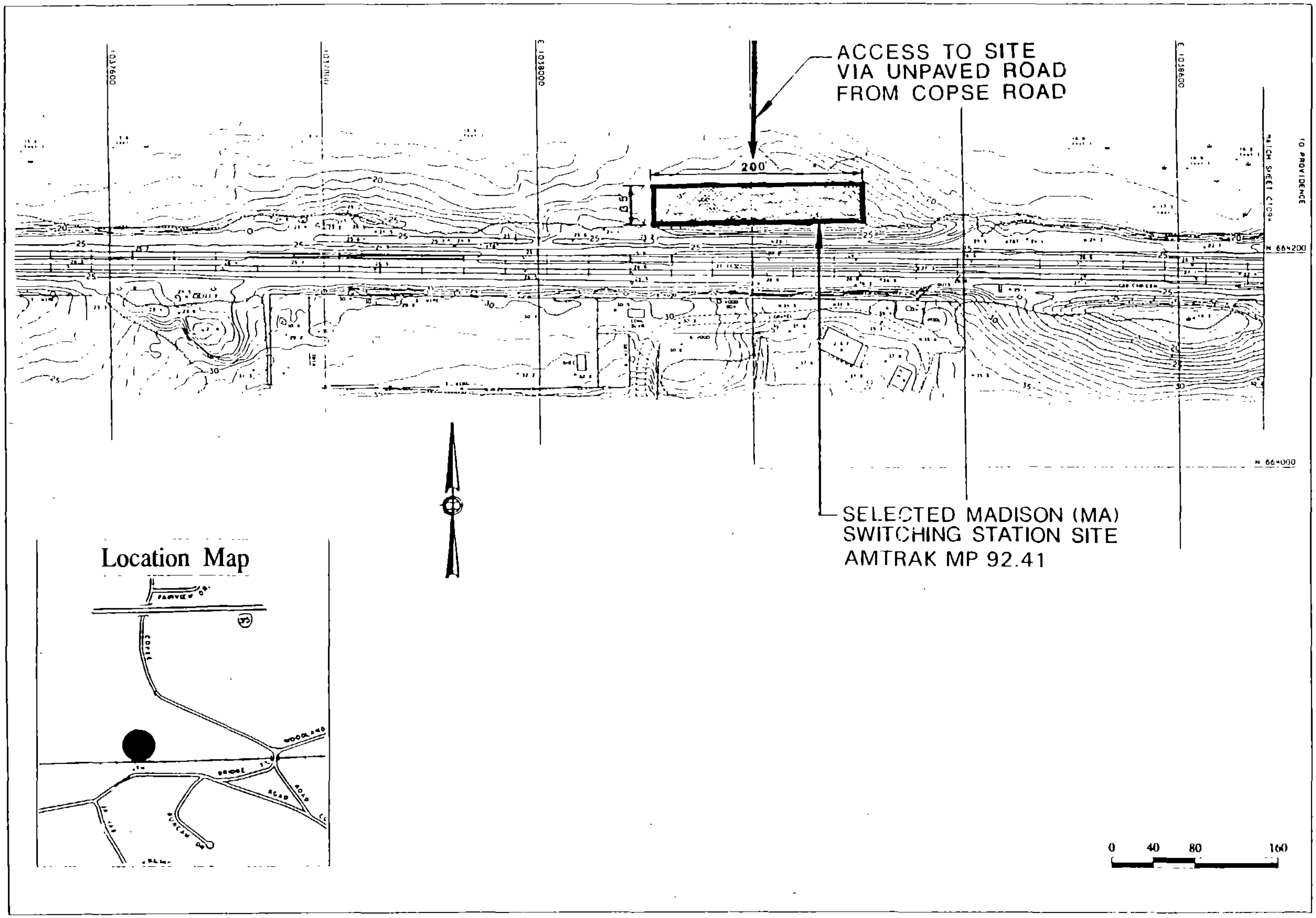

FIGURE A6. MADISON PARALLELING STATION

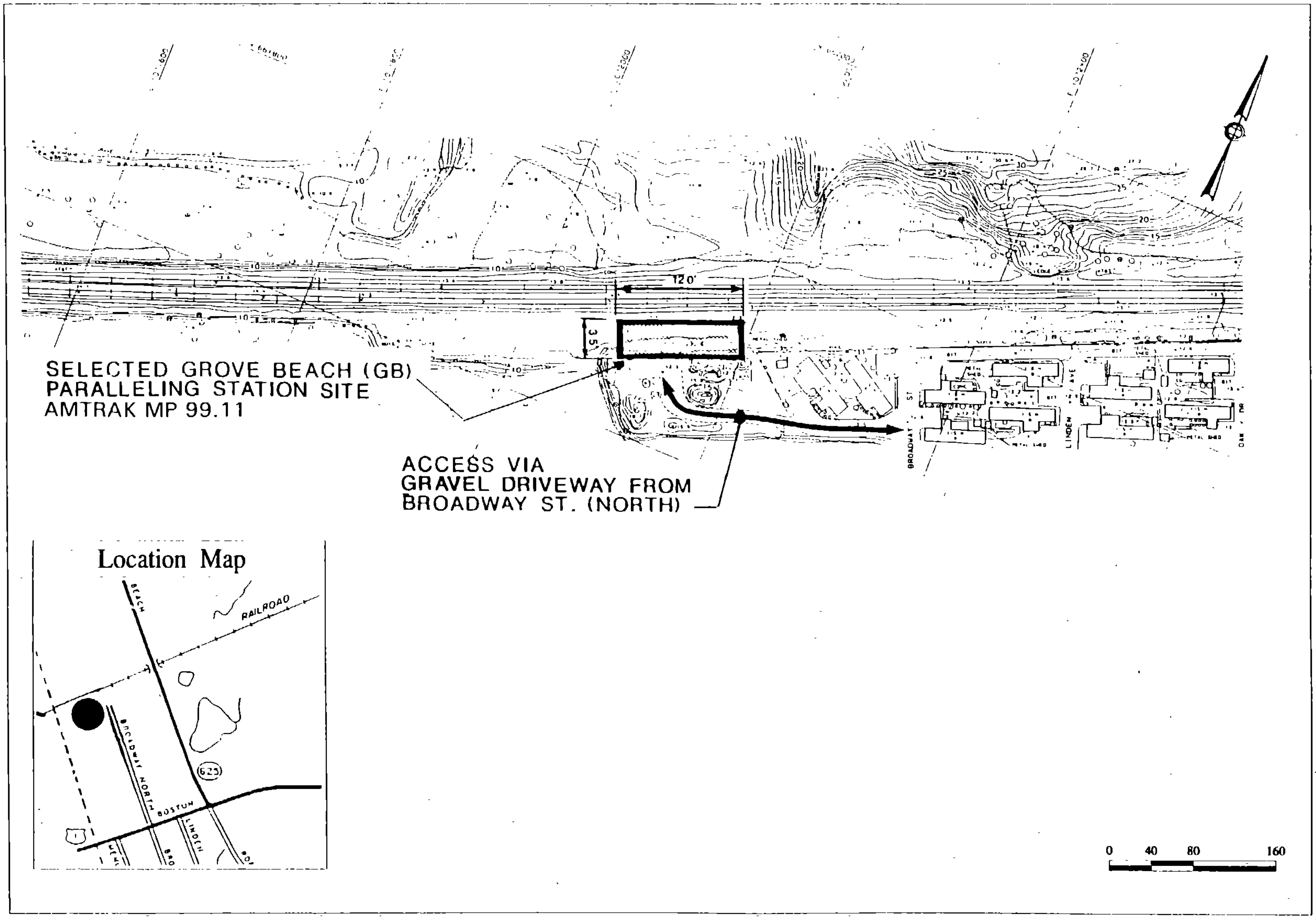

FIGURE A7. GROVE BEACH PARALLELING STATION

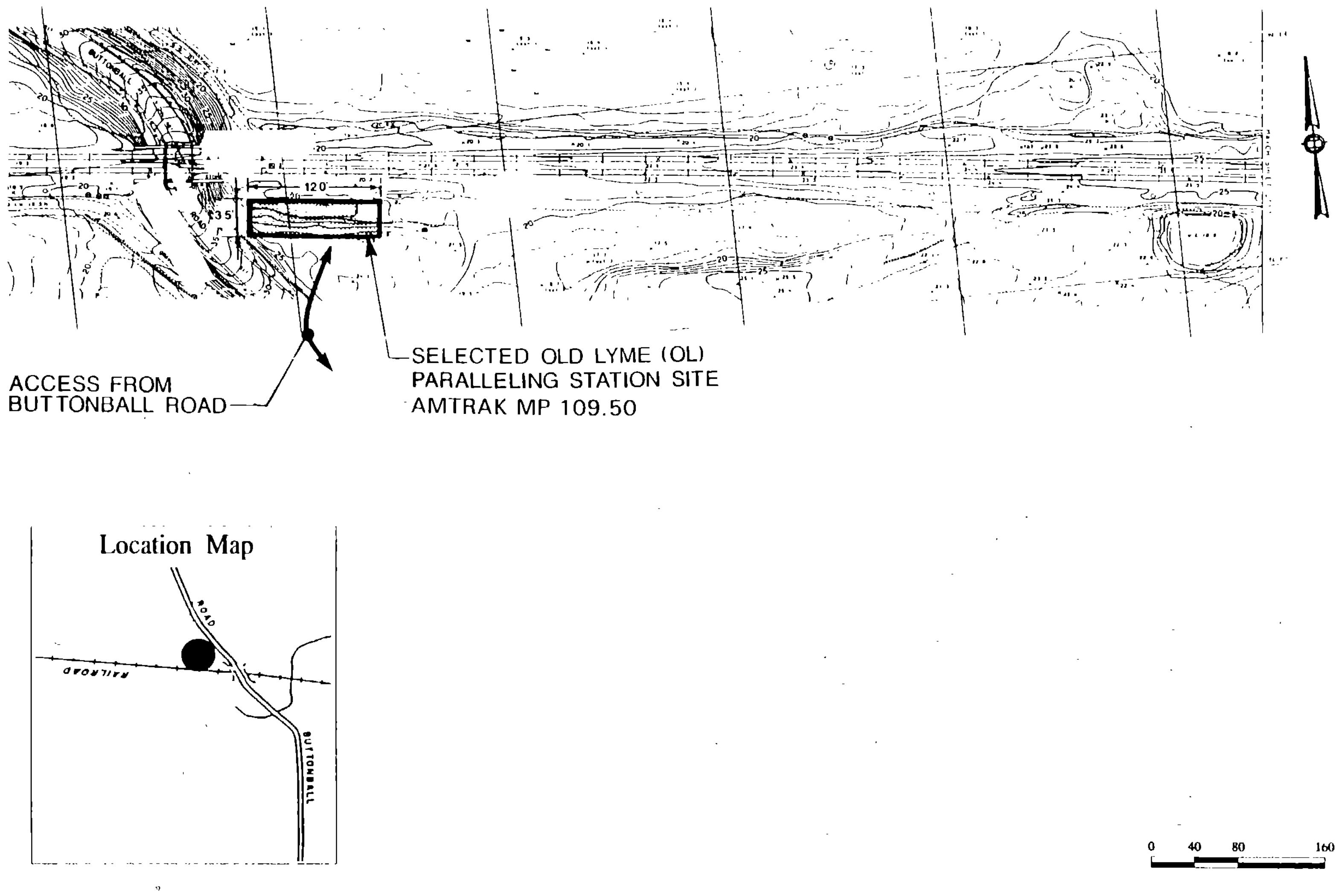

FIGURE A8. OLD LYME PARALLELING STATION

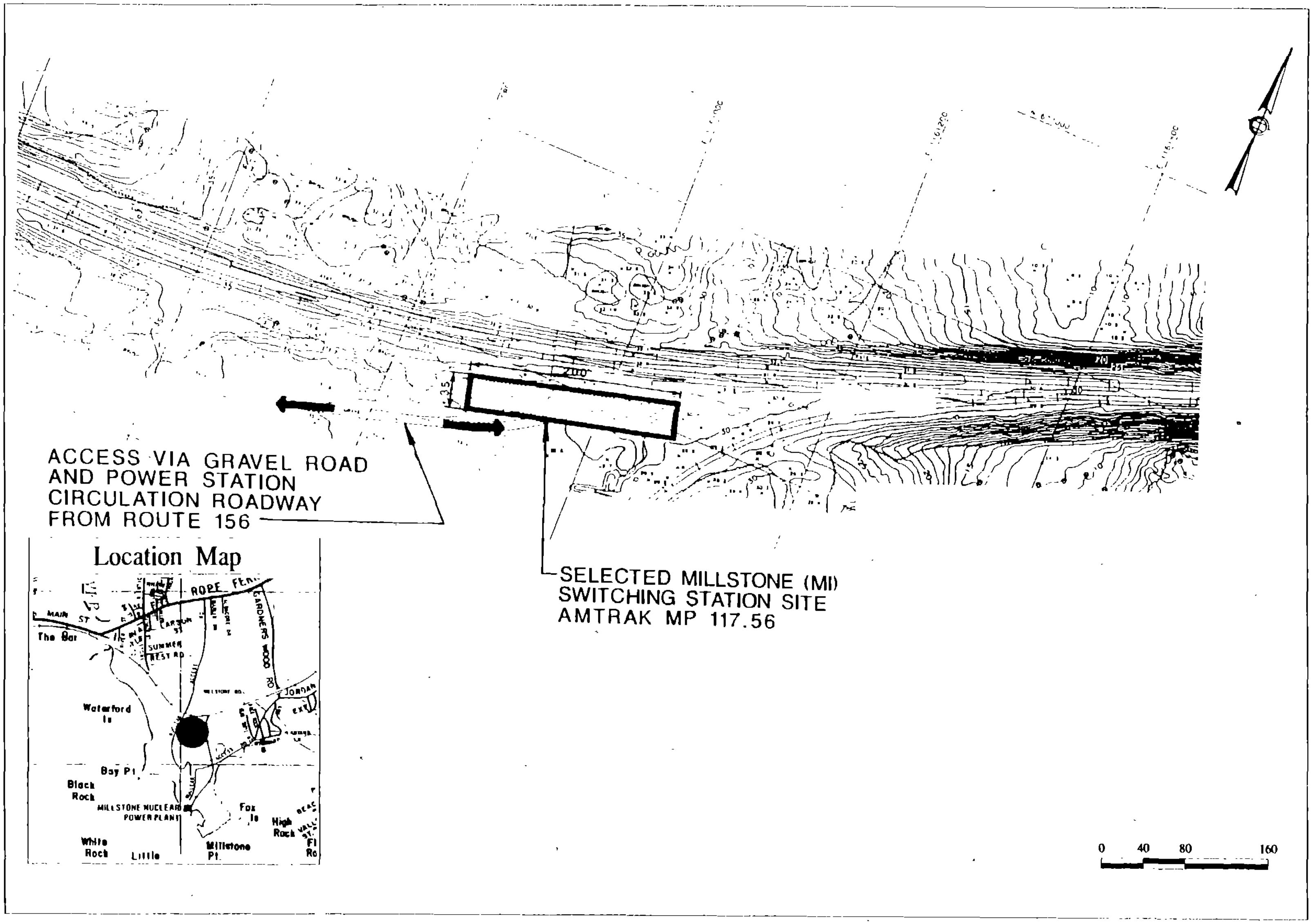

FIGURE A9. MILLSTONE PARALLELING STATION

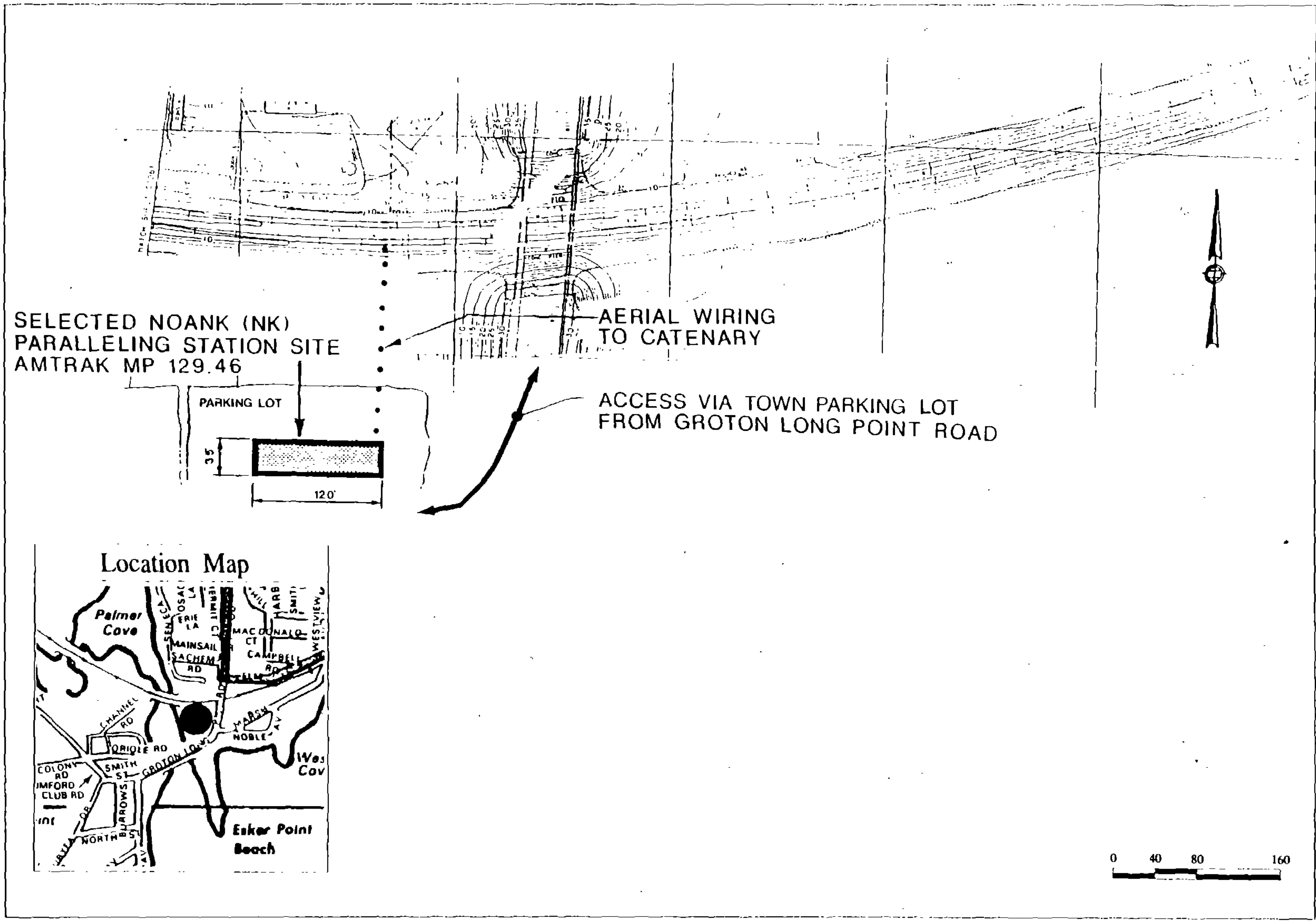

FIGURE A10. NOANK PARALLELING STATION

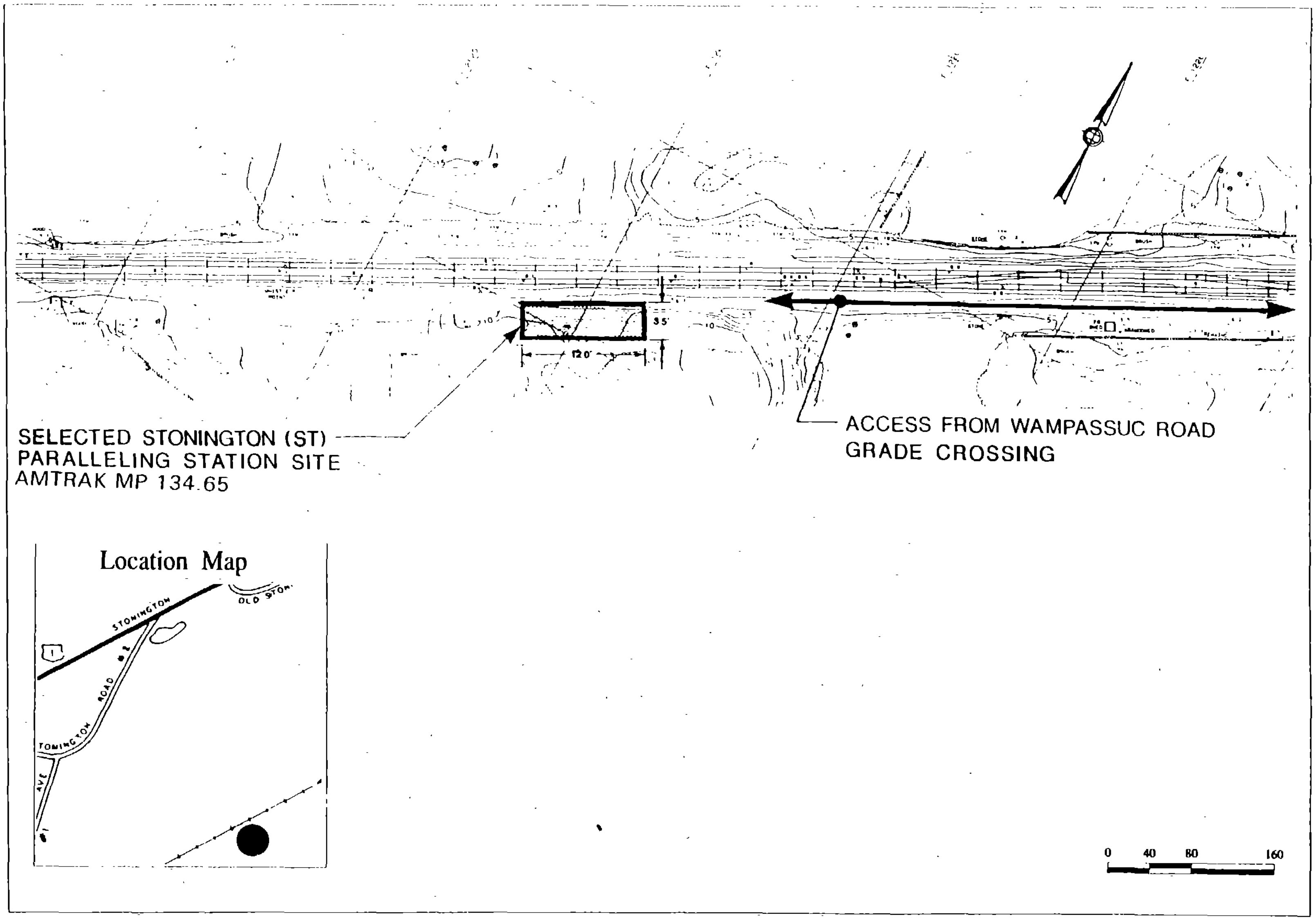

FIGURE A11. STONINGTON PARALLELING STATION

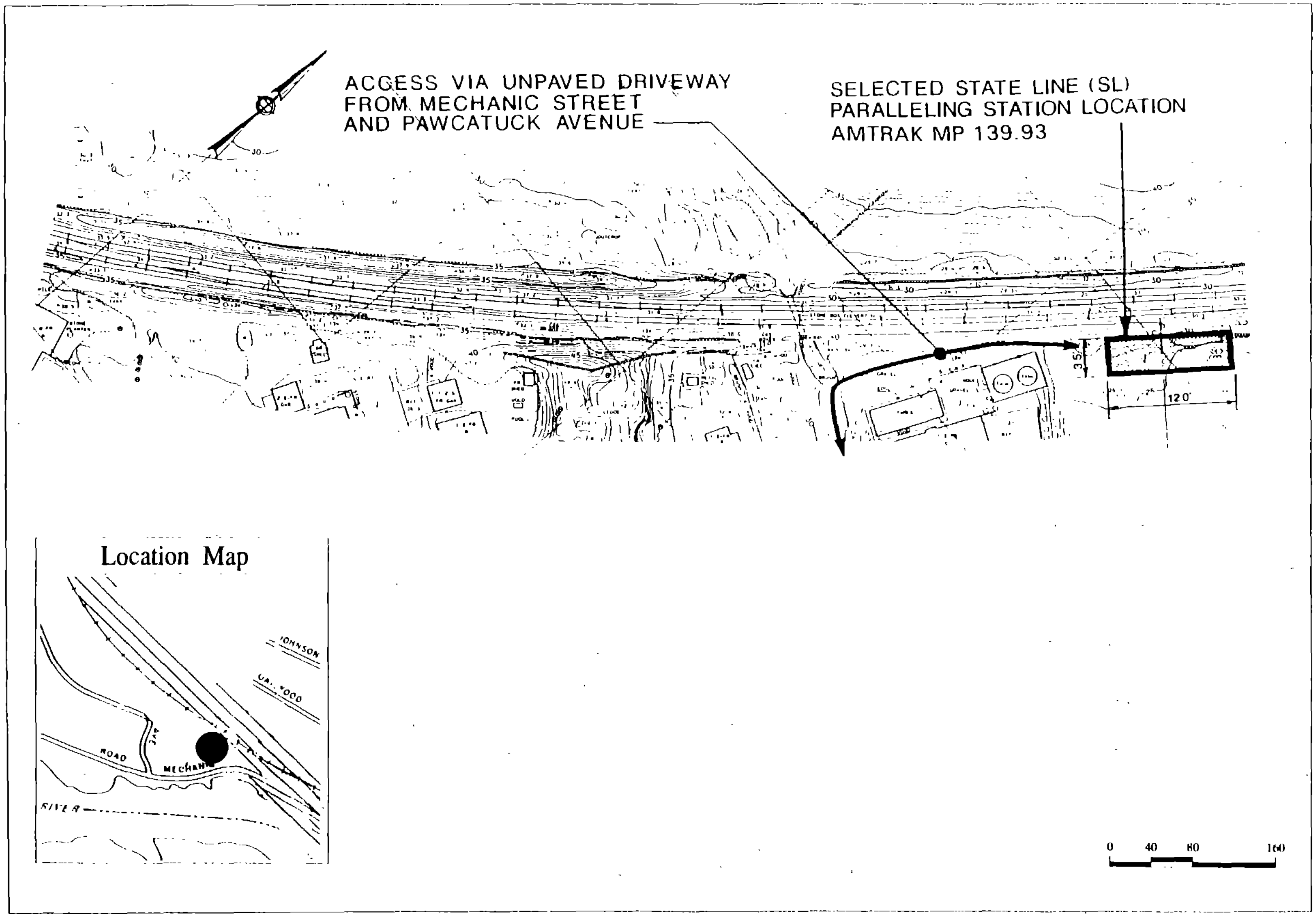

FIGURE A12. STATE LINE PARALLELING STATION

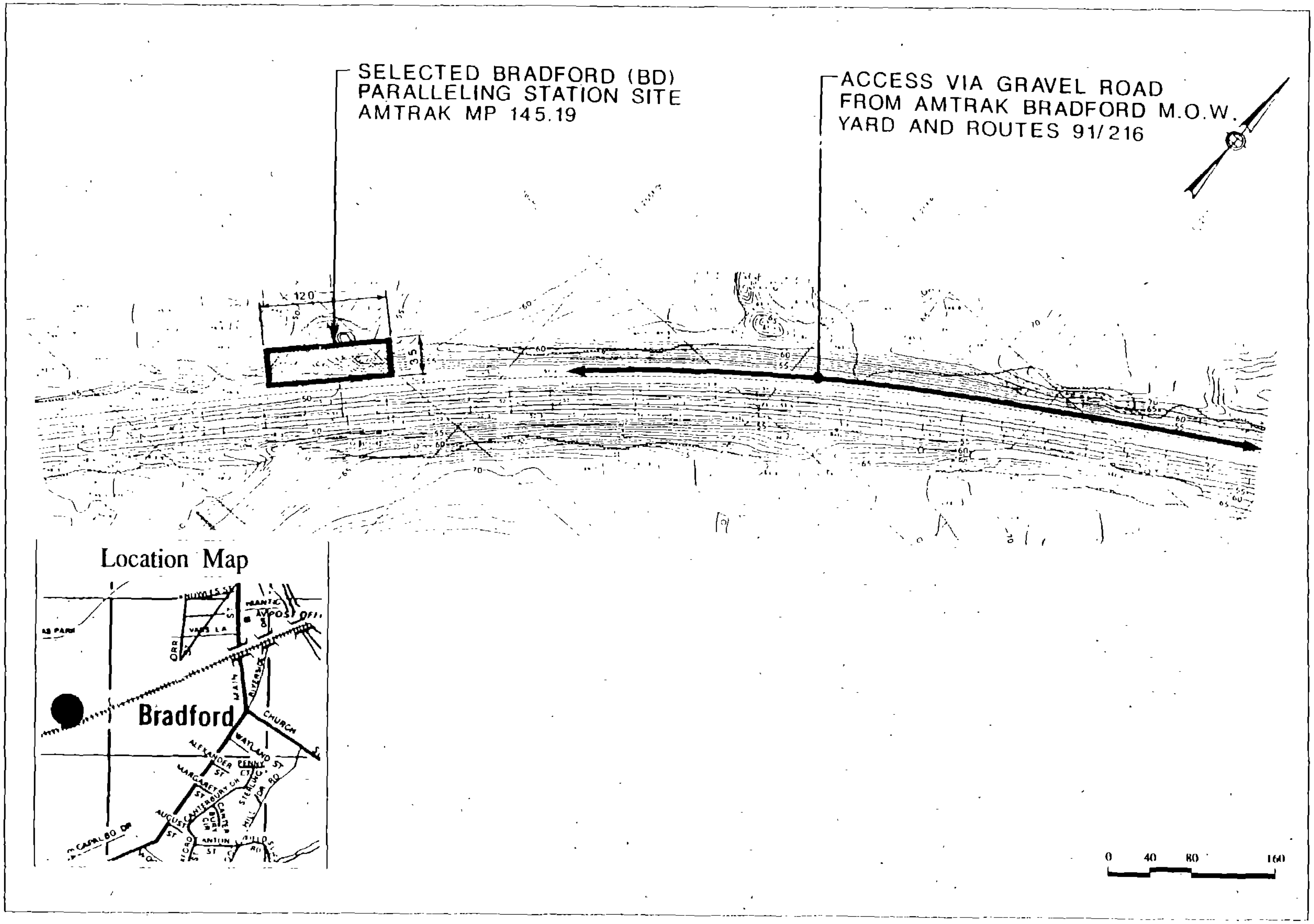

FIGURE A13. BRADFORD PARALLELING STATION

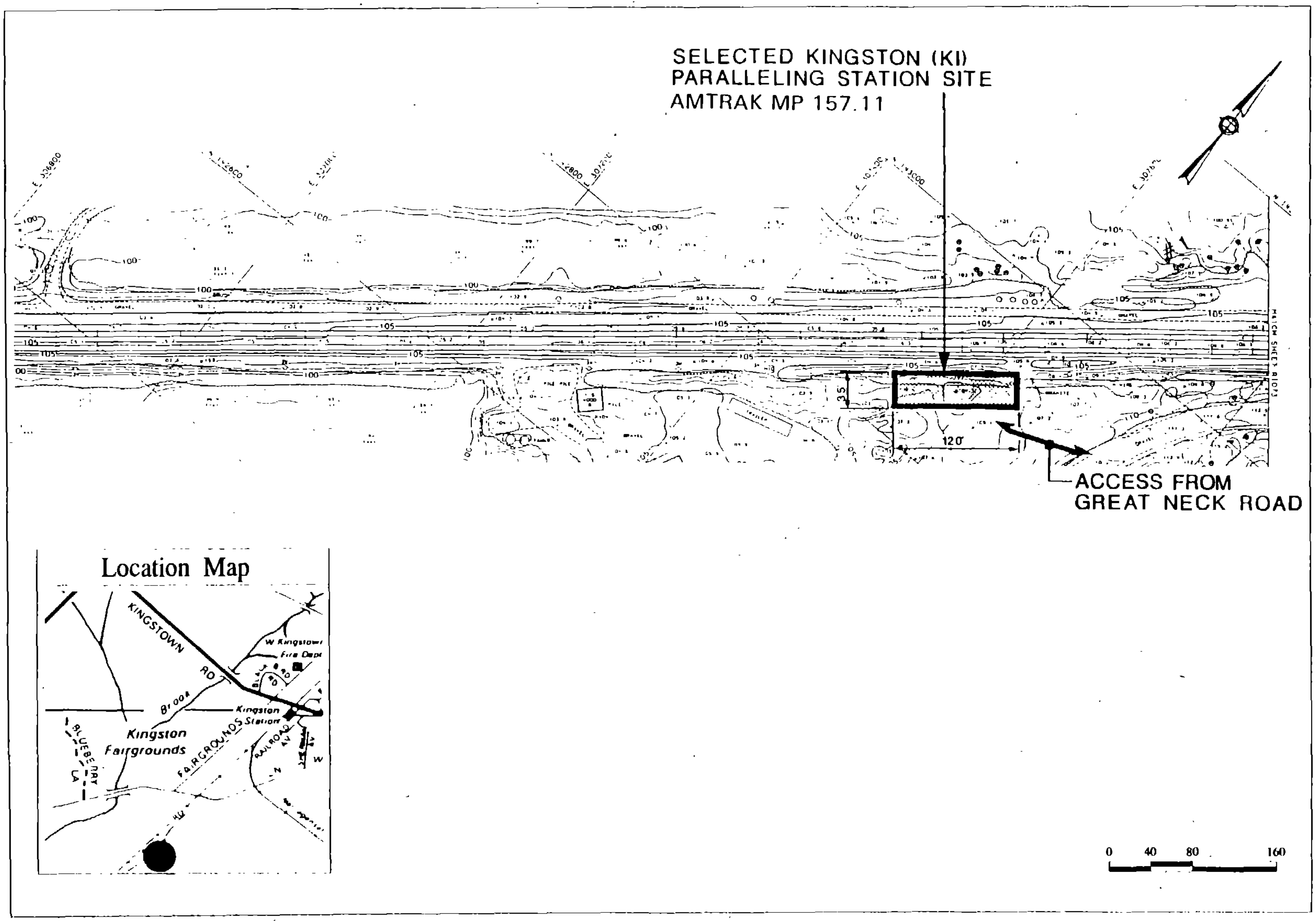

FIGURE A14. KINGSTON PARALLELING STATION

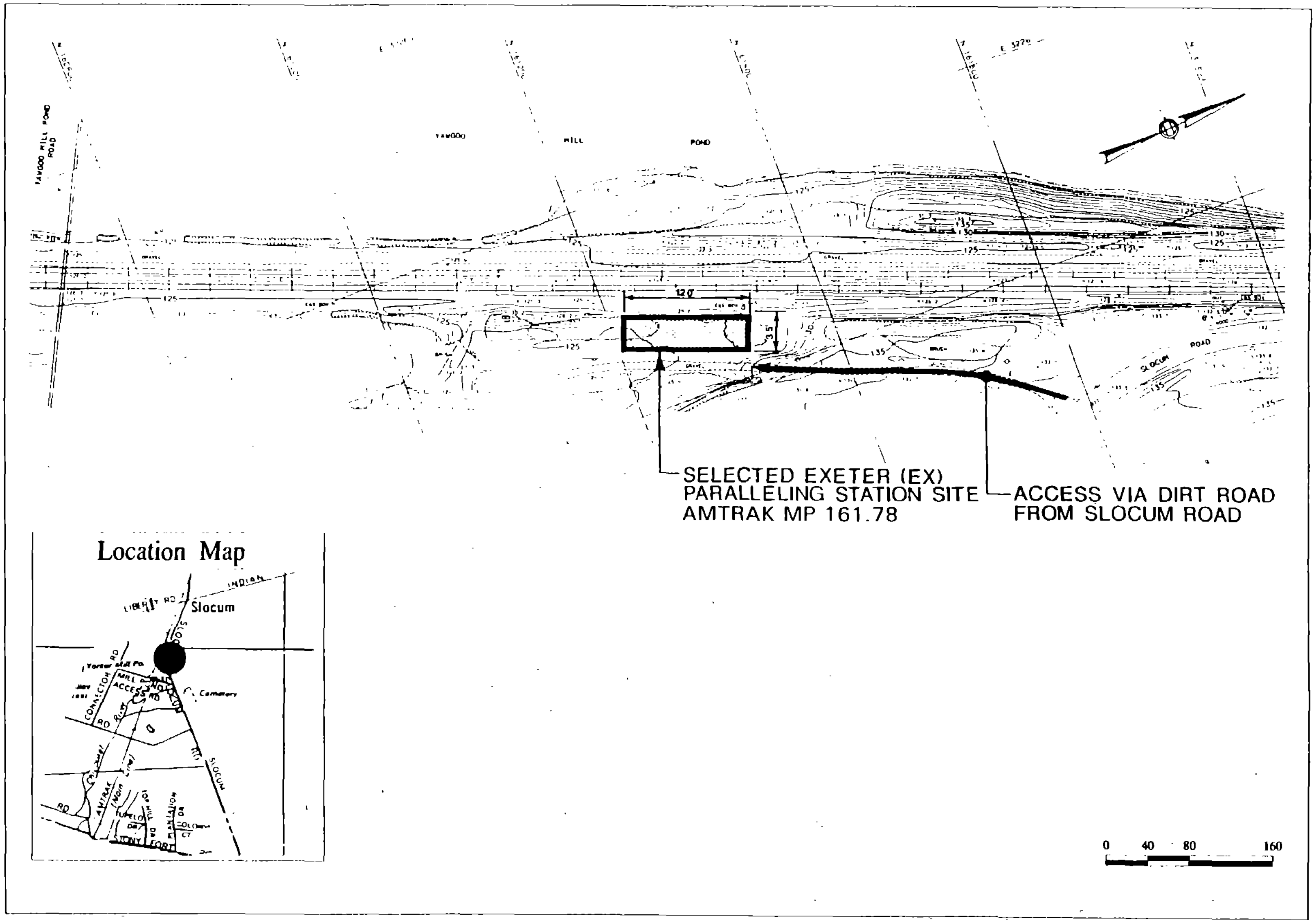

FIGURE A15. EXETER PARALLELING STATION

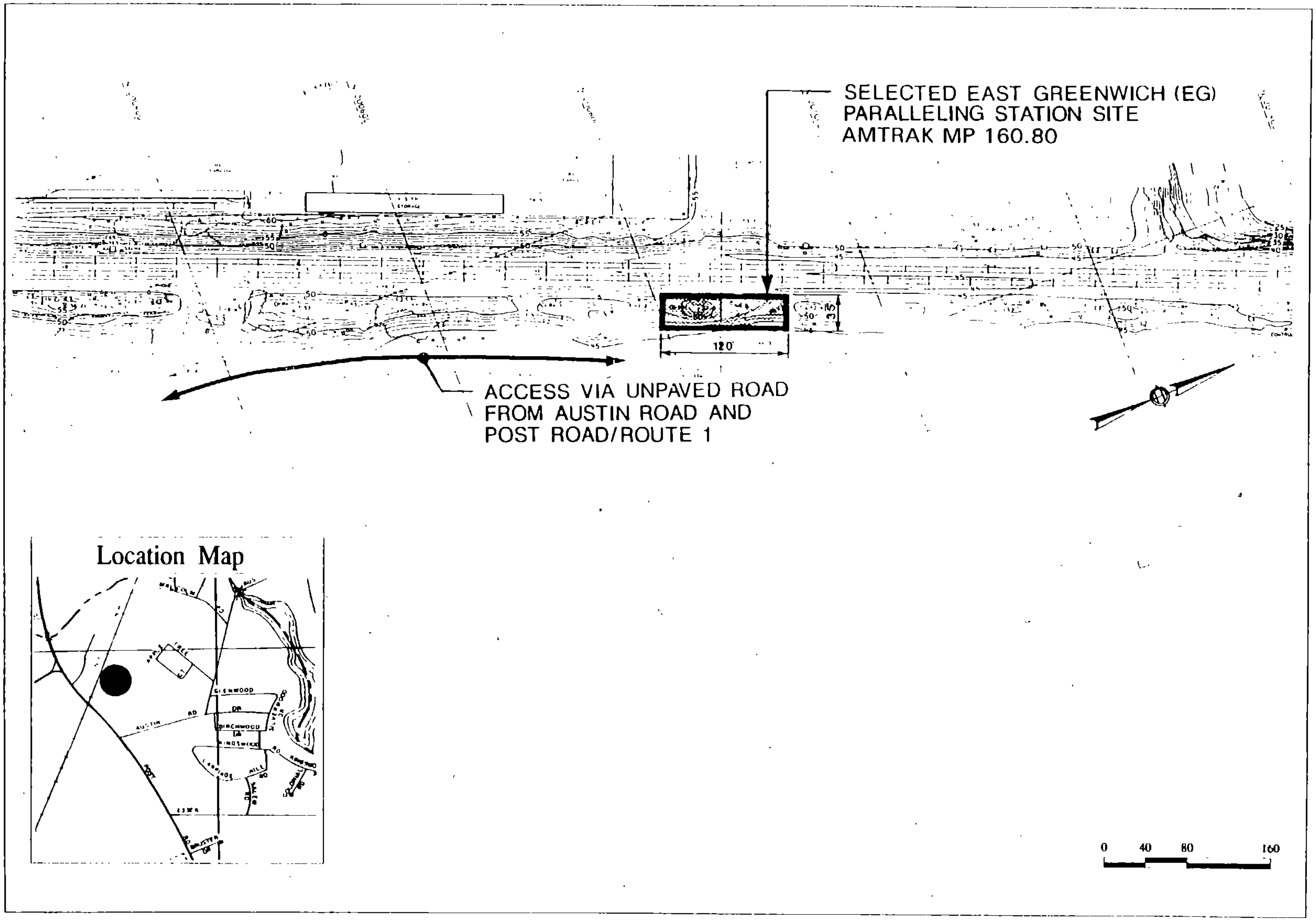

FIGURE A16. EAST GREENWICH PARALLELING STATION

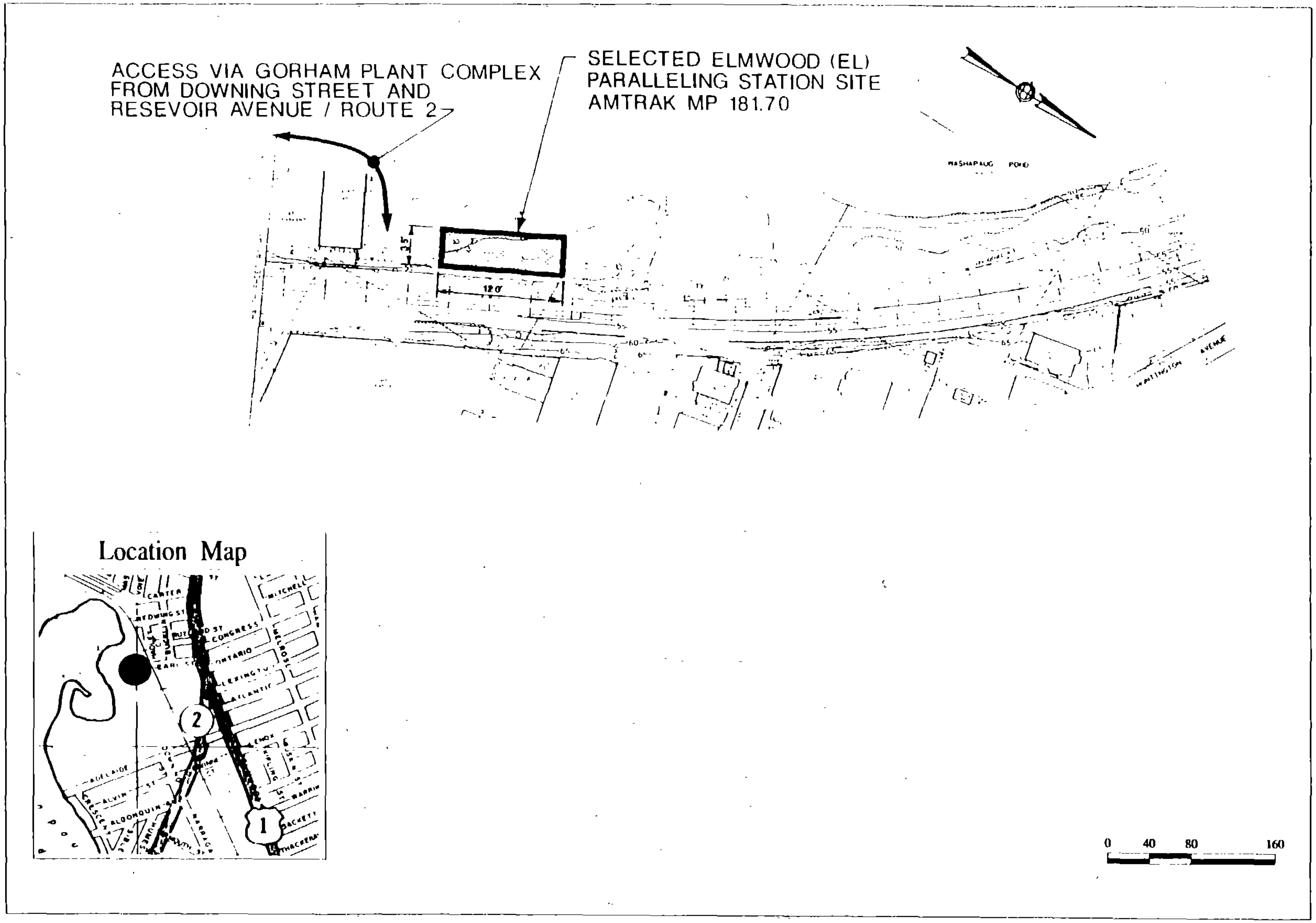

FIGURE A17. ELMWOOD PARALLELING STATION

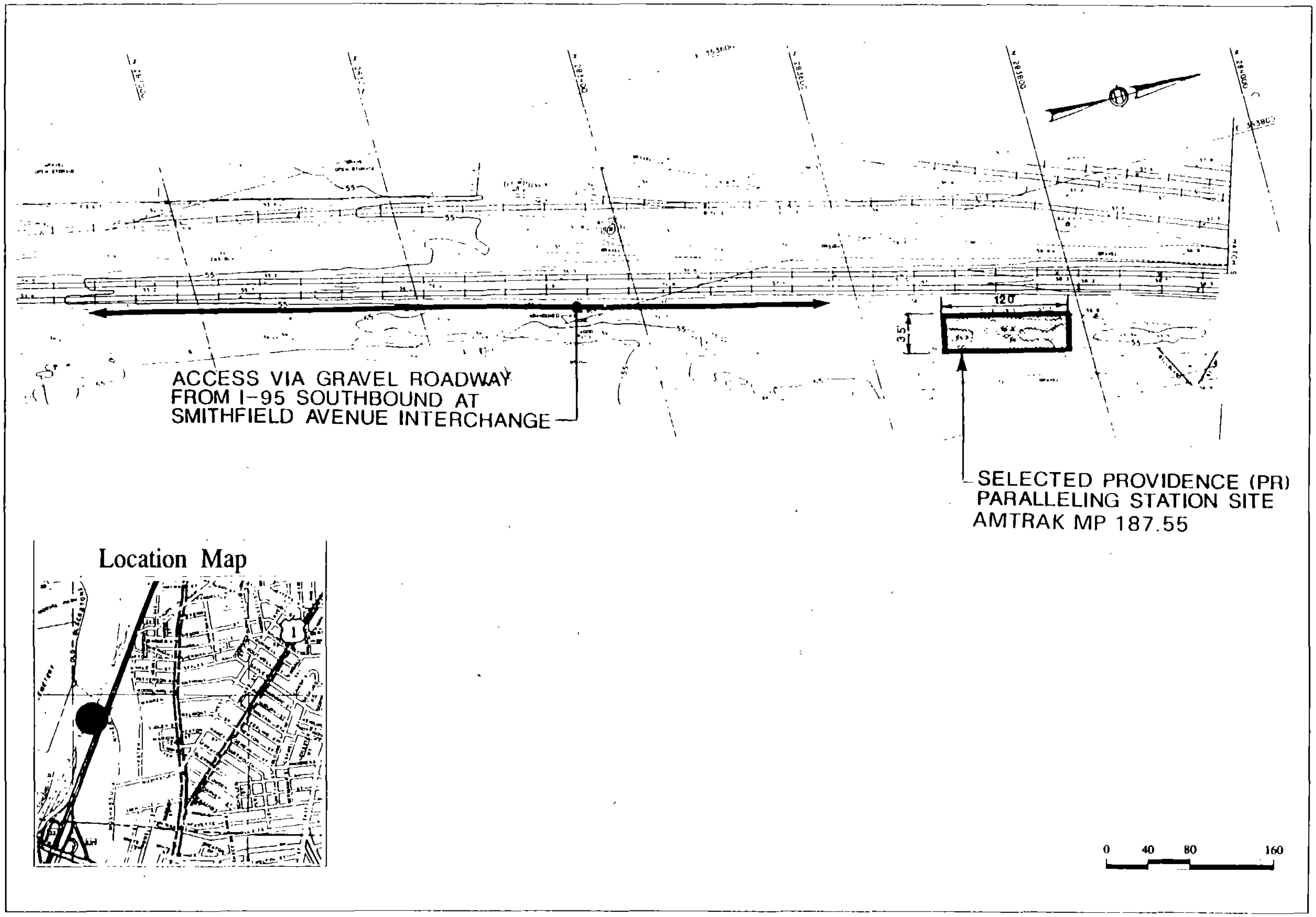

FIGURE A18. PROVIDENCE PARALLELING STATION

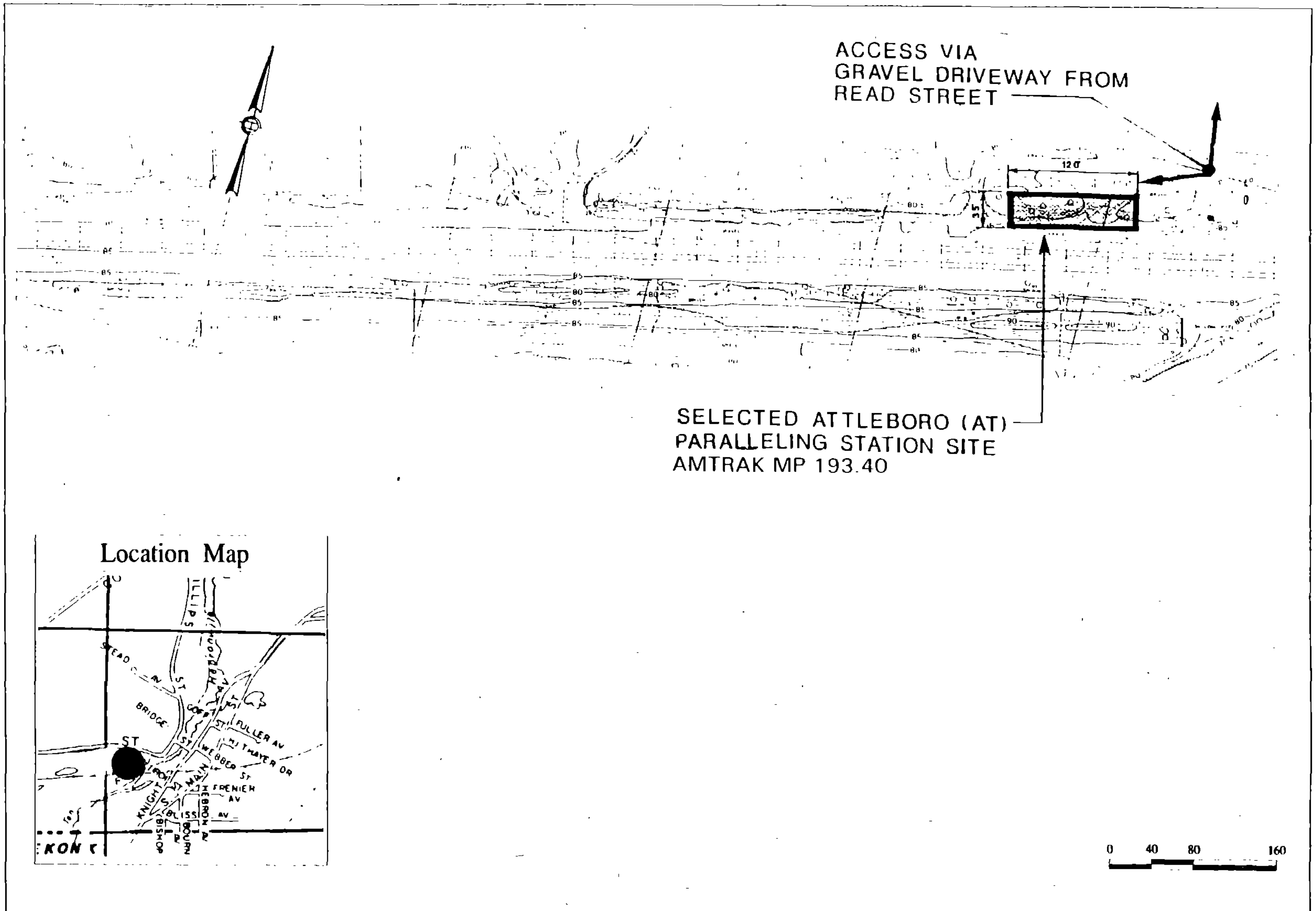

FIGURE A19. ATTLEBORO PARALLELING STATION

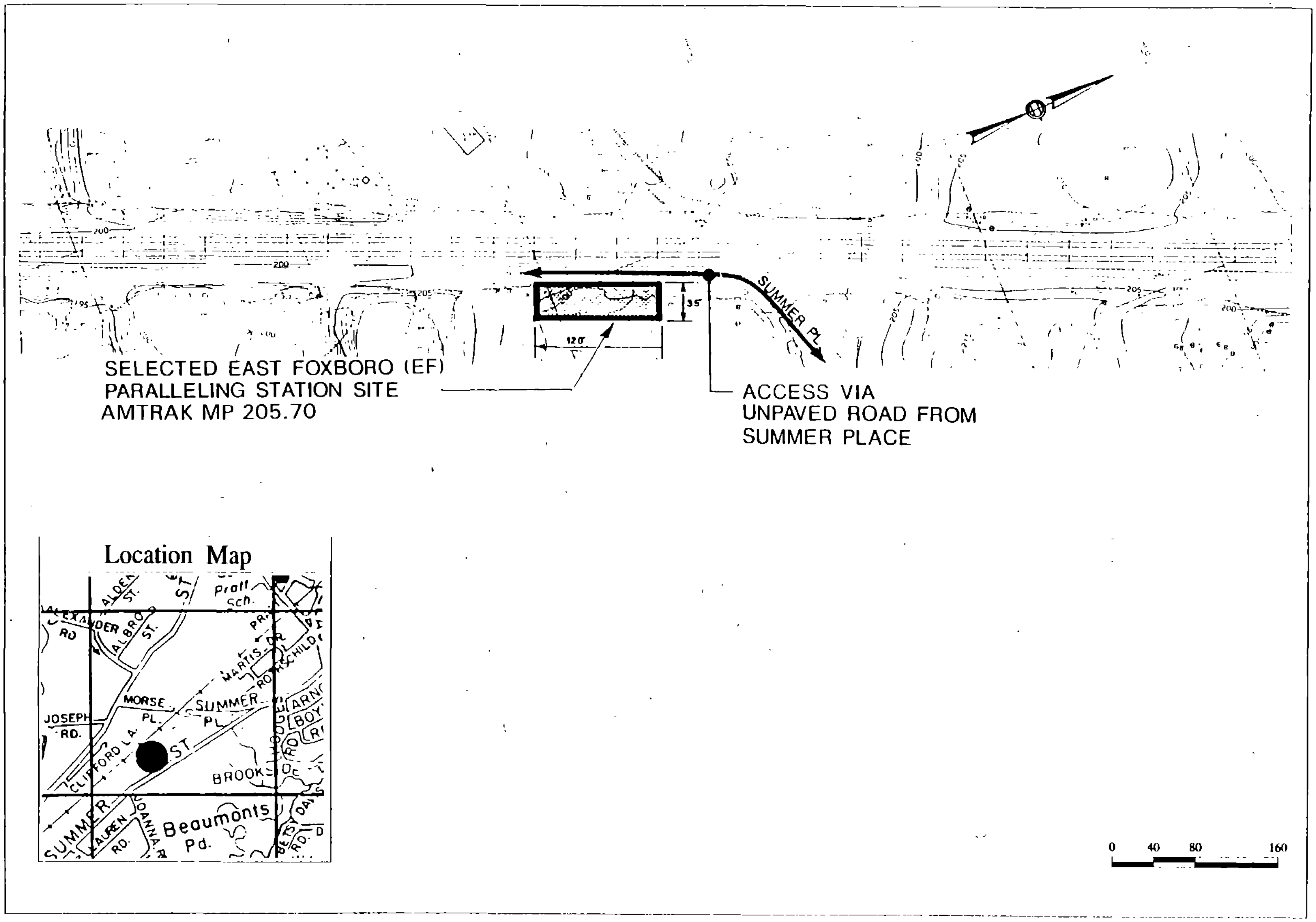

FIGURE A20. EAST FOXBORO PARALLELING STATION

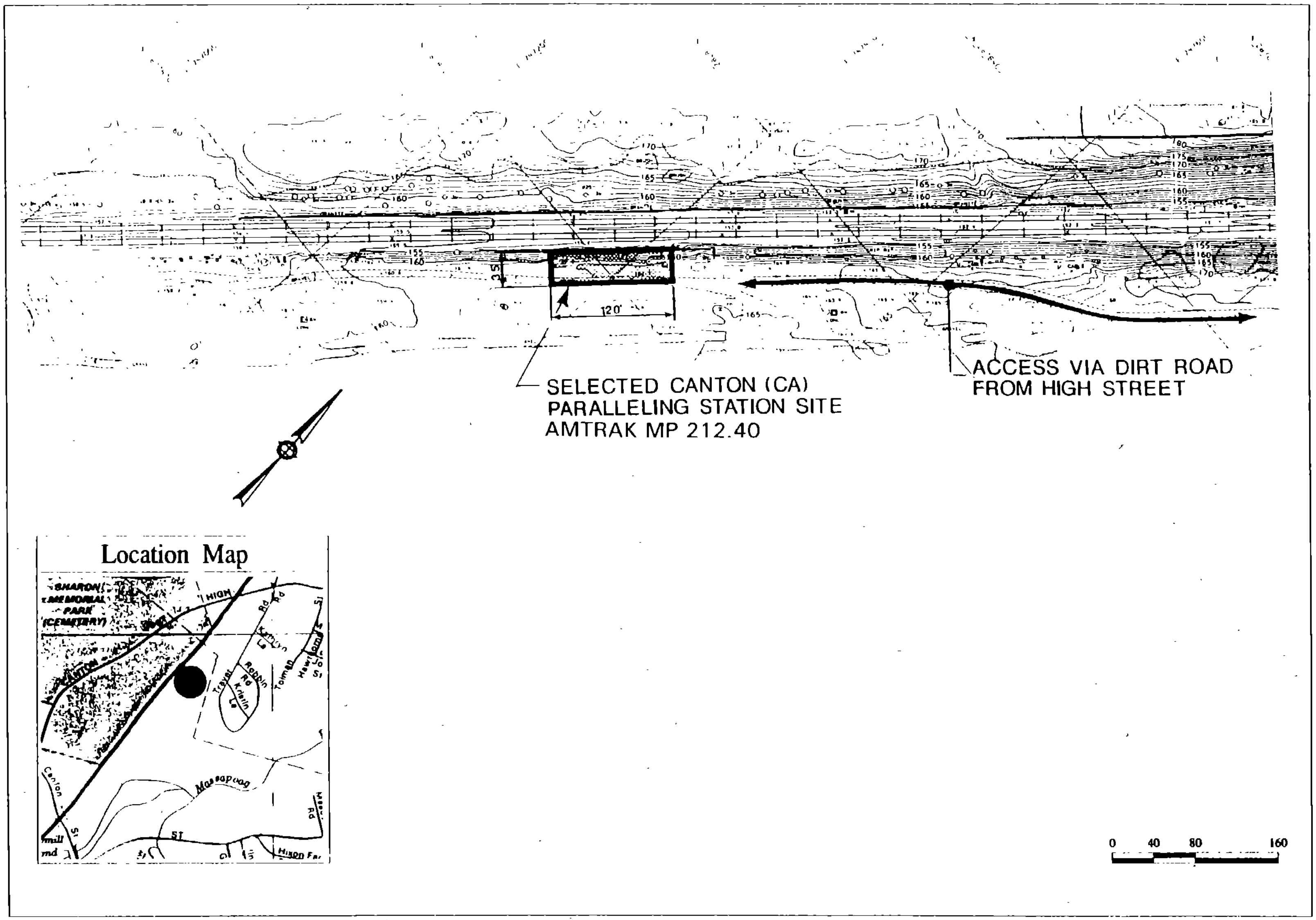

FIGURE A21. CANTON PARALLELING STATION

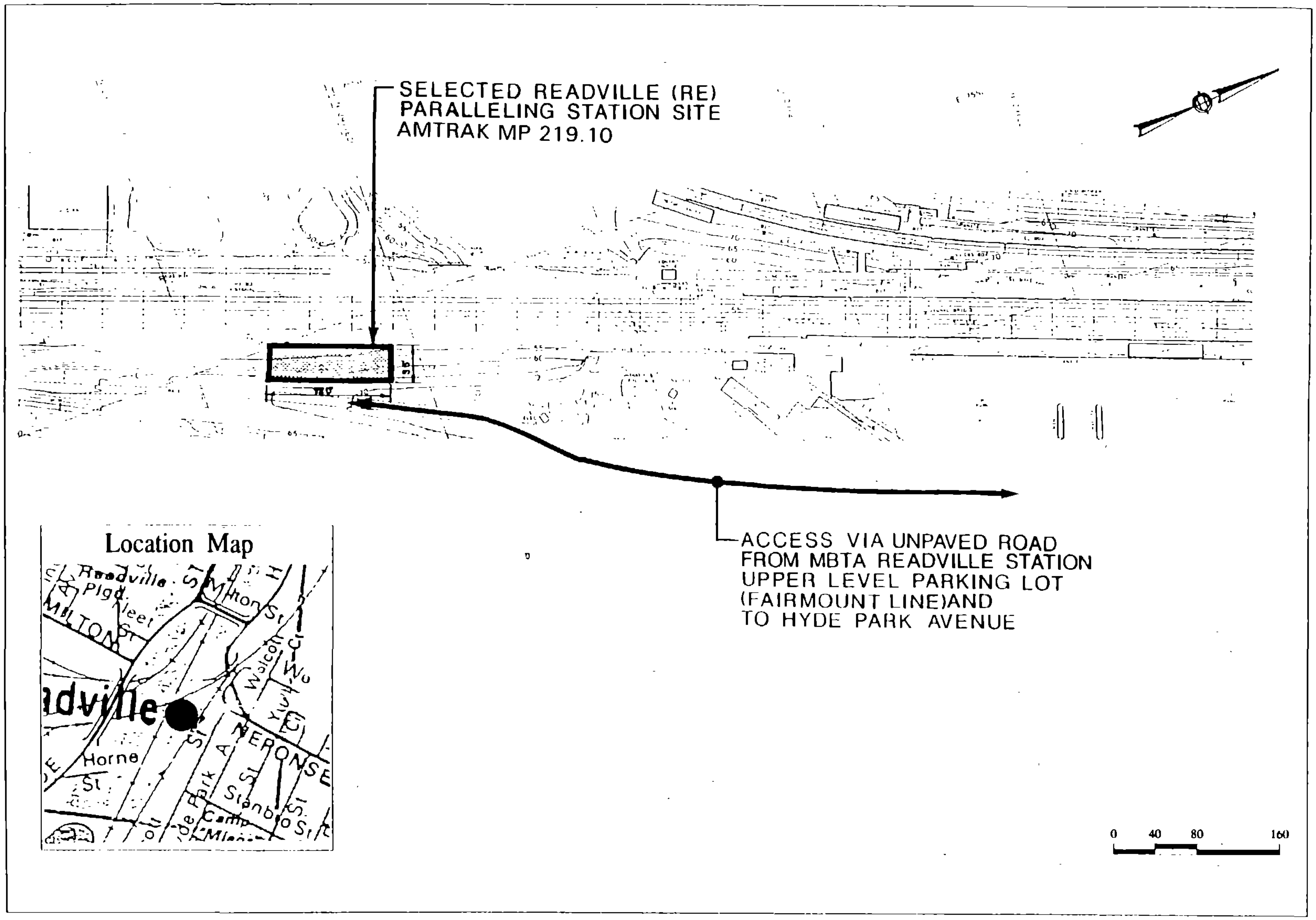

FIGURE A22. READVILLE PARALLELING STATION

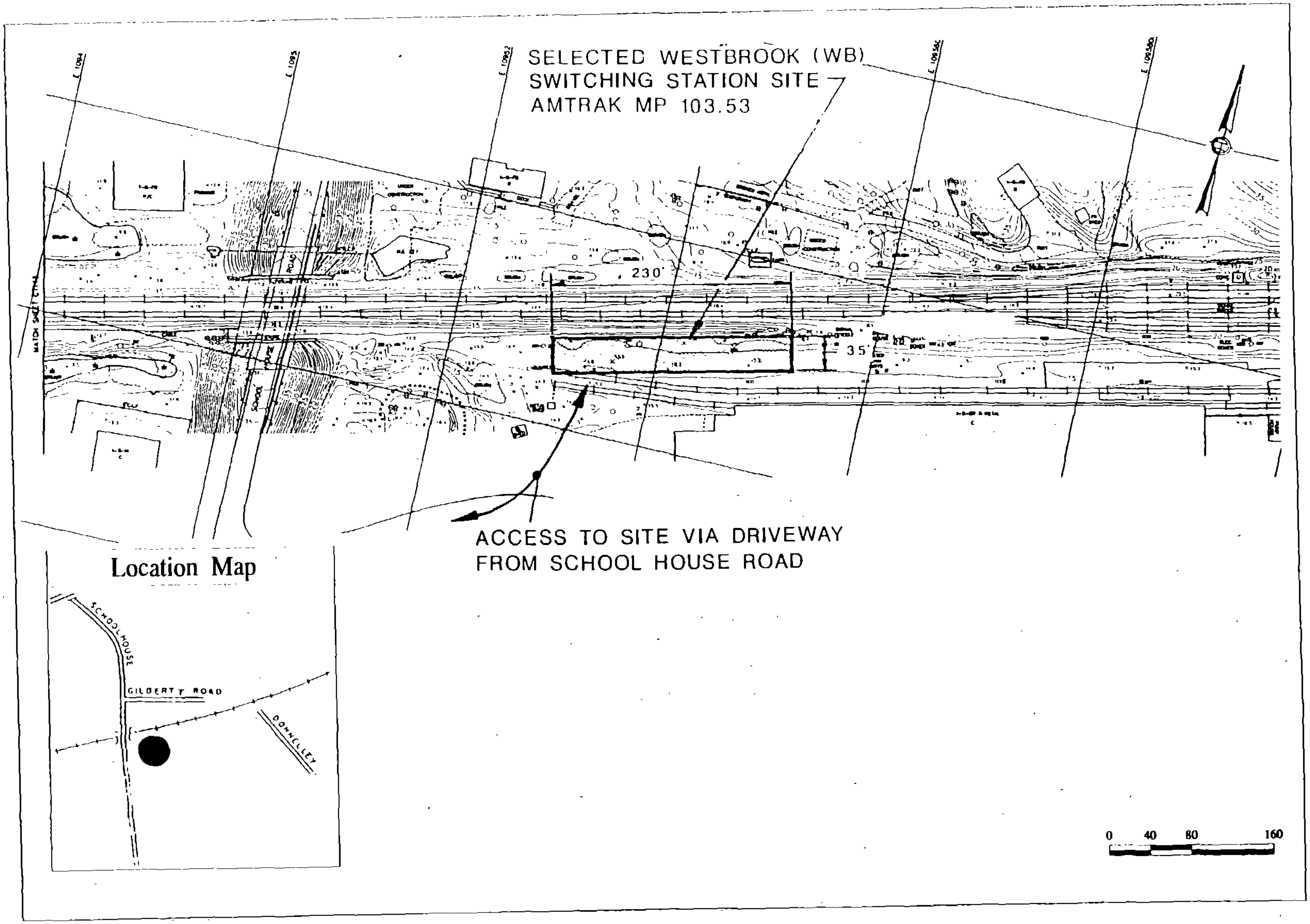

FIGURE A23. WESTBROOK SWITCHING STATION

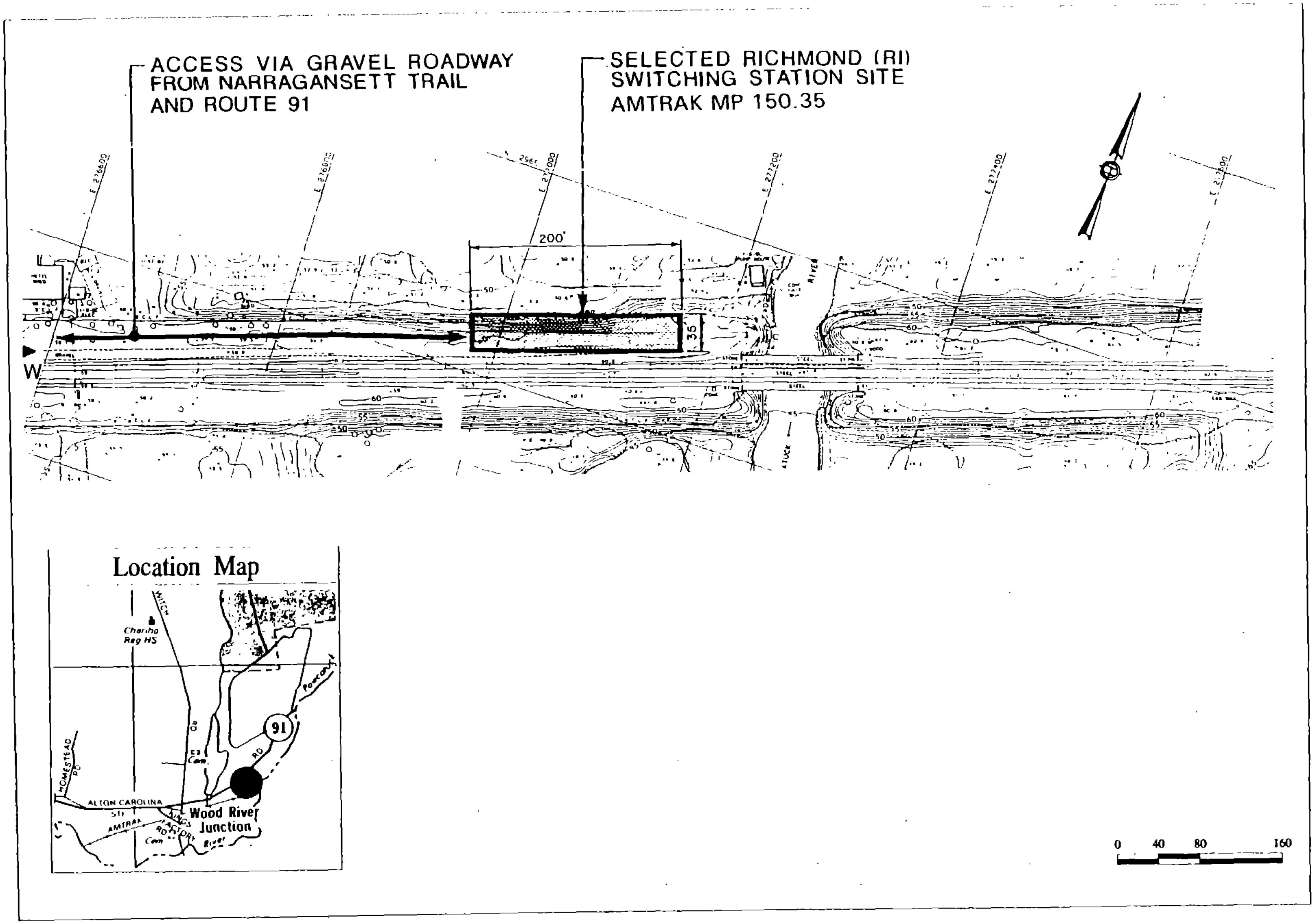

FIGURE A24. RICHMOND SWITCHING STATION

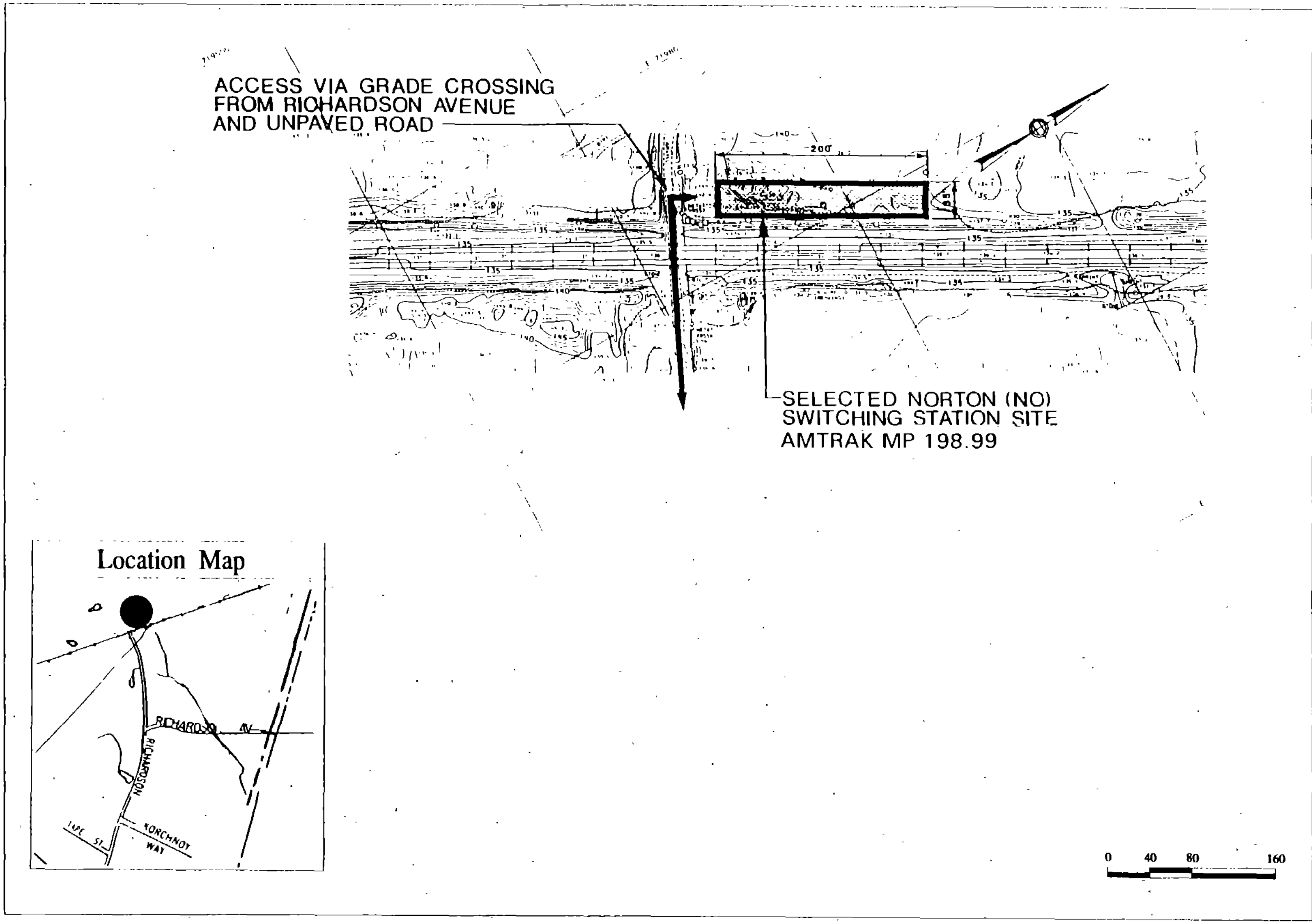

FIGURE A25. NORTON SWITCHING STATION

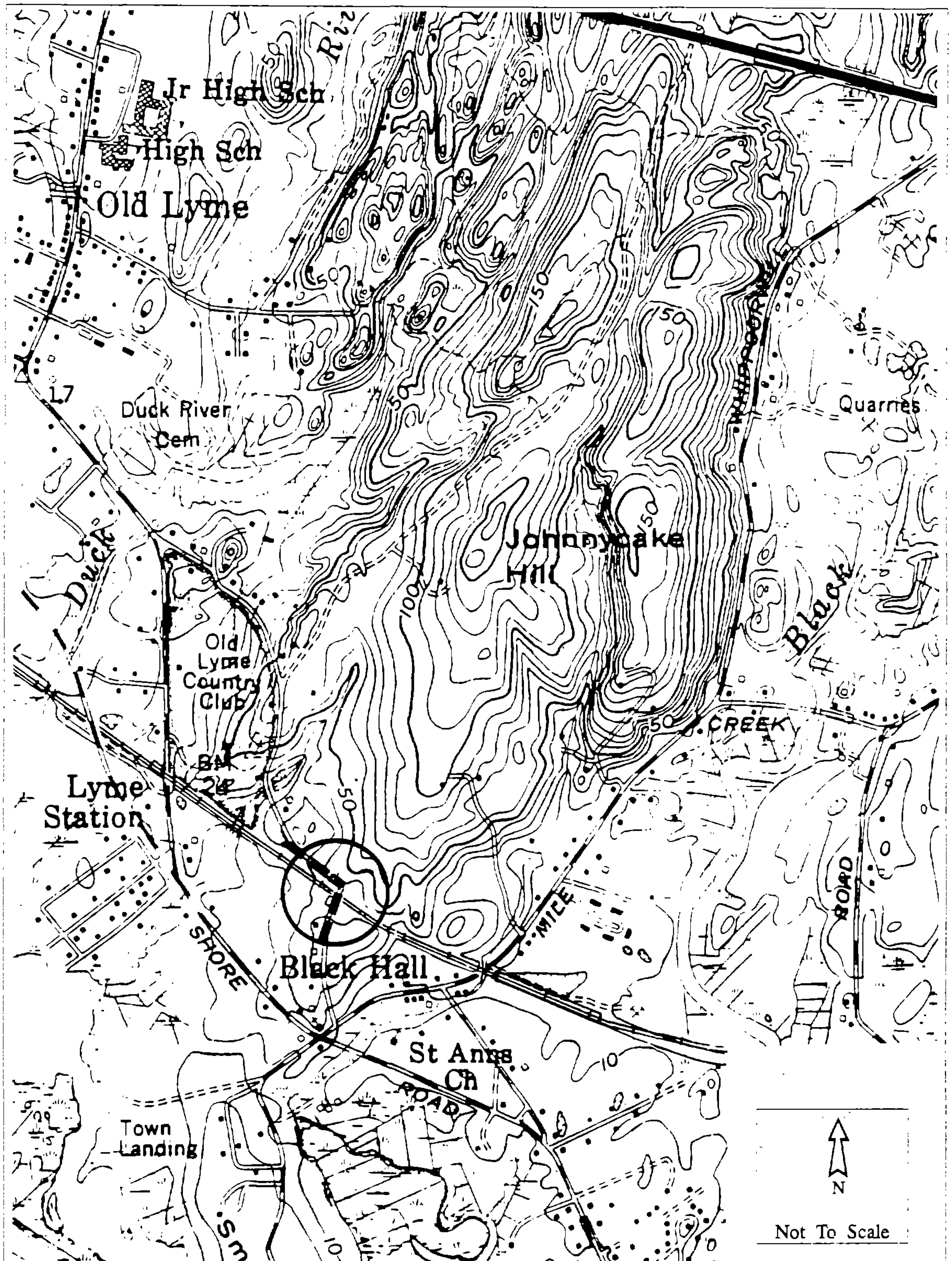

FIGURE A26. JOHNNYCAKE HILL ROAD (REPLACE) - OLD LYME, CT

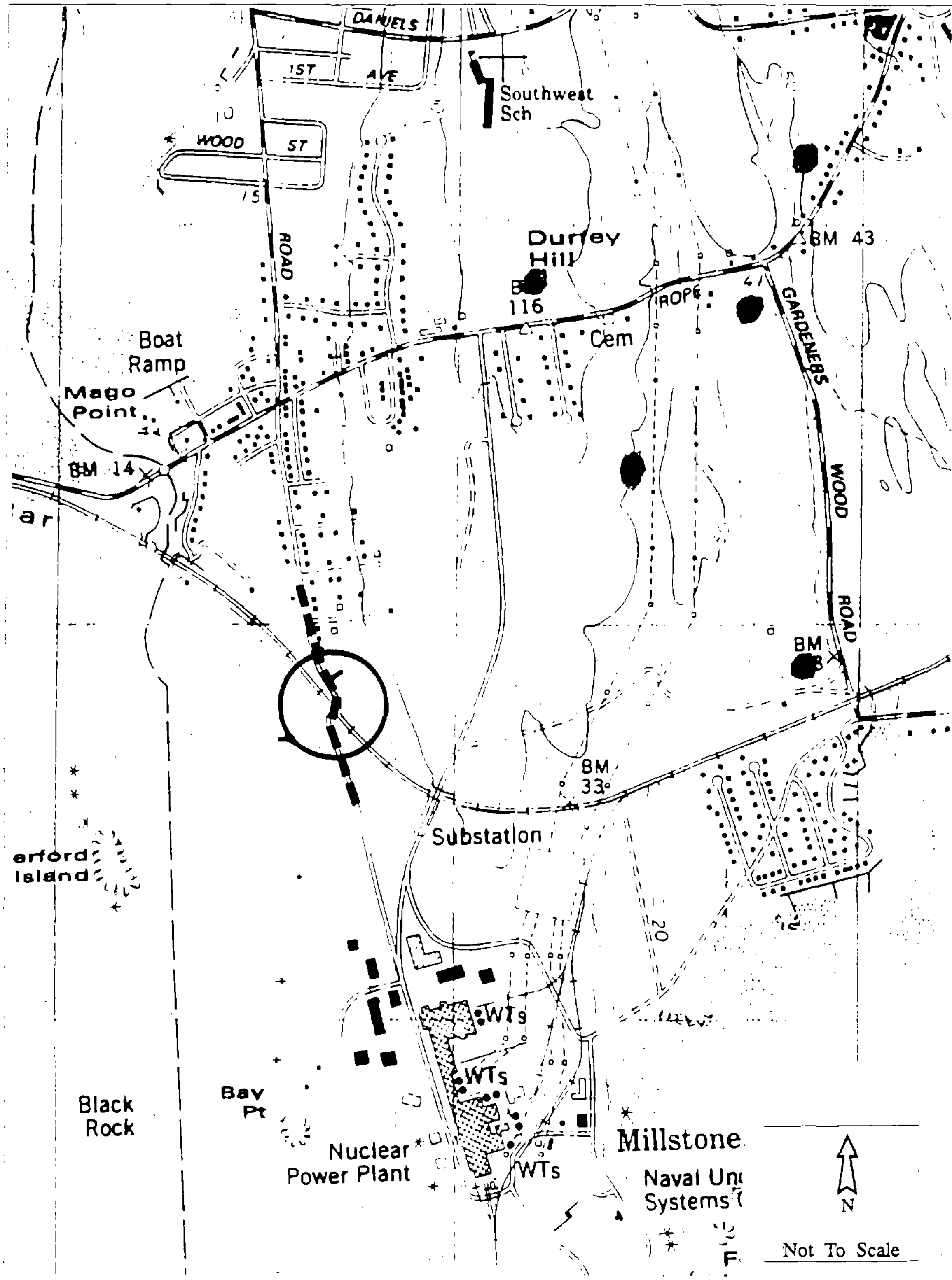

FIGURE A27. MILLSTONE POINT ROAD (RAISE) - WATERFORD, CT

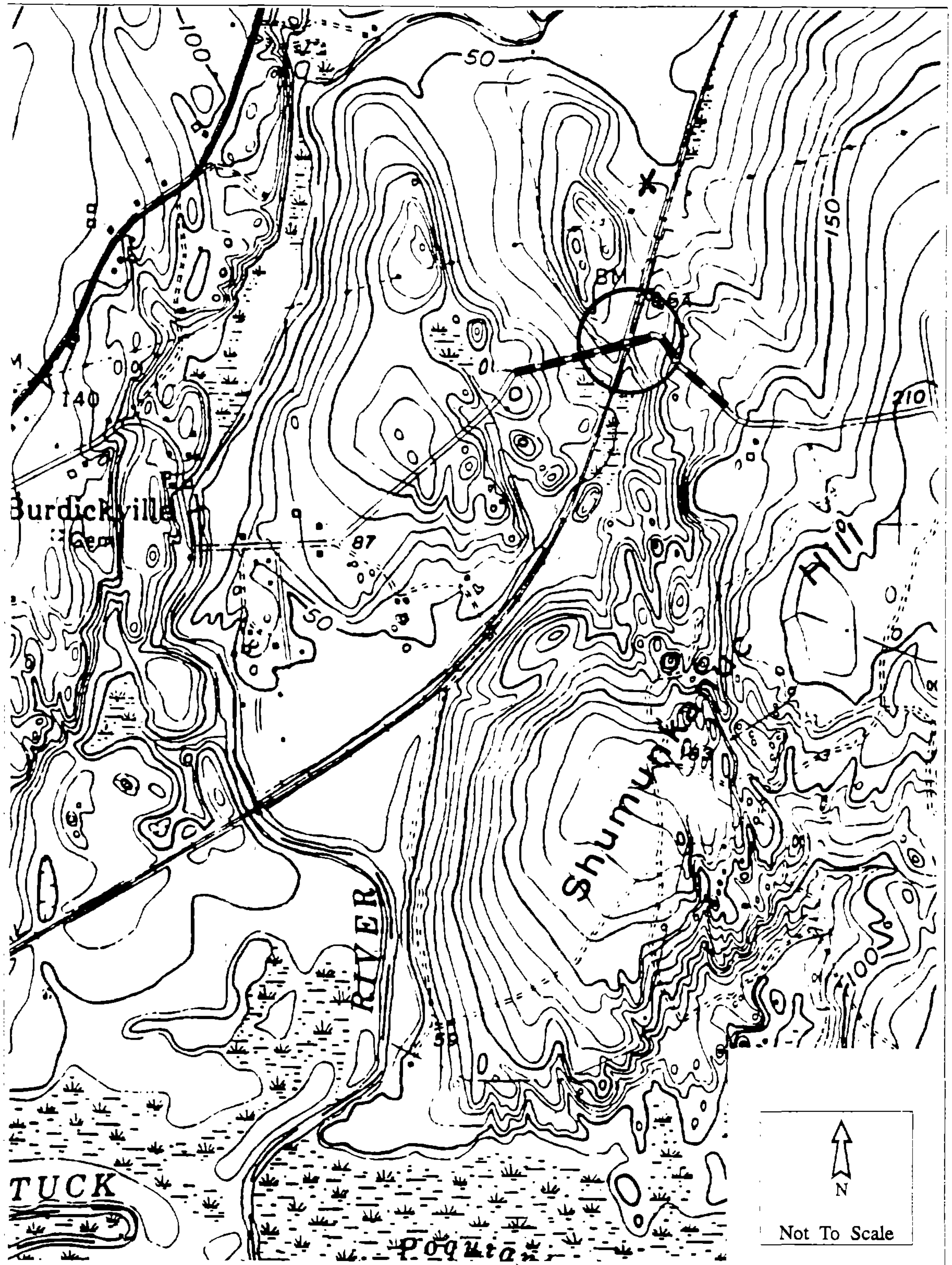

FIGURE A28. BURDICKVILLE (REPLACE) - CHARLESTOWN, RI

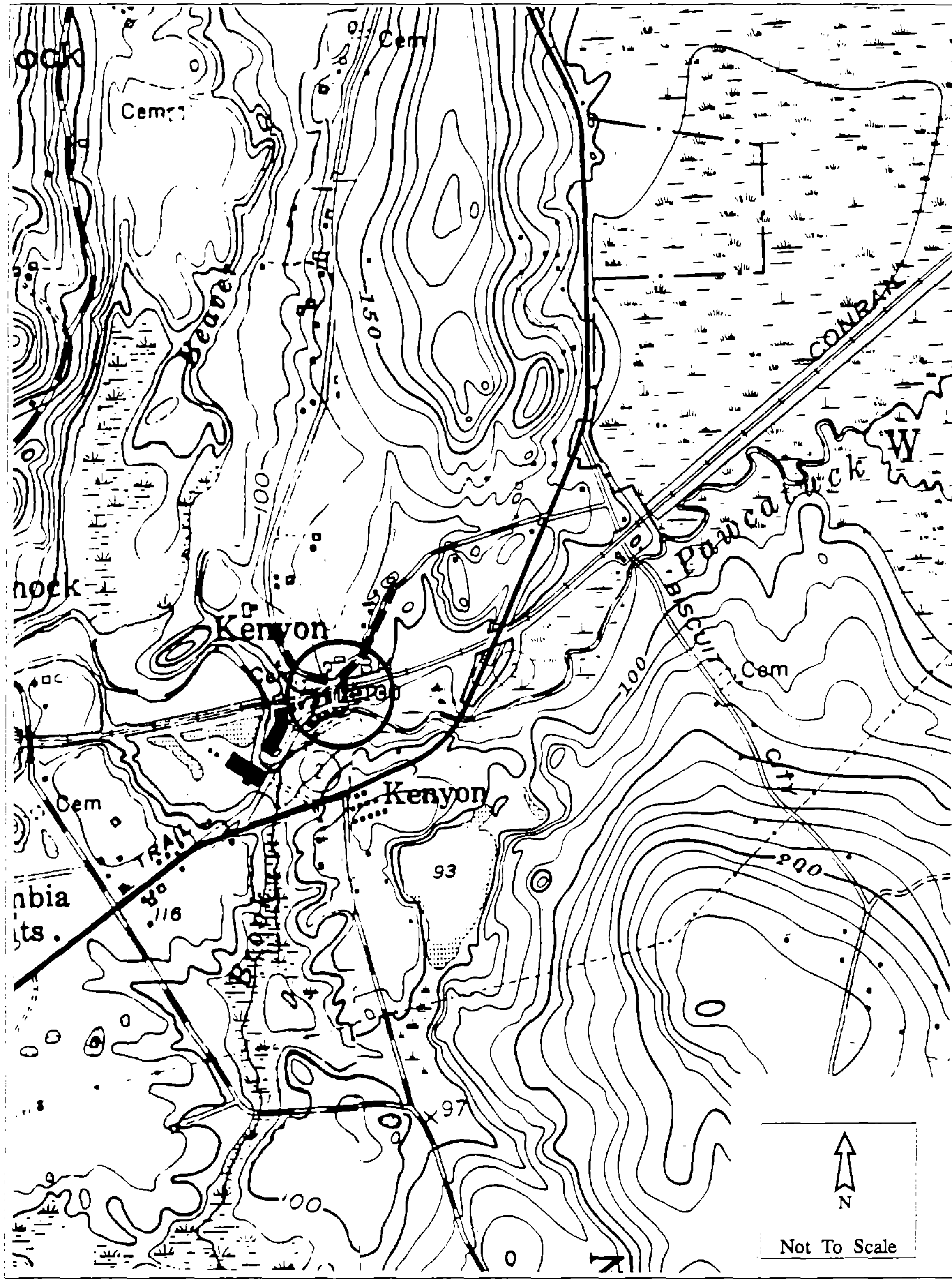

FIGURE A29. KENYON SCHOOL ROAD (REPLACE) - RICHMOND, RI

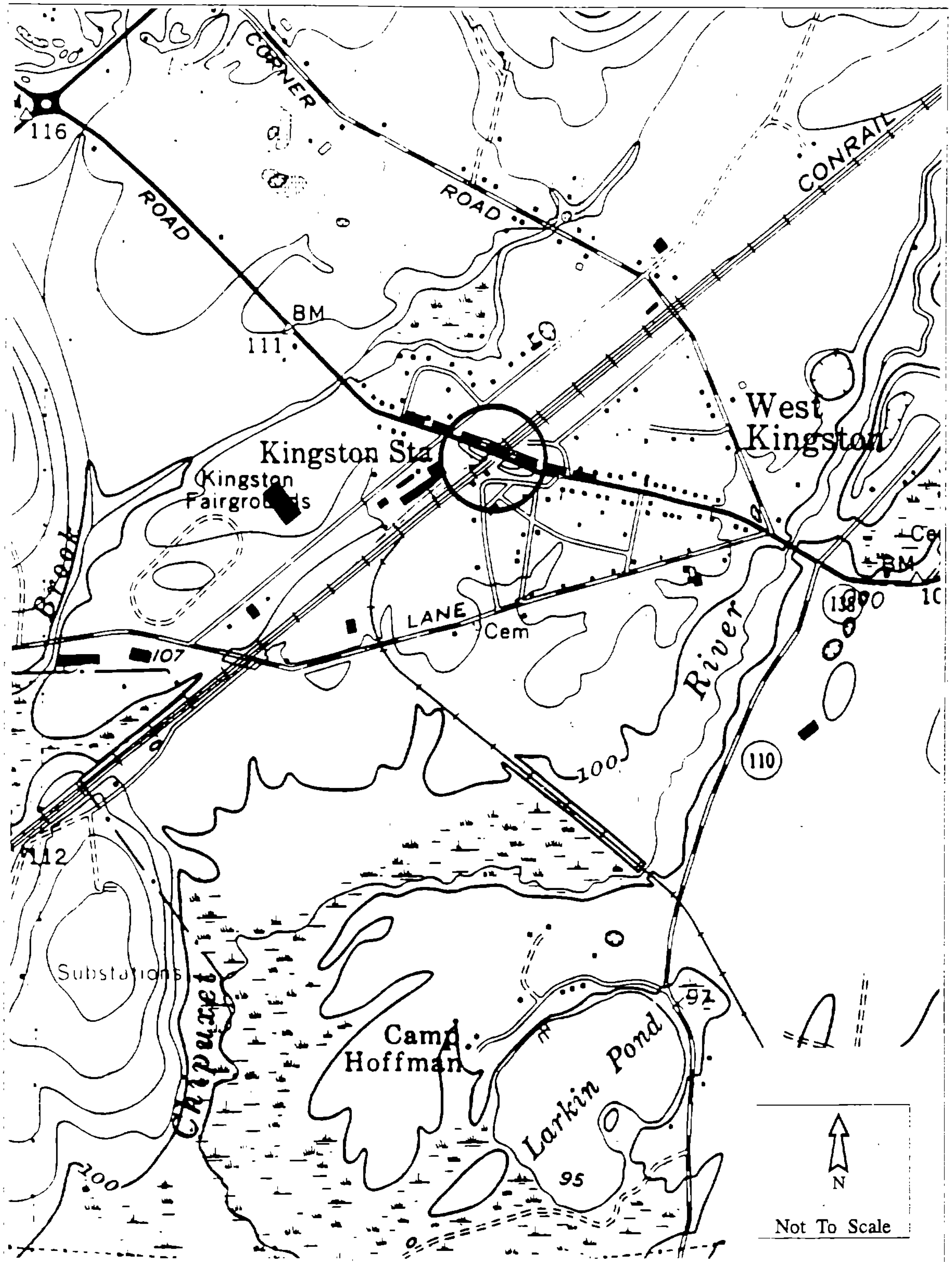

FIGURE A30. RI ROUTE 138 (RAISE) - S. KINGSTOWN, RI

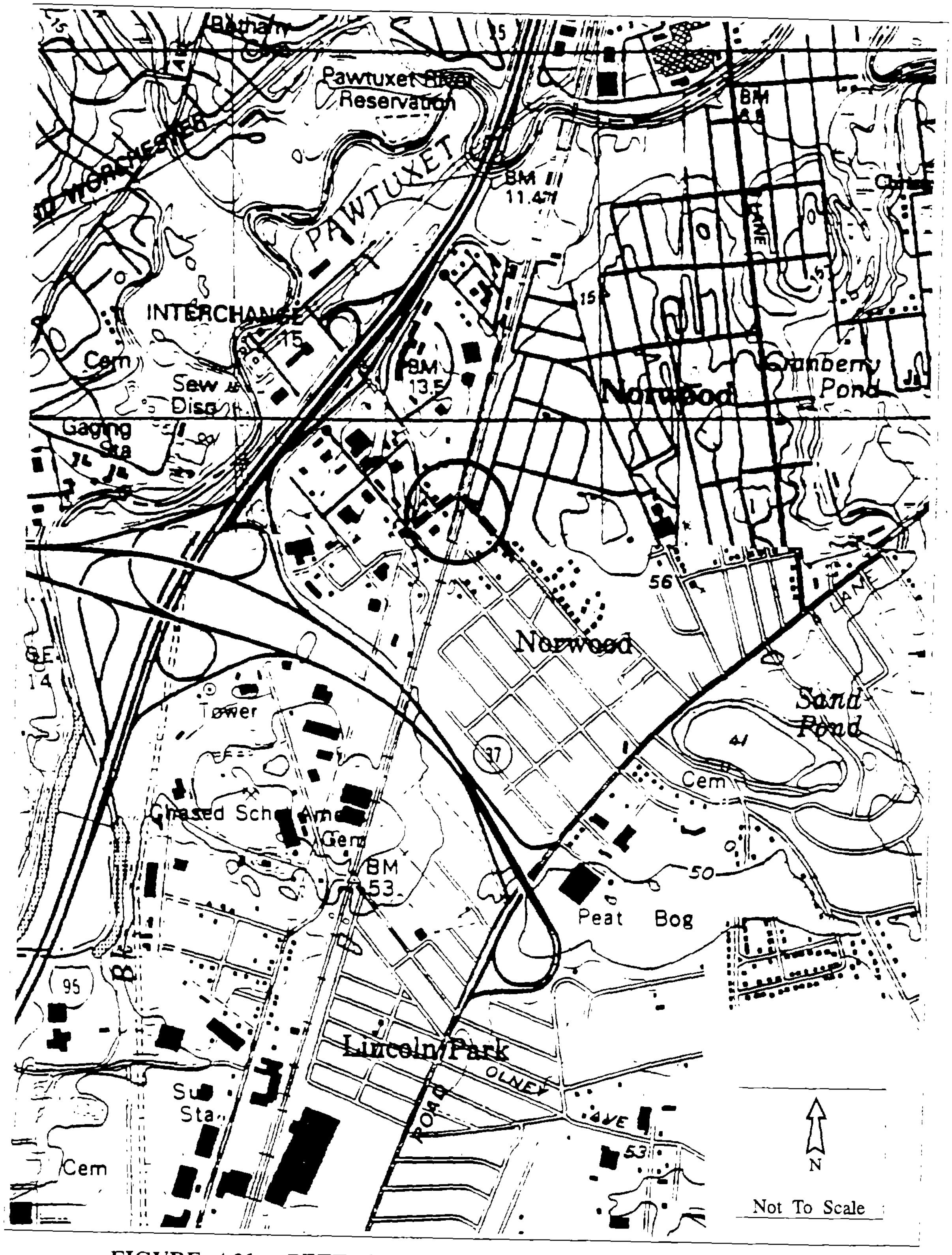

FIGURE A31. PETTACONSETT (REPLACE) - WARWICK, RI

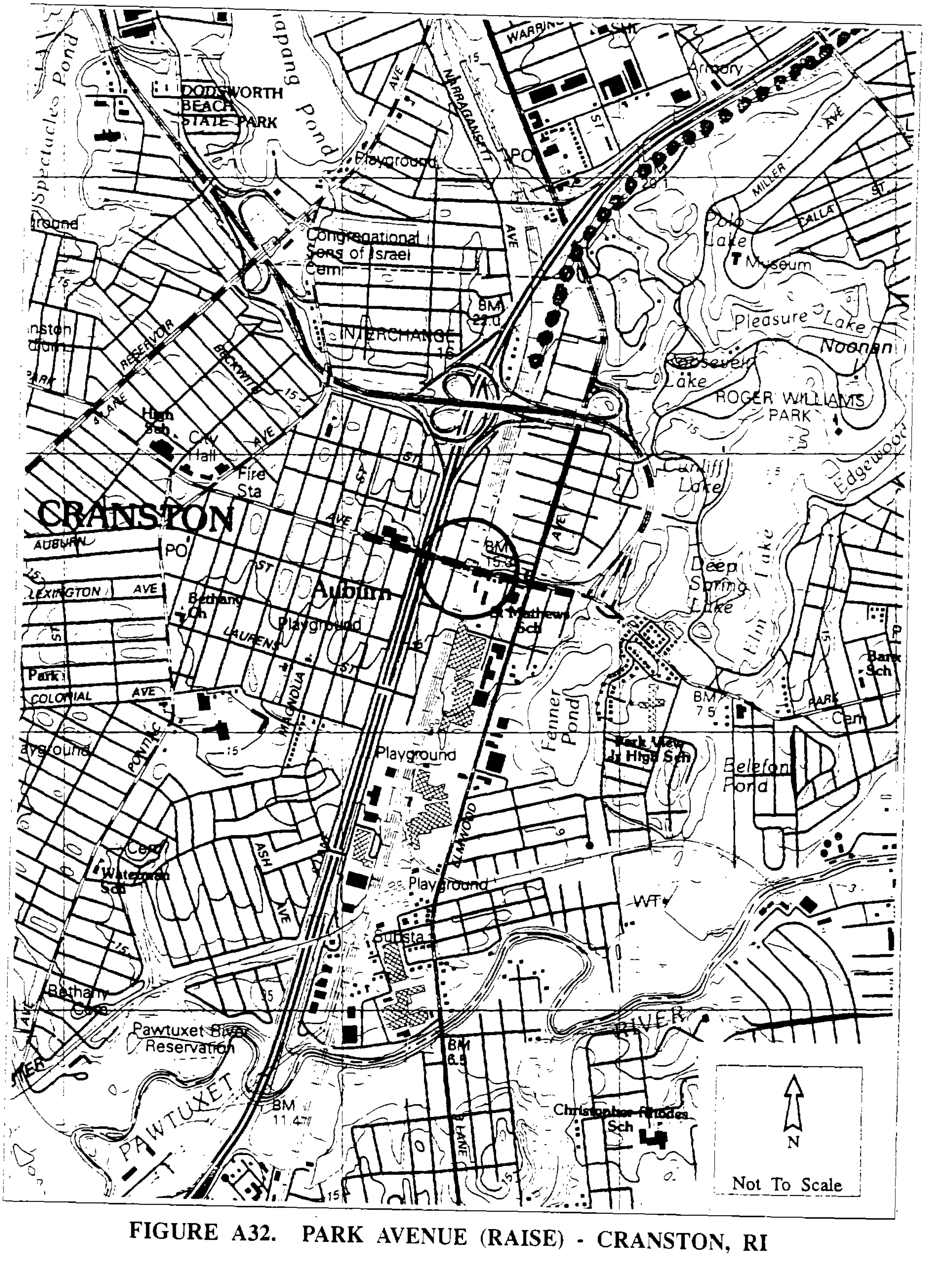

FIGURE A32. PARK AVENUE (RAISE) - CRANSTON, RI

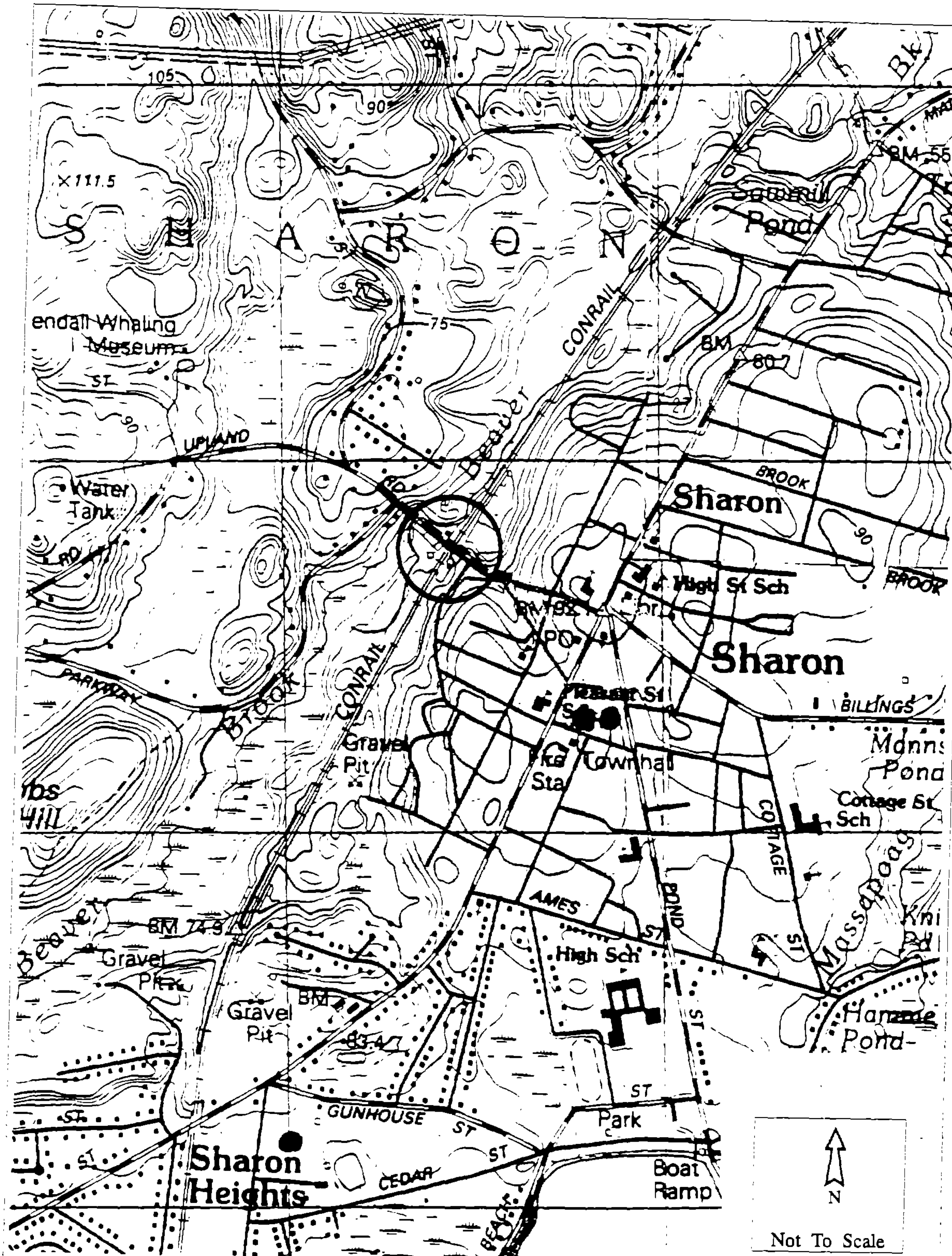

FIGURE A33. DEPOT STREET (REPLACE) - SHARON, MA

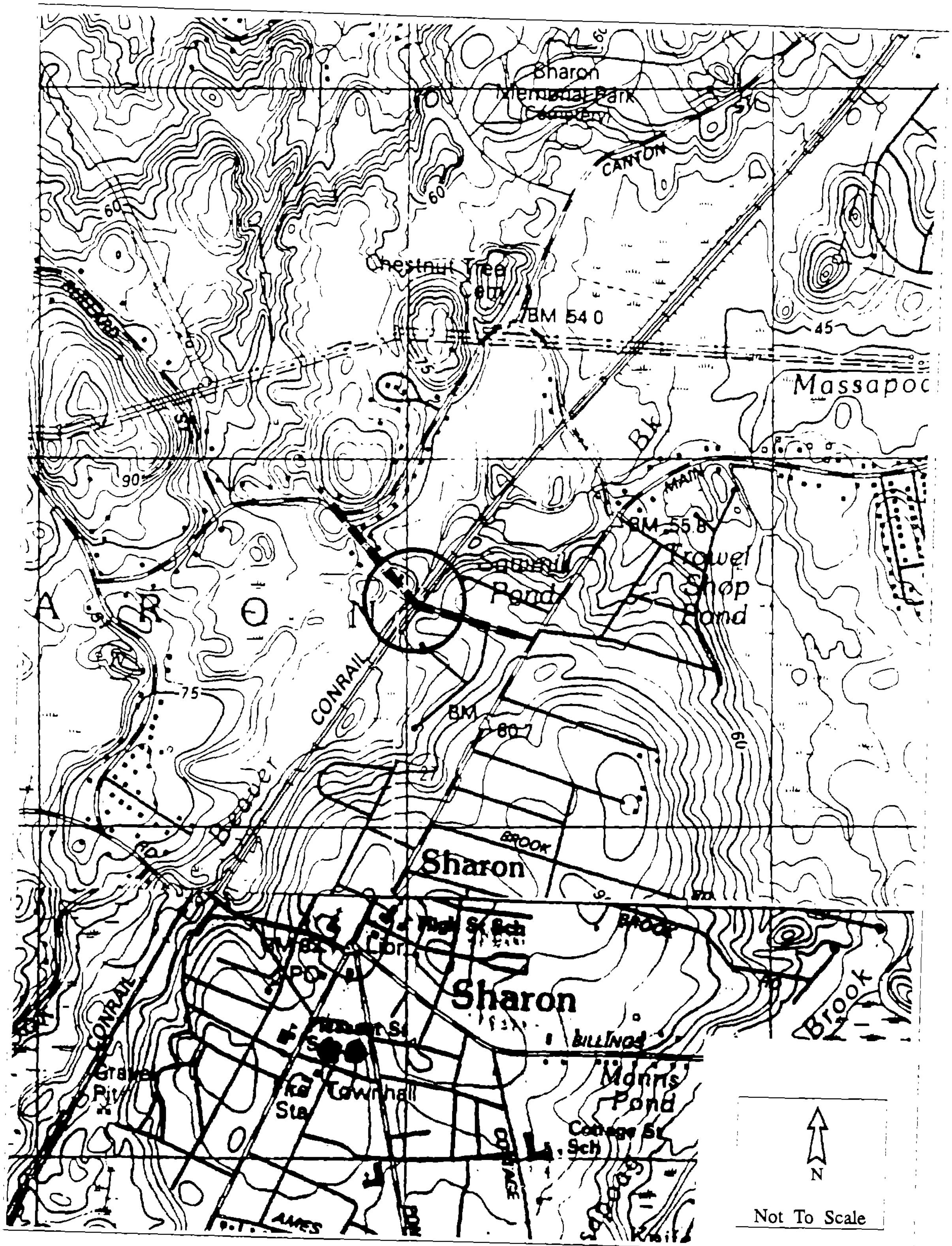

FIGURE A34. MASKWONICUT STREET (RAISE) - SHARON, MA

APPENDIX B
CHAPTER THREE TABLES

TABLE 3.1-1 LAND USES ADJACENT TO THE NORTHEAST CORRIDOR RAIL LINE BY MUNICIPALITY

LOCALITY	MILEAGE	PROJECT FACILITY	PREVALENT LAND USES	SENSITIVE RECEPTORS
New Haven, CT	4.8	None	Industrial, general business, residential, wholesale and distribution, open space/undeveloped areas of the Quinnipiac River and associated wetlands.	8 schools 16 churches 7 recreation areas 3 hospitals 1 nursing home 1 library 1 funeral home
East Haven, CT	1.9	None	Medium and high density residential, commercial, industrial,	1 churches 2 recreation areas 1 library 1 nursing home
Branford, CT	6.7	Branford Substation	Undeveloped, wooded or wetland areas. Commercial and industrial sues, medium to high density residential, Pine Orchard Association (1 ac. residential)	5 parks 1 school 1 church 2 libraries
Guilford, CT	5.0	Leetes Island Paralleling Station	Residential, industrial, commercial, municipal,	2 public recreation sites
Madison, CT	4.2	Madison Paralleling Station	Residential, commercial, industrial, undeveloped	5 recreation areas 1 school 2 churches 1 library 1 cemetery 1 public well site
Clinton, CT	4.1	None	Medium density residential, industrial, golf course, agricultural, dump site, industrial, commercial, municipal, wetlands,	2 schools 4 churches 3 cemeteries 1 nursing home 2 recreation site 1 funeral home
Westbrook, CT	3.5	Grove Beach Paralleling Station	Residential, industrial, commercial, I-95	3 schools 5 recreation sites 1 library 1 church

TABLE 3.1-1 LAND USES ADJACENT TO THE NORTHEAST CORRIDOR RAIL LINE BY MUNICIPALITY (continued)

LOCALITY	MILEAGE	PROJECT FACILITY	PREVALENT LAND USES	SENSITIVE RECEPTORS
Old Saybrook,, CT	4.4	Westbrook Switching Station	I-95, undeveloped, commercial, residential, industrial, commercial	3 schools 2 nursing homes 2 recreation sites 1 funeral home 1 cemetery
Old Lyme	5.6	Old Lyme Paralleling Station Johnnycake Hill Road Bridge	Low to medium density residential, undeveloped, commercial, industrial, wetlands, golf course	5 recreation sites
East Lyme, CT	4.4	None	Residential, commercial, light industrial, Long Island Sound, Niantic Bay	4 recreational areas 2 funeral homes
Waterford, CT	4.2	Millstone Paralleling Station Millstone Point Road Bridge	Open space, residential,	10 recreation areas 1 hospital 1 school
New London, CT	3.0	New London Substation	Industrial, commercial, high density residential, water,	7 parks 2 hospitals 2 school 1 nursing home 1 church 3 funeral homes
City of Groton, CT	1.0	None	I-95, industrial, high density residential, open space, commercial	9 recreation sites 3 schools 2 nursing homes

TABLE 3.1-1 LAND USES ADJACENT TO THE NORTHEAST CORRIDOR RAIL LINE BY MUNICIPALITY (continued)

LOCALITY	MILEAGE	PROJECT FACILITY	PREVALENT LAND USES	SENSITIVE RECEPTORS
Town of Groton, CT	7.1	Noank Paralleling Station	Medium density residential, open spaces (including Haley Farm State Park), coastal features (the railroad crosses over approximately 7 waterways), commercial, industrial, coastal wetlands, Bluff Point State Park, airport, high and medium density residential, commercial, industrial	2 state parks 2 schools numerous recreation areas
Stonington, CT	9.0	Stonington Paralleling Station State Line Paralleling Station	Open space, low and medium density residential, industrial, commercial Long Island Sound and associated wetlands,	5 recreational areas 2 nursing homes 1 cemetery 2 churches Barn Island Hunting Area
Westerly, RI	5.3	Bradford Paralleling Station	Undeveloped, industrial, commercial, high density residential, commercial	2 recreation areas Burlingame State Park Chapman Pond 1 nursing home 1 library 3 churches
Hopkinton, RI	1.0	None	Undeveloped, wetlands	None
Charlestown, RI	4.6	Burdickville Road Bridge	Low density residential, industrial, wetlands,	Burlingame Management Area
Richmond, RI	3.7	Richmond Switching Station Kenyon School Road Bridge	Undeveloped, low density residential, industrial	2 churches
South Kingstown, RI	4.5	Kingston Paralleling Station RI Route 138 Bridge	Low density residential, medium density residential, commercial, industrial, wetlands	1 church

TABLE 3.1-1 LAND USES ADJACENT TO THE NORTHEAST CORRIDOR RAIL LINE BY MUNICIPALITY (continued)

LOCALITY	MILEAGE	PROJECT FACILITY	PREVALENT LAND USES	SENSITIVE RECEPTORS
Exeter, RI	1.7	Exeter Paralleling Station	Low density residential	1 recreation area
North Kingstown, RI	7.9	East Greenwich Paralleling Station	Industrial, commercial, residential	2 schools 2 recreation areas 6 churches
Warwick, RI	7.7	Warwick Substation Pettaconsett Avenue Bridge	Medium density residential, commercial, industrial,recreational	3 schools 5 recreation areas 1 cemetery 3 churches
Cranston, RI	2.0	Park Avenue Bridge	Industrial, manufacturing, high density residential, commercial	2 schools 3 recreation areas 2 churches 1 elderly housing
Providence, RI	6.8	Elmwood Paralleling Station	Industrial, commercial, high density residential	18 schools 24 recreation sites 7 churches 1 hospital 2 elderly housing 1 library 1 cemetery
Pawtucket, RI	2.6	Providence Switching Station	Industrial, commercial, high density residential	9 schools 11 recreation sites 2 libraries 1 cemetery 2 churches
Central Falls, RI	0.6	None	Commercial, industrial, high density residential	4 schools 3 recreation sites 3 churches 1 nursing homes 1 hospital 1 library
Attleboro, MA	8.5	Attleboro Paralleling Station Norton Switching Station	Commercial, industrial, medium density residential	1 school 2 recreation areas 2 churches
Mansfield, MA	5.5	None	Industrial, medium and high density residential	1 school 1 recreation area 1 church

TABLE 3.1-1 LAND USES ADJACENT TO THE NORTHEAST CORRIDOR RAIL LINE BY MUNICIPALITY (continued)

LOCALITY	MILEAGE	PROJECT FACILITY	PREVALENT LAND USES	SENSITIVE RECEPTORS
Foxboro, MA	2.7	East Foxboro Paralleling Station	Undevloped and low density residential, industrial	1 recreation area
Sharon, MA	5.1	Canton Paralleling Station Depot Street Bridge Maskwonicut Street Bridge	Low and medium density residential, commercial	4 recreation areas 1 hospital 1 church 1 funeral home
Canton, MA	3.7	None	Industrial, commercial, low density residential and undeveloped	3 schools 1 library
Westwood, MA	0.8	None	Wetlands, open space, industrial	None
Dedham, MA	1.7	None	Wetlands, open space, industrial	1 school
Boston, MA	10.1	Roxbury Crossing Substation	High and medium density residential, industrial, commercial	52 schools 37 recreation areas 10 hospitals 2 libraries 4 nursing homes 5 churches

TABLE 3.1-2. PRIME AND IMPORTANT FARMLANDS

PROJECT FACILITY	SOIL TYPES	AGRICULTURAL IMPORTANCE
Branford Substation - 1,200 foot aerial feeder utility corridor	Ludlow silt loam (LpB), Whethersfield loam (WkC)	Suited to cultivated crops suited to corn, hay, fruit orchards, and other ground cover crops
Warwick Substation	Hinckley gravelly sandy loam, 3 to 15 percent slopes (HkC)	Suited to cultivated crops, pasture, hazard of erosion is moderate, use of cover crops, stripcropping, the return of crop residue, and irrigation are suitable management practices for farming
Westbrook Switching Station	Hinckley gravelly sandy loam, 3 to 15 percent slopes (HkC)	May be suitable for cultivation
Richmond Switching Station	Hinckley gravelly sandy loam, 0 to 3 percent slopes (HkC)	Suitable for cultivated crops and most areas are farmed or idle
State Line Paralleling Station	Merrimac sandy loam, 0 to 3 percent slopes (MyB)	Well suited for cultivated crops, requires minimum tillage, hazard of erosion is slight

Source: U.S.D.A Soil Conservation Service

TABLE 3.2-1. EMPLOYMENT BY INDUSTRY IN THE PROJECT CORRIDOR

INDUSTRY	CT	RI	MA	TOTAL	%
Services	67,646	80,815	153,663	302,124	33.73
Manufacturing	33,929	58,709	113,439	206,077	23.01
Retail Trade	29,307	42,619	79,609	151,535	16.92
Finance	11,436	16,982	33,359	61,777	6.90
Construction	10,535	12,441	23,768	46,744	5.22
Administration	7,558	10,908	20,102	38,568	4.31
Wholesale Trade	5,833	8,414	17,849	32,096	3.58
Transportation	5,969	7,731	14,291	27,991	3.13
Communications	6,145	4,461	9,006	19,612	2.19
Agriculture	1,460	2,791	4,348	8,599	0.96
Mining	151	143	259	553	0.06
TOTAL	179,969	246,014	469,693	895,676	100.00

TABLE 3.3-1. STATUS OF HISTORIC RESOURCES IN THE PROJECT AREA - CONNECTICUT

NAME OF RESOURCE	LOCATION	MILEPOST	NATIONAL REGISTER STATUS
Strouse Corset Factory	New Haven, CT	72.90	Recommended eligible
Grand Avenue Bridge (Bridge No. 3874)	New Haven, CT	72.94	Determined eligible
Olive Street Bridge (Bridge No. 3752)	New Haven, CT	73.08	Determined eligible
Mill River Railroad Bridge	New Haven, CT	73.72	Recommended eligible
Humphrey Street Bridge	New Haven, CT	73.85	Recommended eligible
Ferry Street Bridge (Bridge No. 3998)	New Haven, CT	74.38	Determined eligible
Clifton Street Bridge (Bridge No. 3879)	New Haven, CT	76.24	Determined eligible
New Haven Tunnel	New Haven, CT	76.64	Recommended eligible
Branford Substation	Branford, CT	79.04	No historic resources
Branford Center Historic District	Branford, CT	82.40	Listed
Route 146 Historic District	Guilford, CT	85.41	Listed
Leetes Island Paralleling Station	Guilford, CT	85.74	No historic resources
Island Creek Railroad Bridge	Guilford, CT	87.27	Recommended eligible
Guilford Historic Town Center Historic District	Guilford, CT	88.43	Listed
East River/Post Road Historic District	Madison, CT	90.90	Recommended eligible
Madison Paralleling Station	Madison, CT	92.18	No historic resources
Greek Revival Style House	Madison, CT	93.40	Recommended eligible
Railroad Avenue Historic District	Madison, CT	96.85-96.93	Recommended eligible
Jonathan Murray House	Madison, CT	94.00	Listed
Eighteenth-century House	Clinton, CT	95.50	Recommended eligible
Pond's Extract Company Factory (Cheeseborough Ponds)	Clinton, CT	96.75	Recommended eligible
Clinton Station	Clinton, CT	96.60	Recommended eligible
Railroad Avenue Historic District	Clinton, CT	96.89	Recommended eligible

TABLE 3.3-1. STATUS OF HISTORIC RESOURCES IN THE PROJECT AREA - CONNECTICUT (continued)

NAME OF RESOURCE	LOCATION	MILEPOST	NATIONAL REGISTER STATUS
Indian River Cemetery	Clinton, CT	96.93	Recommended eligible
Indian River Railroad Bridge	Clinton, CT	97.04	Recommended eligible
Liberty Street Historic District	Clinton, CT	97.49	Recommended eligible
Grove Beach Paralleling Station	Westbrook, CT	98.86	No historic resources
Eighteenth-century House	Westbrook, CT	101.11	Recommended eligible
Patchoque River Railroad Bridge	Westbrook, CT	101.22	Recommended eligible
Westbrook Station	Westbrook, CT	101.35	Recommended eligible
Old Saybrook Station And Freight House	Old Saybrook, CT	102.30	Recommended eligible
Old Saybrook Interlocking Tower	Old Saybrook, CT	102.30	Recommended eligible
Westbrook Switching Station	Old Saybrook, CT	103.53	No historic resources
Connecticut River Railroad Bridge	Old Saybrook, CT	106.89	Listed
Johnnycake Hill Road Bridge	Old Lyme, CT	108.51	Not eligible
Eighteenth-century House	Old Lyme, CT	108.51	Recommended eligible
Old Lyme Paralleling Station	Old Lyme, CT	109.28	No historic resources
Rocky Neck Park Pavilion	Old Lyme, CT	112.70	Listed
Rocky Neck Park Trail Bridge	Old Lyme, CT	112.74	Listed
Bride Brook Railroad Bridge	East Lyme, CT	113.18	Recommended eligible
Morton House	East Lyme, CT	115.90	Recommended eligible
Niantic River Railroad Bridge	East Lyme, CT	116.74	Listed
Millstone Point Road Bridge	Waterford, CT	117.31	Not eligible
Millstone Paralleling Station	Waterford, CT	117.54	No historic resources
Victorian Stone House	Waterford, CT	119.80	Recommended eligible
J.N. LaPointe Tool Company	New London, CT	121.90	Recommended eligible

TABLE 3.3-1. STATUS OF HISTORIC RESOURCES IN THE PROJECT AREA - CONNECTICUT (continued)

NAME OF RESOURCE	LOCATION	MILEPOST	NATIONAL REGISTER STATUS
Downtown New London Historic District	New London, CT	122.70	Listed
New London Railroad Station	New London, CT	122.75	Listed
Connecticut Power Company Power Plant	New London, CT	123.30	Recommended eligible
Central Vermont Railroad Bridge	New London, CT	123.80	Recommended eligible
New London Substation	New London, CT	123.81	No historic resources
Thames River Railroad Bridge	New London, CT	124.09	Listed
Groton Tower	Groton, CT	124.40	Recommended eligible
Haley Farm Historic Rural Landscape	Groton, CT	129.30	Recommended eligible
Noank Paralleling Station	Groton, CT	129.46	No historic resources
Noank Historic District	Groton, CT	129.60	Listed
Noank Cove Railroad Bridge	Groton, CT	130.63	Recommended eligible
Mystic River Historic District	Groton, CT	131.3016	Listed
Mystic Station	Stonington, CT	132.55	Recommended eligible
Packer Tar and Soap Factory	Stonington, CT	132.60	Recommended eligible
Mystic Cemetery	Stonington, CT	132.70	Recommended eligible
Wilcox Road Historic District	Stonington, CT	133.77	Recommended eligible
Stonington Paralleling Station	Stonington, CT	134.69	No historic resources
Stonington Borough Historic District	Stonington, CT	136.10	Listed
State Line Paralleling Station	Stonington, CT	139.99	No historic resources
Mechanic Street (Pawcatuck) Historic District	Stonington, CT	140.50	Listed
Campbell Grain Mill	Stonington, CT	141.30	Recommended eligible
Pawcatuck River Railroad Bridge	Stonington, CT	141.35	Determined eligible (integrity questionable)

TABLE 3.3-2. STATUS OF HISTORIC RESOURCES IN THE PROJECT AREA - RHODE ISLAND

NAME OF RESOURCE	LOCATION	MILE POST	NATIONAL REGISTER STATUS
Pawcatuck River Railroad Bridge	Westerly, RI	141.35	Determined eligible (integrity questionable)
Westerly Railroad Station	Westerly, RI	141.60	Listed
Westerly Freight Station	Westerly, RI	141.62	Recommended eligible
Downtown Westerly Historic District	Westerly, RI	141.50	Listed
Westerly Armory	Westerly, RI	141.65	Recommended eligible
West Street Bridge (RIDOT No. 401)	Westerly, RI	141.67	Determined eligible
Greek Revival-Style House	Westerly, RI	141.67	Recommended eligible
Immaculate Conception Church	Westerly, RI	141.77	Recommended eligible
Westerly Signal Tower	Westerly, RI	142.05	Recommended eligible
Greek Revival-Style House	Westerly, RI	142.00	Recommended eligible
Eighteenth-Century House	Westerly, RI	144.60	Recommended eligible
Stone-Walled Enclosure	Westerly, RI	144.60	Recommended eligible
Bradford Paralleling Station	Westerly, RI	145.19	No historic resources
Bradford Historic District	Westerly, RI	145.50	Determined eligible
Pawcatuck River Railroad Bridge	Westerly, RI	146.39	Recommended eligible
Burdickville Road Bridge (RIDOT No. 914)	Charlestown, RI	148.41	Not eligible (RIDOT)
Pawcatuck River Railroad Bridge	Charlestown, RI	147.45	Recommended eligible
Pawcatuck River Railroad Bridge	Charlestown, RI	149.47	Recommended eligible
Richmond Switching Station	Richmond, RI	150.36	No historic resources
Pawcatuck River Railroad Bridge	Charlestown, RI	150.59	Recommended eligible
Carolina Road Bridge (RIDOT No. 57)	Charlestown, RI	152.30	Not recommended as eligible
Pawcatuck River Railroad Bridge	Charlestown, RI	152.71	Recommended eligible

TABLE. 3.3-2. STATUS OF HISTORIC RESOURCES IN THE PROJECT AREA - RHODE ISLAND (continued)

NAME OF RESOURCE	LOCATION	MILE POST	NATIONAL REGISTER STATUS
Kenyon School Road Bridge	Richmond, RI	154.04	Part of probably eligible district
Victorian-Period House	Richmond, RI	150.00	Recommended eligible
Greek Revival House	Richmond, RI	150.10	Recommended eligible
Shannock Historic District	Richmond, RI	153.90	Listed
Kenyon Historic District	Richmond, RI	154.00	Recommended eligible
Kingston Paralleling Station	South Kingston, RI	157.03	No historic resources
Main Street Bridge (RI Route 138 Bridge) (RIDOT No. 372)	South Kingston, RI	158.32	Recommended eligible
Kingston Railroad Station	South Kingston, RI	158.20	Listed
Kingston Tower	South Kingston, RI	158.35	Recommended eligible
Washington County Courthouse	South Kingston, RI	158.40	Recommended eligible
West Kingston Historic Rural Landscape	South Kingston, RI	158.50	Recommended eligible
Kenyon Homestead/Underwood House	South Kingston, RI	158.70	Recommended eligible
Hundred Acre Pond Bridge	South Kingston, RI	159.37	Recommended eligible
Yawgoo Mill And Company Houses	Exeter, RI	161.50	Recommended eligible
Exeter Paralleling Station	Exeter, RI	161.80	Historic area
W.R. Slocum House	North Kingston, RI	162.00	Determined eligible
Sod Farm Landscape At Slocum	North Kingston, RI	162.30	Recommended eligible
Wickford Junction/Lafayette Historic District	North Kingston, RI	165.80	Determined eligible
Lawton Farm Landscape	North Kingston, RI	166.80	Recommended eligible
Lawton House	North Kingston, RI	166.85	Recommended eligible
Hunt's River Road Bridge (RIDOT No. 7)	North Kingston, RI	169.79	Not recommended as eligible
Pains Pond Culvert	East Greenwich, RI	171.06	Recommended eligible

TABLE. 3.3-2. STATUS OF HISTORIC RESOURCES IN THE PROJECT AREA - RHODE ISLAND (continued)

NAME OF RESOURCE	LOCATION	MILE POST	NATIONAL REGISTER STATUS
East Greenwich Historic District	East Greenwich, RI	171.80	Listed
Warwick Substation	Warwick, RI	176.93	No historic resources
Pettaconsett Bridge (RIDOT No. 921)	Warwick, RI	178.46	Not recommended as eligible
Elizabeth Spring	Warwick, RI	171.00	Listed
Post Road Historic District	Warwick, RI	172.35	Recommended eligible
Ocean Point Road Bridge/Culvert	Warwick, RI	172.75	Recommended eligible
Rhode Island Historical Cemetery No. 34	Warwick, RI	174.50	Recommended eligible
Victorian-Period House	Warwick, RI	174.70	Recommended eligible
Greenwood Railroad Bridge (RIDOT #2)	Warwick, RI	175.70	Recommended eligible
Greenwood Inn	Warwick, RI	175.70	Recommended eligible
Pontiac Railroad Station	Warwick, RI	176.20	Recommended eligible
Elizabeth Mill	Warwick, RI	176.70	Recommended not eligible
Park Avenue Bridge (RIDOT No. 922)	Cranston, RI	180.29	Not eligible
Pawtuxet River Railroad Bridge	Cranston, RI	179.16	Recommended eligible
Maxwell Briscoe Motor Company/Universal Winding Company	Cranston, RI	179.25	Recommended eligible
General Electric Company	Cranston, RI	180.35	Recommended eligible
United Traction Depot and Repair Shop	Cranston, RI	182.70	Determined eligible
Elmwood Paralleling Station	Providence, RI	181.70	Historic sites
Gorham Manufacturing Company, Carriage House and Stable	Providence, RI	181.70	Determined eligible
Union Railroad Company Car Barns and Stable	Providence, RI	181.90	Recommended eligible
Potters Avenue Historic District	Providence, RI	182.00	Recommended eligible
Atlantic Coal Company Storage Elevators	Providence, RI	183.20	Recommended eligible

TABLE. 3.3-2. STATUS OF HISTORIC RESOURCES IN THE PROJECT AREA - RHODE ISLAND (continued)

NAME OF RESOURCE	LOCATION	MILE POST	NATIONAL REGISTER STATUS
Weybosset Mills	Providence, RI	183.55	Recommended eligible
Power Plant	Providence, RI	183.50	Recommended eligible
Commercial Building	Providence, RI	183.55	Recommended eligible
City Machine Company	Providence, RI	184.50	Recommended eligible
Merchant's Cold Storage and Warehouse Company	Providence, RI	184.90	Determined eligible
Downtown Providence Historic District	Providence, RI	184.90	Listed
Brown & Sharp Manufacturing Company	Providence, RI	185.10	Listed
University of Rhode Island Extension Building	Providence, RI	185.30	Recommended eligible
Old Union Station	Providence, RI	185.40	Listed
Rhode Island State House	Providence, RI	185.70	Listed
Roger Williams National Memorial Park	Providence, RI	185.70	Listed
Cathedral Of St. John	Providence, RI	185.70	Listed
Rhode Island State Office Building	Providence, RI	185.80	Recommended eligible
College Hill Historic District	Providence, RI	185.00	Listed
Moshassuck Square Historic District	Providence, RI	186.00	Listed
Oriental Mills	Providence, RI	186.20	Recommended eligible
Silver Spring Bleaching and Dying Company	Providence, RI	186.60	Recommended eligible
Providence Tool Company	Providence, RI	186.70	Recommended eligible
Box Factory/Ginger Ale Plant	Providence, RI	186.85	Recommended eligible
North Burial Ground	Providence, RI	187.00	Listed
Northrup Yard	Providence, RI	187.80	Recommended eligible
Colfax Tower	Providence, RI	187.70	Recommended eligible

TABLE. 3.3-2. STATUS OF HISTORIC RESOURCES IN THE PROJECT AREA - RHODE ISLAND (continued)

NAME OF RESOURCE	LOCATION	MILE POST	NATIONAL REGISTER STATUS
Providence Paralleling Station	Providence, RI	187.73	No historic resources
American Textile Company	Pawtucket, RI	187.80	Recommended eligible
Hope Webbing Company	Pawtucket, RI	188.00	Recommended eligible
Blackstone Canal	Pawtucket, RI	188.27	Listed
Woodlawn Signal Tower	Pawtucket, RI	189.10	Recommended eligible
Mineral Spring Cemetery	Pawtucket, RI	189.20	Recommended eligible
Mineral Spring Park	Pawtucket, RI	189.20	Determined eligible
Conant Thread Complex	Pawtucket, RI	189.20	Determined eligible
Pawtucket Freight Station	Pawtucket, RI	189.40	Recommended eligible
Union Wadding	Pawtucket, RI	189.50	Recommended eligible
Former School	Pawtucket, RI	189.60	Recommended eligible
Italianate-Style House	Pawtucket, RI	189.80	Recommended eligible
Pawtucket/Central Falls Station	Pawtucket, RI	189.80	Determined eligible
Blackstone River Railroad Bridge	Pawtucket, RI	190.55	Recommended eligible
Pumping Station No. 1	Pawtucket, RI	190.65	Recommended eligible
Pumping Station No. 4	Pawtucket, RI	190.65	Recommended eligible
South Central Falls Historic District	Central Falls, RI	189.90	Listed
Central Falls Congregational Church	Central Falls, RI	189.90	Listed
St. Joseph's Church	Central Falls, RI	189.90	Recommended eligible
Victorian-Period House	Central Falls, RI	189.90	Recommended eligible
Norton House	Central Falls, RI	189.90	Recommended eligible
Italianate-Detailed House	Central Falls, RI	190.00	Recommended eligible

TABLE. 3.3-2. STATUS OF HISTORIC RESOURCES IN THE PROJECT AREA - RHODE ISLAND (continued)

NAME OF RESOURCE	LOCATION	MILE POST	NATIONAL REGISTER STATUS
Greene House	Central Falls, RI	190.00	Determined eligible
Flagg House	Central Falls, RI	190.90	Recommended eligible
Central Street Pedestrian Viaduct	Central Falls, RI	190.00	Recommended eligible
Grant House	Central Falls, RI	190.00	Recommended eligible
Crocker House	Central Falls, RI	190.00	Recommended eligible
Wood House	Central Falls, RI	190.00	Recommended eligible
Fales House	Central Falls, RI	190.20	Determined eligible
Boston Switch Tower	Central Falls, RI	190.30	Recommended eligible
Fales and Jenks Mill	Central Falls, RI	190.30	Determined eligible
High Street Bridge	Central Falls, RI	190.49	Recommended eligible

TABLE 3.3-3. STATUS OF HISTORIC RESOURCES IN THE PROJECT AREA - MASSACHUSETTS.

NAME OF RESOURCE	LOCATION	MILE POST	NATIONAL REGISTER STATUS
Howard Bullock Textile Machine Factory	Attleboro, MA	190.75	Recommended eligible
Newport Avenue Bridge	Attleboro, MA	191.99	Possibly eligible
Seven Mile River Railroad Bridge	Attleboro, MA	192.76	Recommended eligible
Attleboro Paralleling Station	Attleboro, MA	193.41	No historic sites
Hebronville Mill Historic District	Attleboro, MA	193.75	Listed
Dodgeville Mill Historic District	Attleboro, MA	195.55	Determined eligible
Dodgeville Mill Tailrace Culvert	Attleboro, MA	195.55	Recommended eligible
Ten Mile River Culvert	Attleboro, MA	195.58	Recommended eligible
Thatcher Street Bridge	Attleboro, MA	196.36	Recommended eligible
Ten Mile River Railroad Bridge	Attleboro, MA	196.59	Recommended eligible
First Parsonage for Second Parish Church	Attleboro, MA	197.00	Listed
East Attleboro Academy	Attleboro, MA	197.10	Listed
South Main Street Bridge	Attleboro, MA	197.13	Determined eligible
D.E. Makepeace Company	Attleboro, MA	197.20	Listed
Mill Street Bridge	Attleboro, MA	197.21	Determined eligible
Attleboro Post Office	Attleboro, MA	197.35	Listed
Park Street Bridge	Attleboro, MA	197.38	Determined eligible
Attleboro Stations	Attleboro, MA	197.50	Listed
Attleboro Tower	Attleboro, MA	197.55	Recommended eligible
Peck Street Bridge	Attleboro, MA	197.64	Determined eligible
Norton Switching Station	Attleboro, MA	198.98	No historic sites
Wading River Railroad Bridge	Mansfield, MA	200.66	Recommended eligible

TABLE 3.3-3. STATUS OF HISTORIC RESOURCES IN THE PROJECT AREA - MASSACHUSETTS (continued)

NAME OF RESOURCE	LOCATION	MILE POST	NATIONAL REGISTER STATUS
Elm Street Bridge	Mansfield, MA	201.67	Possibly eligible
Stone Industrial Building	Mansfield, MA	204.35	Recommended eligible
Brick Textile Mill	Mansfield, MA	204.85	Recommended eligible
East Foxboro Paralleling Station	Foxboro, MA	205.69	No historic sites
Victorian-Period House	Foxboro, MA	206.40	Recommended eligible
Pratt Mansion House	Foxboro, MA	206.50	Listed
"The Homestead"	Sharon, MA	210.00	Recommended eligible
Sharon Historic District	Sharon, MA	211.00	Listed
Sharon Station	Sharon, MA	210.50	Recommended eligible
Depot Street Bridge	Sharon, MA	211.04	Possibly eligible
Sharon Water Works	Sharon, MA	211.10	Recommended eligible
Maskwonicut Street Bridge	Sharon, MA	211.62	Possibly eligible
John Savels House	Sharon, MA	211.80	Recommended eligible
Darius Lothrop House	Sharon, MA	211.90	Recommended eligible
Canton Paralleling Station	Canton, MA	212.39	No historic sites
Neponset Cotton Mill	Canton, MA	213.70	Determined eligible (integrity questionable)
Canton Viaduct	Canton, MA	213.74	Listed
Canton Junction Station	Canton, MA	214.10	Recommended eligible
Spaulding Street Bridge	Canton, MA	214.22	Recommended eligible
Dedham Road Bridge	Dedham, MA	216.18	Possibly eligible
Sprages Brook Bridge	Dedham, MA	218.57	Recommended eligible
Readville Paralleling Station	Boston, MA	219.09	No historic sites

TABLE 3.3-3. STATUS OF HISTORIC RESOURCES IN THE PROJECT AREA - MASSACHUSETTS (continued)

NAME OF RESOURCE	LOCATION	MILE POST	NATIONAL REGISTER STATUS
Franklin Branch Bridge	Boston, MA	219.41	Recommended eligible
Westinghouse Fan and Bearing Plant	Boston, MA	220.10	Recommended eligible
River Street Bridge	Boston, MA	220.74	Recommended eligible
Hyde Park Pumping Station	Boston, MA	221.20	Recommended eligible
Mt. Hope Footbridge	Boston, MA	223.31	Recommended eligible
Arnold Arboretum	Boston, MA	223.65	Listed
Armory Street Workers' Housing	Boston, MA	224.65	Recommended eligible
Franklin Park	Boston, MA	224.70	Listed
Roxbury Highlands Historic District	Boston, MA	225.55	Listed
Dudley Mansion	Boston, MA	225.65	Determined Eligible
Roxbury Crossing Substation	Boston, MA	226.02	No historic resources
South End Historic District	Boston, MA	226.80	Listed
Saint Botolph Street Historic District	Boston, MA	226.95	Determined eligible
Cahners Building	Boston, MA	227.60	Recommended eligible
Youth's Companion Building	Boston, MA	227.65	Listed
Armory of the First Corps of Cadets	Boston, MA	227.80	Listed
Bay Village Historic District	Boston, MA	227.80	Recommended eligible
Fort Point Channel Railroad Bridge	Boston, MA	228.70	Recommended eligible
South Station	Boston, MA	229.20	Listed

TABLE 3.4-1. SUMMARY OF EXISTING NOISE MEASUREMENT RESULTS

SITE	ADDRESS	START DATE AND TIME	DIST. TO NEAR TRACK CENTER (ft)	L_{dn} (dBA)	24- HOUR L_{eq} (dBA)	MAX. HOURLY L_{eq} (dBA)	MIN. HOURLY L_{90} (dBA)	RANGE OF L_{max} FOR TRAINS (dBA)
A-1	135 First Ave. New Haven, CT	11/04/92 12:00 PM	88	69	64	73	39	79-103
A-2	176 Westbrook Heights Rd. Westbrook, CT	11/03/92 04:00 PM	105	68	63	69	44	75-94
A-3	21 Gunshot Rd. Waterford, CT	11/02/92 02:00 PM	80	68	62	67	37	79-97
A-3a	500 Noank Rd. W. Mystic, CT	11/05/92 02:35 PM	35	–	–	–	–	90-114
A-4	8 Wilford Ct. Pawcatuck, CT	11/02/92 06:00 PM	73	77	73	79	41	83-112
A-5	36 Railroad St. Charleston, RI	10/29/92 04:00 PM	57	68	61	70	25	78-103
A-6	88 Alger St. Warwick, RI	10/29/92 06:00 PM	63	72	65	74	35	76-107
A-7	11 Foundry St. Central Falls, RI	10/28/92 04:00 PM	25	74	68	74	47	81-100
A-8	38 Otis St. W. Mansfield, MA	10/29/92 01:00 PM	50	72	66	71	30	72-100
A-9	20 Hartwell Pl. Canton, MA	10/27/92 01:00 PM	60	73	67	72	44	78-99
A-10	2 Westminster St. Hyde Park, MA	10/27/92 11:00 AM	70	74	68	73	36	74-98

TABLE 3.4-2. EXISTING GROUND VIBRATION MEASUREMENT SUMMARY

SITE	ADDRESS	START DATE AND TIME	END DATE AND TIME	DIST. TO NEAR TRACK CENTER (ft)	NUMBER OF TRAINS MEAS.	RANGE OF MAXIMUM VIBRATION VELOCITY LEVEL FOR TRAINS (dB re 1 μ-in/sec)
A-1	135 First Ave. New Haven, CT	11/05/92 08:15 AM	11/05/92 11:59 AM	88	10	65-86
A-2	176 Westbrook Heights Rd. Westbrook, CT	11/04/92 01:27 PM	11/04/92 04:46 PM	105	8	65-76
A-3	21 Gunshot Rd. Waterford, CT	11/02/92 01:56 PM	11/02/92 05:17 PM	80	6	82-86
A-3a	500 Noank Rd. W. Mystic, CT	11/05/92 02:35 PM	11/05/92 05:01 PM	35	5	76-82
A-4	8 Wilford Ct. Pawcatuck, CT	11/03/92 10:10 AM	11/03/92 12:47 PM	73	5	81-87
A-5	36 Railroad St. Charleston, RI	10/30/92 02:37 PM	10/30/92 05:07 PM	57	5	88-92
A-6	88 Alger St. Warwick, RI	10/30/92 09:05 AM	10/30/92 12:26 PM	63	7	86-94
A-7	11 Foundry St. Central Falls, RI	10/29/92 02:09 PM	10/29/92 05:21 PM	25	10	86-95
A-8	38 Otis St. W. Mansfield, MA	10/29/92 08:16 AM	10/29/92 11:50 AM	119	11	68-74
A-9	20 Hartwell Pl. Canton, MA	10/27/92 01:48 PM	10/27/92 05:09 PM	60	10	60-70
A-10	2 Westminster St. Hyde Park, MA	10/28/92 08:00 AM	10/28/92 11:00 AM	70	21	ny78-87

TABLE 3.5-1. POPULATION CATEGORIES POTENTIALLY EXPOSED TO PROJECT-INDUCED EMF

POPULATION TYPE	LOCATION/DESCRIPTION	EMF EXPOSURE CATEGORY
Residential	People in residences located:	
Zone 1	0-50 ft from edge of rail or substation	Environmental
Zone 2	50-100 ft from edge of rail or substation	Environmental
Zone 3	100-150 ft from edge of rail or substation	Environmental
Commercial/Industrial	Employees of businesses located:	
Zone 1	0-50 ft from edge of rail or substation	Occupational
Zone 2	50-100 ft from edge of rail or substation	Occupational
Zone 3	100-150 ft from edge of rail or substation	Occupational
Recreational	People utilizing parks located:	
Zone 1	0-50 ft from edge of rail	Occasional
Zone 2	50-100 ft from edge of rail	Occasional
Zone 3	100-150 ft from edge of rail	Occasional
Amtrak/ConnDOT Employees	Employees who work:	
Zone 1	On the train	Occupational
Zone 2	Along the ROW	Occupational
Zone 3	At stations	Occupational
MBTA/Freight Employees	Employees who work:	
On-train	On the train	Occasional[1]
Off-train	Along the ROW	Occasional[1]
Amtrak/ConnDOT/ RIDOT/MBTA Passengers	On the train	Occasional[2]

1 Since MBTA and freight trains will continue to use diesel fuel, employees will only encounter magnetic fields from the NEC electrification project when passing under or working under an energized catenary section.

2 Amtrak, RIDOT, and ConnDOT passengers will encounter magnetic fields from the NEC electrification project during the duration of their trips. MBTA passengers will only encounter magnetic fields from the NEC electrification when MBTA trains pass under an energized catenary section.

TABLE 3.7-1. ENVIRONMENTAL ATTRIBUTES CONTRIBUTING TO PREHISTORIC ARCHAEOLOGICAL SENSITIVITY RANKINGS

CRITERIA	HIGH SENSITIVITY	MODERATE SENSITIVITY	LOW SENSITIVITY
Distance to Water/Wetland	adjacent or < 150 m	150 to 300m	> 300m
Slope	minimal 0 to 3%	moderate 3 to 15%	steep > 15%
Soil Types	sandy, good drainage	gravelly, fair drainage	very gravelly, poor drainage

TABLE 3.7-2. ENVIRONMENTAL ATTRIBUTES CONTRIBUTING TO HISTORIC ARCHAEOLOGICAL SENSITIVITY RATINGS

CRITERIA	HIGH SENSITIVITY	MODERATE SENSITIVITY	LOW SENSITIVITY
Known historic sites in vicinity	known site adjacent or near	known site in general vicinity	no known site in vicinity
Proximity to fresh water source	adjacent or < 100m	moderate 100 to 300m	distant > 300m
Proximity to water power source	adjacent or < 50m	moderate 50 to 150m	distant > 150m
Access to transportation network	excellent < 200 m	moderate 200 to 1500m	distant > 1500m
Proximity to settlement concentration	adjacent or 800m	moderate 800 to 1500m	distant > 300m
Proximity to agricultural	adjacent or < 100m	moderate 100 to 300m	distant > 300m
Disturbance	none to minimal	minimal to moderate	moderate to severe

TABLE 3.7-3 ARCHAEOLOGICAL SENSITIVITY OF PROJECT SITES

FACILITY	JURISDICTION	MILE POST	POTENTIAL FOR ARCHAEOLOGICAL SIGNIFICANCE
Branford Substation	Branford, CT	79.26	Low potential for prehistoric and historic archaeological sensitivity.
Branford Utility Corridor	Branford, CT	79.26	Low to moderate potential for prehistoric and historic archaeological sensitivity.
Leetes Island Parallel. Station	Guilford, CT	85.99	Moderate to high potential for prehistoric and historic archaeological resources due to presence of archaeological sites nearby.
Madison Paral. Station	Madison, CT	92.41	High potential for prehistoric or historic archaeological sensitivity die to environmental conditions and presence of nearby archaeological sites.
Grove Beach Paral. Station	Westbrook, CT	99.11	Low potential for prehistoric and historic archaeological sensitivity.
Westbrook Sw. Station	Westbrook, CT	103.53	Low potential for prehistoric and historic archaeological sensitivity.
Johnnycake Hill Road Bridge	Old Lyme, CT	108.51	Moderate to high potential for prehistoric and historic archaeological sensitivity due to favorable environmental conditions.
Old Lyme Paral. Station	Old Lyme, CT	109.50	High potential for prehistoric and historic archaeological sensitivity due to presence of nearby archaeological sites.
Millstone Paral. Station	Waterford, CT	117.56	Low potential for prehistoric and historic archaeological sensitivity.
Millstone Point Road Bridge	Waterford, CT	117.31	Low potential for prehistoric and historic archaeological sensitivity.
New London Substation, Utility Corridor & Catenary Feeder	New London, CT	123.55	Low potential for prehistoric and historic archaeological sensitivity.
Noank Paral. Station	Town of Groton, CT	129.46	Low potential for prehistoric and historic archaeological sensitivity.
Stonington Paral. Station	Stonington, CT	134.65	High potential for prehistoric and historic archaeological sensitivity due to favorable environmental conditions and nearby historic resources.

TABLE 3.7-3 ARCHAEOLOGICAL SENSITIVITY OF THE PROJECT SITES (continued)

FACILITY	JURISDICTION	MILE POST	POTENTIAL FOR ARCHAEOLOGICAL SIGNIFICANCE
State Line Paral. Station	Stonington, CT	139.93	Moderate to high potential for prehistoric and historic archaeological sensitivity due to likely presence of nearby archaeological sites.
Bradford Paral. Station	Westerly, RI	145.19	Low potential for prehistoric and historic archaeological sensitivity.
Burdickville Road Bridge	Charlestown, RI	148.41	High potential for prehistoric and historic archaeological resources due to favorable environmental conditions and presence of nearby archaeological sites.
Richmond Sw. Station	Richmond, RI	150.35	Low potential for prehistoric and historic archaeological sensitivity.
Kenyon School Road Bridge	Richmond, RI	154.04	Moderate to high potential for archaeological sensitivity outside bridge superstructure due to the presence of nearby historic districts and structures.
Kingston Paral. Station	South Kingstown, RI	157.11	Low potential for prehistoric or historic archaeological resources on site; prehistoric and historic archaeological sensitivity in accessway due to extensive resources in surrounding Great Swamp, including two National Register historic properties.
Route 138 Bridge	South Kingstown, RI	158.32	Low potential for prehistoric and historic archaeological sensitivity.
Exeter Paral. Station	Exeter, RI	161.78	Low potential for prehistoric and historic archaeological sensitivity.
East Greenwich Paral. Station	North Kingstown, RI	169.80	Low potential for prehistoric and historic archaeological sensitivity.
Warwick Substation	Warwick, RI	176.91	Low potential for prehistoric and historic archaeological sensitivity.
Pettaconsett Avenue Bridge	Warwick, RI	178.46	Low potential for prehistoric and historic archaeological sensitivity.
Park Avenue Bridge	Cranston, RI	180.29	Low potential for prehistoric and historic archaeological sensitivity.
Elmwood Parallel. Station	Providence, RI	181.70	High potential for prehistoric and historic archaeological resources due to favorable presence of nearby archaeological sites.
Providence Parallel. Station	Pawtucket, RI	187.55	Low potential for prehistoric and historic archaeological sensitivity.

TABLE 3.7-3 ARCHAEOLOGICAL SENSITIVITY OF THE PROJECT SITES (continued)

FACILITY	JURISDICTION	MILE POST	POTENTIAL FOR ARCHAEOLOGICAL SIGNIFICANCE
Attleboro Parallel. Station	Attleboro, MA	193.40	High potential for prehistoric and historic archaeological resources due to favorable environmental conditions and presence of nearby archaeological sites.
Norton Sw. Station	Attleboro, MA	198.99	Low potential for prehistoric and historic archaeological sensitivity.
East Foxboro Paral. Station	Foxboro, MA	205.70	High potential for prehistoric and historic archaeological resources due to favorable environmental conditions and presence of nearby archaeological sites.
Depot Street Bridge	Sharon, MA	211.04	Low potential for prehistoric and historic archaeological sensitivity.
Maskwonicut Street Bridge	Sharon, MA	211.62	Low potential for prehistoric and historic archaeological sensitivity.
Canton Paral. Station	Sharon, MA	212.40	Low potential for prehistoric and historic archaeological sensitivity.
Readville Paral. Station	Boston, MA	219.10	Low potential for prehistoric and historic archaeological sensitivity.
Roxbury Crossing Substation	Boston, MA	226.02	Moderate potential for prehistoric and historic archaeological sensitivity due to historic use of site.
Roxbury Crossing Utility Corridor	Boston, MA	226.02	Low potential for prehistoric and historic archaeological sensitivity.

TABLE 3.8-1 CHARACTERISTICS OF EXISTING GRADE CROSSINGS

CROSSING	STATUS	MILE POST	SPEED LIMIT (MPH)	TRAFFIC CONTROL DEVICES[1]	NO. OF LANES	DAILY TRAFFIC VOLUME	NO. COLLISIONS IN LAST 5 YEARS	SETTING
Chapman's Crossing	Private	112.19	70	none	1	N/A[2]	0	Suburban, vehicular emergency access
Miner Lane	Public	120.20	60	G-L-B	2	900	0	Rural
Bank Street	Public	122.50	25	G-L-B	2	200	0	Urban
State Street	Public	122.76	25	G-L-B	2	500	0	Urban
Gov. Winthrop Blvd.	Public	123.01	25	G-L-B	2	2470	0	Urban
School Street	Public	131.50	70	G-L-B	2	900	0	Urban
Broadway Extens.	Public	132.30	50	G-L-B	2	1220	0	Urban
Latimer Point	Public	133.40	70	G-L-B	2	370	0	Suburban
Wampassuc	Public	134.90	70	G-L-B	2	310	0	Suburban
Walkers Dock	Private	136.65	70	G-L-B	1	N/A[2]	0	Urban
Freeman's	Private	136.70	70	G-L-B	1	N/A[2]	0	Urban
Palmer Street	Public	140.55	80	G-L-B	2	1650	0	Rural
Wolf Rocks Road	Public	160.30	100	G-L-B	2	N/A[3]	0	Rural
Lazy Lady Farm	Private	198.96	95	none	1	N/A[2]	0	Rural

[1] G=gate, L=flashing lights, B=bells
[2] Private road; traffic volume not available
[3] Programmed to be grade-separated in 1993

TABLE 3.8-2. PEDESTRIAN CROSSINGS IN CONNECTICUT

LOCATION	MILEPOST	MUNICIPALITY	FENCING	NUMBER OF TRACKS	SPEED LIMIT (MPH)
Railroad Avenue	92.80	Madison	no	2	90
Privateer LTD	96.00	Clinton	partial	2	85
N. Broadway	99.20	Westbrook	partial	2	85
Westbrook Heights Road	101.30	Westbrook	no	2	90
Boston Post Road	105.20	Old Saybrook	no	2	90
Near Shore Road	107.60	Old Lyme	no	2	75
Rocky Neck State Park	112.65	East Lyme	yes (break)	2	75
Ridgewood Drive	113.80	East Lyme	no	2	75
Gada Road	114.80	East Lyme	no	2	75
Grand Street	116.20	East Lyme	yes (break)	2	75
Near MP 128.30	128.30	Groton	no	2	55
Spicer Avenue	130.4	Groton	no	2	50
Near MP 136.2	136.2	Stonington	no	2	50

TABLE 3.8-3. PEDESTRIAN CROSSINGS IN RHODE ISLAND

LOCATION	MILEPOST	MUNICIPALITY	FENCING	NUMBER OF TRACKS	SPEED LIMIT (MPH)
Old Baptist Road	168.50	Warwick	no	2	100
Rocky Hollow Road	170.00	Warwick	no	2	90
Queen Street	171.50	Warwick	no	2	85
Alger Avenue	172.90	Warwick	no	2	85
Folly Landing	173.9	Warwick	no	2	80

TABLE 3.8-4. PEDESTRIAN CROSSINGS IN MASSACHUSETTS

LOCATION	MILEPOST	MUNICIPALITY	FENCING	NUMBER OF TRACKS	SPEED LIMIT (MPH)
Knight Street	193.70	Hebronville	no	2	100
Oak Street	197.78	Attleboro	yes	2	100
Morse/Summer Place	206.00	East Foxboro	yes	2	95
Garden Street	209.52	Sharon	partial	4	95

TABLE 3.8-5. STATION CHARACTERISTICS AND PEDESTRIAN ACCESS AT RAILROAD STATIONS

STATION	NO. OF TRACKS	PLATFORM	PASSENGER ACCESS	FENCING[1]	TYPE SERVICE[2]	AMTRAK SPEED (MPH)	
						1992	2010
New Haven	4	High level	Pedestrian underpass	N/A	B	N/A[4]	N/A[4]
Branford, Guilford, Madison, Clinton, Westbrook	2	Short, low level, outside one track only	Across tracks at grade	FS	C	50-90	65-120
Old Saybrook	2	Short, low level, outside one track only	Across tracks at grade	FS	B	50-90	65-120
New London	3	Full length, low level, outside all tracks	State St. public grade crossing	I	A	25	60
Mystic	2	Full length, low level, outside both tracks	Broadway public grade crossing	I	A	55	75
Westerly	2	Full length, low level, outside both tracks	Pedestrian tunnel to westbound track	I	A	75	100
Kingston	2	Low level, outside eastbound track; narrow low level between tracks on westbound side	Across tracks at grade	None	A	100 wb[3]	150
Providence	4	Full length, high level, outside all tracks	Direct from terminal	N/A	B	N/A[4]	N/A[4]
South Attleboro	2	Full length, low level, outside both tracks[5]	Pedestrian overpass to eastbound track	I	C	100wb	150

TABLE 3.8-5 STATION CHARACTERISTICS AND PEDESTRIAN ACCESS AT RAILROAD STATIONS (continued)

STATION	NO. OF TRACKS	PLATFORM	PASSENGER ACCESS	FENCING[1]	TYPE SERVICE[2]	AMTRAK SPEED (MPH)	
						1992	2010
Attleboro	3	Full length, low level, outside both tracks[5]	Underpass on adjacent streets	I	C	95 wb 100 eb	150
Mansfield	2	Full length, low level, outside both tracks[5]	Underpass on adjacent Route 106	I	C	100	150
Sharon	2	Full length, low level, outside both tracks	Depot Street overpass	I	C	95	140
Canton Junction	2	Full length, low level, outside both tracks	Across tracks at grade	I	C	80	150
Route 128	2	Full length, low level, outside both tracks	Pedestrian overpass to eastbound track	I	B	N/A[4]	N/A[4]
Hyde Park	3	Full length, low level, outside outer tracks	Overpass on River Street	I	C	100	150
Ruggles	3	Full length, high level between western tracks	Overhead rapid transit station	N/A	C	100	150
Back Bay	3	Full length, high level	Direct from terminal	N/A	B	N/A[4]	N/A[4]
South Station	11	Full length, high level	Direct from terminal	N/A	B	N/A[4]	N/A[4]

[1] I = Intertrack fencing; FS = Fencing on far side of tracks from the parking/access; BS = Fencing on both sides of tracks.
[2] A = Amtrak service only; B= Both Amtrak and Commuter Service; C = Commuter service only.
[3] wb = Westbound; eb = Eastbound.
[4] Not applicable because all trains stop at this station.
[5] Mini, high level platforms outside both tracks for handicapped access.

TABLE 3.9-1 EXISTING (1988) DISTRIBUTION OF ANNUAL TRIPS BY TRAVEL MODE

TRAVEL MODE	NUMBER TRIPS	% OF TRIPS
Intercity Train	1,053,000	5.9
Intercity Aircraft	3,529,000	19.6
Automobile	13,418,000	74.5
TOTAL	**18,000,000**	**100**

SOURCE: Volpe National Transportation Systems Center

TABLE 3.9-2 EXISTING AMTRAK AND COMMUTER RIDERSHIP AT EXPRESS STATIONS (on & off in thousands)

STATION	INTERCITY PASSENGERS	COMMUTERS	TOTAL
South Station	897	7,100	7,997
Back Bay	121	4,356	4,477
Route 128	161	815	976
Providence	305	320	625
New Haven	314	1,647	1,961
TOTAL	**1,798**	**14,238**	**16,036**

SOURCE: Amtrak, MBTA, ConnDOT

TABLE 3.9-3. CURRENT DAILY RAILROAD FREIGHT OPERATIONS

ROUTE SEGMENT	MILE POST LIMITS	NUMBER OF DAILY TRAINS	
		1993	2010
New Haven - Groton	73.8-124.6	2	6
Groton - Davisville	124.6-168.0	0	2
Davisville-Atwells	168.0-184.2	2	6
Atwells-Lawn	184.2-188.8	4	8
Lawn-South Attleboro	188.8-192.2	0	0
South Attleboro-Attleboro	197.2-192.2	2	2
Attleboro-Mansfield	197.2-204.2	4	7
Mansfield-Canton Junction	204.2-213.8	2	2
Canton Junction-Route 128	213.8-217.2	4	4
Route 128-Readville	217.2-220.0	6	6
Readville-Back Bay	220.0-228.0	0	0
Back Bay-Boston Herald	228.0-228.3	4	4
Boston Herald-South Bay Wye	228.3-228.5	2	2
South Bay Wye-South Station	228.5-229.4	0	0

SOURCE: Providence & Worcester Railroad Company and Conrail

TABLE 3.9-4. EXISTING LEVEL OF SERVICE[1] AT CRITICAL INTERSECTIONS

STATION[2]	INTERSECTION	APPROACH	EXISTING AM	EXISTING PM
South	Summer Street/ Atlantic Avenue	Overall	F	F
Route 128	Blue Hill Drive/ Route. 128	LT 128 ramp	D	B
	Blue Hill Drive/ University Avenue	LT Univ.	A	D
		Blue Hill (all)	F	F
Providence	Smith/Gaspee /State Streets	Overall	F	F
	Francis/Gaspee Streets	Overall	A	B

[1] See Table 3.9-4 for Level of Service definitions.
[2] New Haven not available.

SOURCE: Traffic counts taken March and April, 1993.

TABLE 3.9-5. AMTRAK-GENERATED PARKING DEMAND AT RAILROAD STATIONS[1]

STATION	(1993) EXISTING SUPPLY	(1993) DEMAND	2010 NO-BUILD DEMAND	2010 ELECTRIFICATION DEMAND
South Station	0	110	145	225
Back Bay	0	15	35	70
Route 128	820[2]	170	550	1,260
Providence	360[3]	200	415	665
New Haven	1,207[4]	240	425	470

SOURCES:
[1] Demand: Estimates by DMJM/Harris
[2] MBTA
[3] RIDOT
[4] ConnDOT-125 spaces reserved for Police Department

TABLE 3.9-6. LOCATION AND CHARACTERISTICS OF PROPOSED BRIDGE MODIFICATIONS

BRIDGE	MILE POST	LOCATION	1993 AV. DAILY TRAFFIC	ACTION	DETOUR	DURATION (in months)
Johnnycake Hill Road	108.51	Old Lyme, CT	N/A	Replace	No[1]	1
Millstone Point Road	117.31	Waterford, CT	4290	Raise	No	2.5
Burdickville Road	148.41	Charlestown, RI	150	Replace	No	4
Kenyon School Road	154.04	Richmond, RI	3215	Replace	Yes	3
Main Street	158.32	South Kingston, RI	14,315	Raise	No	3
Pettaconsett Avenue	178.46	Warwick, RI	1360	Replace	Yes	4.5
Park Avenue	180.29	Cranston, RI	17,470	Raise	Yes	4
Depot Street	211.04	Sharon, MA	12,050	Replace	Yes	9
Maskwonicut Street	211.62	Sharon, MA	1770	Raise	Yes	3

[1] Footbridge

SOURCE: Amtrak

TABLE 3.9-7. ROADWAY CHARACTERISTICS AND AVERAGE EXISTING DELAY OF VEHICLES PER TRAIN EVENT AT GRADE CROSSINGS

GRADE CROSSING	SPEED (mph)	# TRAINS /DAY	GATE DOWN TIME (seconds)	AVERAGE DELAY[1] (seconds)	SURROUNDING LAND USE	SURROUNDING CHARACTER
Miners Lane[2]	60	22	6.46	3.23	Industrial	Rural
Bank Street[2]	25	22	15.51	7.75	Commercial	Urban
State Street[2]	25	22	15.51	7.75	Commercial	Urban
Gov. Winthrop Blvd.[2]	25	22	15.51	7.75	Commercial	Urban
School Street[2]	70	22	5.54	2.77	Residential	Suburban
Broadway Ext.	50	20	7.76	3.88	Commercial	Suburban
Latimer Point Rd.	70	20	5.54	2.77	Residential	Rural
Wampassuc	70	20	5.54	2.77	Residential	Rural
Walkers Dock Rd.	70	20	5.54	2.77	Residential	Suburban
Freemans Crossing	70	20	5.54	2.77	Residential	Suburban
Palmer Street	80	20	4.85	2.42	Residential	Urban
Wolf Rocks Rd.	70	20	3.88	1.94	Residential	Rural

SOURCE: Amtrak.
NOTES: [1] Computed based on 0.5 x time grade crossing gates in down position.
[2] Includes Montrealer Service.

TABLE 3.10-1. NATIONAL, CONNECTICUT, RHODE ISLAND AND MASSACHUSETTS AIR QUALITY STANDARDS[1]

POLLUTANT	AVERAGE TIME	PRIMARY STANDARD[2]
CO	8 hours	9 ppm
	1 hour	35 ppm
Ozone	1 hour	0.12 ppm
NO_2	Annual arithmetic mean	(0.05 ppm) 100μg/m
PM10[3]	Annual arithmetic mean	50 μg/m
	24 hours	150μg/m

NOTES:

[1] National standards other than those based upon annual arithmetic means are not to be exceeded more than once a year

[2] The tabulated thresholds are for primary standards which are for protection of public health. National Secondary Standards are for protection of public welfare. Secondary standards for these pollutants are the same as the primary standards.

[3] PM10[3] includes those particles with an aerodynamic diameter of less than or equal to a nominal 10 microns. Expected number of exceedances shall not be more than one per year.

TABLE 3.10-2 1991 MONITORING RESULTS FOR THE PROJECT CORRIDOR[1]

SITE ID	LOCATION	MAX. 1-HR. 1ST	MAX. 1-HR. 2ND	MAX. 8-HR. 1ST	MAX. 8-HR. 2ND	MAX. 24-HR. 1ST	MAX. 24-HR. 2ND	ANNUAL	NO. OBS. > STD.[2]
Carbon Monoxide[3]									
09-009-0019	New Haven, CT[4]	10.8	9.7	6.5	6.3	--	--	--	0
44-007-0015	Providence, RI[5]	14.7	11.2	7.1	6.8	--	--	--	0
44-007-0015	Providence, RI	11.8	11.3	8.2	7.4	--	--	--	0
25-025-0002	Boston, MA[6]	7.4	6.5	4.9	4.2	--	--	--	0
25-025-0016	Boston, MA[6]	7.9	7.2	5.3	4.2	--	--	--	0
25-025-0021	Boston, MA[6]	7.9	6.5	3.7	3.6	--	--	--	0
25-025-0038	Boston, MA[6]	8.0	6.7	4.3	4.2	--	--	--	0
Ozone[7]									
09-0009-1123	New Haven, CT	0.161[4]	0.147	--	--	--	--	--	7
44-007-0012	Providence, RI	0.116[5]	0.114	--	--	--	--	--	0
25-025-1003	Chelsea, MA	0.126[6]	0.122	--	--	--	--	--	1
Nitrogen Dioxide[8]									
09-009-0021	New Haven, CT	--	--	--	--	--	--	0.028	0
44-007-0012	Providence, RI	--	--	--	--	--	--	0.025	0
25-025-0002	Boston, MA	0.154[6]	0.150	--	--	--	--	0.035	0
25-025-0021	Boston, MA	0.092	0.089	--	--	--	--	0.032	0

[1] All concentrations are in parts per million (ppm)
[2] The number of observations exceeding the standard shown in Table 10.1.
[3] The carbon monoxide 1-hour standard is 35 ppm and the 8-hour standard is 9 ppm.
[4] Source: 1991 Air Quality Data Summary - CT Department of Environmental Protection.
[5] Source: 1991 Air Quality Data Summary - RI Department of Environmental Management.
[6] Source: 1991 Air Quality Data Summary - MA Department of Environmental Protection.
[7] The ozone 1-hour standard is 0.125 ppm.
[8] The nitrogen dioxide annual standard is 0.05 ppm and the Massachusetts 1-hour NO_2 Policy level is 0.170 ppm.
[9] PM10 means particulate matter of 10 microns in diameter or smaller. The PM10 24-hour standard is 150 $\mu g/m^3$ and the Annual standard is 50 $\mu g/m^3$.

TABLE 3.10-3. SOURCES OF EXISTING EMISSIONS (tons/day)

POLLUTANT	LOCATION	POINT SOURCES	AREA SOURCES	MOBILE SOURCES	BIOGENIC SOURCES	TOTAL EMISSIONS
Carbon Monoxide	New Haven County, CT	3.6	3.4	378.7	--	386
	Providence & Kent Counties, RI	5.8	2.1	556.0	--	569
	Norfolk & Suffolk Counties, MA	6.0	16.2	555.1	--	577
Oxides of Nitrogen	New Haven County, CT	23.3	2.5	75.0	--	101
	Providence & Kent Counties, RI	7.1	4.3	67.5	--	79
	Norfolk & Suffolk Counties, MA	53.4	28.6	101.1	--	183
Volatile Organic Compounds	New Haven County, CT	15.5	52.7	49.6	48.7	168
	Providence & Kent Counties, RI	22.1	63.6	72.7	72.9	232
	Norfolk & Suffolk Counties, MA	18.2	92.6	78.7	25.9	216

TABLE 3.10-4. EXISTING PROJECT-RELATED VOC EMISSIONS IN THE NEC BY STATE (kg/day)

SOURCE	CONNECTICUT		RHODE ISLAND		MASSACHUSETTS		CORRIDOR TOTAL	
	KG/DAY	%	KG/DAY	%	KG/DAY	%	KG/DAY	%
Automobiles	2,230	93.0	839	92.8	709	58.6	3,778	83.8
Aircraft	108	4.5	42	4.7	422	35.0	572	12.7
Amtrak	28	1.2	18	2.0	14	1.2	60	1.3
Other Trains	16	0.7	2	0.2	48	4.0	66	1.5
Buses	15	0.6	3	0.3	14	1.2	32	0.7
Power Generation	0	0.0	0	0.0	0	0.0	0	0.0
TOTAL	2,397	100	904	100	1,207	100	4,508	100

TABLE 3.10-5. EXISTING PROJECT-RELATED NOX EMMISSIONS IN THE NEC BY STATE (kg/day)

SOURCE	CONNECTICUT		RHODE ISLAND		MASSACHUSETTS		CORRIDOR TOTAL	
	KG/DAY	%	KG/DAY	%	KG/DAY	%	KG/DAY	%
Automobiles	2,990	64.0	1,176	60.5	951	24.3	5,117	48.6
Aircraft	34	0.7	60	3.1	703	17.9	797	7.6
Amtrak	909	19.4	576	29.6	469	12.0	1,954	18.5
Other Trains	505	10.8	80	4.1	1,568	40.0	2,153	20.4
Buses	236	5.1	52	2.7	229	5.8	517	4.9
Power Generation	0	0.0	0	0.0	0	0.0	0	0.0
TOTAL	4,674	100	1,944	100	3,920	100	10,538	100

TABLE 3.10-6. EXISTING PROJECT-RELATED CO EMISSIONS IN THE NEC BY STATE (kg/day)

SOURCE	CONNECTICUT		RHODE ISLAND		MASSACHUSETT S		CORRIDOR TOTAL	
	KG/DAY	%	KG/DAY	%	KG/DAY	%	KG/DAY	%
Automobiles	27,490	98.9	11,236	97.5	8,742	84.7	47,468	95. 6
Aircraft	102	0.4	211	1.8	1,338	13.0	1,651	3.3
Amtrak	80	0.3	51	0.5	41	0.4	172	0.4
Other Trains	45	0.2	7	0.1	138	1.3	190	0.4
Buses	69	0.2	15	0.1	67	0.6	151	0.3
Power Generation	0	0.0	0	0.0	0	0.0	0	0.0
TOTAL	27,786	100	11,520	100	10,326	100	49,632	10 0

TABLE 3.10-7 ESTIMATED MAXIMUM 1992 BASELINE EIGHT-AND ONE-HOUR CO CONCENTRATIONS[1] AT THE INTERSECTION OF UNIVERSITY AVENUE AND BLUE HILL DRIVE

RECEPTOR LOCATION	EIGHT-HOUR	ONE-HOUR
R1 Westwood Office Park	5.7	2.7
R2 Rt. 128 Train Station	4.0	1.9
R3 General Motors Bldg.	4.3	2.2
R4 Blue Hill Rd. EB @ 10m	9.4[2]	4.5
R5 Blue Hill Rd. EB @ 20m	9.4[2]	4.0
R6 Blue Hill Rd. EB @ 40m	9.4[2]	3.4
R7 University Ave. SB @ 10m	6.1	6.7
R8 University Ave. SB @ 20m	6.7	6.0
R9 University Ave. SB @ 40m	6.0	4.2
R10 University Ave. NB @ 10m	9.3[2]	4.8
R11 University Ave. NB @ 20m	8.7	4.6
R12 University Ave. NB @ 40m	7.9	4.2
R13 Green Lodge Rd. WB @ 10m	NA[3]	5.2
R14 Green Lodge Rd. WB @ 20m	NA	4.0
R15 Green Lodge Rd. WB @ 40m	NA	3.2

[1] Concentrations are in parts per million (ppm). The Federal and Massachusetts eight-and one-hour standards are respectively 9 and 35 ppm.
[2] These entries represent violations of the standards.
[3] NA means not applicable.

TABLE 3.10-8. ESTIMATED MAXIMUM 1992 BASELINE EIGHT-AND ONE-HOUR CO CONCENTRATIONS[1] AT THE INTERSECTIONS OF BLUE HILL DRIVE AND ROUTE 128 SOUTH RAMPS

RECEPTOR LOCATION	EIGHT-HOUR	ONE-HOUR
R1 Residence A	4.7	2.7
R2 Residence B	3.7	2.5
R3 Residence C	3.3	2.5
R4 Westwood Office Park	3.8	2.5
R5 Blue Hill Rd. EB @ 10m	7.0	4.0
R6 Blue Hill Rd. EB @ 20m	7.3	3.9
R7 Blue Hill Rd. EB @ 40m	6.2	3.7
R8 Rt. 128 SB Off-Ramp @ 10m	4.7	3.2
R9 Rt. 128 SB Off-Ramp @ 20m	4.2	3.3
R10 Rt. 128 SB Off-Ramp @ 40m	3.8	3.1
R11 Blue Hill Rd. WB @ 10m	5.2	3.8
R12 Blue Hill Rd. WB @ 20m	5.1	3.6
R13 Blue Hill Rd. WB @ 40m	4.7	3.5

[1] Concentrations are in parts per million (ppm). The Federal and Massachusetts eight-and one-hour standards are respectively 9 and 35 ppm.

TABLE 3.11-1. VISUAL MODIFICATION DETERMINATIONS FOR VISUALLY SENSITIVE RECEPTORS

LOCATION OF VISUALLY SENSITIVE RECEPTOR	VISUALLY SENSITIVE RECEPTOR	DISTANCE (in ft.) FROM VSR	VIEW FROM VSR	VISUAL COMPLEXITY	VMC[1]
33 Thimble Island Rd. Branford, CT	Residence	240	Long Island Sound	High	2
45 Thimble Island Rd. Branford, CT	Residence	320	Long Island Sound	Moderate	4
49 Thimble Island Rd. Branford, CT	Residence	500	Long Island Sound	High	3
53 Thimble Island Rd. Branford, CT	Residence	470	Long Island Sound	Moderate	3
59 Thimble Island Rd. Branford, CT	Residence	160	Long Island Sound	Moderate	4
63 & 71 Thimble Island Rd. Branford, CT	Residence	160	Long Island Sound	Moderate	4
76 Thimble Island Rd. Branford, CT	Residence	350	Long Island Sound	High	3
78 Thimble Island Rd. Branford, CT	Residence	350	Long Island Sound	High	3
82 Thimble Island Rd. Branford, CT	Rectory	340	Long Island Sound	High	2
W. of 229 Leetes Island Rd. Guilford, CT	From Road	320	Cockaponset Forest	Moderate	4
229 Leetes Island Rd. Guilford, CT	Residence	200	Long Island Sound	High	2
429 Stone House Lane Guilford, CT	Residence	140	Long Island Sound	High	2
40 Nod Place Guilford, CT	Residence	30	L.I. Sound/East R.	High	2
21 Clark St. Old Saybrook, CT	Residence	170	Connecticut R. & Long Island Sound	High	2
45 Old Black Point Rd. East Lyme, CT	Residence	60	Wooded area, Pettagansett River	High	3
43 Old Black Point Rd. East Lyme, CT	Residence	50	Wooded area, Pettagansett River	High	3
265 Lake Shore Rd. Waterford, CT	Residence	730	Wooded area, Jordan Cove	High	2
268 Lake Shore Rd. Waterford, CT	Residence	730	Wooded area, Jordan Cove	Moderate	2
71 Lamphere Rd. Waterford, CT	Residence	360	Wooded area, Jordan Cove	Moderate	3
211 Seneca Drive Groton, CT	Residence	140	Residential uses, Palmer Cove	Moderate	4
235 Seneca Drive Groton, CT	Residence	160	Palmer Cove, L.I. Sound, Esker Point Beach	Moderate	4
Groton Long Point Rd. Groton, CT	View from Road	920	Palmer Cove	Low	2
239 Elm St. Groton, CT	Residence	1600	Beebe Cove	High	1
63 Cedar Rd. Groton, CT	Residence	1100	Mystic River	Moderate	3
21 Buttonwood Lane Groton, CT	Residence	480	Mystic Harbor	High	2

TABLE 3.11-1. VISUAL MODIFICATION DETERMINATIONS FOR VISUALLY SENSITIVE RECEPTORS (continued)

LOCATION OF VISUALLY SENSITIVE RECEPTOR	VISUALLY SENSITIVE RECEPTOR	DISTANCE (in ft.) FROM VSR	VIEW FROM VSR	VISUAL COMPLEXITY	VMC[1]
20 & 23 Wilcox Ave. Stonington, CT	Residence	170	Long Island Sound, vegetation	Low	4
34 Wilcox Ave. Stonington, CT	Residence	130	Long Island Sound	Moderate	4
36 Wilcox Ave. Stonington, CT	Residence	170	Long Island Sound	Low	4
44 Wilcox Ave. Stonington, CT	Residence	250	Long Island Sound	Low	4
162 Wilcox Ave. Stonington, CT	Residence	480	Long Island Sound	Low	2
Harbor View Ter. Stonington, CT	From Road	1280	Stonington Harbor	Moderate	1
3 Lambert's Lane Stonington, CT	Residence	880	Stonington Harbor	Moderate	1
13 Lambert's Lane Stonington, CT	Residence	880	Stonington Harbor	Moderate	1
End of Summit St. Stonington, CT	From Road	140	Long Island Sound	Low	4
13 Bayview St. Stonington, CT	Residence	80	Long Island Sound	Low	4
Elihu St. Stonington, CT	Residence	50	Long Island Sound	Low	4
15 Bradley St. Stonington, CT	Residence	40	Long Island Sound	Moderate	4
8 Cheesbro St. Stonington, CT	Residence	320	Wequetequock Cove	Moderate-High	4
End of Island Rd. Stonington, CT	From Road	80	Wequetequock Cove	Moderate	3
9 Ladd Rd. Warwick, RI	Residence	50	Greenwich Bay	Low-Moderate	4
7 Ladd Rd. Warwick, RI	Residence	50	Greenwich Bay	Moderate	3
20 Blackstone St. Warwick, RI	Residence	125	Greenwich Bay	Moderate-High	3
10 Williams St. Warwick, RI	Residence	125	Greenwich Bay	Moderate	2
5 Williams St. Warwick, RI	Residence	125	Greenwich Bay	Low	3
4496 Boston Post Rd. Warwick, RI	Condos	75	Greenwich Bay	Low	4
4490 Boston Post Rd. Warwick, RI	Condos	50	Greenwich Bay	Low	4
4480 Boston Post Rd. Warwick, RI	Condos	50	Greenwich Bay	Low	4
4456 Boston Post Rd. Warwick, RI	Residence	125	Greenwich Bay	Moderate	3
4158 Boston Post Rd. Warwick, RI	Condos	125	Greenwich Bay	Low	4
4090 Boston Post Rd. Warwick, RI	Condos	125	Greenwich Bay	Low	4
3986 Boston Post Rd. Warwick, RI	Nursing Home	500	Greenwich Bay	Moderate-High	3

* Depicted in Figures 4.11-1 through 4.11-10.

[1] Visual Modification Classification (VMC) of 3 of 4 indicates an adverse impact.

TABLE 3.12-1. OCCURRENCE OF NATURAL RESOURCES ON SUBSTATION SITES AND POWER LINE CORRIDORS[1]

SUBSTATION & UTILITY CORRIDOR	MILE POST	WETLANDS	WILDLIFE VALUE	ENDANGERED SPECIES	FLOOD PLAINS	COASTAL RESOURCES	WATER RESOURCES
Branford Branford, CT	79.10	near substation-to-rail feeder	limited	none	none	none	private wells
New London New London, CT	123.81	none	very limited	none	substation	substation: developed shorefront	none
Warwick Warwick, RI	176.61	none	limited	none	none	none	none
Roxbury Crossing Boston, MA	226.10	none	minimal	none	none	none	none

[1] NOTES:
Wetlands: indicates whether the site is in wetlands or the buffer zone. Buffer zone in Connecticut municipalities is 50 feet unless otherwise specified in text. Buffer zone in Rhode Island is 50 feet unless otherwise specified in text. Buffer zone in Massachusetts is 100 feet.

Wildlife: indicates the value of the site as wildlife habitat and considers the presence and appropriateness of the plant community for providing food and cover and the diversity of the habitat (e.g. open fields, wetlands, forest).

Endangered Species: indicates the presence of threatened or endangered species, as defined in the Endangered Species Act, using information provided by the states' Natural Heritage Inventories.

Floodplains: indicate whether a site falls within the boundaries of the 100-year flood zone.

Coastal Resources: indicates whether the site falls within the coastal zone, as delineated by each states coastal zone mamagement agency. In Resources. Connecticut, coastal resources are categorized and the category shoreland describes uplands.

Water Resources: indicates whether the site is on or near ground or surface drinking water supplies, other surface waters, or water resource protection areas.

TABLE 3.12-2. OCCURRENCE OF NATURAL RESOURCES ON SWITCHING STATION SITES[1]

SWITCHING STATION & LOCATION	MILE POST	WETLANDS	WILDLIFE VALUE	ENDANGERED SPECIES	FLOOD PLAINS	COASTAL RESOURCES	WATER RESOURCES
Westbrook Old Saybrook, CT	103.53	buffer	limited	none	none	none	none
Richmond Richmond, RI	150.35	buffer[2]	limited	none	yes	none	sole source aquifer (EPA)
Norton Attleboro, MA	198.99	buffer	diverse edge habitat	none	none	none	Bungay River Water Resource Protection District

[1] See notes following Table 1 for descriptions of resource categories.
[2] Buffer of rivers greater than 200 feet wide is 200 feet. This site lies approximately 90 feet from the Pawtucket River.

TABLE 3.12-3. OCCURRENCE OF NATURAL RESOURCES ON PARALLELING STATION SITES[1]

PARALLELING STATION & LOCATION	MILE POST	WETLANDS	WILDLIFE VALUE	ENDANGERED SPECIES	FLOOD PLAINS	COASTAL RESOURCES	WATER RESOURCES
Leetes Island Guilford, CT	85.99	none	limited	none	yes	coastal flood hazard area	none
Madison Madison, CT	92.41	none	limited	none	none	none	none
Grove Beach Westbrook, CT	99.11	buffer	limited	none	none	shorelands	none
Old Lyme Old Lyme, CT	109.50	none[2]	moderate	none	none	shoreland[2]	none
Millstone Waterford, CT	117.56	buffer	moderate: many species	none	none	shoreland	buffer
Noank Groton, CT	129.46	buffer of stream	limited	none	yes	coastal flood hazard area	buffer of stream
Stonington Stonington, CT	134.65	none	moderate	state endangered species	yes	shoreland	none
State Line Stonington, CT	139.93	none[2]	limited	none	none	shoreland[2]	sole source aquifer (EPA)

continued on next page

[1] See notes following Table 1 for descriptions of resource categories.

[2] These sites are listed on town wetlands maps as poorly drained soils, which are considered wetlands by the towns and Long Island Sound (coastal zone) Program. Field investigations, however, determined that these are filled areas with no wetlands characteristics. Amtrak should apply for reclassification of these sites. Upon reclassification, they will be classified as shorelands - the coastal zone designation for uplands.

TABLE 3.12-3, CONTINUED. OCCURRENCE OF NATURAL RESOURCES ON PARALLELING STATION SITES

PARALLELING STATION & LOCATION	MILE POST	WETLANDS	WILDLIFE VALUE	ENDANGERED SPECIES	FLOOD PLAINS	COASTAL RESOURCES	WATER RESOURCES
Bradford Westerly, RI	145.19	onsite or in buffer - pending	limited	none	none	none	critical recharge area& sole source aquifer (EPA)
Kingston So. Kingston, RI	157.11	none	high	none	none	none	sole source aquifer (EPA)
Exeter Exeter, RI	161.78	none	moderate	none	none	none	sole source aquifer (EPA)
East Greenwich No. Kingstown, RI	169.80	none	limited	none	none	none	wellhead protection area; groundwater recharge district
Elmwood Pawtucket, RI	181.70	none	limited	none	none	none	none
Providence Providence, RI	187.55	none	limited	none	none	none	none
Attleboro Attleboro, MA	193.40	none	limited	none	none	none	Ten Mile River buffer
East Foxboro Foxboro, MA	205.70	none	moderate	none	none	none	Adjacent to Canoe River ACEC
Canton Sharon, MA	212.40	none	limited	none	none	none	none
Readville Boston, MA	219.10	none	limited	none	none	none	300 ft from Fowl Meadow ACEC

TABLE 3.12-4. OCCURRENCE OF NATURAL RESOURCES AT BRIDGES TO BE MODIFIED

BRIDGE NAME	MILE POST	WETLANDS	WILDLIFE VALUE	ENDANGERED SPECIES	FLOOD PLAINS	COASTAL RESOURCES	WATER RESOURCES
Johnnycake Hill Road Old Lyme, CT	106.51	none	edge habitat	none	none	none	none
Millstone Point Road Waterford, CT	117.31	buffer/pending	limited	none	none	shoreland	none
Burdickville Road Charlestown, RI	148.41	westerly approach road/pending	moderate	none	none	none	sole source aquifer (EPA)
Kenyon School/ Beaver River Road Richmond, RI	154.04	none	limited	none	none	none	sole source aquifer (EPA)
RI Route 138/Main St. So. Kingston, RI	158.32	none	edge habitat	none	none	none	groundwater protection overlay district; sole source aquifer (EPA)
Pettaconsett Avenue Warwick, RI	178.48	none	limited	none	none	none	none
Park Avenue Cranston, RI	180.29	none	limited	none	none	none	pending
Depot Street Sharon, MA	211.04	buffer	limited	none	none	none	groundwater protection district, adjacent town well
Maskwonicut Street Sharon, MA	211.62	wetlands & buffer - pending[2]	moderate	none	yes	none	groundwater protection district, Beaver Brook

[1] See notes following Table 1 for descriptions of resource categories.
[2] Buffer of 200 feet from rivers greater than 10 feet wide may apply.

TABLE 3.12-5. OCCURRENCE OF NATURAL RESOURCES AT MOVEABLE BRIDGE CABLE CROSSINGS

MOVEABLE BRIDGE & LOCATION	WETLANDS	WILDLIFE VALUE	ENDANGERED SPECIES	FLOOD PLAINS	COASTAL RESOURCES	WATER RESOURCES
Connecticut River Old Saybrook/Old Lyme, CT	in river	moderate	Federal - short nosed sturgeon	yes	coastal flood hazard area; estuarine embayment	Connecticut River
Niantic River East Lyme/ Waterford, CT	in river	moderate	none	yes	coastal flood hazard area; beaches & dunes	Niantic River
Shaw's Cove New London, CT	in river	moderate	none	yes	coastal flood hazard area; developed shorefront	Shaw's Cove
Thames River New London/ Groton, CT	in river	moderate	none	yes	coastal flood hazard area; estuarine embayment; developed shorefront	Thames River
Mystic River Groton/ Stonington, CT	in river	moderate	none	yes	coastal flood hazard area; estuarine embayment; developed shorefront	Mystic River

APPENDIX C
PUBLIC PARTICIPATION PROGRAM, MEPA CERTIFICATE AND NOTICES

APPENDIX C
PUBLIC PARTICIPATION PROGRAM

C.1 INTRODUCTION

The National Environmental Policy Act (NEPA) and the Massachusetts Environmental Policy Act (MEPA) afford citizens the opportunity to assess the environmental impacts of major government projects. Under NEPA and MEPA the joint DEIS/R serves as the vehicle for obtaining public input into project decision-making. In addition to these regulations, the FRA has encouraged the active participation of private citizens and Federal, state and local agencies throughout the course of this study. This involvement is important to ensure that issues of concern to communities and agencies are addressed in the EIS/R, and that the resulting project is responsive to those concerns and in compliance with relevant Federal and state mandates.

The proposed electrification project will impact a 156-mile rail corridor comprised of three New England states and 36 cities and towns. Given the large number of communities, organizations and government agencies involved, an integrated and ongoing public participation program is critical to the success of the project. The goal of this program is twofold: 1) to inform interested public and private parties of the progress of the DEIS/R; and 2) to provide opportunities for their input into the environmental study.

C.2 MAJOR PUBLIC PARTICIPATION ACTIVITIES

The public involvement program for this DEIS/R consists of four elements. These include:

- Scoping sessions;
- Public information meetings;
- Coordination and consultation with regulatory agencies; and
- Public hearings

Each of these elements is described below.

C.2.1 NEPA Scoping

Scoping for the DEIS began in September 1991. The study team met with regulatory agencies in Massachusetts, Rhode Island and Connecticut in addition to Federal agencies with jurisdiction under NEPA. These agencies included but are not limited to:

- Connecticut Department of Environmental Protection/ Office of the Long Island Sound Program
- Connecticut Department of Transportation Highway, Rail Operations and Environmental Coordination Departments
- Rhode Island Department of Transportation
- Rhode Island Department of Environmental Management
- Massachusetts Executive Office of Transportation and Construction
- Massachusetts Executive Office of Environmental Affairs
- Massachusetts Bay Transportation Authority
- Massachusetts Highway Department

The agencies were briefed on Amtrak's electrification proposal and asked to provide comments and suggestions regarding a work program for the environmental assessment.

In accordance with NEPA requirements, formal public scoping sessions were then held in November 1991 at the following locations:

Location	Date	No. of Meetings
New London, CT	Nov. 4 & 20	3
Providence, RI.	Nov. 5	2
Cambridge, MA	Nov. 6	2
New Haven, CT	Nov 20	1

A Notice of Intent (NOI) to prepare the EIS appeared in the Federal Register on October 21, 1991 and in six regional newspapers along the study corridor, including: the Boston Globe; the Boston Herald; the New Haven Register; the Providence Journal; The Day (New London); and the Hartford Courant. Participants were invited to comment on the scope of the issues to be addressed in the environmental analysis. A copy of the NOI is provided at the end of this section.

Forty-eight government agencies and officials, forty organizations and fifty-nine individuals attended the scoping sessions. Among the major issues raised were:

- Potential health effects of electromagnetic fields;
- Aesthetic impact of the catenary installation;
- Increased noise as a result of higher speed and more frequent trains; and
- Increased risk of higher speed trains striking pedestrians and vehicles; and
- Restricted access to the waterfront due to additional fencing.

At the end of the public comment period, 150 comments were received from organizations and individuals. In addition to comments regarding impact categories and evaluation methods, several alternatives to the proposed project were suggested and then reviewed for consideration in the DEIS. A scoping document was prepared and distributed. This document identified the issues and alternatives raised in the scoping process and contained a summary of meeting minutes, oral and written comments and a list of participants. It provided a framework for the subsequent screening, selection and evaluation of alternatives, including the work program for the environmental assessment and resulting technical reports.

C.2.2 MEPA Scoping

Scoping requirements for Rhode Island and Connecticut were fulfilled by the NEPA scoping sessions. Massachusetts required a separate state environmental review process and scoping session pursuant to MEPA. A project Environmental Notification Form (ENF) was published in the Environmental Monitor on August 7, 1992; and one state scoping session was held on August 21, 1992.

As a result of the scoping session, the Massachusetts Secretary of Environmental Affairs directed FRA to prepare a state Environmental Impact Report for the project and outlined a scope for the study (See appendix for 9/9/92 MEPA certificate and scope). To reconcile the Federal and state environmental review processes, it was agreed that the project would prepare a combined Draft EIS and EIR (DEIS/R) followed by a Final EIS and EIR (FEIS/R).

C.2.3 Public Information Meetings

In the fall of 1992, public information meetings were held at the following locations:

Location	Date
Old Saybrook, CT	Nov. 17
Madison, CT	Nov. 18
Stonington, CT	Nov. 19
Charlestown, RI	Nov. 30
Cranston, RI	Dec. 1
Attleboro, MA	Dec. 2
Dedham, MA	Dec. 7
Jamaica Plain, MA	Dec. 8

Notices of the meetings were printed in 38 local newspapers and sent to 2 local cable television stations as well as posted in public buildings along the NEC. The purpose of these meetings was to report on EIS process and status and explain the various project elements proposed by Amtrak. The study team reviewed the potential impacts of extending electrification east of New Haven and the proposed methodology for evaluating each impact. Amtrak officials were present to answer questions about the project design. Participants were invited to provide comments and suggestions; approximately 280 people attended the 8 meetings.

The majority of issues raised at these meetings were already addressed in the DEIS/R scope. Several issues were raised that were beyond the scope of the project as defined by FRA and therefore, were not addressed in the study. Three new issues were incorporated into the subsequent analysis. These included:

- Public safety at commuter rail stations;
- Impacts to existing and future freight operations; and
- Expanded electric and magnetic field (EMF) testing program.

Follow-up meetings were held in April 1993 at the request of participants in Stonington, Connecticut, and in the Jamaica Plain-Roslindale area of Boston to present additional information on noise, vibration and EMF and the impact analysis.

The FRA maintained a project mailing list of approximately 1,000 individuals and organizations who wrote or contacted FRA or MEPA regarding the project, or attended one of the meetings or scoping sessions described above. The mailing list was updated on a regular basis and used for distribution of DEIS/R material and notices of project-related meetings and events.

C.2.4 Coordination and Consultation with Regulatory Agencies

The project team has engaged in extensive coordination with Federal, state and local government agencies since the outset of the study. These efforts have focused on: 1) data collection and the identification of resources; 2) compliance with regulatory requirements; and 3) review of study methods and results. Agencies consulted include:

Agency	Topic
• U.S. Soil Conservation Service Regional Offices	Farmlands, soil and Farmland Protection Policy Act Coordination
• U.S. Fish and Wildlife Service and similar State Agencies	Section 7 Consultation, threatened and endangered species
• U. S. Army Corps of Engineers (COE)	Section 404 and Section 10 permits, wetlands
• U. S. Coast Guard	Navigation and bridge construction permits
• U. S. Environmental Protection Agency	Air Quality Analysis Methods
• State Departments of Transportation, Highway and Transit Agencies	Proposed project and DEIS/R workplan
• State Departments of Environmental Protection	DEIS/R scope, required permits and reviews
• State Historic Preservation Officers	Historic and Archeological resources and resources and study methods
• Town Planning Departments	Land use and sensitive receptors

C.2.5 Public Hearings

After the FRA approves the DEIS/R for circulation, the document will be distributed to local, state and Federal agencies and officials, and individuals who have attended prior EIS/R meetings or have otherwise requested a copy. It will also be available through public libraries and other repositories in each of the affected communities along the study corridor, in compliance with NEPA and MEPA requirements. A complete distribution list is provided in Chapter 8.

Formal public hearings are anticipated in early fall 1993 to solicit written and oral testimony on the environmental impacts of the alternatives presented in the document. Comments will be received for a minimum of 45 days commencing with a Notice of Availability of the DEIS/R in the Federal Register and the Massachusetts Environmental Monitor. Based on technical information presented in this document and public and agency comments, the FRA will determine the environmental acceptability of each project alternative. A joint Final Environmental Impact Statement and Environmental Impact Report will then be prepared addressing all comments received on the DEIS/R and any project design changes as a result of the analysis contained herein. Following publication of the FEIS/R, the FRA will issue a Record of Decision (ROD). Following agreement of all parties on the ROD, Amtrak would be able to advance the project into construction.

The Commonwealth of Massachusetts
Executive Office of Environmental Affairs
100 Cambridge Street, Boston, 02202

September 9, 1992

WILLIAM F. WELD
GOVERNOR

ARGEO PAUL CELLUCCI
LIEUTENANT GOVERNOR

SUSAN F. TIERNEY
SECRETARY

(617) 727-9800

CERTIFICATE OF THE SECRETARY OF ENVIRONMENTAL AFFAIRS ON THE ENVIRONMENTAL NOTIFICATION FORM

PROJECT NAME	: Northeast Corridor Improvement Project Electrification
PROJECT LOCATION	: Statewide - South Attleboro (RI border) to South Station in Boston
EOEA NUMBER	: 9134
PROJECT PROPONENT	: National Railroad Passenger Corporation (AMTRAK)
DATE NOTICED IN MONITOR	: August 10, 1992

Pursuant to the Massachusetts Environmental Policy Act (G. L., c. 30, s. 61-62H) and Sections 11.04 and 11.06 of the MEPA regulations (301 CMR 11.00), I hereby determine that the above project requires the preparation of an Environmental Impact Report (EIR).

The proposed project consists of the electrification of the Northeast Corridor (NEC) railroad main line between New Haven, CT and South Station in Boston using an overhead 25,000 volt - 60 hertz single phase catenary system. Within Massachusetts from the Rhode Island border in South Attleboro to South Station, the NEC is approximately 38.5 miles long. It contains three passenger stations: South Station, Back Bay Station, and Route 128 Station.

The project includes the installation of three substations and three switching stations. The proposed locations for the substations have been identified as: Roxbury Crossing, Canton, and Attleboro/Norton. The proposed switching station locations have been identified as: South Station, Readville, and Foxborough. Substation locations may require property acquisitions. Switching station locations will be located within the existing right-of-way (ROW). Both substation and switching station locations are expected to alter less than one acre per site. There also is flexibility in locating these structures away from sensitive areas. In order to eliminate an unsafe grade crossing, the only private grade crossing along the ROW is being considered for acquisition as part of Attleboro/Norton substation site.

Catenary supports are anticipated to be slender poles placed on both sides of the tracks within the ROW and spaced at approximately 200 foot intervals. In some areas, the tracks will be lowered under overhead structures or structural modifications to overhead bridges will be undertaken to provide adequate clearance for the catenary. Three bridges are anticipated to undergo structural modifications. They have been identified as: School Street in Mansfield, Depot Street/Upland Road in Sharon, and Maskwonicut Street in Sharon. Fencing will be installed in some locations as part of this project.

Since the Environmental Notification Form (ENF) was submitted, both the gas turbine - third rail electric alternative and the alternative forms of electrification alternative have been eliminated by the proponent.

Because this project will cross both the newly designated Fowl Meadow and Ponkapoag Bog Area of Critical Environmental Concern (ACEC) and the Canoe River ACEC and because it has the potential for significant environmental impacts, I am requiring an EIR. However,in order to reduce duplication of effort because this project requires an Environmental Impact Statement (EIS) under the National Environmental Policy Act (NEPA), the MEPA Scope should be incorporated into the federal scope, Environmental Impact Statement Draft Work Plan (Revised) - August 10, 1992. I request that a joint EIS/EIR be prepared in one document for review purposes.

SCOPE

This EIR should follow the MEPA Regulations of 301 CMR 11.07 for outline and content, as modified by this scope. It should address the comments listed at the end of this Certificate, to the extent that they are within the required scope, and should include a copy of this Certificate.

Traffic:

The EIR should be prepared in conformance with the EOEA/EOTC Guidelines for EIR/EIS Traffic Impact Assessment. It should identify appropriate mitigation measures for areas where the project will impact traffic operations. As part of the federal EIS scope, the proponent has agreed to undertake a level of service (LOS) analysis at six intersections within Massachusetts to determine the impacts of more frequent passenger rail service on the traffic using nearby critical intersections at stations. The EIR should also include the following critical intersections, which are not listed in the federal scope:

- o Dartmouth Street/Columbus Avenue
- o University Avenue/Route 128 NB ramps.

The EIR should examine present and future build and no-action traffic volumes for the roadways and intersections specified in this and the federal scope. It should identify the impacts of bridge closings on local traffic flow and any interruptions in railroad service from the project. The EIR should propose mitigation to alleviate adverse impacts. It should document the expected increases in traffic flow and whether a deterioration in the LOS occurs.

The EIR should examine the adequacy of parking at Route 128 Station.

Are any of the access roadways to substations and switching stations in environmentally sensitive areas?

Air Quality:

The proponent should ensure that this project conforms to the requirements of the Department of Environmental Protection (DEP) regulations 310 CMR 7.36.

Noise:

The EIR should evaluate in detail the potential for increased levels of noise and vibration near the corridor resulting from higher speed trains and more frequent service. It should propose appropriate mitigation to reduce or eliminate these increases. The EIR should identify the net change in L(max) noise levels associated with a single train pass by, and it should document the possible changes in L (DN) levels at selected points within the ROW. If noise impacts increase as a result of this project, a comprehensive noise mitigation protocol should be developed.

Wetlands and Flooding:

The EIR should identify potential wetland impacts, where new wetlands may develop from the receipt of runoff, and mitigation measures. It should specify wetland impacts to the Fowl Meadow and Ponkapoag Bog ACEC and the Canoe River ACEC. The EIR should identify floodplain areas along the ROW.

Where it has been demonstrated that impacts are unavoidable, the EIR must illustrate that the impacts have been minimized, and that the project will be accomplished in a manner that is consistent with the Performance Standards of the Wetlands Regulations.

The EIR must address the significance of the wetland resources on-site, including public and private water supply; flood control; storm damage prevention; fisheries; shellfish; and wildlife habitat.

All resource area boundaries, applicable buffer zones, and 100-year flood elevations should be clearly delineated on a plan at a scale of not greater than 1 inch = 100 feet. Bordering vegetated wetlands that have been delineated in the field should be surveyed, mapped, and located on the plans. <u>Each</u> wetland resource area should be characterized according to 310 CMR 10.00.

The text should explain whether the local conservation commissions have accepted the resource area boundaries and any disputed boundary should be identified. How does the proponent intend to achieve zero-peak runoff as required by the Wetlands Protection Act regulations?

Aesthetics and Open Space:

The EIR should develop ways to reduce or mitigate visual impacts at the Fowl Meadow and Ponkapoag Bog ACEC, the Canoe River ACEC, and the Southwest Corridor Park. The proponent should consult with the Metropolitan District Commission (MDC) regarding these visual impacts to its park land and proposed mitigation. The EIR should provide and compare visual graphics or actual photographs of scenic areas along the route with views of the alternatives with their proposed mitigation. It should address the potential for adverse visual effects from the catenary installation on historically and culturally important properties or districts, residential areas, and park land.

Drainage:

The proposed alterations in drainage patterns should be examined in areas where track elevation will be lowered to accommodate overhead wires, especially between Back Bay and South Stations. The EIR should address the problem of the lowering of the water table, and it should identify appropriate mitigation measures to avoid or eliminate adverse impacts to nearby structures. It should identify potential problems with localized flooding.

The EIR should present drainage calculations and detailed plans for the management of stormwater from the proposed project where alterations to the existing system are proposed or where corrective measures are necessary. It should include a detailed description of the proposed drainage system alterations or new facilities proposed, including a discussion of the alternatives considered along with their impacts. The EIR should identify the quantity and quality of flows. The rates of stormwater runoff should be analyzed for the 10, 25, 100-year storm events. If the proponent ties into the existing ROW drainage system, the EIR should identify if there will be a recharge deficit on-site. The EIR should discuss where the ROW drainage system discharges. It should also be demonstrated that the proposed drainage system will control storm flows at existing levels.

In addition, a maintenance program for the drainage system will be needed to ensure its effectiveness. This maintenance program should outline the actual maintenance operations, responsible parties, and default systems.

Water Supply:

The EIR should provide the Best Management Practices (BMP) to address stormwater drainage concerns and urban runoff in order to avoid negative impacts to water quality (especially local public wells) and wetlands in the Fowl Meadow and Ponkapoag Bog ACEC and the Canoe River ACEC. It should identify public well sites adjacent to the ROW. How will the projected increase in traffic/parking at Route 128 Station affect the water quality around this area.

Historical/Archaeological Impacts:

The Massachusetts Historical Commission (MHC) has requested that a comprehensive cultural resources reconnaissance survey (950 CMR 70) be included in the Scope of the DEIR in order to identify historical and archaeological properties which may be affected, and I agree with this request.

Energy Efficiency:

The EIR should discuss the efficiency of diesel vs. electric train service in terms of energy consumed and pollution produced/mile traveled. The efficiency of electric train travel, BTUs/passenger mile/gallon figures, vs. auto, diesel train, diesel/electric train, bus, and airplane travel should be compared using the same criteria. This analysis should be informed by the discussions with electric utilities described in the federal scope (Section 4.6.3). The proponent should make every effort to introduce into its analyses the practical cost, energy efficiency, and pollution trade-offs associated with actual dispatch order considerations of generating units needed to serve the electric requirements of the proposed project. This should reflect the project's actual projected daily demand for electricity on an hourly basis, for use in comparing with hourly electric supply costs and pollution impacts.

Miscellaneous:

The EIR should address safety and access for wildlife migrations and movements across the tracks.

The EIR should identify project alternatives with respect to vertical clearances and address each of the following areas of concern: bridge structures; park land; Southwest Corridor stations; and potential rail corridor development. It should clearly set out the impacts of each alternative. How will the clearance issue be resolved for each of the 27 overhead structures?

The EIR should identify positive impacts from this project such as: reducing vehicle miles traveled on roadways, noise benefits from reduced flights over residential areas, and eliminating diesel fumes in the corridor (reduced vent stack emissions in the Southwest Corridor).

The EIR should indicate if there is a determination by the U.S. Department of Agriculture of the applicability of the Federal Farmland Protection Act to this project.

The EIR should develop a fencing policy for the ROW in order to determine where fencing will be located.

Will the proposed project affect the existing herbicide management/operation plan along the ROW?

Is a risk assessment being conducted for the continued use of diesel locomotives under the no-action alternative?

The EIR should address the issue of developing several service scenarios such as those suggested by the Conservation Law Foundation in its comment letter. It should identify whether this proposed project is compatible with extending passenger rail service beyond South Station to North Station in Boston.

Circulation:

The EIR should be circulated in compliance with the MEPA Regulations 301 CMR 11.24 and copies should also be sent to the list of "comments received" below. A copy of the EIR should be made available for public review at each public library for each community through which the proposed project passes.

September 9, 1992
DATE

Susan F. Tierney, Secretary

Comments received :
Arline F. Love, 7/12/92
Certified Engineering, 7/14/92
Foxborough Planning Bd., 8/4/92
Anne Ladd, 8/5/92
Frederick R. Harris, 8/10/92
MAPC, 8/11/92
Frederick R. Harris, 8/13/92
BRA, 8/20/92
MBTA, 8/21/92
Boston Environment Dept., 8/24/92
Stephen H. Kaiser, 8/25/92
Friends of the Blue Hills, 8/26/92
Neponset River Watershed Assoc., 8/26/92
Assoc. for Public Transportation, 8/26/92
MWRA, 8/27/92
MHD, 8/27/92
Dorchester Allied Neighborhood Assoc., 8/27/92
Town of Sharon, 8/29/92
MA Dept. of Food & Agriculture, 8/29/92
Elizabeth S. Houghton, 8/29/92
DEP, 8/31/92
MDC, 8/31/92
Conservation Law Foundation, 8/31/92
BTD, 8/31/92
BRA, 9/2/92

SFT/WTG/wg

responsibilities of the Administrator prescribed by law.

Specific limitations with respect to the FAA's approval of an airport Noise Compatibility Program are delineated in FAR part 150, § 150.5. Approval is not a determination concerning the acceptability of land uses under Federal, State, or local law. Approval does not by itself constitute an the FAA implementing action. A request for Federal action or approval to implement specific noise compatibility measures may be required, and an FAA decision on the request may require an environmental assessment of the proposed action. Approval does not constitute a commitment by the FAA to financially assist in the implementation of the program nor a determination that all measures covered by the program are eligible for grant-in-aid funding from the FAA. Where Federal funding is sought, requests for project grants must be submitted to the FAA Airports Division Office in Hawthorne, California.

The DOA and the City of Ontario submitted to the FAA on August 20, 1990, the Noise Exposure Maps, descriptions, and other documentation produced during the Noise Compatibility Planning study conducted from September 1984 through August 1990. The Noise Exposure Maps were determined by the FAA to be in compliance with applicable requirements on April 2, 1990. Notice of this determination was published in the Federal Register on April 11, 1991.

The study contains a proposed Noise Compatibility Program comprised of actions designed for phased implementation by airport management and adjacent jurisdictions from the date of study completion to, or beyond, the year 1991. It was requested that the FAA evaluate and approve this material as a Noise Compatibility Program as described in section 104(b) of the Act. The FAA began its review of the program on April 2, 1991 and was required by a provision of the act to approve of disapprove the program within 180 days (other than the use of new flight procedures for noise control). Failure to approve or disapprove such program within the 180-day period shall be deemed to be an approval of such program.

The submitted program contained twenty-two (22) proposed actions for noise mitigation on and off the airport. The FAA completed its review and determined that the procedural and substantive requirements of the Act and FAR part 150 have been satisfied. The overall program, therefore, was approved by the Assistant Administrator for Airports effective September 27, 1991.

Outright approval was granted for 12 of the specific program elements. The measures that were approved include the following: Continue nighttime preferential runway use; Continue to develop Impact Areas I and II according to the existing General Plan; Acquire and remove incompatible uses for developed land in Impact Area II; Acoustical treatment, purchase assurance and neighorhood enhancement of developed incompatible land in Impact Area III; Acoustical treatment and study of impacted schools; Development of an ongoing airport/community compatibility forum to adjust the part 150 NCP and a computer based land use/noise monitoring system; Prohibition of nighttime jet engine runups for maintenance purposes; and Continue to obtain aviation easements for all new construction of incompatible uses with the projected 12 Million Annual Passenger Level, 65 CNEL.

The Nine (9) elements that were disapproved include Achieving a 65% or greater Stage III fleet mix at ONT by 1995 and 100% by 2000 through the use of a noise regulation. Modification of the PRADO TWO Standard Instrument Departure Procedure; Extension of Runway 26R; Relocation of Bon View Elementary School; Monitoring and maintenance of the 65-CNEL noise exposure level. Annual funding commitment from the DOA, City of Ontario and the FAA; Prohibition of pilot training in jet powered air carrier aircraft; and the active pursuit of an amendment of Title 21—Airport Noise Standards.

No action was taken on one (1) measure that proposed modification to three (3) SIDs for the airport.

These determinations are set forth in detail in a Record of Approval endorsed by the Assistant Administrator for Airports on September 27, 1991. The Record of Approval, as well as other evaluation materials and the documents comprising the submittal, are available for review at the FAA office listed above and at the administrative offices of the Department of Airports.

Issued in Hawthorne, California on October 7, 1991.

Herman C. Bliss,

Manager, Airports Division, AWP-600, Western-Pacific Region.

[FR Doc. 91-25242 Filed 10-18-91; 8:45 am]

BILLING CODE 4910-01-M

Aviation System Capacity Advisory Committee

Pursuant to section 10(a)(2) of the Federal Advisory Committee Act (Pub. L. 92-463; 5 U.S.C. app. I), notice is hereby given of a meeting of the Federal Aviation Administration (FAA) Aviation System Capacity Advisory Committee to be held on Thursday, November 14, 1991. The meeting will take place at 9 a.m. in the MacCracken Room, 10th Floor, FAA, 800 Independence Avenue, SW., Washington, DC.

The agenda for this meeting is:

- Report of Noise Working Group
- Report of Airport Development and Government Roles Working Group
- Report of Finance Working Group
- Report of System Capacity Technology and Procedures Development Working Group

Attendance is open to the interested public, but limited to space available. With the approval of the committee chairman, members of the public may present oral statements at the meeting. Persons wishing to present oral statements or obtain information should contact Mr. James McMahon, FAA, Office of System Capacity and Requirements, (202) 267-7425.

Any member of the public may present a written statement to the Subcommittee at any time.

Issued in Washington, DC, on October 9, 1991.

E.T. Harris,

Director, Office of System Capacity and Requirements.

[FR Doc. 91-25243 Filed 10-18-91; 8:45 am]

BILLING CODE 4910-13-M

Federal Railroad Administration

Environmental Impact Statement on the Northeast Corridor Electrification From New Haven, Connecticut to Boston, Massachusetts

AGENCY: Federal Railroad Administration; Department of Transportation.

ACTION: Notice of intent to prepare an Environmental Impact Statement.

SUMMARY: The Federal Railroad Administration gives notice that it intends to prepare an Environmental Impact Statement (EIS) in accordance with the National Environmental Policy Act (NEPA), on the proposed electrification of the Northeast Corridor Rail Route, from New Haven, Connecticut to Boston, Massachusetts. The FRA will prepare the EIS so that it also satisfies the requirements of the

Massachusetts Environmental Policy Act (MEPA), the Rhode Island Department of Environmental Management (DEM), and the Connecticut Department of Environmental Protection (CDEP). In addition to electrification, the EIS will evaluate no-action and any other alternatives identified through the scoping process. Scoping will be accomplished through correspondence with interested persons, organizations, and Federal, State and local agencies, and through public meetings.

DATES: Written comments on the scope of alternatives and impacts to be considered should be sent to the Volpe National Transportation Systems Center by November 18, 1991. Public scoping meetings will be held in each State as follows:

Connecticut—November 4, 1991 at 2 p.m. and 7 p.m.
Rhde Island—November 5, 1991 at 2 p.m. and 7 p.m.
Massachusetts—November 6, 1991 at 2 p.m. and 7 p.m.

ADDRESSES: Written comments on the project scope should be sent to: US DOT/RSPA Volpe National Transportation Systems Center, Attn: NEC Electrification Project, Glenn Goulet, DTS—77, Kendall Square, Cambridge, MA 02142-1093.

The scoping mettings will be held at three locations:

Connecticut: Martin Center Auditorium, 120 Broad Street, New London, CT, Phone (203) 447-5250.
Rhode Island: Omni Biltmore, 11 Dorrance Street, Providence, RI 02903 Phone (401) 421-0700.
Massachusetts: Volpe National Transportation Systems Center, 55 Broadway, Cambridge, MA 02142, (617) 494-2002.

FOR FURTHER INFORMATION CONTACT: Mark E. Yachmetz, Federal Railroad Administration. Phone (202) 366-6593.

SUPPLEMENTARY INFORMATION:

Scoping

The FRA invites interested individuals, organizations, and Federal, State and local agencies to participate in defining the issues to be evaluated in the EIS. Scoping comments may be made verbally at the public scoping meetings or in writing. Written comments will be received for a period of 30 days after the publication of this notice (See the **DATES** and **ADDRESSES** sections above for locations and times). During scoping, comments should focus on identifying specific social, economic, or environmental impacts to be evaluated and suggesting alternatives that are less costly or less environmentally damaging while achieving similar objectives. Scoping is not the time to indicate a preference for a particular alternative. There will be an opportunity to comment on preferences after the Draft EIS has been completed.

Mailing List

If you wish to be placed on the mailing list to receive further information as the project develops, contact Glenn Goulet or Mark Yachmetz as previously described.

Description of Study Area and Project Need:

The study area begins at New Haven, extends through New London, Connecticut and Providence, Rhode Island, and terminates at Boston, Massachusetts, a distance of approximately 160 miles. The proposed action is extension of electrification—catenary installation with all necessary support systems—along the Northeast Corridor. A significant part of the project involves providing adequate clearance at the roadway bridges and tunnels. Various means such as lowering the tracks or raising roadway bridges may be necessary. Other aspects of the project include, but are not limited to, construction of electrical substations and switching stations at specific intervals along the route, modification of railroad bridges to support the new catenary system, and elimination or improved protection of public and private highway and pedestrian grade crossings.

The current use of diesel locomotives along this route limits train acceleration and imposes a delay in New Haven while locomotives are switched between diesel and electric. The project will produce a shorter trip time between New York and Boston, achieved due to the higher acceleration capability and top speed of electric motive power and the elimination of the engine change at New Haven. A shorter trip time is projected to increase ridership substantially and thus reduce highway and airport congestion.

Alternatives:

The Alternatives proposed for evaluation include: (1) No-action, resulting in continued use of diesel locomotives,

(2) Construction of 25 kV-60 Hz constant tension catenary system for electrification of the entire route, including substations and switching stations. The design is to be compatible with a maximum train speed of up to 150 mph., and

(3) Any other alternatives identified during the scoping process.

Probable Effects:

The FRA will evaluate all significant environmental, social, and economic impacts of the alternatives analyzed in the EIS. Impacts include changes in the natural environment (air and water quality, rare and endangered species), changes in the social environment (land use and neighborhoods, noise and vibration, aesthetics, historic and archaeological resources), human health (electromagnetic field effects), and changes in transportation patterns and protection at grade crossings. The impacts will be evaluated both for the construction period and for the long-term period of operation. Measures to mitigate significant adverse impacts will be addressed.

Procedures:

The Draft EIS will be prepared in conjunction with Preliminary Engineering. After its publication, the Draft EIS will be available for public and agency review and comment, and a public hearing will be held. On the basis of the Draft EIS and the comments received, the FRA will prepare the Final EIS.

Issued in Washington, DC on October 15, 1991.

James T. McQueen,
Associate Administrator for Railroad Development.

[FR Doc. 91-25212 Filed 10-18-91; 8:45 am]

BILLING CODE 4910-06-M

DEPARTMENT OF THE TREASURY

Public Information Collection Requirements Submitted to OMB for Review

Dated October 15, 1991.

The Department of Treasury has submitted the following public information collection requirement(s) to OMB for review and clearance under the Paperwork Reduction Act of 1980, Public Law 96-511. Copies of the submission(s) may be obtained by calling the Treasury Bureau Clearance Officer listed. Comments regarding this information collection should be addressed to the OMB reviewer listed and to the Treasury Department Clearance Officer, Department of the Treasury, room 3171 Treasury Annex, 1500 Pennsylvania Avenue, NW., Washington, DC 20220.

INTERNAL REVENUE SERVICE

OMB Number: 1545-0155.
Form Number IRS Form 3468.
Type of Review: Revision.

Environmental Notification Form Published in the Massachusetts Environmental Monitor on August 7, 1992

ENVIRONMENTAL NOTIFICATION FORM

EOEA No. 9134
TOWN: Statewide
MEPA Contact Person
Bill Gage
(727-6830)

I. SUMMARY

A. Project Identification NECIP - Electrification

1. Project Name New Haven, CT to Boston, MA
Address/Location South Station Boston to South Attleborough, MA (RI border)
City/Town See below*
2. Project Proponent Amtrak **
Address
3. Est. Commencement Summer, 1993 Est. Completion 1997
Approx. Cost $ ______ Status of Project Design 10 % Complete.
4. Amount (if any) of bordering vegetated wetlands, salt marsh, or tidelands to be dredged, filled, removed, or altered (other than by runoff of runoff) as a result of the project. ______ acres ______ square feet.
5. This project is categorically included and therefore requires preparation of an EIR. Yes ______ No X ?

B. Narrative Project Description
Describe project and site.

Congress has appropriated funds to the Federal Railroad Administration (FRA) for transfer to Amtrak for the purpose of extending electric traction to the Northeast Corridor (NEC) Main Line between New Haven, CT and Boston, MA. FRA has determined that the transfer of these funds would constitute "a major Federal action" within the meaning of NEPA. Pursuant to the CEQ regulations-implementing the procedural provisions of NEPA (40 CFR parts 1500-1508), and FRA's "Procedures for Considering Environmental Impacts" (FR Vol. 45 page 40854), FRA is preparing an environmental impact statement (EIS) for this project. The EIS will consider reasonable alternatives to Amtrak's proposed project which is described in detail below. Scoping for the EIS was conducted in the fall of 1991 and the list of alternatives included in the attached work plan.

The project proposed by Amtrak is the electrification of the NEC main line between Union Station, New Haven and South Station, Boston using an overhead 25,000 volt-60 hertz single phase
(Continued next page)

Copies of the complete ENF may be obtained from (proponent or agent):
Name Glenn Goulet Firm/Agency Volpe National Transportation Systems Center
Address Kendall Square Phone No. (617) 494-2007

1986 THIS IS AN IMPORTANT NOTICE. COMMENT PERIOD IS LIMITED.
For information, call (617) 727-5830

* Boston, Dedham, Westwood, Canton, Sharon, Foxborough, Mansfield and Attleborough

** National Railroad Passenger Corporation (Amtrak) is the private
(Continued on next page)

1.A.2 Project Proponent (Continued)

\# 9134

federally subsidized proponent of the project. The Federal Railroad Administration (FRA) is the Federal administration responsible for disbursement of congressional appropriations funding the proposed project and therefore is responsible for preparation of the environmental impact statement (EIS).

The corridor right-of-way (ROW) is owned by the Massachusetts Bay Transportation Authority (MBTA). Amtrak has operating rights for intercity passenger service.

1.B Narrative Project Description (Continued)

catenary system. In Massachusetts, the project includes installation of approximately six (total) substations and switching stations adjacent to the ROW and in some areas lowering the tracks or structural modifications to overhead bridges to provide adequate clearance for the catenary. Fencing will be installed in some locations.

Preliminary design is underway with the 30 percent submittal expected mid August of this year. This submittal will include detailed information on proposed substation/switching station and utility corridor locations and overhead bridge clearances necessary to install the catenary system, as well as other design elements. To assist MEPA in evaluating this ENF, the following is provided:

- Preliminary locations of substations and utility corridors are shown on the attached site plans. Amtrak indicates that switching stations will generally be located on the existing ROW, while substation locations may require property acquisition.
- Substations/switching station sites are anticipated to alter less than one acre per site. In selecting these sites, emphasis will be placed on locations outside sensitive areas.
- Catenary support structures are anticipated as slender poles placed on both sides of the tracks (within the ROW) and spaced at approximately 200± ft. intervals.
- There is one private grade crossing and no public grade crossings in Massachusetts. Amtrak is considering the acquisition of this area for a substation and thus the elimination of this crossing.
- Given Amtrak's preliminary vertical clearance requirements, approximately 27 overhead structures may require increased clearance.

APPENDIX D
LIST OF PREPARERS AND REVIEWERS

APPENDIX D
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APPENDIX E
LIST OF AGENCIES, ORGANIZATIONS, AND PERSONS RECEIVING THE DEIS/R

APPENDIX E

NAME	REPRESENTING
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FRANK VACCA	AMTRAK
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APPENDIX E

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WENDY FIELDS	CONGRESSMAN GEJDENSON'S OFFICE
CRAIG M. GRANT	CONGRESSMAN MATCHLEY'S OFFICE
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REP. SIDNEY J. HOLBROOK	CT GENERAL ASSEMBLY - DIST. 35
REP. ALAN KYLE	CT GENERAL ASSEMBLY - DIST. 36
REP. GARY OREFICE	CT GENERAL ASSEMBLY - DIST. 37
REP. ANDREA L. STILLMAN	CT GENERAL ASSEMBLY - DIST. 38
REP. WADE A HYSLOP, JR.	CT GENERAL ASSEMBLY - DIST. 39
REP. NANCY A. DEMARINIS	CT GENERAL ASSEMBLY - DIST. 40
REP. LENNY T. WINKLER	CT GENERAL ASSEMBLY - DIST. 41
REP. PARTICIA A. DILLON	CT GENERAL ASSEMBLY - DIST. 92
REP. HOWARD C. SCIPIO	CT GENERAL ASSEMBLY - DIST. 93
REP. WILLIAM R. DYSON	CT GENERAL ASSEMBLY - DIST. 94
REP. ANDREA JACKSON-BROOKS	CT GENERAL ASSEMBLY - DIST. 95
REP. CAMERON C. STAPLES	CT GENERAL ASSEMBLY - DIST. 96
REP. CHRISTOPHER DEPINO	CT GENERAL ASSEMBLY - DIST. 97
REP. JANET C. ROSS	CT GENERAL ASSEMBLY - DIST. 98
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SENATOR WILLIAM A ANISKOVICH	CT STATE SENATE - DIST. 12
SENATOR CATHERINE W. COOK	CT STATE SENATE - DIST. 18
SENATOR MELODIE PETERS	CT STATE SENATE - DIST. 20
SENATOR EILEEN M. DAILY	CT STATE SENATE - DIST. 33
SENATOR ROBERT R. SIMMONS	CT STATE SENATE - DIST. 43

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REP KEVIN FITZGERALD	MA GENERAL ASSEMBLY - DIST. 105
REP. GLORIA FOX	MA GENERAL ASSEMBLY - DIST. 108
REP. WILLIAM C. GALVIN	MA GENERAL ASSEMBLY - DIST. 109
REP. PAUL J. GANNON	MA GENERAL ASSEMBLY - DIST. 110
REP. ALTHEA GARRISON	MA GENERAL ASSEMBLY - DIST. 112
REP. LIDA E. HARKINS	MA GENERAL ASSEMBLY - DIST. 122
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REP. BARBARA C. HYLAND	MA GENERAL ASSEMBLY - DIST. 131
REP. LOUIS L. KAFKA	MA GENERAL ASSEMBLY - DIST. 135
REP. STEPHEN KAROL	MA GENERAL ASSEMBLY - DIST. 136
REP. MARIE-LOUISE KEHOE	MA GENERAL ASSEMBLY - DIST. 137
REP. VINCENT G. MANNERING	MA GENERAL ASSEMBLY - DIST. 155
REP. JOHN E. MCDONOUGH	MA GENERAL ASSEMBLY - DIST. 161
REP. SHIRLEY OWENS-HICKS	MA GENERAL ASSEMBLY - DIST. 173
REP. KEVIN PORIER	MA GENERAL ASSEMBLY - DIST. 183
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REP. BYRON RUSHING	MA GENERAL ASSEMBLY - DIST. 192
REP. ANGELO SCACCIA	MA GENERAL ASSEMBLY - DIST. 193
REP. EMANUEL C. SERRA	MA GENERAL ASSEMBLY - DIST. 196
REP. SUSAN M. TRACY	MA GENERAL ASSEMBLY - DIST. 211
REP. PHILIP TRAVIS	MA GENERAL ASSEMBLY - DIST. 212
REP. RICHARD A. VOKE	MA GENERAL ASSEMBLY - DIST. 215
REP. JAMES T. BRETT	MA GENERAL ASSEMBLY - DIST. 69
REP. SALVATORE F. DIMASI	MA GENERAL ASSEMBLY - DIST. 97
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SENATOR THOMAS F. BIRMINGHAM	MA STATE SENATE - DIST. 25
SENATOR WILLIAM R. KEATING	MA STATE SENATE - DIST. 35
SENATOR ROBERT E. TRAVAGLINI	MA STATE SENATE - DIST. 54
SENATOR MARIAN WALSH	MA STATE SENATE - DIST. 55
SENATOR W. PAUL WHITE	MA STATE SENATE - DIST. 57
SENATOR DIANNE WILKERSON	MA STATE SENATE - DIST. 58
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REP. STEVEN F. SMITH	RI GENERAL ASSEMBLY - DIST. 12
REP. CHARLENE LIMA	RI GENERAL ASSEMBLY - DIST. 13
REP. FRANK T. CAPRIO	RI GENERAL ASSEMBLY - DIST. 14
REP. PATRICK J. KENNEDY	RI GENERAL ASSEMBLY - DIST. 16
REP. MARY C. ROSS	RI GENERAL ASSEMBLY - DIST. 17
REP. JOSEPH E. NEWSOME	RI GENERAL ASSEMBLY - DIST. 18
REP. HAROLD M. METTS	RI GENERAL ASSEMBLY - DIST. 19
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REP. GOERGE A. CASTRO	RI GENERAL ASSEMBLY - DIST. 20
REP. PAUL H. ARCHETTO	RI GENERAL ASSEMBLY - DIST. 21
REP. BEATRICE A. LANZI	RI GENERAL ASSEMBLY - DIST. 22
REP. JAMES J. GINOLFI	RI GENERAL ASSEMBLY - DIST. 23
REP. FRANK A. MONTANARO	RI GENERAL ASSEMBLY - DIST. 24
REP. JOSEPH A. DELORENZO JR.	RI GENERAL ASSEMBLY - DIST. 25
REP. ROBERT B. JACQUARD	RI GENERAL ASSEMBLY - DIST. 26
REP. JOHN S. SIMONIAN	RI GENERAL ASSEMBLY - DIST. 27

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REP. JAMES R. LANGEVIN	RI GENERAL ASSEMBLY - DIST. 29
REP. EDITH H. AJELLO	RI GENERAL ASSEMBLY - DIST. 3
REP. PAUL V. SHERLOCK	RI GENERAL ASSEMBLY - DIST. 30
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REP. EILEEN S. NAUGHTON	RI GENERAL ASSEMBLY - DIST. 32
REP. PETER T. GINAITT	RI GENERAL ASSEMBLY - DIST. 33
REP. ROBERT E. FLAHERTY	RI GENERAL ASSEMBLY - DIST. 34
REP. GEORGE A. ZAINYEH	RI GENERAL ASSEMBLY - DIST. 35
REP. RUSSEL BRAMLEY	RI GENERAL ASSEMBLY - DIST. 36
REP. WILLIAM C. MCGOWAN	RI GENERAL ASSEMBLY - DIST. 37
REP. LINDA J. KUSHNER	RI GENERAL ASSEMBLY - DIST. 4
REP. ROBERT A. WATSON	RI GENERAL ASSEMBLY - DIST. 43
REP. SUZANNE M. HENSELER	RI GENERAL ASSEMBLY - DIST. 44
REP. MELVOID J. BENSON	RI GENERAL ASSEMBLY - DIST. 45
REP. KENNETH CARTER	RI GENERAL ASSEMBLY - DIST. 46
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REP. DONALD J. LALLY,JR.	RI GENERAL ASSEMBLY - DIST. 48
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REP. ANTONIO J. PIRES	RI GENERAL ASSEMBLY - DIST. 79
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REP. EUGENE F. GARVEY	RI GENERAL ASSEMBLY - DIST. 81
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REP. MARIA J. LOPES	RI GENERAL ASSEMBLY - DIST. 83
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SENATOR THOMAS J. IZZO	RI STATE SENATE - DIST. 13
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SENATOR JOHN C. REVENS, JR.	RI STATE SENATE - DIST. 18
SENATOR JOHN FEROCE	RI STATE SENATE - DIST. 19
SENATOR MYRTH YORK	RI STATE SENATE - DIST. 2
SENATOR J. MICHAEL LENIHAN	RI STATE SENATE - DIST. 22
SENATOR DOMENIC A. DiSANDRO	RI STATE SENATE - DIST. 24
SENATOR W.M. SULLIVAN	RI STATE SENATE - DIST. 25

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SENATOR JOSEPH A. MONTALBANO	RI STATE SENATE - DIST. 37
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SENATOR WILLIAMS V. IRONS	RI STATE SENATE - DIST. 39
SENATOR DOMINICK J. RUGGERIO	RI STATE SENATE - DIST. 4
SENATOR HAROLD J. MILLER, JR	RI STATE SENATE - DIST. 40
SENATOR BRADFORD GORHAM	RI STATE SENATE - DIST. 41
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SENATOR HELEN M. MATHIEU	RI STATE SENATE - DIST. 46
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SENATOR CHARLES D. WALTON	RI STATE SENATE - DIST. 9
SENATOR PAUL TAVARES	RI STATE SENATE - DIST. 9
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APPENDIX F
CORRESPONDENCE

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northeast Region
Habitat and Protected
Resources Division
One Blackburn Drive
Gloucester, MA 01930-2298

April 28, 1993

TSA ROUTING LIST
Melissa ....
Bill ....
Chron .... [X]
Project 42-1006 NE Corridor [X]
Other mms - Protected Species [X]

Jim Fougere
The Smart Associates
72 N. Main Street
Concord, NH 03301

Dear Mr. Fougere:

This responds to your letter requesting information regarding the presence of shortnose sturgeon (Acipenser brevirostrum) near several Connecticut bridges. Your letter indicated that plans for an Amtrak electrification project include burying electric cables beneath river bottoms at all of the noted bridge sites. As you identified on the maps enclosed with your letter, the Connecticut River bridge is the only proposed construction site located within sturgeon habitat.

Shortnose sturgeon typically migrate to the lower Connecticut River Estuary from upstream spawning grounds in summer where they are believed to feed mostly on mussels and insect larvae. Depending on the timing and extent of work required for this project, construction activities may affect shortnose sturgeon or their feeding habitat. An Endangered Species Act section 7 consultation concerning the impact of the Connecticut River bridge project on endangered shortnose sturgeon needs to be completed prior to issuing a permit for this activity.

If you have questions concerning these comments, please contact me at (508) 281-9388.

Sincerely,

Nancy J. Haley
Protected Species Program

cc:
Mike Amarol - US FWS, Concord, NH

File: 1514-05 COE-Nationwides 1993

STATE OF CONNECTICUT
DEPARTMENT OF ENVIRONMENTAL PROTECTION
FISHERIES DIVISION
HABITAT CONSERVATION AND ENHANCEMENT
P.O. BOX 719
OLD LYME, CT 06371
(203) 434-6043

June 3, 1993

Jim Fougere
The Smart Associates,
Environmental Consultants, Inc.
72 N. Main St.
Concord, NH 03301

Dear Jim:

Thank you for sending me the drawings of the proposed layout for the submarine cables associated with the AMTRACK electrification project. Information on fisheries resources, and our preliminary questions and concerns follow:

Burial of the cable will be necessary at the lower Thames River, Connecticut River, Niantic River, and Mystic Rivers and Shaw's Cove in New London. All of these areas support a variety of marine, estuarine and anadromous finfish. The attached table lists the predominant finfish species which are seasonal or permanent residents of these areas. In addition, the Connecticut River also supports Atlantic salmon (Salmo salar) and shortnose sturgeon (Acipenser brevirostrum), a federally endangered species.

Of the fish that inhabit these areas, the cunner, killifish, sheepshead minnow, silversides, sticklebacks, tomcod, and white perch can be considered year-round residents. All of these species may complete their entire life cycle in nearshore, estuarine, environments.

Winter flounder are permanent residents of Long Island Sound. Adults migrate into cooler, deeper waters during the summer and move inshore during the winter. Spawning occurs in estuaries during late winter and early spring. Juveniles spend their first year in shallow, inshore waters. Blackfish and windowpane flounder are also permanent residents of Long Island Sound.

The remainder of the fish occur seasonally in the area, usually the result of onshore-offshore and/or coastwise north-south migrations. These fish include bluefish, butterfish, summer flounder, mackerel, menhaden, scup, striped bass and weakfish.

You may wish to contact John Volk, the Director of the CT. Department of Aquaculture (874-0696) for information on shellfish resources.

Because a number of fish species are known to be sensitive to extremely low frequency electromagnetic fields, the impact of the submarine cable on the behavior of finfish, particularly anadromous species, is of primary concern. Preliminary questions that come to mind are: What will be the strength of the electromagnetic fields associated with the submarine and above river cables and, can you provide any documentation that these levels will not have adverse impacts on finfish? Are there similar cables in other river systems, and have any impacts been noted, particularly on migratory species? I have provided several references which may be useful.

Secondary concerns include the effects of suspended sediments during cable installation. The Fisheries Division sometimes recommends seasonal restrictions on unconfined excavation in order to minimize impacts on spawning or migrating finfish. Final recommendations would be dependent on the cable installation methods proposed, the amount and type of material to be excavated, and the duration of the project.

I hope this information is useful. If I can be of additional assistance, please don't hesitate to contact me.

Sincerely,

Linda Gunn Alexander
Sr. Fisheries Biologist

Table 1. Marine and anadromous finfish Expected to be present in the Connecticut, Thames, Niantic and Mystic Rivers.

American shad (Alosa sapidissima)
American eel (Anguilla rostrata)
River herrings (Alosa spp.)
Blackfish (Tautoga onitis)
Bluefish (Pomatomus saltatrix)
Butterfish (Peprilus tricanthus)
Cunner (Tautogolabrus adspersus)
American eel (Anguilla rostrata)
Summer flounder (Paralichthys dentatus)
Winter flounder (Pseudopleuronectes americanus)
Windowpane flounder (Scophthalmus aquosus)
Killifish (Fundulus spp.)
Mackerel (Scomber scombrus)
Menhaden (Brevoortia tyrannus)
Scup (Stenotomus chrysops)
Silversides (Menidia menidia)
Sticklebacks (Apeltes spp., Gasterosteus spp.)
Smelt (Osmerus mordax)
Striped bass (Morone saxatilis)
Tomcod (Microgadus tomcod)
Sea-run brown trout (Salmo trutta)
White perch (Morone americanus)
Weakfish (Cynoscion regalis)

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