DOE/EIS-0372

Draft Environmental Impact Statement for the

Bangor Hydro-Electric Company Northeast Reliability Interconnect

August 2005

Volume 1: Draft EIS

U.S. Department of Energy
Washington, DC

Cooperating Agencies

U.S. Department of the Interior
U.S. Fish and Wildlife Service

National Marine
Fisheries Service

U.S. Department of Commerce
National Oceanic and Atmospheric Administration

Department of Energy
Washington, DC 20585

August 2005

Dear Sir/Madam:

This letter transmits the *Bangor Hydro-Electric Company (BHE) Northeast Reliability Interconnect Draft Environmental Impact Statement* (DOE/EIS-0372), prepared by the Department of Energy (DOE) pursuant to the National Environmental Policy Act of 1969 (NEPA) and its implementing regulations. The U.S. Fish and Wildlife Service of the U.S. Department of the Interior and the National Marine Fisheries Service of the U.S. Department of Commerce National Oceanic and Atmospheric Administration are cooperating agencies in the preparation of this Draft EIS.

The proposed DOE action in the Draft EIS is to amend BHE's existing Presidential permit to allow construction along the Modified Consolidated Corridors Route of a single-circuit, 345,000-volt, electric transmission line that would cross the U.S. international border in the vicinity of Baileyville, Maine. DOE has prepared this Draft EIS to evaluate the potential environmental impacts in the United States of the proposed action and the range of reasonable alternatives, including the No Action alternative. Under the No Action alternative, only the previously permitted route could be utilized by BHE for construction of the transmission line. In addition to the Modified Consolidated Corridors Route and the Previously Permitted Route, two other alternative routes are analyzed in the Draft EIS: the Consolidated Corridors Route, and the MEPCO South Route. DOE also analyzed a rescission alternative under which the existing permit would be rescinded and no international transmission line could be constructed. As indicated in the Draft EIS, DOE has designated the Modified Consolidated Corridors Route as its preferred alternative.

You are invited to comment on this Draft EIS during the 45-day comment period that will begin when the U.S. Environmental Protection Agency publishes a notice of its availability in the *Federal Register*, expected by August 26, 2005. Comments submitted after the close of the comment period will be considered to the extent practicable. Information on how to submit comments is provided at the end of this letter.

DOE and the cooperating agencies will conduct public hearings in the vicinity of the proposed project during this comment period. You are invited to attend these hearings and to provide oral and written comments on the Draft EIS. Detailed information on the times, dates, and locations of these hearings will be published in the *Federal Register* and also in local newspapers in the near future. The Draft EIS is available on the project's website at http://web.ead.anl.gov/interconnecteis/ and will soon be on DOE's NEPA website at www.eh.doe.gov/nepa/documentspub.html.

If you have any questions or comments on the Draft EIS, or would like additional copies, please contact me either by mail at the Office of Electricity Delivery and Energy Reliability, OE-20, U.S. Department of Energy, Washington, DC 20585, by telephone at 202-586-3362, by fax at 202-318-7761, or by e-mail at Jerry.Pell@hq.doe.gov. However, please note that conventional mail to DOE tends to be delayed because of anthrax screening.

Very truly yours,

Jerry Pell, Ph.D., CCM Project Manager Office of
Electricity Delivery
and Energy Reliability

Enclosure

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Permitting, Siting, and Analysis Division
Office of Electricity Delivery and Energy Reliabiliity
U.S. Department of Energy
Washington, DC 20585

Cooperating Agencies

U.S. Department of the Interior
U.S. Fish and Wildlife Service

National Marine
Fisheries Service

U.S. Department of Commerce
National Oceanic and
Atmospheric Administration

COVER SHEET

Responsible Federal Agency: U.S. Department of Energy, Office of Electricity Delivery and Energy Reliability

Cooperating Agencies: U.S. Department of the Interior, U.S. Fish and Wildlife Service (USFWS) and U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Marine Fisheries Service (NOAA Fisheries)

Title: Draft Environmental Impact Statement for the Bangor Hydro-Electric Company Northeast Reliability Interconnect

Location: Hancock, Penobscot, and Washington Counties, Maine.

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U.S. Department of Energy
Washington, DC 20585
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leave a message at (800) 472-2756

Abstract: A U.S. Department of Energy (DOE) Presidential Permit is required before anyone can construct, connect, operate, and maintain an electric transmission line across the U.S. border. On September 30, 2003, Bangor Hydro-Electric Company (BHE) applied to DOE to amend Presidential Permit PP-89 to authorize BHE to construct an 85-mi (137-km) long, single-circuit, 345,000-volt (345-kV) alternating current (AC) electric transmission line that would originate at the Orrington Substation and extend eastward to the U.S.-Canada border near Baileyville, Maine, and continue into New Brunswick, Canada. The currently proposed transmission line is along a different route from that for which DOE issued PP-89 to BHE on January 22, 1996.

BHE states that the proposed transmission line would improve the reliability of the bulk electric transmission system. The proposed transmission line would also create an additional north-to-south transfer capacity of 300 megawatts (MW) and allow a south-to-north transfer capacity of up to 400 MW on a more consistent basis.

DOE has determined that the issuance of an amendment of an existing Presidential permit for this project would constitute a major Federal action within the meaning of the *National Environmental Policy Act of 1969*, as amended. The *Federal Register* "Notice of Intent to Prepare an Environmental Impact Statement and to Conduct Public Scoping Meetings and Notice of Floodplain and Wetlands Involvement; Bangor Hydro-Electric Company" was published on November 2, 2004 (69 FR 63514). DOE held public scoping meetings on November 17, 2004, in Baileyville, Maine, and on November 18, 2004, in Brewer, Maine. DOE also solicited written and electronic comments on the scope of the EIS in the Notice of Intent, at the scoping meetings, and electronically through a project Web site (http://web.ead.anl.gov/interconnecteis).

The EIS addresses the environmental impacts of the proposed transmission line and the range of reasonable alternatives. Four alternative transmission line routes are analyzed in this EIS (the Modified Consolidated Corridors Route [both BHE's and DOE's preferred alternative], the Consolidated Corridors Route, the Previously Permitted Route [the "No Action" alternative], and the MEPCO South Route), as well as the "Rescission of the Presidential Permit" alternative, under which no transmission line as proposed would be constructed. DOE will use the EIS to ensure that it has the information needed for purposes of informed decision making. The decisions themselves will be issued subsequent to the Final EIS, in the form of a Record of Decision by DOE no sooner than 30 days after publication of the U.S. Environmental Protection Agency Notice of Availability of the Final EIS, and the amendment to the Presidential permit, as appropriate.

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NOTATION

The following is a list of the abbreviations, acronyms, chemical symbols, and units of measure used in this document. (Some acronyms and abbreviations used only in tables may be defined only in those tables.)

GENERAL ACRONYMS AND ABBREVIATIONS

AC	alternating current
ACSR	aluminum conductor, steel reinforced
AMA	American Medical Association
ANL	Argonne National Laboratory
APLIC	Avian Power Line Interaction Committee
ARRL	American Radio Relay League, Inc.
ATC	American Transmission Company
ATV	all-terrain vehicle
BCD	Biological and Conservation Data System
BHE	Bangor Hydro-Electric Company
BLM	Bureau of Land Management
BP	before present
ca.	about
CAA	Clean Air Act
CCR	Consolidated Corridors Route
CEQ	Council on Environmental Quality
CFR	*Code of Federal Regulations*
CWA	Clean Water Act
DC	direct current
DEIS	draft environmental impact statement
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
DPS	distinct population segment
EEZ	exclusive economic zone
EFH	essential fish habitat
EIA	environmental impact assessment
EIS	environmental impact statement
EMEC	Eastern Maine Electric Cooperative
EMF	electromagnetic field or electric and magnetic fields
EMI	electromagnetic interference
E.O.	Executive Order

EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FCC	Federal Communications Commission
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FMP	Fishing Management Plan
FR	*Federal Register*
GIS	geographic information system
HAPC	habitat area(s) of particular concern
HMMH	Harris Miller Miller & Hanson, Inc.
ISO NE	Independent System Operator New England
LURC	Land Use Regulation Commission
M&N	Maritimes & Northeast Pipeline, L.L.C.
Maritimes	Maritimes & Northeast Pipeline, L.L.C.
MASC	Maine Atlantic Salmon Commission
MBEP	Maine Board of Environmental Protection
MBTA	Migratory Bird Treaty Act
MCCR	Modified Consolidated Corridors Route
MDEP	Maine Department of Environmental Protection
MDIFW	Maine Department of Inland Fisheries and Wildlife
MDOC	Maine Department of Conservation
MDOT	Maine Department of Transportation
MEPCO	Maine Electric Power Company
MHPC	Maine Historic Preservation Commission
MIG	Minnesota IMPLAN Group, Inc.
MNAP	Maine Natural Areas Program
MNHP	Maine Natural Heritage Program
MPCB	Maine Pesticide Control Board
PMUC	Maine Public Utilities Commission
MSA	Magnuson-Stevens Fish Conservation and Management Act
MSA	metropolitan statistical area
MSR	MEPCO South Route
NAAQS	National Ambient Air Quality Standards
NB Power	New Brunswick Power Corporation
NEB	National Energy Board of Canada
NEFMC	New England Fishery Management Council
NEPA	National Environmental Policy Act of 1969
NEPOOL	New England Power Pool
NESFA	North East State Forester Association

NESHAPs	National Emission Standards for Hazardous Air Pollutants
NHPA	National Historic Preservation Act
NIEHS	National Institute of Environmental Health Sciences
NOAA	National Oceanic and Atmospheric Administration
NOAA Fisheries	NOAA National Marine Fisheries Service
NOI	Notice of Intent
NPS	National Park Service
NRC	National Research Council
NRCS	Natural Resource Conservation Service
NRHP	*National Register of Historic Places*
NRI	Northeast Reliability Interconnect
NRPA	National Resources Protection Act
NSPS	New Source Performance Standards
NSR	New Source Review
NWI	National Wetlands Inventory
OSHA	Occupational Safety and Health Administration
PCB	polychlorinated biphenyl
P.L.	Public Law
$PM_{2.5}$	particulate matter with a mean aerodynamic diameter of 2.5 µm or less
PM_{10}	particulate matter with a mean aerodynamic diameter of 10 µm or less
PP	Presidential permit
PPR	Previously Permitted Route
RF	radio frequency
RI	radio interference
ROD	Record of Decision
ROI	region of influence
ROW	right-of-way
SAV	submergent aquatic vegetation
SIP	State Implementation Plan
SHPO	State Historic Preservation Officer
TRC	TRC Environmental Corporation
TV	television
TVI	television interference
U.S.	United States
USACE	U.S. Army Corps of Engineers
USC	*United States Code*
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey

VHF	very high frequency
VIA	visual impact assessment
VRM	Visual Resource Management
WHO	World Health Organization

CHEMICALS

CO	carbon monoxide
NO_2	nitrogen dioxide
NO_x	oxides of nitrogen
O_3	ozone
Pb	lead
SO_2	sulfur dioxide

UNITS OF MEASURE

ac-ft	acre-foot (feet)
°C	degree(s) Celsius
cm	centimeter(s)
dB	decibel(s)
dB(A)	A-weighted decibel(s)
°F	degree(s) Fahrenheit
ft	foot (feet)
ft^2	square foot (feet)
ft^3	cubic foot (feet)
gal	gallon(s)
ha	hectare(s)
Hz	hertz
in.	inch(es)
kg	kilogram(s)
kHz	kilohertz
km	kilometer(s)
km^2	square kilometer(s)
kph	kilometer(s) per hour
kV	kilovolt(s)
kWh	kilowatt-hour(s)
lb	pound(s)
L	liter(s)
m	meter(s)
m^2	square meter(s)
m^3	cubic meter(s)
mi	mile(s)
mi^2	square mile(s)
mG	milligauss
MHz	megahertz
min	minute(s)
mph	mile(s) per hour
MVA	megavolt-ampere(s)
MW	megawatt(s)
MWh	megawatt-hour(s)
ppb	part(s) per billion
ppm	part(s) per million
s	second(s)
µg	microgram(s)
µm	micrometer(s)
V	volt(s)
yd	yard(s)
yd^3	cubic yard(s)

ENGLISH/METRIC AND METRIC/ENGLISH EQUIVALENTS

The following table lists the appropriate equivalents for English and metric units.

Multiply	By	To Obtain
English/Metric Equivalents		
acres	0.4047	hectares (ha)
cubic feet (ft^3)	0.02832	cubic meters (m^3)
cubic yards (yd^3)	0.7646	cubic meters (m^3)
degrees Fahrenheit (ºF) –32	0.5555	degrees Celsius (ºC)
Feet (ft)	0.3048	meters (m)
gallons (gal)	3.785	liters (L)
gallons (gal)	0.003785	cubic meters (m^3)
inches (in.)	2.540	centimeters (cm)
miles (mi)	1.609	kilometers (km)
miles per hour (mph)	1.609	kilometers per hour (kph)
pounds (lb)	0.4536	kilograms (kg)
short tons (tons)	907.2	kilograms (kg)
short tons (tons)	0.9072	metric tons (t)
square feet (ft^2)	0.09290	square meters (m^2)
square yards (yd^2)	0.8361	square meters (m^2)
square miles (mi^2)	2.590	square kilometers (km^2)
yards (yd)	0.9144	meters (m)
Metric/English Equivalents		
centimeters (cm)	0.3937	inches (in.)
cubic meters (m^3)	35.31	cubic feet (ft^3)
cubic meters (m^3)	1.308	cubic yards (yd^3)
cubic meters (m^3)	264.2	gallons (gal)
degrees Celsius (ºC) +17.78	1.8	degrees Fahrenheit (ºF)
hectares (ha)	2.471	acres
kilograms (kg)	2.205	pounds (lb)
kilograms (kg)	0.001102	short tons (tons)
kilometers (km)	0.6214	miles (mi)
kilometers per hour (kph)	0.6214	miles per hour (mph)
liters (L)	0.2642	gallons (gal)
meters (m)	3.281	feet (ft)
meters (m)	1.094	yards (yd)
metric tons (t)	1.102	short tons (tons)
square kilometers (km^2)	0.3861	square miles (mi^2)
square meters (m^2)	10.76	square feet (ft^2)
square meters (m^2)	1.196	square yards (yd^2)

SUMMARY

S.1 BACKGROUND

S.1.1 Purpose and Need for National Environmental Policy Act Review

Executive Order (E.O.) 10485 (September 9, 1953), as amended by E.O. 12038 (February 7, 1978), requires that a Presidential permit be issued by the U.S. Department of Energy (DOE) before electric transmission facilities may be constructed, operated, maintained, or connected at the U.S. international border. Bangor Hydro-Electric Company (BHE) has applied to DOE to amend Presidential Permit PP-89, which authorizes BHE to construct a single-circuit, 345,000-volt (345-kV) alternating-current (AC) electric transmission line across the U.S. international border in the vicinity of Baileyville, Maine.

The proposed transmission line would originate at the existing Orrington Substation, located in Orrington, Maine, and extend eastward to the international border between the United States and Canada near Baileyville, Maine, where it would connect with a transmission line to be constructed, operated, and maintained by New Brunswick Power Corporation (NB Power). DOE has determined that an amendment to the Presidential permit would constitute a major Federal action that may have a significant impact on the environment within the meaning of the National Environmental Policy Act of 1969 (NEPA). For this reason, DOE has prepared this environmental impact statement (EIS) to address potential environmental impacts from the proposed action and the range of reasonable alternatives.

S.1.2 Background of Project Permitting and NEPA History

In 1970, Maine Electric Power Company (MEPCO), a partnership of Central Maine Power Company, Maine Public Service Company, and BHE, placed in service a 345-kV transmission interconnection with NB Power. The BHE system now comprises about 600 mi (966 km) of transmission line corridors, including the MEPCO 106-mi (171-km), 345-kV transmission line that interconnects the Orrington Substation with NB Power's system and that crosses the border near Orient, Maine.

On December 16, 1988, BHE applied to DOE for a Presidential permit to construct and operate a second 345-kV transmission line to New Brunswick, Canada, that would extend eastward 84 mi (135 km) from the Orrington Substation to the U.S.-Canada border near Baileyville, Maine. The route was referred to as the Stud Mill Road Route. At the border, the proposed transmission line was to connect with a transmission line to be built, operated, and owned by NB Power. DOE published a notice of that application in the *Federal Register* on January 19, 1989 (Volume 54, page 2201 [54 FR 2201]), and a "Notice of Intent to Prepare an Environmental Impact Statement and to Conduct Public Scoping Meetings" in the *Federal Register* on May 22, 1989 (54 FR 22006). In August 1995, DOE published an EIS titled *Construction and Operation of the Proposed Bangor Hydro-Electric Company's Second 345-kV*

Transmission Tie Line to New Brunswick. DOE decided to grant Presidential Permit PP-89 in a Record of Decision (ROD) signed on January 18, 1996 (62 FR 2244), and issued the Permit on January 22, 1996.

In addition to the Presidential permit, the BHE transmission line required regulatory approval from the State of Maine. BHE received its original State permit for the Stud Mill Road Route in 1992 and was granted State permit extensions in 1994 and 1996. In 1999, a natural gas transmission line was constructed by Maritimes & Northeast Pipeline, L.L.C. (M&N) in the same general vicinity of Stud Mill Road and BHE's approved electric transmission route. In 2001, BHE requested a third State permit extension. The Maine Board of Environmental Protection, Maine's primary environmental review entity, conducted a public hearing and indicated, in a draft order, a preference for BHE to use a route different from the Stud Mill Road Route, one that would be more closely consolidated with established linear corridors. This order was never finalized because BHE withdrew the request for an extension of the State permit. On May 10, 2005, BHE applied to the Maine Department of Environmental Protection for new permits under the Site Location of Development Act, the Natural Resources Protection Act, and Section 401 of the Clean Water Act.

On September 30, 2003, BHE applied to DOE to amend Presidential Permit PP-89 for a modification of the previously authorized transmission line route.[1] DOE published a notice of that application in the *Federal Register* on October 29, 2003 (68 FR 61659). The proposed transmission line project (now referred to as the Northeast

Northeast Reliability Interconnect
Project Time Line

- 1970: MEPCO and BHE placed in service a 106-mi (171-km)-long 345-kV interconnection with NB Power.
- December 1988: BHE applied to DOE for a second 345-kV line from the Orrington Substation to the U.S.-Canada border near Baileyville, Maine.
- 1992: BHE received the State permit for the proposed line referred to as the "Stud Mill Road Route."
- December 1993: DOE published a draft EIS for the proposed line.
- 1994: The State granted a permit extension.
- August 1995: DOE issued the final EIS for the proposed line.
- January 1996: DOE issued a ROD and Presidential Permit PP-89 for the proposed line.
- 1996: The State granted a second permit extension.
- 1999: The M&N natural gas pipeline was built near Stud Mill Road.
- 2001: BHE requested a third State permit extension; request subsequently withdrawn.
- September 2003: BHE applied to DOE to amend PP-89.
- November 2, 2004: DOE published a Notice of Intent to conduct an EIS for the proposed PP-89 amendments.
- November 17–18, 2004: DOE held scoping meetings in Maine for the EIS.
- May 10, 2005: BHE applied for a new State permit.
- August 2005: DOE issued a draft EIS for PP-89 amendments (this document).

[1] The application to DOE to amend Presidential Permit PP-89 did not specify a preferred route; however, BHE subsequently advised DOE of its selection of the Modified Consolidated Corridors Route as the applicant's preferred route.

Reliability Interconnect [NRI]) that is the subject of this EIS differs from the original project in the proposed route between the Orrington Substation and the international border crossing near Baileyville, Maine. This proposed project also differs from any of the routes analyzed in the 1995 EIS. In the United States, the applicant's preferred transmission line route (referred to as the Modified Consolidated Corridors Route) would be about 85 mi (137 km) long. Figure S-1 shows the locations of the Modified Consolidated Corridors Route, the Previously Permitted Route (the Stud Mill Road Route), the existing MEPCO 345-kV transmission line, and substations that would need to be modified. In Canada, the NB Power transmission line would continue for almost 60 mi (96.6 km) to the substation at the Point Lepreau Nuclear Generating Station via Keswick, a town north of Fredericton.

S.2 PURPOSE AND NEED

S.2.1 DOE's Purpose and Need

The purpose and need for DOE's action is to respond to BHE's request to amend Presidential Permit PP-89. DOE may issue or amend a Presidential permit if it determines that the action is in the public interest and after obtaining favorable recommendations from the U.S. Departments of State and Defense. In determining whether issuance of a permit for a proposed action is in the public interest, DOE considers the environmental impacts of the proposed project pursuant to NEPA, the project's impact on electric reliability by ascertaining whether the proposed project would adversely affect the operation of the U.S. electric power supply system under normal and contingency conditions, and any other factors that DOE may consider relevant to the public interest.

If DOE determines that granting or amending a Presidential permit would be in the public interest, the information contained in the EIS would provide a basis upon which DOE would decide which alternative(s) should be implemented and which mitigation measures, if any, would be appropriate for inclusion as a condition of the permit. A decision, in the form of a ROD, can be issued no sooner than 30 days subsequent to the U.S. Environmental Protection Agency's (EPA's) publication of a "Notice of Availability of the Final EIS" in the *Federal Register*. The issuance of the Presidential permit or permit amendment would occur simultaneously with or subsequent to the ROD.

Because the proposed project also would involve the export of electric energy from the United States, BHE must obtain a separate electricity export authorization from DOE under Section 202(e) of the Federal Power Act before it could export electricity to Canada over the proposed 345-kV transmission line. DOE may authorize electricity exports to a foreign country if it determines that the proposed export would not impair the sufficiency of electric supplies within the United States and that it would not impede, or tend to impede, the coordination of regional transmission facilities. DOE also must comply with NEPA prior to authorizing electricity exports. Therefore, this EIS also will serve to satisfy DOE's NEPA responsibilities in determining whether to authorize exports over the proposed international transmission line.

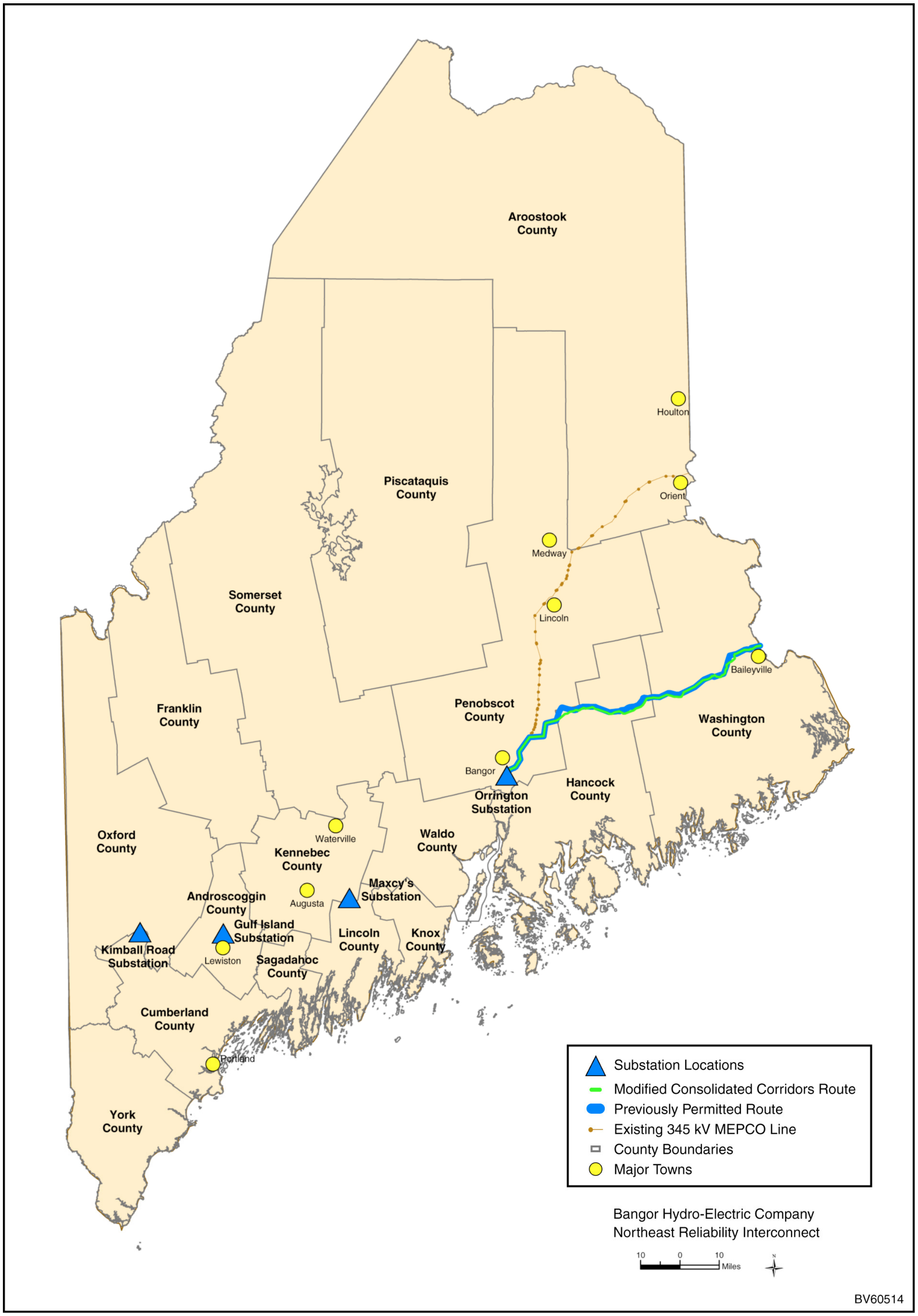

FIGURE S-1 Locations of the Modified Consolidated Corridors Route, Previously Permitted Route, Existing MEPCO 345-kV Transmission Line, and Substations That Would Require Modification

S.2.2 Applicant's Purpose and Need

The following material reflects the view of the applicant regarding the merits of the proposed project:

> BHE's stated purpose for the NRI is to improve the reliability and stability of the bulk electric transmission system of both the Maritimes area of Canada (New Brunswick, Nova Scotia, and Prince Edward Island) and New England, increase the import-export transmission capacity between Maine and New Brunswick, and reduce costly line losses.
>
> The NRI would increase the north-to-south (New Brunswick to Maine) transfer capacity by 300 megawatts (MW) (700-MW capacity exists currently). The NRI also would increase a south-to-north (Maine to New Brunswick) transfer capacity to 400 MW on a more consistent basis than provided by the existing single tie-line. The transfer capacity of the present single tie-line to export power from Maine to New Brunswick ranges from zero to 150 MW, depending upon specific system conditions, including which generation units are in use. The NRI would thus enhance the sharing of generation capacity between the Maritimes and New England, thereby reducing reserve generation requirements, increasing the reliability of the overall transmission system, and allowing for expanded exports of energy to the Maritimes from the New England Power Pool (NEPOOL). This also would allow for long-term contracts of export energy and may allow utilities that are not directly connected to the U.S. electric grid (e.g., Eastern Maine Electric Cooperative [EMEC]) access to market-based power. The opportunity for NEPOOL to export power would most likely occur in the winter months during the Maritimes' period of peak demand. During New England's peak summer use, Canada has surplus generating capacity that could be sold in the New England market. Increased trading of power would help balance supply with demand and increase the reliability and stability of bulk electric transmission.
>
> The proposed transmission line also would reduce transmission line losses in the overall regional system. Transmission line loss is electrical energy lost through heat as electricity flows through a wire. Such losses are inefficient and require production of more electricity to compensate for the line losses. Line losses increase with distance and the amount of power sent through a line.

S.3 PUBLIC PARTICIPATION AND THE NEPA PROCESS

S.3.1 Cooperating Agencies

In accordance with the regulations implementing the procedural provisions of NEPA, specifically the *Code of Federal Regulations*, Title 40, Part 1501.6 (40 CFR 1501.6), DOE invites an agency to participate in the preparation of an EIS, either as a contributor in its area of expertise or as a cooperating agency, to ensure that any jurisdiction it may have by law will be adequately addressed in the document. The U.S. Department of the Interior's U.S. Fish and Wildlife Service (USFWS) and the U.S. Department of Commerce's National Oceanic and

Atmospheric Administration's National Marine Fisheries Service (NOAA Fisheries) are cooperating agencies in DOE's EIS preparation but have no decisions to make based on it.

S.3.2 Public Scoping

DOE issued the "Notice of Intent to Prepare an Environmental Impact Statement and to Conduct Public Scoping Meetings and Notice of Floodplain and Wetlands Involvement; Bangor Hydro-Electric Company" in the *Federal Register* on November 2, 2004 (69 FR 63514). DOE also placed announcements in local newspapers. A project Web site maintained for DOE by Argonne National Laboratory (ANL) provides background information on the proposed project, including DOE's NEPA process (http://web.ead.anl.gov/interconnecteis). This site is regularly updated as the preparation of the EIS progresses. DOE planned three public scoping meetings at Maine locations on November 17 (Baileyville) and November 18 (Lincoln and Brewer), 2004. No members of the public attended the Lincoln meeting; thus, no official records or transcript were made. Transcripts of the Baileyville and Brewer meetings are available at the Web site referenced above. In all, three individuals presented oral comments at the two public scoping meetings.

DOE also solicited written and electronic comments on the scope of the EIS in the Notice of Intent, at the scoping meetings, and electronically through the Web site. Three submissions of written comments were received during the scoping period, which closed on December 2, 2004.

The following issues were raised and are addressed in this EIS:

- The EIS should evaluate the impact of the project on bald eagles (*Haliaeetus leucocephalus*) that nest or feed within the general vicinity of the proposed transmission line corridor.

- The EIS should evaluate impacts on fish habitats, particularly identified Atlantic salmon (*Salmo salar*) streams and other water bodies that provide appropriate habitat that is or could be used by the Atlantic salmon, including impacts from transmission line construction, installation of AC mitigation to the M&N gas pipeline, and removal of forest vegetation where corridors cross streams.

- The EIS should carefully consider the temporary and permanent impacts of the proposed project on wildlife habitats, including impacts of habitat alteration and fragmentation, particularly on sensitive forest-interior bird species, and the effects of noise and disturbance, particularly on nesting birds in wetland areas.

In addition, commentors stated that the NRI would provide socioeconomic benefits to eastern Maine and the region (New England); for example, it would foster new business development and expansion in eastern Maine.

S.3.3 Issues outside the Scope of the EIS

Impacts of the Canadian transmission line that would connect to the NRI are outside the scope of this EIS. NEPA does not require an analysis of environmental impacts that occur within another sovereign nation that result from actions approved by that sovereign nation. E.O. 12114, “Environmental Effects Abroad of Major Federal Actions,” was issued on January 9, 1979 (44 FR 1957). The E.O. requires Federal agencies to prepare an analysis of significant impacts from a Federal action in certain defined circumstances and exempts agencies from preparing analyses in others. The E.O. does not require Federal agencies to evaluate impacts outside the United States when the foreign nation is participating with the United States or is otherwise involved in the action (Section 2-3[b]).

In addition, the proposed Federal action is not an action that, for purposes of E.O. 12114, would require analysis of impacts outside the United States, as it would not affect the global commons (e.g., outer space or Antarctica); would not produce a product, emission, or effluent that is “prohibited or strictly regulated by Federal law in the United States because its toxic effects on the environment create a serious public health risk,” or which involves regulated or prohibited radioactive materials; and would not significantly affect natural or ecological resources of global importance designated for protection under Executive Order by the President.

The Federal action evaluated in this EIS is only to permit the transmission line to cross the United States border. Limiting NEPA reviews to the U.S. portion of the transmission line interconnection (1) is consistent with applicable Federal laws, including the generally held legal presumption that Acts of Congress do not ordinarily apply outside the U.S. borders; (2) avoids the appearance of the assertion of extraterritorial control over actions that were approved by and occur within the lands of another sovereign nation; and (3) prevents interference in the foreign relations of the United States. The scope of the NEPA review is particularly appropriate here, because the transmission line to be built in New Brunswick has both been reviewed for the environmental impacts of the project and has been approved by Canada (the foreign sovereign).

Other topics outside the scope of this EIS are as follows:

- The development of emergency outage response plans, which is the purview of local public safety officials.

- The proposed transmission line presents no greater target for terrorists than any other high-voltage transmission line in the United States. Therefore, homeland security issues are not addressed in this EIS. A good general discussion of this subject can be found at http://www.globalsecurity.org/security/intro/power.htm and at http://www.globalsecurity.org/security/library/congress/2003_h/030904-gilbert.htm.

NB Power prepared an environmental impact assessment (EIA), a supplemental information report, and a comprehensive study report on the potential impacts of the proposed Canadian portion of the transmission line interconnection. The Canadian EIA is equivalent to an EIS prepared under NEPA for a U.S. project and is subject to review by various provincial and

Federal agencies in Canada, as well as by the public. The entire document can be found on the Web at http://transmission.nbpower.com/en/regulatory/EIA.html. The New Brunswick transmission line project has been approved and licensed by the National Energy Board of Canada. For details, see http://transmission.nbpower.com/en/intlpowerline/nebipldec.pdf.

S.4 ALTERNATIVES ANALYZED

This section describes the proposed action and the five alternatives that are analyzed in the EIS. It also describes other alternatives (two alternative routes and alternative technologies) that were considered but dismissed from detailed analysis. Descriptions of transmission line specifications; construction, operation, and maintenance activities; and schedule and mitigation common to all construction alternatives are also provided.

The five alternatives analyzed in this EIS are as follows:

1. Modified Consolidated Corridors Route,
2. Consolidated Corridors Route,
3. Previously Permitted Route (No Action),
4. MEPCO South Route, and
5. Rescission of Presidential Permit PP-89.

The first four are route alternatives (including the No Action Alternative) and could result in construction of the 345-kV transmission line. The rescission alternative could not result in construction of the line along any route.

DOE’s proposed action is to grant the amendment to Presidential Permit PP-89 for construction of the line along the Modified Consolidated Corridors Route. This is the applicant’s and DOE’s preferred alternative. DOE could choose, however, to grant an amendment to PP-89 for any one, two, or three of the new routes (Modified Consolidated Corridors Route, Consolidated Corridors Route, and MEPCO South Route).

If DOE were to deny an amendment to the Presidential Permit, PP-89 would remain in effect and a transmission line could be constructed along the Previously Permitted Route, as analyzed under the Previously Permitted Route Alternative (equivalent to “No Action” on the part of the Department).

If DOE were to both deny the amendment to the Presidential Permit and rescind PP-89, no transmission line as proposed could be built.

S.4.1 Alternative Routes

Alternative routes between the two desired connection points are considered by the applicant for the purpose of selecting the transmission line corridor that is best, that is, that holistically optimizes considerations of impacts, practicality, viability, economics, reliability, etc. The four route alternatives presented in this EIS reflect the outcome of the applicant's selection process.

The four alternative routes, including the applicant's preferred transmission line route, are evaluated in detail in this EIS for their environmental impacts: (1) Alternative One, the Modified Consolidated Corridors Route, the proposed action and the applicant's and DOE's preferred alternative; (2) Alternative Two, the Consolidated Corridors Route; (3) Alternative Three, the Previously Permitted Route, also considered the No Action Alternative; and (4) Alternative Four, the MEPCO South Route (Figure S-2). All of these routes have the same beginning and end points, namely the Orrington Substation and the crossing of the St. Croix River near Baileyville. Also, the initial 12.2 mi (19.6 km) from the Orrington Substation would be identical for all four routes (Figure S-3). The applicant considered a number of factors when evaluating the alternative routes, including concerns expressed by State and local authorities, local zoning and planning regulations, cost and engineering criteria, and environmental and land use considerations. Through its stakeholder outreach process, the applicant solicited and considered public comment regarding all of the route alternatives. DOE conducted public scoping meetings as described previously. The scoping process was designed to solicit concerns and suggestions from property owners, local residents, government agencies, Indian Tribes, public interest groups, and other stakeholders. DOE has reviewed the methodology and rationale employed in the applicant's evaluation and, on the basis of that review, concludes that the alternative routes identified by the applicant are an acceptable range of reasonable alternatives.

S.4.1.1 Alternative One: Modified Consolidated Corridors Route (Preferred Alternative)

From the Orrington Substation, the Modified Consolidated Corridors Route would parallel the existing 345-kV MEPCO transmission line to Blackman Stream in Bradley (Figure S-3). The Modified Consolidated Corridors Route would then proceed northeast within a new corridor until meeting Stud Mill Road and M&N gas pipeline right-of-way (ROW); it would then proceed east-northeast, generally paralleling the M&N gas pipeline and Stud Mill Road, to the international border near Baileyville, Maine (Figures S-3 and S-4). The total distance of the Modified Consolidated Corridors Route would be about 85 mi (137 km) and would consist of 15 mi (24 km) of new ROW, 58 mi (93 km) adjacent to the M&N gas pipeline and/or Stud Mill Road, and 12 mi (19 km) adjacent to the existing MEPCO 345-kV transmission line (including portions that are co-located with the M&N gas pipeline and/or other transmission lines).

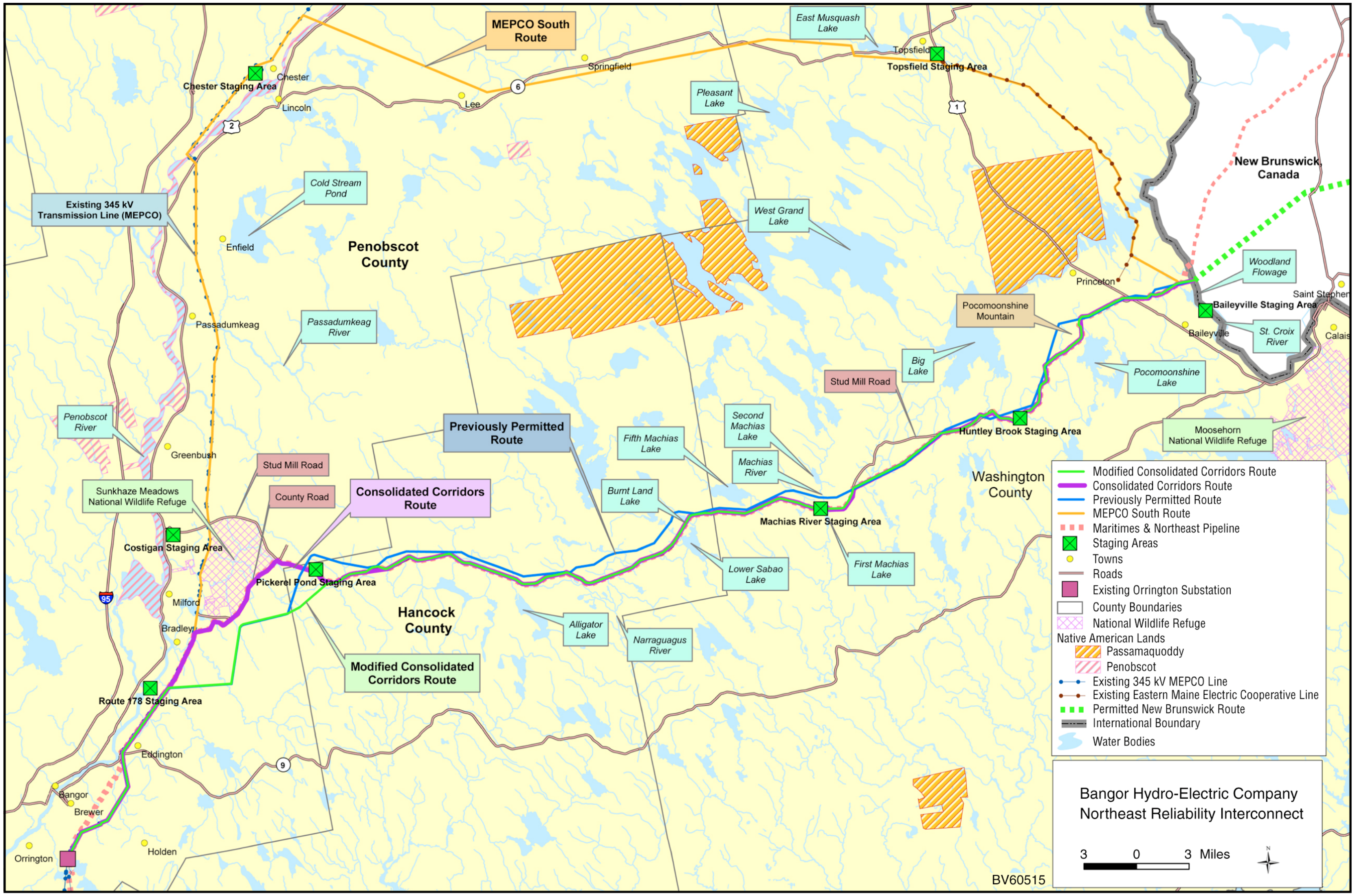

FIGURE S-2 Alternative Route and Staging Area Locations

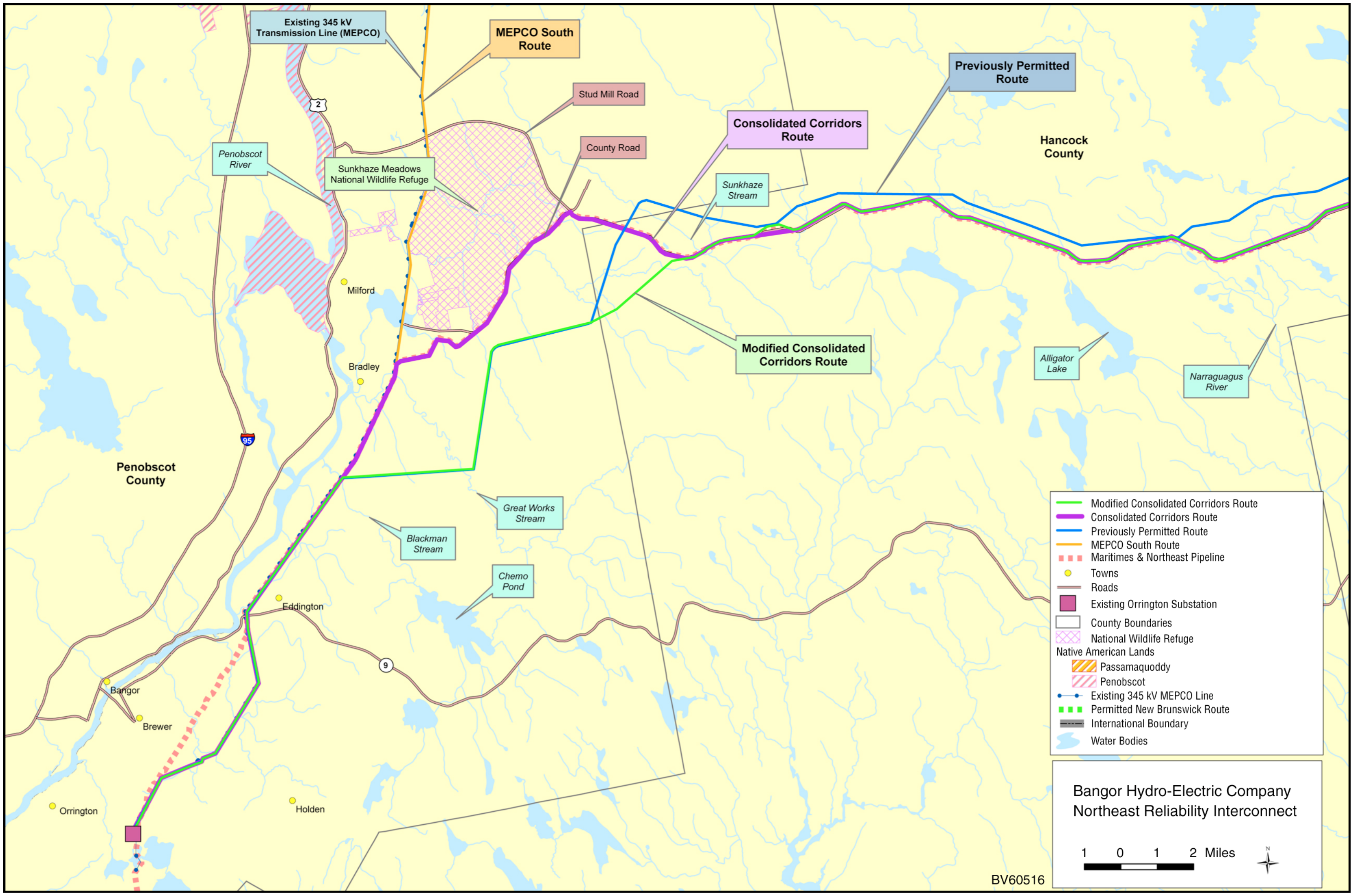

FIGURE S-3 Location Where the Alternative Routes Initially Diverge

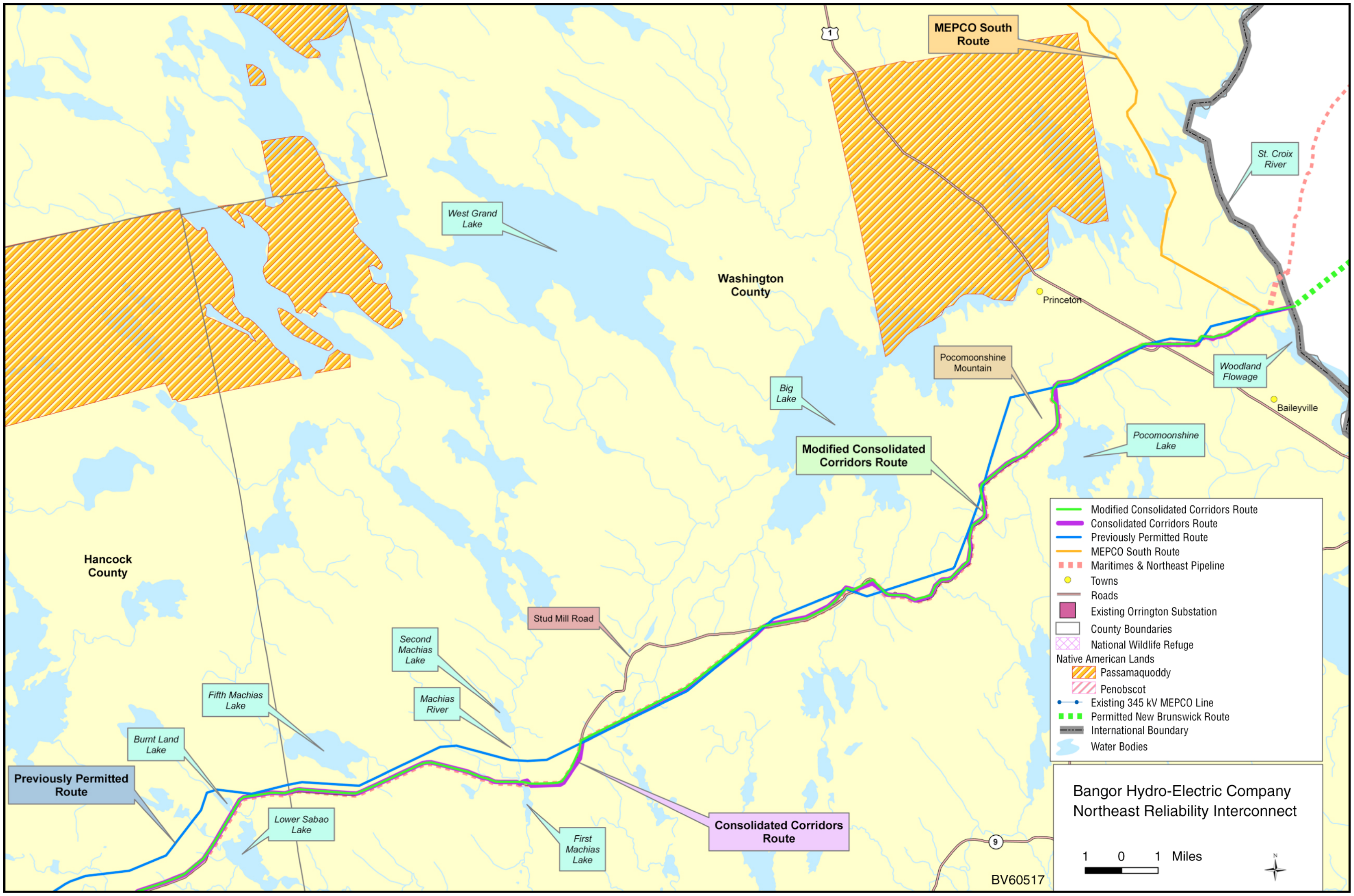

FIGURE S-4 Location of the Alternative Routes within Washington County

S.4.1.2 Alternative Two: Consolidated Corridors Route

The Consolidated Corridors Route would be similar to the Modified Consolidated Corridors Route, except where the Modified Consolidated Corridors Route deviates from it in two locations (Figures S-3, S-5, and S-6). The first and longest route deviation occurs between Blackman Stream and Stud Mill Road southeast of Pickerel Pond (Figure S-5) and is referred to in this EIS as the "Pickerel Pond Reroute." The second deviation occurs in the area of Myra Camps, just west of Dead Stream (Figure S-6), and is referred to in this EIS as the "Myra Camps Reroute." After this short deviation, the Consolidated Corridors Route and the Modified Consolidated Corridors Route would be identical to the international border near Baileyville, Maine. The Consolidated Corridors Route would traverse a total distance of about 85 mi (137 km) and would consist of 2 mi (3 km) of new ROW, 68 mi (109 km) adjacent to the M&N gas pipeline and/or Stud Mill Road, and 15 mi (24 km) adjacent to the existing MEPCO 345-kV transmission line (including portions that are co-located with the M&N gas pipeline and/or other transmission lines).

S.4.1.3 Alternative Three: Previously Permitted Route (No Action)

The initial portion of the Previously Permitted Route from the Orrington Substation would be the same as the Modified Consolidated Corridors Route until it crosses the border between Penobscot and Hancock Counties (Figure S-3). The Previously Permitted Route would proceed to the east-northeast, generally paralleling the M&N Pipeline and Stud Mill Road to the international border near Baileyville, Maine (Figures S-3 and S-4). Although formerly known as the Stud Mill Road Route, the Previously Permitted Route would not be immediately adjacent to the road but would be separated by as much as 9,400 ft (2,865 m). The Previously Permitted Route would cross over Stud Mill Road 13 times, would parallel the road in several locations with about a 200-ft (61-m) separation, and would have an average separation of about 2,500 ft (762 m). The total distance of the Previously Permitted Route would be about 84 mi (135 km) and would consist of 62 mi (100 km) of new ROW, 10 mi (16 km) adjacent to the M&N gas pipeline and/or Stud Mill Road, and 12 mi (19 km) adjacent to the existing MEPCO 345-kV transmission line (including portions that are co-located with the M&N gas pipeline and/or other transmission lines).

S.4.1.4 Alternative Four: MEPCO South Route

From the Orrington Substation, the MEPCO South Route would parallel the existing 345-kV transmission line to Chester, Maine (Figure S-2). This includes an initial crossing of the Penobscot River south of Lincoln. The route would then proceed southeast (recrossing the Penobscot River) to Route 6 east of Lee, Maine. The MEPCO South Route would then generally parallel, but not be co-located with, Route 6 until just west of Route 1 at Topsfield, Maine. The route would then generally proceed southeast to the international border near Baileyville, Maine (Figure S-2). The total distance of the MEPCO South Route would be about 114 mi (183 km) and would consist of 39 mi (63 km) of new ROW, 54 km (87 km) adjacent to the existing

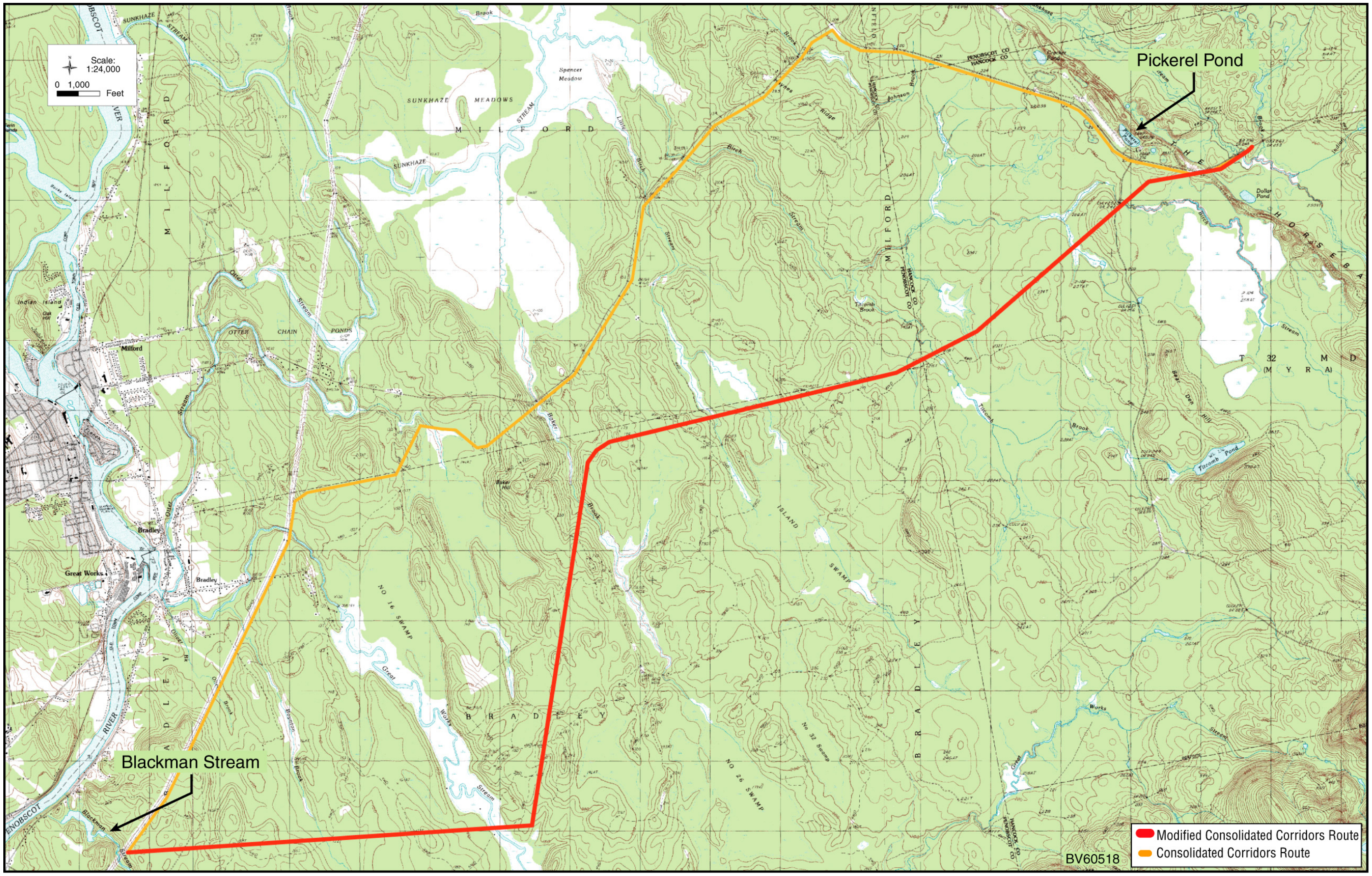

FIGURE S-5 Modified Consolidated Corridors Route and Consolidated Corridors Route Divergence between Blackman Stream and the Pickerel Pond Area

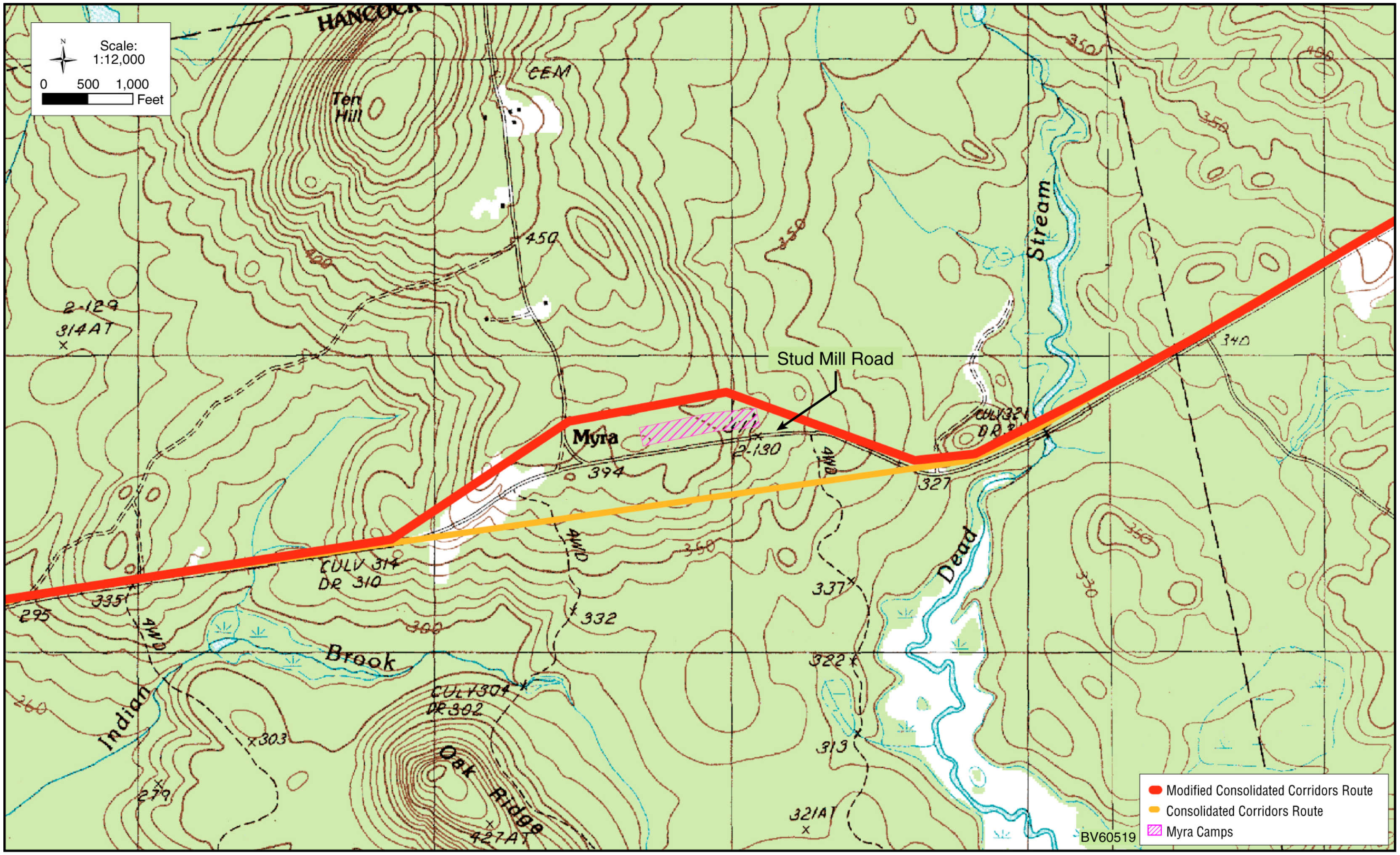

FIGURE S-6 Modified Consolidated Corridors Route and Consolidated Corridors Route Divergence in the Area of Myra Camps

MEPCO 345-kV transmission line (including portions that are co-located with the M&N gas pipeline and/or other transmission lines), and 21 mi (34 km) adjacent to an existing EMEC 69-kV transmission line.

S.4.2 Rescission of the Presidential Permit Alternative

Under the Rescission of the Presidential Permit Alternative, the presently permitted transmission line could not be constructed. Thus, it is reasonably foreseeable that the environmental status quo would continue and that there would be no environmental impacts related to the construction, operation, maintenance, and connection of a transmission line. It is possible, however, that BHE or another entity could take other actions to achieve the purpose of the proposed project if the currently permitted or proposed transmission line were not built.

S.4.3 Transmission Line Specifications, Construction, Operation, Maintenance, and Schedule Common to All Alternative Routes

S.4.3.1 Transmission Line Design Parameters

Table S-1 lists the basic design parameters for the proposed AC transmission line. The transmission line would have a single-circuit configuration and would consist of two overhead shield wires and three phases with two conductor wires per phase. Table S-1 lists the number of structures required and the average span between structures for each of the alternative routes. Self-supporting wood-pole H-frame structures (Figure S-7) would be used as the tangent support structure (i.e., structures used where the line is essentially along a straight path).

In addition to tangent structures, angle and dead-end structures would be required. These structures would consist of either three wood poles or three steel poles. The wood-pole angle and dead-end structures would use guy wires for support (e.g., Figure S-8), while guy wires would not be required for the steel-pole structures (e.g., Figure S-9). Dead-end structures would be required either (1) where the line makes an angle of 30 degrees or more, or (2) after 7 to 8 mi (11.3 to 12.9 km) of continuous suspension-type (tangent and light- and medium-angle) support structures to prevent the potential cascading (domino-like collapse) of all of the support structures in the event of a major accident. A dead-end structure would also be used for the last structure before the crossing of the St. Croix River.

The conductors would be protected from lightning strikes by grounding systems installed at each structure (counterpoise ground wires) and by two aerial ground wires (shield wires). The transmission line would meet required horizontal and vertical clearance requirements as discussed below. Transmission line height reflects requirements for protecting the line from interference due to tall trees. The amount of sag on a given conductor is determined by a number of variables, including distance between towers, conductor weight, capacity, and temperature. Conductors also swing laterally. Side clearance is determined on the basis of a worst possible

TABLE S-1 Design Parameters for the NRI

Parameter	Value (or Description)[a]			
	MCCR[b]	CCR	PPR	MSR
Length of line (U.S. portion)	85 mi	85 mi	84 mi	114 mi
Voltage	345 kV			
Capacity	500 MW[c]			
Conductors	Standard 1,192.5 kcml[d] 45/7 ACSR[e] code “bunting” (two per phase) with a diameter of 1.302 in., a weight of 1.344 lb/ft, and a rated breaking strength of 32,000 lb			
Shield wires	Standard 7 No. 8 Alumoweld[f]			
Guy wires (if, and where, required)	Standard 7 No. 5 Alumoweld, 0.546-in. diameter			
Insulators – conductor	5.75-in. × 10-in. porcelain ball and socket or polymer composite units			
Insulators – shield wire	Porcelain pin-clevis type			
Number of structures (total)	608	636	563	885
Tangent (wood)	491	472	499	821
Angle and dead-end (wood)	110	86	64	60
Angle and dead-end (steel)	7	78	0	4
Average span length (ft)	731	706	786	680
Minimum vertical clearance to vegetation (ft)	15			

[a] To convert miles to kilometers, multiply by 1.609; to convert inches to centimeters, multiply by 2.54; to convert pounds to kilograms, multiply by 0.454; to convert feet to meters, multiply by 0.305.

[b] CCR = Consolidated Corridors Route, MCCR = Modified Consolidated Corridors Route, MSR = MEPCO South Route, PPR = Previously Permitted Route.

[c] Maximum capacity of 1,000 MW during emergency conditions.

[d] kcml = 1,000 circular mil(s); the wire size for multiple-stranded conductors. A mil is one thousandth of an inch (0.001 in.) or approximately 0.0254 millimeter.

[e] ACSR = aluminum conductor, steel reinforced.

[f] One shield wire may be replaced with an optical ground wire if BHE were to install fiber communication as part of the project.

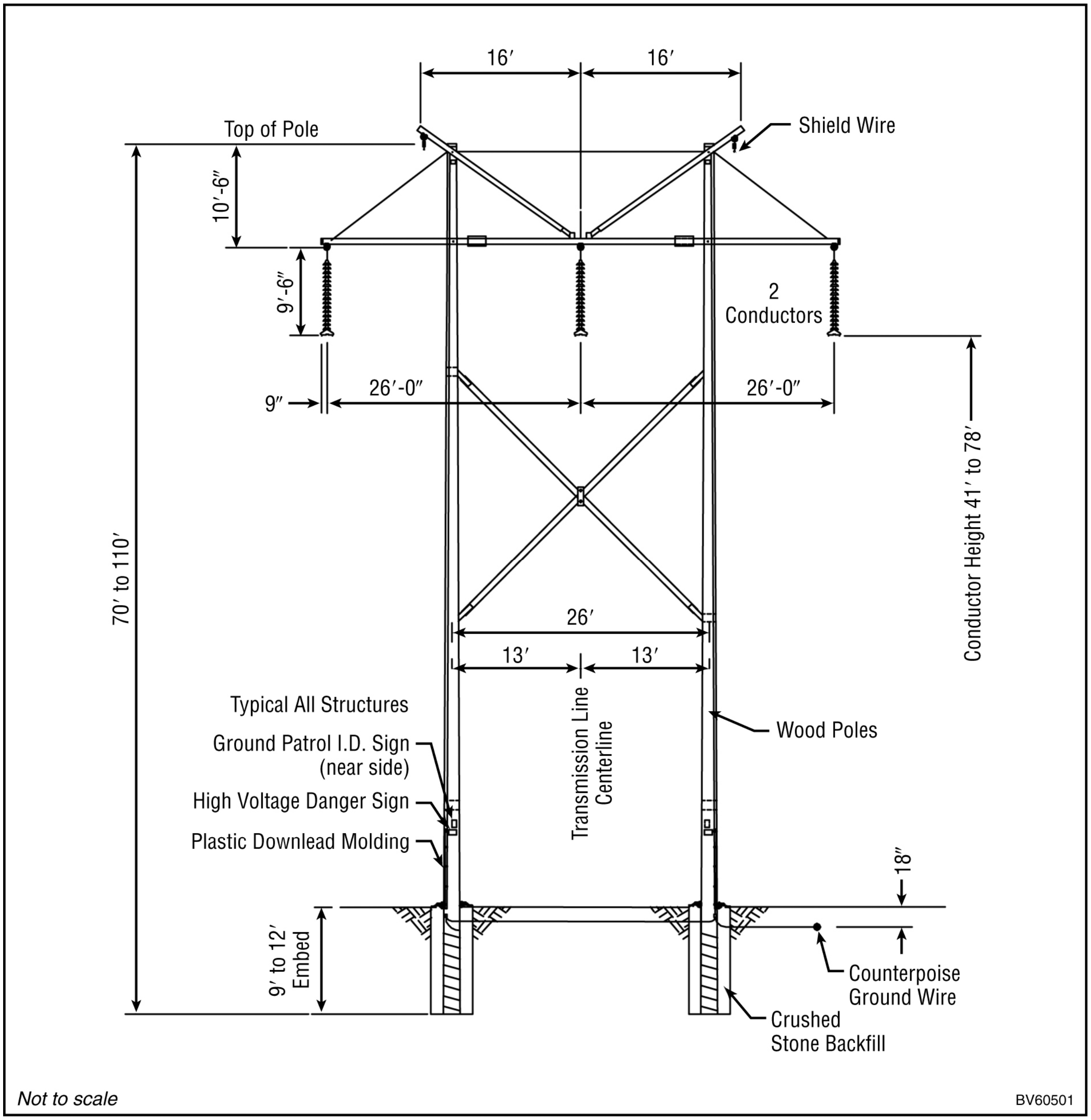

FIGURE S-7 H-Frame Wood-Pole Tangent Support Structure

condition (i.e., high temperature and high wind velocities). A minimum distance is maintained between conductors of different phases or voltages to prevent “flashover,” defined as a sudden surge of voltage causing an arc between conductors.

The transmission line design would meet the National Electric Safety Code specifications for heavy-loading conditions (e.g., radial ice of 0.5 in. [1.3 cm] thickness and 4 lb/ft^2 [19.5 kg/m^2] of wind pressure) and extreme wind conditions (i.e., wind pressure of 23 lb/ft^2 [112 kg/m^2], equivalent to a wind speed of 90 mph [145 kph]). In addition, the transmission

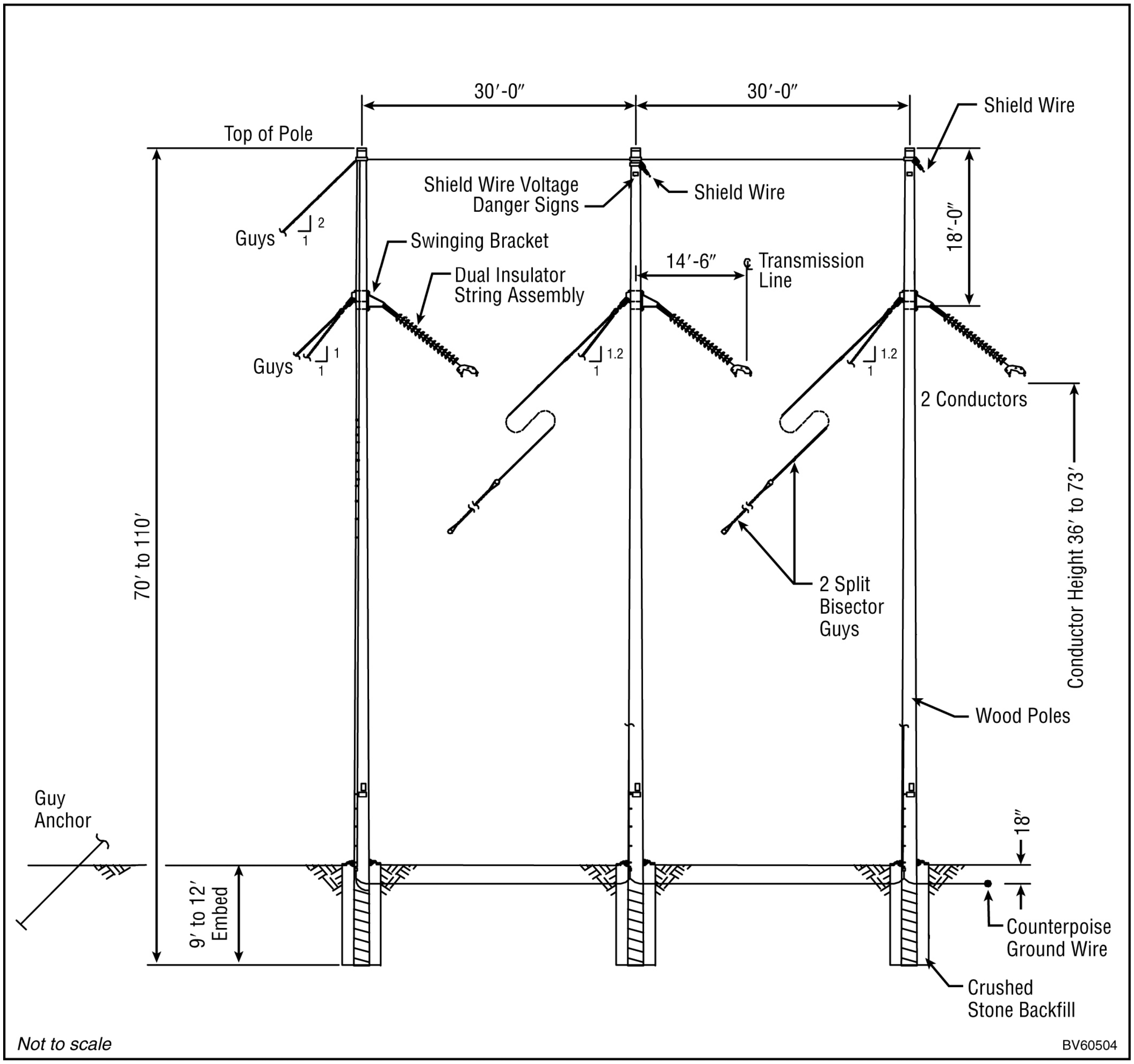

FIGURE S-8 Heavy-Medium Angle Wood-Pole Support Structure

structures would be designed to withstand heavy icing as determined from a review of meteorological data (e.g., radial ice of 1.3 in. [3.3 cm] thickness) and longitudinal loading imbalance due to differential ice buildup and sheering.

S.4.3.2 ROW Configurations

The ROW widths for various segments of the transmission line routes would depend on the types of structures and their proximity to existing utility ROWs or roads. The wood-pole H-frame support structure and its horizontal configuration of phases (a 26-ft [7.9-m] separation

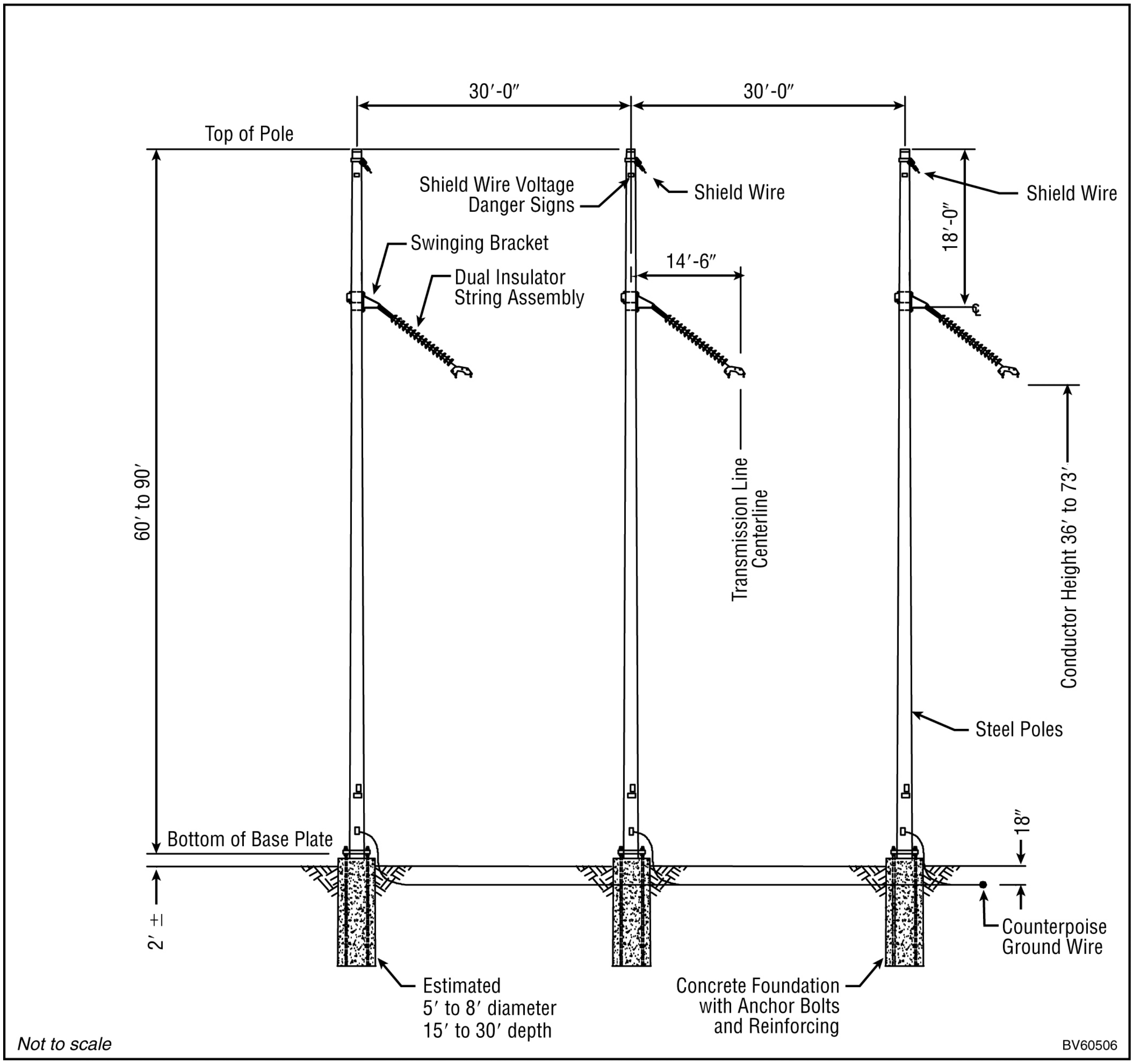

FIGURE S-9 Heavy-Medium Angle Steel-Pole Support Structure

from the outside phase to the centerline) were used as the standard support structure design to estimate the ROW widths (Figure S-10). The ROW width for a new corridor segment would be 170 ft (51.8 m). This width is based on the spacing of the conductors (26 ft [7.9 m]) and the desired clearances of the outside conductor to the edge of the ROW (e.g., to trees) to ensure a safe and reliable line.

Where the transmission line would be immediately adjacent to an existing cleared ROW or road, the required ROW width would be reduced on the side where the ROWs or road would be adjoining. Where the transmission line would parallel an existing transmission line, the ROW width would be based on the requirement of MEPCO to maintain a minimum of 100 ft (30.5 m)

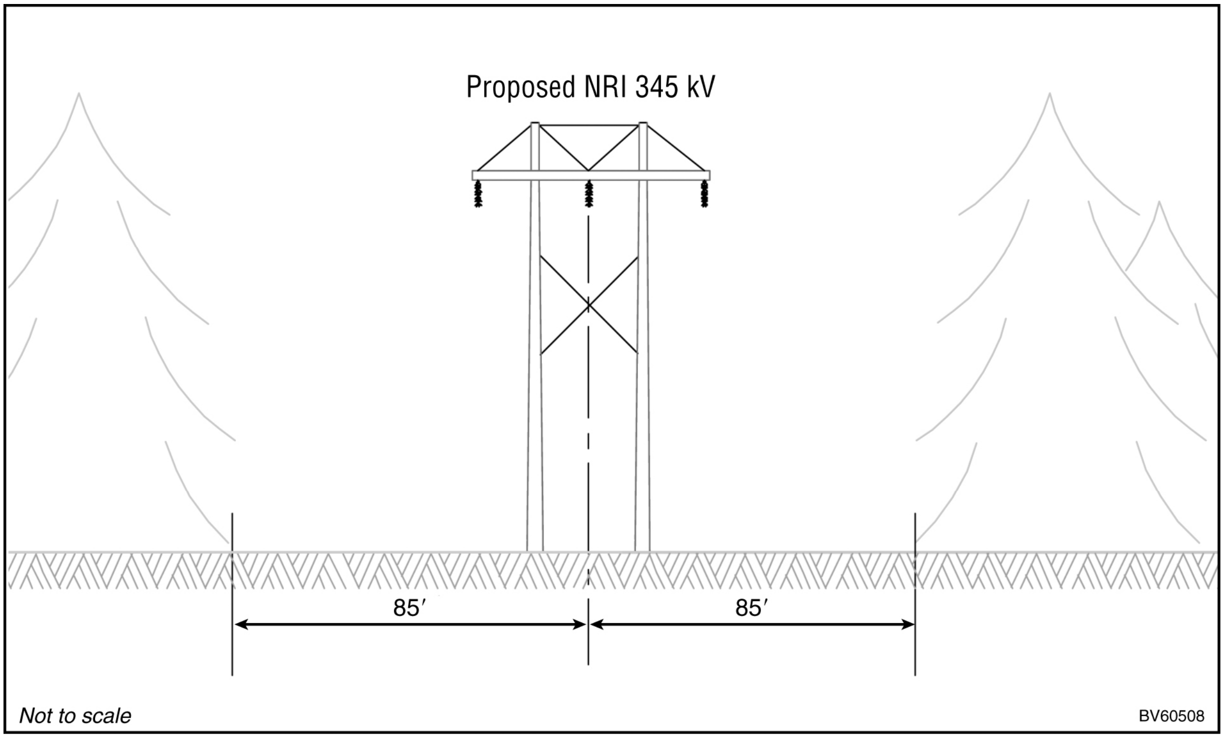

FIGURE S-10 Placement of the NRI within a New ROW

of separation between the centerlines of the two transmission lines. The distance to the edge of the opposite side of the ROW would be 85 ft (25.9 m), one-half of the 170 ft (51.8 m) required for the full width of a new corridor. Where the M&N gas pipeline would be located between the two transmission lines, the centerline separation between the lines would be 125 ft (38.1 m).

Where the M&N gas pipeline or Stud Mill Road would be paralleled, the proposed transmission line ROW width would average 155 ft (47.2 m). This situation would occur wherever the NRI would parallel the M&N pipeline, parallel first the M&N pipeline and then Stud Mill Road, or parallel first Stud Mill Road and then the pipeline. This dimension is based on the requisite half-width of 85 ft (25.9 m) from the transmission line centerline to the forested side of the ROW and 70 ft (21.3 m) between the centerline of the transmission line and the edge of the pipeline ROW or Stud Mill Road. Table S-2 lists the lengths and percentages of the ROWs for the alternative routes that would be either a new ROW or adjacent to an existing ROW. It also provides the total area within each alternative route.

S.4.3.3 Substation Alterations

Alterations to four substations within Maine would be required regardless of the alternative route selected. The substations to be modified would be the Orrington Substation located in Orrington, the Maxcys Substation located in Windsor, the Gulf Island Substation

TABLE S-2 Summary of NRI ROW Requirements by Alternative

	Alternative[a]			
Requirement	MCCR	CCR	PPR	MSR
ROW length (mi)[b,c]				
Total line	85	85	84	114
ROW configuration (mi)				
New ROW (170 ft wide[d])	15 (18%)	2 (2%)	62 (74%)	39 (35%)
Adjacent to M&N gas pipeline and/or Stud Mill Road (155 ft wide)	58 (68%)	68 (80%)	10 (12%)	0 (0%)
Adjacent to MEPCO line (100 ft wide)	5 (6%)	8 (10%)	5 (6%)	47 (41%)
Adjacent to M&N gas pipeline and MEPCO line (125 ft wide)	7 (8%)	7 (8%)	7 (8%)	7 (6%)
Adjacent to the EMEC[e] 69-kV line (100 ft wide)	0 (0%)	0 (0%)	0 (0%)	21 (18%)
Total ROW area (acres)	1,566	1,522	1,633	1,734

[a] CCR = Consolidated Corridors Route, MCCR = Modified Consolidated Corridors Route, MSR = MEPCO South Route, PPR = Previously Permitted Route.

[b] Values rounded to nearest whole mile, acre, or percent. Percentage values are percent of total ROW length.

[c] To convert miles to kilometers, multiply by 1.609; to convert feet to meters, multiply by 0.305; to convert acres to hectares, multiply by 0.405.

[d] Maximum width of new clearing required.

[e] EMEC = Eastern Maine Electric Cooperative.

located in Lewiston, and the Kimball Road Substation located in Harrison (Figure S-1). Required changes to each substation are described below.

The Orrington Substation would require modifications both inside and outside the current fenced boundary of the substation. Modifications within the existing fence line would include the relocation of an existing line, the addition of breakers and associated disconnect switches, the addition of a new dead-end structure and other miscellaneous components, and the expansion of the existing control house. The proposed project would also require the addition of series compensation on the line south of the substation. The construction of two short ground access roads and the modification of an existing retention pond would be conducted outside the existing fence line These modifications would require approximately 0.8 acre (0.3 ha) of new substation area.

The Maxcys Substation would require the replacement of an existing breaker. This change would occur within the current fence line. The existing breaker would need to be replaced with a breaker of higher short-circuit current rating. The Gulf Island Substation would require a new capacitor bank within the current fence line. The Kimball Road Substation would also require a new capacitor bank. However, this would require a 0.2-acre (0.09-ha) expansion of the existing substation.

S.4.3.4 Transmission Line Construction

The construction of the NRI, including ROW clearing and installation of the structures, would be performed by independent contractors under close daily supervision by BHE engineering and environmental inspectors to ensure that work is performed as specified by permit conditions and construction specifications. The general sequence of activities would be surveying; construction of access roads; ROW clearing; and support structure installation, framing, and stringing.

S.4.3.4.1 Surveying. The first operation to be completed would be a survey of the selected route. Surveying would establish the centerline and edges of the ROW. Generally, only a survey crew and small items of survey equipment would be required during this phase of the project. Establishing the ROW centerline could require limited cutting of trees for line-of-sight staking, profiling, and distance measuring. Existing roads would be used to obtain access to the selected route. Most of the surveying work would proceed cross-country and on foot.

S.4.3.4.2 Construction of Access Roads. To the extent possible, existing roads would be used to gain access to project construction sites. An extensive network of timber haul roads traverses much of the project area. In addition, the existing MEPCO corridor allows access to the initial 12.2 mi (19.6 km) of any of the alternative transmission line routes and would eliminate the need to construct new access roads within that area.

No new permanent access roads would be required for construction or maintenance of any of the alternative transmission line routes. However, some new temporary access roads would be required to reach the ROW construction area from existing roads. It is preferable that there be at least one point of access for each 1.0 mi (1.6 km) along the route. The approximate clearing required for new temporary access roads (20-ft [6.1-m] width) would be as follows: Modified Consolidated Corridors Route — none; Consolidated Corridors Route — none; Previously Permitted Route — 21 acres (8.5 ha); and MEPCO South Route — 32 acres (13 ha).

S.4.3.4.3 ROW Clearing. Trees would be cleared within the ROW only where necessary in order to facilitate (1) staking, access, assembly, and erection of structures; (2) installation of conductors and shield wires; (3) provision of adequate clearance for energized lines; and (4) maintenance. Low-growth woody vegetation would be left undisturbed where possible. The clearing program would be planned and implemented to encourage growth of low-growing native plants that would both stabilize the ROW against erosion and minimize the growth of trees.

Because about 90% of each of the alternative ROWs is forested (including forested wetlands), vegetation clearing can be generally categorized as (1) clear-cutting; or (2) several types of selective cutting. In addition to ROW clearing, danger trees (trees that could pose a threat to the operation of the line if they grew or fell into the conductor security zone before the next cutting cycle) would be cleared outside of the designated ROW. Generally, trees would be cut to 6 in. (15 cm) above the ground within cleared sections of the ROW. All logs would be removed from the ROW, while stumps would be removed only from support structure sites and from some temporary access road areas.

The applicant's normal cutting practice in forested areas would be used. First, the appropriate environmental safeguards would be established in the area to be cleared, primarily by placing appropriate erosion control measures to the extent practicable. Trees would then be cut. Clear-cutting involves the manual or mechanical cutting of all trees within the ROW. Low-growing shrubs and brush would be left to the extent practicable. All vegetation cut during initial clearing would be cleaned up and disposed of in accordance with the Maine Slash Law. As part of land-clearing operations, much of the merchantable wood materials (e.g., sawlogs and pulpwood) would be salvaged. Tops of trees, cull material, and branches could be chipped on site and the chips hauled to local power plants for use as fuel. Trees less than 2 in. (5 cm) in diameter may be left on site to deter the formation of new drainage channels in areas susceptible to erosion. In areas of low erosion potential, such trees may be windrowed or mulched. Following cutting and removal of the timber, the tree stumps of deciduous species may receive a basal application of approved herbicide applied by a low-pressure backpack applicator.

Table S-3 summarizes the clearing and cutting practices that would be conducted within the ROW, including various types of buffers. Figure S-11 illustrates the vegetation clearing and maintenance along the NRI.

Because of the limited reach of feller bunchers,[2] three access ways would be required within the 75-ft (23-m)-wide water body buffers. They would enable large trees across the ROW to be cut and removed with minimal additional ground disturbance and damage to remaining vegetation that would otherwise occur if the trees were hand cut and dragged out of the buffer with a cable. One access way would be located at about the middle of the ROW, and each of the other two would be located about halfway between the middle access way and an edge of the ROW. The access ways would be 10 to 12 ft (3 to 4 m) wide. The stream buffer access ways differ from temporary access roads in that, within the access ways, only trees that would prevent the harvesting equipment from performing its job or that would otherwise be seriously damaged by the equipment traveling along the access way would be removed. Also, access ways would not require grading or the addition of any surfacing materials such as gravel. The access ways would not extend closer than 25 ft (7.6 m) to the edge of the stream banks. The two outer access ways would be restored at the completion of clearing activities, while the central access way would be restored at the end of all construction activities in the area. The outer access ways

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[2] A feller buncher is a large logging machine similar to a backhoe with an attachment that cuts trees in place of a shovel. It consists of a standard heavy-equipment base with a tree-grabbing device equipped with a saw or other device at the bottom that cut the tree off at the base and places it on the stack of cut trees.

TABLE S-3 Summary of Clearing and Cutting Practices during ROW Construction and Maintenance

Location	Buffer Width	Clearing and Cutting during Construction[a]	Cutting during Maintenance[a]
Typical ROW areas with no restrictions	Not applicable	Cut at ground level all vegetation >2 in.[b] in diameter at breast height; remove or top[c] all other vegetation that is 8 to 10 ft[b] or taller.	Cut at ground level all capable trees that are 8 to 10 ft or taller; top all other vegetation that is 8 to 10 ft or taller.
Standard stream buffers where NRI parallels the existing MEPCO 345-kV line	25 ft on each side of the water body	Cut at ground level all capable trees[d] that are 8 to 10 ft or taller; no other vegetation is cut.	Cut at ground level all capable trees that are 8 to 10 ft or taller; no other vegetation is cut.
Standard stream buffers where NRI does not parallel the existing MEPCO 345-kV line	75 ft on each side of the water body	Cut at ground level all capable trees that are 8 to 10 ft or taller; no other vegetation is cut.	Cut at ground level all capable trees that are 8 to 10 ft or taller; no other vegetation is cut.
Atlantic salmon stream buffers	75 ft on each side of the water body	Top all capable trees that could grow to within 15 ft of a conductor in the next 3 to 4 years; no other vegetation is cut.	Top all capable trees that could grow to within 15 ft of a conductor in the next 3 to 4 years; no other vegetation is cut.
Visual buffers at the Narraguagus, Machias, and St. Croix Rivers	Varies from 75 to 500 ft	Top all capable trees that could grow to within 15 ft of a conductor in the next 3 to 4 years; no other vegetation is cut.	Top all capable trees that could grow to within 15 ft of a conductor in the next 3 to 4 years; no other vegetation is cut.

[a] Dead or danger trees are removed at any time.

[b] To convert inches to centimeters, multiply by 2.54; to convert feet to meters, multiply by 0.305.

[c] The tree would be cut at ground level if topping would not leave sufficient foliage to sustain the tree.

[d] Capable trees are those that could grow within the conductor clearance zone before the next management cycle.

would be allowed to revert to their original state (within maintenance requirements), while the middle access way would be maintained as low-growing vegetation to allow small vehicle access during ROW vegetation maintenance.

S.4.3.4.4 Support Structure Installation, Framing, and Stringing. To accommodate installation of each support structure, a work area about 100 ft (30.5 m) wide and 170 ft (51.9 m) long, or 0.4 acre (0.16 ha), would be cleared of all woody growth except low shrubs and brush.

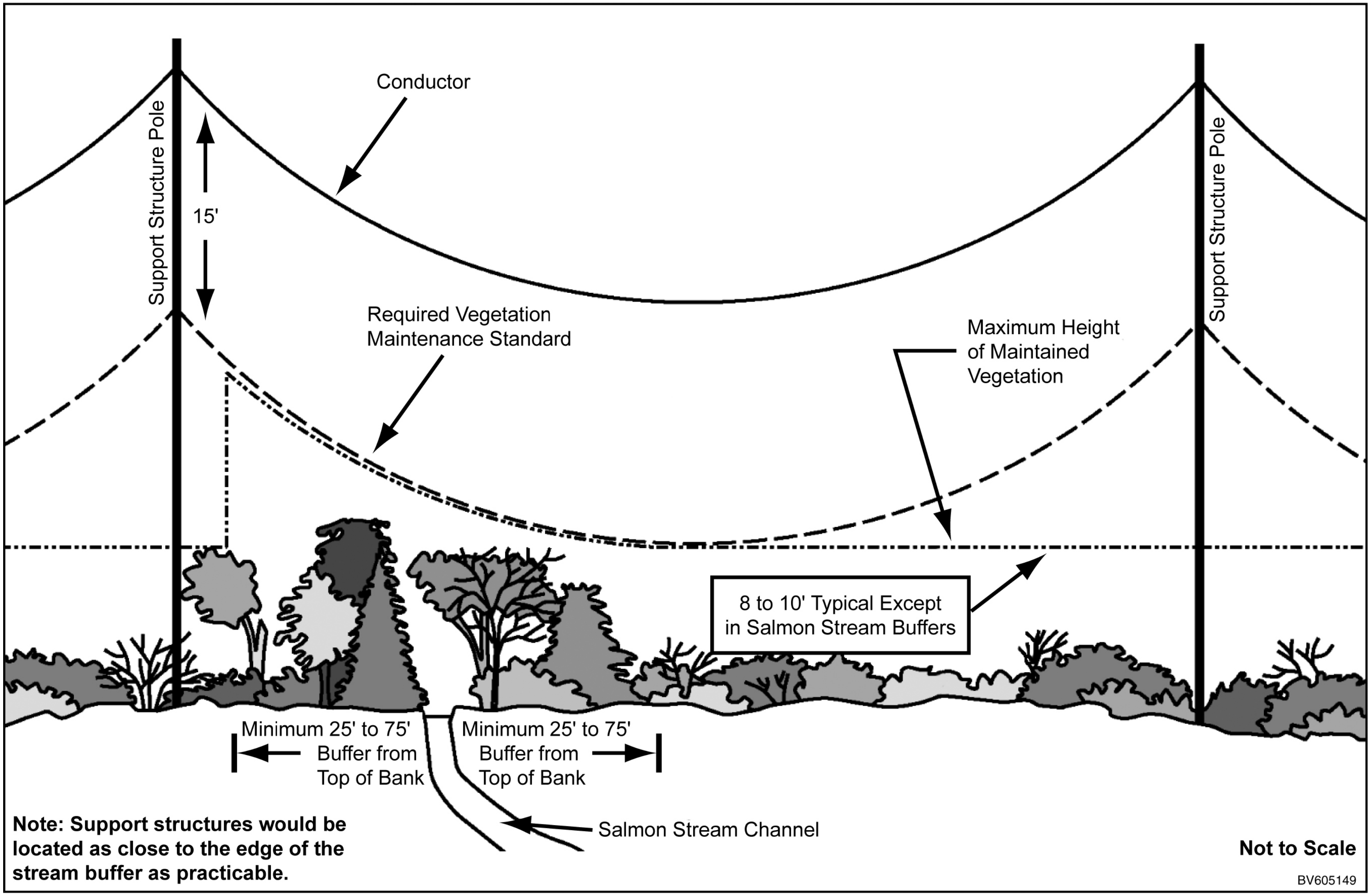

FIGURE S-11 Specifications for Vegetation Clearing and Maintenance along the Proposed ROW

All small woody plants would be removed from the immediate structure locations. The structural components would be placed in these work areas in preparation for construction and installation of the support structures.

Holes for support structure poles would be made with an auger or backhoe. Some blasting might be required if bedrock occurred at structure locations or, more rarely, for breaking or moving large boulders that restricted access by construction equipment.

H-frame wood-pole structures would be directly embedded in the ground. A 9- to 12-ft (2.7- to 3.7-m)-deep foundation hole would be excavated at each pole location, and backfill would be placed around the pole after installation. Guy anchors for the wood-pole angle and dead-end structures would consist of steel anchor rods connected to a log buried in a trench about 7 ft (2.1 m) deep. The support structures would be assembled on the ground and erected by a crane with a long boom. Total construction time for a wood-pole support structure would be less than 1 day.

Steel-pole support structures could also be directly embedded in a similar manner except that some would be backfilled with concrete. They could also be installed on concrete bases, depending on site conditions. Foundation holes would be up to 30 ft (9 m) deep. Total construction time would be less than 4 days per steel-pole support structure.

After the support structures were in place, insulators would be installed and aerial shield (ground) wires and conductors strung. Conductors and shield wires would be pulled through the stringing blocks by tensioning equipment to keep them from coming in contact with the ground or other objects that could cause damage.

S.4.3.4.5 Construction Staging Areas. The same five staging areas (i.e., construction headquarters along the route where materials are received, stored, and shipped to the ROW) would be used during construction of the line along the Modified Consolidated Corridors Route, the Consolidated Corridors Route, or the Previously Permitted Route. The following staging areas would be used: Route 178, Costigan Mill, Pickerel Pond, Machias River, and Huntley Staging Areas. The Route 178 and Costigan Mill Staging Areas, along with the Chester, Topsfield, and Baileyville Staging Areas, would be used for the MEPCO South Route. These construction staging areas are described below. Figure S-2 shows the locations of the staging areas.

Route 178 Staging Area. This site is about 9 mi (14.5 km) northeast of the Orrington Substation. It is located on the west side of State Route 178 in Bradley north of the entrance to the Penobscot Experimental Forest. The site consists of about 5 acres (2 ha) of cleared and disturbed land.

Costigan Mill Staging Area. This 20-acre (8-ha) staging area would be located at a former sawmill operation in Penobscot County, Maine, near the Town of Milford and the

Community of Costigan. The Costigan Mill Staging Area would primarily be for rail unloading and storage of utility materials (e.g., poles and wire).

Pickerel Pond Staging Area. This staging area is located at an abandoned air strip near Pickerel Pond and is adjacent to Stud Mill Road. The site, which primarily consists of broken pavement and ground, encompasses about 6 acres (2.4 ha).

Machias River Staging Area. This staging area would consist of about 6.5 acres (2.6 ha) along Stud Mill Road, about 0.25 mi (0.4 km) west of the Machias River. This former work-camp site is presently cleared. About 1 acre (0.4 ha) of the staging area is located north of Stud Mill Road; the remainder is south of it.

Huntley Brook Staging Area. This site is located near where Stud Mill Road crosses Huntley Brook. About 4.5 acres (1.8 ha) of presently cleared land would be used.

Chester Staging Area. This 10-acre (4-ha) site is an inactive chip-burning facility in Chester, Maine. The plant has been dismantled and has a large yard for chip storage. The site is located near both proposed river crossings of the Penobscot River.

Topsfield Staging Area. This 6-acre (2.4-ha) site is the location of an old hayfield. The site is located along Route 1 and Route 6, the major transportation corridors in the region.

Baileyville Staging Area. This staging area, located near the terminus of the line, would consist of two parcels, one of 16 acres (6.5 ha) and one of 28 acres (11.3 ha). The staging area is the site of a now-closed oriented strand board mill. Each parcel has two large yards that can easily accommodate poles and other equipment.

S.4.3.5 Installation of AC Mitigation for the M&N Gas Pipeline

Any time a wire carrying AC is in the vicinity of a metal pipeline, the wire has the potential of inducing voltages in the pipeline.

Induced voltages in the M&N gas pipeline could be a concern where the NRI would be located near (e.g., within 1 mi [1.6 km]), parallel to, or cross over the pipeline. AC mitigation would be required to protect worker and public safety, as well as to minimize potential impacts on the integrity of the pipeline facilities (e.g., reduce the effectiveness of the cathodic [corrosion] protection employed by the pipeline).

The AC mitigation technique under consideration for the M&N gas pipeline includes the installation of a zinc ribbon buried about 1.5 ft (0.5 m) deep above and parallel to the existing unprotected pipeline, the top of which is at least 3 ft (1 m) below ground. The zinc ribbon would be either plowed in place or installed into an excavated trench that would be backfilled after the ribbon is installed. The ribbons would be attached to the pipeline at regular intervals. The zinc ribbon would be installed over 68 mi (109 km) for the Modified Consolidated Corridors, Consolidated Corridors, and Previously Permitted Routes; while about 45 mi (72 km) of zinc ribbon would be required for the MEPCO South Route. The ribbon would not be installed where the existing pipeline crosses streams.

In addition to the zinc ribbon, ground mats would be installed at existing test stations along the pipeline. These stations, which resemble pipeline markers in appearance, are spaced at intervals of about every 1 mi (1.6 km) and are located directly above the pipeline. Ground mats would consist of a grounding material (e.g., coiled zinc ribbon) and crushed rock over an area up to 12 ft (3.7 m) in diameter around each test station. About 68 test stations would require ground mats for the Modified Consolidated Corridors Route, the Consolidated Corridors Route, or the Previously Permitted Route, while 45 ground mats would be required for the MEPCO South Route. In addition, four pipeline valve sites and the Baileyville Compressor Station would require some additional grounding. AC mitigation would be installed by M&N prior to energizing the NRI.

S.4.3.6 Post-Construction Maintenance Practices

Post-construction maintenance would consist primarily of line inspection and vegetation management. ROW inspections would be periodically required to determine if there are areas where trees may approach minimum clearances before the next scheduled vegetation maintenance period. Management of vegetation along the ROW would consist of the felling of danger trees adjacent to the ROW and control of vegetation within the ROW.

Maintenance clearing generally would be performed on a 3- to 4-year cycle and would consist of some of the same types of activities as during the initial clearing. ROW maintenance within buffer zones would be limited to cutting only those trees that could present a safety hazard to the transmission line before the next cutting period. Encroaching branches from each side of the ROW would be cut (i.e., side trimming). The ROW would be maintained by hand and mechanical cutting, combined with optional foliar, basal, and cut-stump application of herbicides. Only herbicides registered for use by the EPA and approved for use by the State of Maine would be applied.

S.4.3.7 Schedule

Construction would begin with ROW clearing upon issuance of all required Federal, State, and local permits. ROW clearing is anticipated to begin in the winter in order to take advantage of frozen ground so as to minimize impacts, especially within wetlands. It is anticipated that the ROW would require about 6 months to clear, support structures would require 8 months to install, and shield wires and conductors would require 8.5 months to install. To some extent, these activities could be conducted concurrently, and the use of additional crews would shorten the construction time. Substations would be modified as needed during the same period as the stringing operations. Site-specific mitigation and restoration activities would be carried out during all phases of construction. Plans call for the project to be completed and the line energized within 12 to 18 months of commencement of construction.

S.5 COMPARISON OF THE POTENTIAL ENVIRONMENTAL IMPACTS AMONG ALTERNATIVES

Table S-4 at the end of this summary presents a comparison of the alternatives on the basis of the analysis presented in Chapter 4 of the EIS.

The following resource areas were evaluated for potential impacts:

- Air quality,
- Land features,
- Land use,
- Hydrological resources,
- Ecological resources,
- Cultural resources,
- Socioeconomics,
- Minority and low-income populations (environmental justice),
- Visual resources, and
- Health and safety.

The following discussion emphasizes the environmental implications of choosing among the alternatives, organized by resource area. Impacts during the construction period (approximately 12 to 18 months) and operation (particularly maintenance) of the project are considered. In general, the Rescission of the Presidential Permit Alternative has the least impact on the environment because it does not involve ground-disturbing activities or the introduction of a transmission line into the visual landscape.

S.5.1 Air Quality

No significant differences in air quality impacts would occur for any of the four route alternatives. Temporary localized fugitive dust emission impacts from construction activities would occur. Fugitive dust impacts would be tempered since as much construction as possible would be conducted in winter and since, in most cases, ground vegetation would not require removal. The use of vehicles and equipment during construction and maintenance would also result in short-term localized emission of air pollutants. During operation of the line, corona-produced ozone (O_3) would be less than 1.0 part per billion (ppb), well below the 8-hour and 1-hour O_3 standards of 80 ppb and 120 ppb, respectively. A conformity review is not required for the proposed project because the project area is not located within a nonattainment area for any of the criteria pollutants.

Under the Rescission of the Presidential Permit Alternative, BHE would not build the NRI. Therefore, there would be no potential impacts on air quality beyond those already occurring.

S.5.2 Land Features

The construction of the NRI along any of the alternative routes would not impact geologic resource availability. Construction of the alternative routes would require the excavation of approximately 7,933 yd^3 (6,069 m^3) of soil from the Previously Permitted Route, 9,097 yd^3 (6,959 m^3) of soil from the Modified Consolidated Corridors Route, 11,913 yd^3 (9,113 m^3) of soil from the Consolidated Corridors Route, and 12,347 yd^3 (9,445 m^3) from the MEPCO South Route. The amount of soil removed for any alternative route would be very small relative to the availability of the material in the region. Localized terrain changes could result from the installation of support structures, substation expansion, or establishment of new temporary access roads. These terrain changes would be localized to the individual locations of the support structures, the substation expansion area, and new temporary access roads. Because of the relatively flat terrain of most of the project area, topographic changes to the area would be negligible. Impacts on soils from localized erosion and compaction would be negligible because standard mitigation practices would be used to minimize soil erosion and promptly restore construction areas. Because most of the construction activities in sensitive areas would be conducted in winter when precipitation occurs as snowfall and the soil surface is frozen, the potential for soil erosion or compaction as a result of construction would be minimized. None of the alternative routes are located in areas of relatively high seismic activity.

Under the Rescission of the Presidential Permit Alternative, BHE would not build the NRI. Therefore, there would be no potential impacts on land features (physiography, geology, and soils) beyond those already occurring.

S.5.3 Land Use

All four alternative routes would cross primarily through privately owned commercial forested land. ROW clearance and support structure installation are the main activities under the proposed action that could result in impacts on land use. The line length of each of the alternatives, except for the MEPCO South alternative, would be relatively similar (84 to 85 mi [135 to 137 km]). The MEPCO South line would be 114 mi (183 km) long.

Between about 1,391 and 1,513 acres (563 and 612 ha) of forested land could be impacted by ROW land-disturbing activities for the alternative routes, which is a very small fraction of the local acreage of timberlands (approximately 4.3 million acres [1.7 million ha]) within Hancock, Penobscot, and Washington Counties. The presence of the proposed project would not restrict the continuation of commercial forestry in areas adjacent to the ROW; however, the ROW area would be excluded from future timber production for the life of the project.

Between 28 acres and 86 acres (11 and 34 ha) of agricultural land (cropland, orchards, pastureland, and rangeland) could be impacted by the alternative routes. In the three-county area, there are more than 300,000 acres (120,000 ha) of land in farms. The MEPCO South Route would impact 86 acres (34 ha), while the other three routes would be at the low end of the range. The presence of the ROW would not restrict the continuation of agricultural land use, but it is probable that some support structures would need to be placed within agricultural lands. A support structure would exclude no more than 0.03 acre (0.01 ha) of agricultural land from production. Between 0.29 acre (0.12 ha) and 1.32 acres (0.53 ha) of agricultural land could be lost from production by the alternative routes because of constraints on farm equipment use in the immediate area of support structures (including guy wires).

Recreational activities in the project area include all-terrain vehicle (ATV) use, snowmobiling, canoeing, fishing, and hunting. The primary impact on recreational activities would be increased access and a change in the visual setting where recreation occurs. No land would be taken out of or removed from recreational use as a result of the proposed project. The Modified Consolidated Corridors, Consolidated Corridors, and Previously Permitted Routes would be within the viewshed of two Outstanding River Segments, which are rivers declared by the Maine Legislature to provide irreplaceable social and economic benefits to people because of their unparalleled natural and recreational values.

The proposed project could affect residential areas either visually or through displacement of dwellings by condemnation through BHE's eminent domain rights as a public utility. Up to 10 dwellings would be displaced for the MEPCO South Route, while no dwellings would be displaced for the Modified Consolidated Corridors Route. The Previously Permitted and Consolidated Corridors Routes would displace two and three dwellings, respectively. The number of dwellings within 600 ft (183 m) of the proposed project[3] would be 121 for the

[3] The 600-ft (183-m) distance was selected during BHE's stakeholder process for the purpose of evaluating visual impacts on landowners and has been accepted by DOE as reasonable.

MEPCO South Route, 59 for the Consolidated Corridors Route, 40 for the Modified Consolidated Corridors Route, and 39 for the Consolidated Corridors Route.

No potentially limiting land use issues have been identified for the Modified Consolidated Corridors Route, Consolidated Corridors Route, or MEPCO South Route. The Previously Permitted Route crosses about 40 mi (64 km) of land owned by International Paper, and logging operations along this portion of the route could be disrupted. The Machias River Project[4] could also preclude the Previously Permitted Route's proposed crossing location of the Machias River.

Under the Rescission of the Presidential Permit Alternative, BHE would not build the NRI. Therefore, there would be no land use impacts beyond those already occurring.

S.5.4 Hydrological Resources

No adverse impacts on surface water or groundwater resources would occur from any of the alternative routes. All four alternative routes would span about the same number of streams and rivers. BHE would avoid placing support structures within 75 ft (23 m) from the top of stream banks (25 ft [7.6 m] for the portion that would parallel the existing 345-kV transmission line). However, support structures would be placed as close to Atlantic salmon streams of special concern[5] as possible to minimize the amount of clearing required in order to maintain stream temperatures. The Modified Consolidated Corridors, Consolidated Corridors, and Previously Permitted Routes would cross two designated Outstanding River Segments. Support structures would be placed farther away from these streams to minimize visual impacts. However, because the crossing locations for these streams are relatively open, no changes in stream temperatures from the ROW are expected.

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[4] The Machias River Project was a Nature Conservancy initiative to establish conservation protection for the Machias River shoreline. In 2003, a transaction involving the State of Maine, The Nature Conservancy, and International Paper was completed, creating a conservation corridor along the Machias River consisting of conservation easement and fee ownership. In the vicinity of Stud Mill Road, this conservation corridor was conveyed to the State of Maine as fee land (i.e., the State became the owner of the property). This corridor is approximately 2,500 ft (762 m) wide and extends north of the Stud Mill Road to include the area of the crossing of the Previously Permitted Route. At Stud Mill Road, International Paper retained a 1,000-ft (205-m)-wide utility corridor that was subsequently conveyed to ECHO Easement Corridor, LLC. This utility easement provides the right to construct and maintain most types of utility facilities, including electric transmission lines. The Modified Consolidated Corridors and Consolidated Corridors Routes would cross the Machias River within this utility easement. In contrast, the Previously Permitted Route would cross the Machias River within the Machias River conservation corridor, where there is currently no established utility easement. The absence of an existing utility easement at this location does not preclude the crossing of the river by the Previously Permitted Route. A stream crossing may be negotiated with the State, or this portion of the Previously Permitted Route could be rerouted to move the Machias River crossing approximately 3,400 ft (1,036 m) south to the ECHO Easement Corridor location.

[5] An Atlantic salmon stream of special concern is a stream or river identified by the Maine Atlantic Salmon Commission as being most important to the various life stages of the Atlantic salmon.

Restrictions on refueling and herbicide mixing locations would protect surface water and groundwater from contamination by fuel, lubricants, and herbicides during construction. Standard mitigation practices would be implemented along the length of the line for erosion and sedimentation control.

No support structures would be located in streams, and the placement of support structures elsewhere in floodplains is not expected to result in any increase in flood hazard. The support structure poles would not impede floodwater movement or reduce floodwater-storage capacity.

Under the Rescission of the Presidential Permit Alternative, BHE would not build the NRI. Therefore, there would be no impacts on hydrological resources beyond those already occurring.

S.5.5 Ecological Resources

Vegetation would be affected by clearing to establish the ROW, installation of support structures, creation of new temporary access roads, and installation of AC mitigation, as required. Forest clearing for the project would fragment habitat by creating a new ROW through contiguous forested habitats or by expanding the ROW width where the NRI would be co-located with existing facilities. The acreage of forest clearing for the ROW would be as follows: Modified Consolidated Corridor Route — 1,411 acres (570 ha); Consolidated Corridors Route — 1,391 acres (563 ha); Previously Permitted Route — 1,461 acres (591 ha); and MEPCO South Route — 1,513 acres (612 ha). The ROW would be maintained in a shrubland or old field condition. Standard mitigation practices would minimize the potential for adverse impacts from selective herbicide use.

The potential impacts on wildlife (beneficial or adverse) for each alternative route would be proportional to the total acreage of the ROW. Impacts from transmission line construction would be local and affect only individual animals. Population-level impacts on wildlife species are considered to be very unlikely. Herbicides would not be expected to adversely affect wildlife. The potential exists for birds to collide with the transmission line conductors and shield wires. This would be most likely to occur where the proposed project crosses through areas where birds would be most likely to congregate, such as waterfowl and wading bird habitats. The acreage of waterfowl and wading bird habitats that would be crossed by the proposed project would be as follows: Modified Consolidated Corridors Route — 133 acres (54 ha); Consolidated Corridors Route — 113 acres (45 ha); Previously Permitted Route — 93 acres (37 ha); and MEPCO South Route — 148 acres (60 ha).

Minimal adverse impacts on aquatic biota would be expected for any alternative route because standard mitigation practices would be used to minimize erosion and sedimentation, stream warming, and chemical contamination (e.g., by herbicides or fuel).

Impacts on wetlands would occur where forested wetlands are converted to scrub-shrub or emergent wetlands. The acreage affected would be as follows: Modified Consolidated

Corridors Route — 70 acres (29 ha); Consolidated Corridors Route — 53 acres (21 ha); Previously Permitted Route — 103 acres (41 ha); and MEPCO South Route — 73 acres (29 ha). Only very minor permanent fills of wetlands would occur from support structure pole placement in wetlands. No impacts on wetlands with standing water from herbicide use are expected for any alternative route.

Impacts on special status species would be similar to those described for other biota, but any impacts could affect their populations because of the species' limited distribution and/or abundance. The establishment of a ROW would be potentially beneficial for some special status species and adverse for others. Potential adverse impacts from construction and maintenance of the ROW would be minimized or eliminated by the implementation of standard mitigation practices aimed at special status species. For example, ball markers and/or flappers would be placed on shield wires across the St. Croix River, Machias River, Narraguagus River, Great Works Stream, and Penobscot River to minimize the potential for bald eagles to collide with the wires, and standard mitigation practices would be employed at Atlantic salmon essential fish habitat streams to minimize erosion and sedimentation, protect stream banks, and maintain stream shading.

Under the Rescission of the Presidential Permit Alternative, BHE would not build the NRI. Therefore, there would be no impacts on ecological resources beyond those already occurring.

S.5.6 Cultural Resources

No impacts on cultural resources are expected for the Modified Consolidated Corridors Route. The route was modified to avoid the one significant historic property recorded during the archaeological survey for the proposed project. Impacts on cultural resources are possible, but unlikely, for the Consolidated Corridors and Previously Permitted Routes; impacts on cultural resources would be more probable, however, for the MEPCO South Route since the Penobscot River drainage has been identified as an area of high potential for containing significant archaeological material. A cultural resource survey and approval of the survey results by the Maine State Historic Preservation Office would be required if the Consolidated Corridors Route, Previously Permitted Route, or MEPCO South Route were selected for the proposed project. Archaeological surveys may be required in areas designated for new temporary access roads and some staging areas. No cultural resources are expected in areas where AC mitigation may be required, since those areas were previously disturbed when the M&N gas pipeline was installed.

Under the Rescission of the Presidential Permit Alternative, BHE would not build the NRI. Therefore, there would be no impacts on cultural resources beyond those already occurring.

S.5.7 Socioeconomics

The construction of the Modified Consolidated Corridors Route, Consolidated Corridors Route, or the Previously Permitted Route would create approximately 120 direct (construction) jobs and approximately 110 indirect (service-related) jobs. The MEPCO South Route would create approximately 150 direct jobs and 130 indirect jobs. The jobs created by the construction of the NRI would primarily benefit Hancock, Penobscot, and Washington Counties. No significant influx of population or stress to community services would be expected from project construction. No socioeconomic impacts would be expected from project operation because most jobs created would be filled by current residents.

Under the Rescission of the Presidential Permit Alternative, BHE would not build the NRI. Therefore, there would be no socioeconomic impacts beyond those already occurring.

S.5.8 Environmental Justice Considerations

The Modified Consolidated Corridors, Consolidated Corridors, and Previously Permitted Routes would not have a disproportionately high and adverse impact on minority or low-income populations. One minority census block group occurs within a small portion of the 2-mi (3.2-km) buffer along the MEPCO South Route. Standard mitigation practices would minimize potential impacts from noise, dust, and emissions during construction.

Under the Rescission of the Presidential Permit Alternative, BHE would not build the NRI. Therefore, there would be no impacts on environmental justice considerations beyond those already occurring.

S.5.9 Visual Resources

Visual impacts would occur primarily from the introduction of support structures and transmission line wires into the landscape. A transmission line along any of the alternative routes would be moderately incompatible, mildly contrasting, and, occasionally, a dominant feature in the landscape. This would be most notable in areas where more remote recreational activities occur. The MEPCO South Route would be visible to more residents than the other alternatives, given its closer proximity to more towns and roads along the Route 2 and Route 6 corridors. The Modified Consolidated Corridors, Consolidated Corridors, and Previously Permitted Routes would cross two designated Outstanding River Segments (Narraguagus and Machias Rivers). Standard mitigation practices would be used to minimize visual impacts at these two river crossings and at the U.S. side of the St. Croix River, which would be crossed by all four alternative routes.

Under the Rescission of the Presidential Permit Alternative, BHE would not build the NRI. Therefore, there would be no visual resource impacts beyond those already occurring.

S.5.10 Health and Safety

Procedures are well established to reduce or eliminate the potential for shock hazards associated with operation of the NRI. AC mitigation would be required where the NRI would be located near, parallel to, or cross over the M&N gas pipeline.

Although each alternative route passes primarily though forested land, the MEPCO South Route would have the highest number of houses in close proximity to the transmission line. Electric field exposures at the edge of the ROW for all alternatives would be less than guidelines that have been established by several states. Magnetic field exposures at most residences for all routes would be well below average daily exposure to maximum magnetic fields (0.8 milligauss [mG]) from some common household and office appliances and machinery. No health effects would be expected from electric and magnetic field (EMF) exposure.

There are no significant differences in potential noise impacts from any of the four alternative routes. Noise levels would increase above background during construction. Temporary construction noise increases would primarily impact residents and recreationists close to the ROW. Elevated noise would occur only during daytime. During operation, long-term noise from the corona effect on transmission lines would generally be lost in background noise.

The potential risk to people with pacemakers would be negligible for all alternative routes. The potential for radio and television interference from the proposed project would be negligible. What little potential there is would be slightly greater for the MEPCO South Route because it has more dwellings within 100 ft (30 m) of the ROW and has more highway crossings than the other alternative routes.

The potential human health risks from herbicide usage for maintaining the proposed project ROW would be negligible because of adherence to regulations and implementation of standard mitigation practices associated with the use of these products.

The potential for fatalities of, and injuries to, construction and maintenance workers would be slightly greater for the MEPCO South Route than for the other alternative routes because of its greater length, which would require more clearing and more support structures. Nevertheless, fatality risks would be less than 1 fatality for all alternative routes. Nonfatal occupational injuries and illnesses for construction of the NRI would be 9.7 for the MEPCO South Route and 6.9 for the other alternative routes; nonfatal injuries and illnesses during maintenance would be fewer than 1 per 10 full-time field personnel for all alternative routes. The use of standard mitigation practices for occupational health and safety compliance would reduce the potential for fatalities and injuries.

Under the Rescission of the Presidential Permit Alternative, BHE would not build the NRI. Therefore, there would be no health and safety impacts beyond those already occurring.

S.6 CUMULATIVE IMPACTS

The cumulative impacts from the combination of BHE's proposed project and other past, present, and reasonably foreseeable actions could affect air quality, land features, land use (including recreation), hydrological resources, ecological resources, cultural resources, socioeconomic resources, environmental justice considerations, visual resources, and health and safety. These potential cumulative impacts are primarily related to long-term development of land that is currently used for other activities such as commercial timber production and recreation. If multiple projects are under construction simultaneously, an increased amount of land could be used temporarily for construction lay-down and staging areas, and an increased amount of airborne dust could be generated. The cumulative change on land use could affect natural habitats, special status species, and cultural resources, and could lead to an increase in soil erosion. The cumulative impacts on human health and safety could be an increase in background EMF exposure to residents in the immediate vicinity of the NRI. No long-term cumulative human health impacts are expected to occur. No disproportionately high and adverse impacts were identified for minority or low-income populations for the proposed project. Thus, the proposed project would not contribute cumulatively to any environmental justice impacts.

The NRI would result in only very small incremental (cumulative) environmental impacts within east-central Maine because most of the new transmission facility would be constructed within commercial timber areas (where impacts associated with harvesting of trees currently occur). It is estimated that 22 to 98% of the proposed line, depending on the alternative route, would be located within existing ROWs, which would result in widening the ROWs by 100 to 155 ft (30 to 47 m). The remaining 2 to 78% of the proposed transmission line would be within a new 170-ft (52-m)-wide ROW. The new ROW segments would add to various ROWs and timber clearings that currently exist in the east-central portion of Maine.

The rescission of the Presidential Permit Alternative would not contribute to cumulative impacts within the project area.

TABLE S-4 Summary of Key Project and Environmental Characteristics and Potential Impacts of the Proposed Action and Other Alternatives by Resource Area[a]

Resource Area (EIS Impact Analysis Section Number)	Modified Consolidated Corridors Route (Preferred Alternative)	Consolidated Corridors Route Alternative	Previously Permitted Route (No Action Alternative)	MEPCO South Route Alternative	Recission of Presidential Permit Alternative
Air Quality (4.1)					
Construction	Temporary localized fugitive dust emissions from construction activities would occur. These would be negligible, since as much construction as possible would be conducted during winter when the soil surface is frozen and since ground-level vegetation would be maintained to the extent possible. No conformity review required as the project area is in attainment with the EPA's NAAQS.				No impact on air quality. Current air quality trends would continue.
Operation	Impacts from operation and maintenance activities would be limited to vehicle emissions and dust from occasional travel on unpaved roads by BHE personnel or their contractors. Corona would generate less than 1 ppb of ozone in the immediate vicinity of the conductors.				
Land Features (4.2)					
Physiography	Negligible localized terrain changes could occur from installation of support structures, substation expansion, and establishment of new temporary access roads.				No impacts on land features.
Geology	Impacts on geologic resources would be negligible. The placement of poles, new temporary access roads, and substation expansions would require some disturbance and removal of near-surface material. (See *Land Use* for estimates of areas disturbed.) Foundations for wood-pole support structures would require direct embedment of poles, requiring excavation of pits. Blasting may be required in areas of shallow bedrock. Concrete fill or foundations would be required for steel-pole support structures.				
Soils	Impacts on soils from erosion and compaction would be negligible because of the use of standard mitigation practices to minimize soil erosion and to promptly restore construction areas (Section 2.4).				
Seismicity	Low seismic risk within the project area.				
Land Use (4.3)					
Total ROW length (mi)[b]	85	85	84	114	
Total ROW area (acres)[c]	1,566	1,522	1,633	1,734	

TABLE S-4 (Cont.)

Resource Area (EIS Impact Analysis Section Number)	Modified Consolidated Corridors Route (Preferred Alternative)	Consolidated Corridors Route Alternative	Previously Permitted Route (No Action Alternative)	MEPCO South Route Alternative	Recission of Presidential Permit Alternative
Land Use (4.3) (Cont.)					
Length of new ROW (mi)	15	2	62	39	No impacts on existing land use.
Length adjacent to existing MEPCO or EMEC transmission lines (mi)	5	8	5	68	
Length adjacent to M&N gas pipeline and MEPCO transmission line (mi)	7	7	7	7	
Length adjacent to M&N gas pipeline and/or Stud Mill Road (mi)	58	68	10	0	
Number of support structures	608	636	563	885	
Number of support structure poles	1,333	1,436	1,190	1,834	
Permanent area occupied by all support structure poles (acres)	0.5	0.5	0.4	0.6	
Permanent additional area occupied by substation modifications (acres)	1.0	1.0	1.0	1.0	
Area requiring clearing for new temporary access roads (acres)	0	0	21	32	
Temporary area occupied by staging areas (acres)	42	42	42	57	

TABLE S-4 (Cont.)

Resource Area (EIS Impact Analysis Section Number)	Modified Consolidated Corridors Route (Preferred Alternative)	Consolidated Corridors Route Alternative	Previously Permitted Route (No Action Alternative)	MEPCO South Route Alternative	Recission of Presidential Permit Alternative
Land Use (4.3) (Cont.)					
Temporary disturbance by installation of AC migitation over M&N gas pipeline (acres)[d]	82	82	82	54	
Forested lands within ROW (acres)	1,411	1,391	1,461	1,513	
Agricultural lands within ROW (acres)	30	28	28	86	
Agricultural lands within ROW lost from production (acres)	0.35	0.35	0.29	1.32	
Other land use within ROW (acres)	125	103	144	135	
Number of displaced dwellings	0	3	2	10	
Number of dwellings within 300 ft	14	20	10	47	
Number of dwellings within 600 ft	40	59	39	121	
Recreation	Recreational activities in the vicinity of the proposed project would primarily be impacted by a change in the visual setting of the recreation and by providing further access to recreational activities such as fishing, hunting, and ATV use.				
ATV impact areas (number of new or enhanced access areas)	0	0	19	1	

TABLE S-4 (Cont.)

Resource Area (EIS Impact Analysis Section Number)	Modified Consolidated Corridors Route (Preferred Alternative)	Consolidated Corridors Route Alternative	Previously Permitted Route (No Action Alternative)	MEPCO South Route Alternative	Recission of Presidential Permit Alternative
Land Use (4.3) (Cont.)					
Land use conflicts	No conflicts identified.	No conflicts identified.	Potentially conflicts with commercial logging activities.	No conflicts identified.	
Hydrological Resources (4.4)					
Construction and maintenance impacts	No adverse impacts on groundwater or surface water resources. Construction activities would not occur within streams or rivers. Standard mitigation practices would minimize erosion and sedimentation, loss of stream shading, and potential for contamination from herbicides and fuels.				No hydrological resource impacts. Current hydrologic resource patterns would continue.
ROW crossings of stream (number)	67	66	65	66	
ROW crossings of Class AA streams (number)	13	10	18	5	
ROW crossings of Class A streams (number)	44	46	41	41	
Crossings of streams for new temporary access roads (number)	0	0	0	1	
Lakes within 1 mi of ROW (number)	24	25	22	11	
Floodplains	Negligible change in flood elevation or changes in flow-carrying capacity of streams because of support structure placement in floodplains.				
Ecological Resources (4.5)					
Terrestrial vegetation	Upland vegetation would be primarily affected by clear-cutting or selective cutting to establish the ROW and, where required, installation of AC mitigation.				No impacts on ecological resources.
Forest lands crossed by ROW (acres)	1,411	1,391	1,461	1,513	

TABLE S-4 (Cont.)

Resource Area (EIS Impact Analysis Section Number)	Modified Consolidated Corridors Route (Preferred Alternative)	Consolidated Corridors Route Alternative	Previously Permitted Route (No Action Alternative)	MEPCO South Route Alternative	Recission of Presidential Permit Alternative
Ecological Resources (4.5) (Cont.)					
Disturbance of low-lying vegetation by installation of AC mitigation (acres)	82	82	82	54	
Wildlife	Impacts from transmission line construction would be temporary, local, and affect only individual animals. Impacts (beneficial or adverse) from the establishment of a ROW corridor on individual wildlife species are summarized in Appendix D of the EIS. Population-level impacts are considered to be very unlikely.				
Number of deer wintering areas crossed by ROW	2	1	2	1	
Area of deer wintering areas crossed by ROW (acres)	7.3	5.8	6.5	7.6	
Waterfowl and wading bird habitats crossed by ROW (acres)	133	113	93	148	
Aquatic biota	No adverse impacts on aquatic biota expected because of mitigation measures that would minimize the potential for erosion and sedimentation, stream warming, and chemical contamination (herbicides and fuel).				
Wetlands					
Number of NWI wetlands crossed by ROW	188	184	193	319	
Area of NWI wetlands crossed by ROW (acres)	133	108	152	173	
Length of NWI wetlands crossed by ROW (mi)	7.7	6.6	8.2	11.6	

TABLE S-4 (Cont.)

Resource Area (EIS Impact Analysis Section Number)	Modified Consolidated Corridors Route (Preferred Alternative)	Consolidated Corridors Route Alternative	Previously Permitted Route (No Action Alternative)	MEPCO South Route Alternative	Recission of Presidential Permit Alternative
Ecological Resources (4.5) (Cont.)					
Number of wetland crossings for new temporary access roads	0	0	2	11	
Forested wetlands converted to scrub-shrub or emergent wetlands in ROW (acres)	70	53	103	73	
Forested wetlands converted to scrub-shrub or emergent wetlands for new temporary access roads (acres)	0	0	0	0.6	
Special status species	Impacts are not expected to produce population-level effects that are distinguishable from natural variations in numbers or caused from ongoing perturbations (such as commercial forestry operations). Mitigation measures would protect special status species.				
Number of EFH water bodies crossed by ROW	67	66	65	66	
Forested land converted to scrub-shrub land within 150 ft of EFH water bodies (acres)	82	89	92	65	
Number of Atlantic salmon distinct-population-segment water bodies crossed by ROW	31	32	27	0	
Number of Atlantic salmon streams of special concern crossed by ROW	9	9	9	0	

TABLE S-4 (Cont.)

Resource Area (EIS Impact Analysis Section Number)	Modified Consolidated Corridors Route (Preferred Alternative)	Consolidated Corridors Route Alternative	Previously Permitted Route (No Action Alternative)	MEPCO South Route Alternative	Recission of Presidential Permit Alternative
Ecological Resources (4.5) (Cont.)					
Number of shortnose sturgeon habitats crossed by ROW	0	0	0	2	
Number of known bald eagle essential habitats crossed by ROW	0	0	0	1	
Cultural Resources (4.6)					
Potential for impacts on cultural resources	No impacts expected.	Impacts possible, but unlikely.	Impacts possible, but unlikely.	Impacts probable; Penobscot River drainage identified as an area of high potential for containing significant archaeological material.	No impacts on cultural resources.
Historic archaeological resources (number of sites within ROW)	0	0	0	1	
Historic archaeological resources (number of sites within 1 mi of ROW)	8	8	8	10	
Prehistoric archaeological resources (number of sites within ROW)	4	5	4	12	
Prehistoric archaeological resources (number of sites within 1 mi of ROW)	30	31	28	46	
NRHP sites (number of sites within ROW)	0	0	0	0	

TABLE S-4 (Cont.)

Resource Area (EIS Impact Analysis Section Number)	Modified Consolidated Corridors Route (Preferred Alternative)	Consolidated Corridors Route Alternative	Previously Permitted Route (No Action Alternative)	MEPCO South Route Alternative	Recission of Presidential Permit Alternative
Cultural Resources (4.6) (Cont.)					
NRHP sites (number of sites within 1 mi of ROW)	0	0	0	1	
Significant sensitive soils within ROW (acres)	87	111	115	21	
Significant sensitive soils within 1 mi of ROW (acres)	2,843	3,496	3,334	1,763	
Number of locations possessing high and moderate archaeological sensitivity along each ROW	51	51	51	59	
Socioeconomics (4.7)					
Construction period	Socioeconomic impacts would be similar for these three alternative routes. The proposed project would result in the creation of approximately 120 direct (construction) jobs and approximately 110 indirect (service-related) jobs during construction. No influx of population or stress to community services would be expected.			The proposed project would result in the creation of approximately 150 direct and 130 indirect jobs during construction. No influx of population or stress to community services would be expected.	No socioeconomic impacts. Current socioeconomic trends would continue.
Operational period	No adverse socioeconomic impacts would be expected from project operation for any of the alternative routes.				

TABLE S-4 (Cont.)

Resource Area (EIS Impact Analysis Section Number)	Modified Consolidated Corridors Route (Preferred Alternative)	Consolidated Corridors Route Alternative	Previously Permitted Route (No Action Alternative)	MEPCO South Route Alternative	Recission of Presidential Permit Alternative
Environmental Justice Considerations (4.8)					
Project impacts	No disproportionately high and adverse impacts on minority or low-income populations.			One minority census block group occurs within the 2-mi zone along the route. No disproportionately high and adverse impacts on minority or low-income populations.	Existing conditions would continue. No disproportionately high and adverse impacts on minority or low-income populations.
Native American lands crossed by ROW (acres)	0	0	0	4	
Visual Resources (4.9)					
Visual impacts	Visual impacts would occur from the introduction of support structures and transmission line wires into the landscape. Substation expansions would have negligible visual impact given that similar equipment already exists on site and because of existing development in the area of the substations.				The existing landscape and scenic integrity would continue.
Number of Outstanding River Segments crossed by ROW	2	2	2	0	
Health and Safety (4.10)					
Electric shocks	Industrywide standards are in place to eliminate or greatly reduce the potential for electric shocks for all alternative routes. AC mitigation would be required to reduce shock hazards for the M&N gas pipeline.				No health and safety impacts. EMF exposure from existing transmission lines and household appliances would continue. Current noise patterns would continue. No fatalities or injuries from construction or maintenance activities.
EMF effects	EMF exposure at the nearest residences would mostly be below the average daily exposure to maximum magnetic fields from common household appliances. Electric field exposures at the edge of the ROW would be below guidelines that have been established for several states. No health effects would be expected from this exposure.				
Noise effects	The primary effect of noise would be annoyance to the residents and recreationists nearest to the ROW during construction, and this impact would be short term. Long-term noise from corona effect on transmission lines would be generally lost in background noise. Noise from maintenance activities (such as tree trimming with chainsaws) would be localized, short lived, and infrequent.				

TABLE S-4 (Cont.)

Resource Area (EIS Impact Analysis Section Number)	Modified Consolidated Corridors Route (Preferred Alternative)	Consolidated Corridors Route Alternative	Previously Permitted Route (No Action Alternative)	MEPCO South Route Alternative	Recission of Presidential Permit Alternative
Health and Safety (4.10) (Cont.)					
Cardiac pacemaker and radio/television interference	The potential risk to people with pacemakers and the potential for radio and television interference would be negligible for all alternative routes. What little potential there is would be slightly greater for the MEPCO South Route because it has more dwellings within 100 ft of the ROW and has more highway crossings than the other alternative routes.				
Herbicide use	The potential human health risks from herbicide usage would be negligible for all alternative routes because of regulations and standard mitigation practices associated with the use of these products.				
Project-related fatalities and injuries	The potential risk of occupational physical injuries or fatalities to construction and maintenance workers would be small (i.e., <1 death and <10 nonfatal injuries from construction and <0.1 death and <6 nonfatal injuries from maintenance). The potential risk of physical injuries or fatalities to the general public would be small and would primarily occur from indirect impacts such as snowmobile or ATV accidents while using the ROW.				

[a] Abbreviations: AC = alternating current, ATV = all-terrain vehicle, BHE = Bangor Hydro-Electric Company, EFH = essential fish habitat, EMEC = Eastern Maine Electric Cooperative, EPA = U.S. Environmental Protection Agency, MEPCO = Maine Electric Power Company, M&N = Maritimes & Northeast Pipeline, L.L.C., NAAQS = National Ambient Air Quality Standards, NRHP = *National Register of Historic Places*, NWI = National Wetlands Inventory, ppb = part(s) per billion, ROW = right-of-way.

[b] To convert miles to kilometers, multiply by 1.609; to convert acres to hectares, multiply by 0.405; to convert feet to meters, multiply by 0.305.

[c] Total area was determined by multiplying ROW length by ROW width on the basis of the following assumptions: (1) width of new ROW would be 170 ft; (2) width of ROW when adjacent to existing transmission line would be 100 ft; (3) width of ROW when adjacent to M&N gas pipeline and a transmission line would be 125 ft; and (4) width of ROW when adjacent to M&N gas pipeline and/or Stud Mill Road would be 155 ft.

[d] Installation of AC mitigation over the M&N gas pipeline is a connected action to the proposed project.

1 INTRODUCTION

> **Bangor Hydro-Electric Company (BHE)**
>
> BHE is an electric utility wholly owned by Emera, Inc. BHE serves a population of 192,000 in eastern and east-coastal Maine and provides electricity transmission and distribution service to 107,000 customers. BHE is a member of the New England Power Pool (NEPOOL) and is interconnected with other New England utilities to the south and with New Brunswick Power Corp. (NB Power) to the north. The BHE Web site is located at http://www.bhe.com.

Executive Order (E.O.) 10485 (September 9, 1953), as amended by E.O. 12038 (February 3, 1978), requires that a Presidential permit be issued by the U.S. Department of Energy (DOE) before electric transmission facilities may be constructed, operated, maintained, or connected at the U.S. international border. Bangor Hydro-Electric Company (BHE) has applied to DOE to amend Presidential Permit PP-89, which authorizes BHE to construct a single-circuit, 345,000-volt (345-kV) alternating-current (AC) electric transmission line across the U.S. international border in the vicinity of Baileyville, Maine.

The proposed transmission line would originate at the existing Orrington Substation, located in Orrington, Maine, and extend eastward to the international border between the United States and Canada near Baileyville, Maine, where it would connect with a transmission line to be constructed, operated, and maintained by New Brunswick Power Corporation (NB Power). DOE has determined that an amendment to the Presidential permit would constitute a major Federal action that may have a significant impact on the environment within the meaning of the National Environmental Policy Act of 1969 (NEPA). For this reason, DOE has prepared this environmental impact statement (EIS) to address potential environmental impacts from the proposed action and the range of reasonable alternatives.

1.1 BACKGROUND

In 1970, Maine Electric Power Company (MEPCO), a partnership of Central Maine Power Company, Maine Public Service Company, and BHE, placed in service a 345-kV transmission interconnection with NB Power. The BHE system now comprises about 600 mi (966 km) of transmission line corridors, including the MEPCO 106-mi (171-km) 345-kV transmission line that interconnects the Orrington Substation with NB Power’s system and that crosses the border near Orient, Maine.

On December 16, 1988, BHE applied to DOE for a Presidential permit to construct and operate a second 345-kV transmission line to New Brunswick, Canada, that would extend eastward 84 mi (135 km) from the Orrington Substation to the U.S.-Canada border near Baileyville, Maine. The route was referred to as the Stud Mill Road Route. At the border, the proposed transmission line was to connect with a transmission line to be built, operated, and owned by NB Power. DOE published a notice of that application in the *Federal Register* on January 19, 1989 (Volume 54, page 2201 [54 FR 2201]), and a “Notice of Intent to Prepare an

Environmental Impact Statement and to Conduct Public Scoping Meetings" in the *Federal Register* on May 22, 1989 (54 FR 22006). DOE decided to grant Presidential Permit PP-89 in August 1995, DOE published an EIS titled *Construction and Operation of the Proposed Bangor Hydro-Electric Company's Second 345-kV Transmission Tie Line to New Brunswick* (DOE 1995). DOE decided to grant Presidential Permit PP-89 in a Record of Decision (ROD) signed on January 18, 1996 (62 FR 2244), and issued the Permit on January 22, 1996.

In addition to the Presidential permit, the BHE transmission line required regulatory approval from the State of Maine. BHE received its original State permit for the Stud Mill Road Route in 1992 and was granted State permit extensions in 1994 and 1996. In 1999, a natural gas transmission line was constructed by Maritimes & Northeast Pipeline, L.L.C. (M&N) in the same general vicinity of Stud Mill Road and BHE's approved electric transmission line route. In 2001, BHE requested a third State permit extension. The Maine Board of Environmental Protection (MBEP), Maine's primary environmental review entity, conducted a public hearing process and indicated, in a draft order, a preference for BHE to use a route different from the Stud Mill Road Route, one that would be more closely consolidated with established linear corridors. This order was never finalized because BHE withdrew the request for an extension of the State permit. On May 10, 2005, BHE applied to the Maine Department of Environmental Protection (MDEP) for new permits under the Site Location of Development Act, the Natural Resources Protection Act, and Section 401 of the Clean Water Act (CWA).

On September 30, 2003, BHE applied to DOE to amend Presidential Permit PP-89 for a modification of the previously authorized

Northeast Reliability Interconnect Project Time Line

- 1970: MEPCO and BHE placed in service a 106-mi (171-km)-long 345-kV interconnection with NB Power.
- December 1988: BHE applied to DOE for a second 345-kV line from the Orrington Substation to the U.S.-Canada border near Baileyville, Maine.
- 1992: BHE received the State permit for the proposed line referred to as the "Stud Mill Road Route."
- December 1993: DOE published a draft EIS for the proposed line.
- 1994: The State granted a permit extension.
- August 1995: DOE issued the final EIS for the proposed line.
- January 1996: DOE issued a ROD and Presidential Permit PP-89 for the proposed line.
- 1996: The State granted a second permit extension.
- 1999: The M&N natural gas pipeline was built near Stud Mill Road.
- 2001: BHE requested a third State permit extension; request subsequently withdrawn.
- September 2003: BHE applied to DOE to amend PP-89.
- November 2, 2004: DOE published a Notice of Intent to conduct an EIS for the proposed PP-89 amendments.
- November 17–18, 2004: DOE held scoping meetings in Maine for the EIS.
- May 10, 2005: BHE applied for a new State permit.
- August 2005: DOE issued a draft EIS for PP-89 amendments (this document).

transmission line route (Devine Tarbell & Associates, Inc. 2003).[1] DOE published a notice of that application in the *Federal Register* on October 29, 2003 (68 FR 61659). The proposed transmission line project (now referred to as the Northeast Reliability Interconnect [NRI]) that is the subject of this EIS differs from the original project in the proposed route between the Orrington Substation and the international border crossing near Baileyville, Maine. This proposed project also differs from any of the routes analyzed in the 1995 EIS. In the United States, the applicant's preferred transmission line route (referred to as the Modified Consolidated Corridors Route) would be about 85 mi (137 km) long. Figure 1.1-1 shows the locations of the Modified Consolidated Corridors Route (the proposed route), the Previously Permitted Route (the Stud Mill Road Route), the existing MEPCO 345-kV transmission line, and substations that would need to be modified. In Canada, the NB Power transmission line would continue for almost 60 mi (96.6 km) to the substation at the Point Lepreau Nuclear Generating Station via Keswick, a town north of Fredericton.

1.2 PURPOSE AND NEED

1.2.1 DOE's Purpose and Need

The purpose and need for DOE's action is to respond to BHE's request to amend Presidential Permit PP-89. DOE may issue or amend a Presidential permit if it determines that the action is in the public interest and after obtaining favorable recommendations from the U.S. Departments of State and Defense. In determining whether issuance or amendment of a permit for a proposed action is in the public interest, DOE considers the environmental impacts of the proposed project pursuant to NEPA, the project's impact on electric reliability by ascertaining whether the proposed project would adversely affect the operation of the U.S. electric power supply system under normal and contingency conditions, and any other factors that DOE may consider relevant to the public interest.

If DOE determines that granting or amending a Presidential permit would be in the public interest, the information contained in the EIS would provide a basis upon which DOE would decide which alternative(s) should be implemented and which mitigation measures, if any, would be appropriate for inclusion as a condition of the permit. A decision, in the form of a ROD, can be issued no sooner than 30 days subsequent to the U.S. Environmental Protection Agency's (EPA's) publication of a "Notice of Availability of the Final EIS" in the *Federal Register*. The issuance of the Presidential permit or permit amendment would occur simultaneously with or subsequent to the ROD.

Because the proposed project also would involve the export of electric energy from the United States, BHE must obtain a separate electricity export authorization from DOE under

[1] The application to DOE to amend Presidential Permit PP-89 did not specify a preferred route; however, BHE subsequently advised DOE of its selection of the Modified Consolidated Corridors Route as the applicant's preferred route.

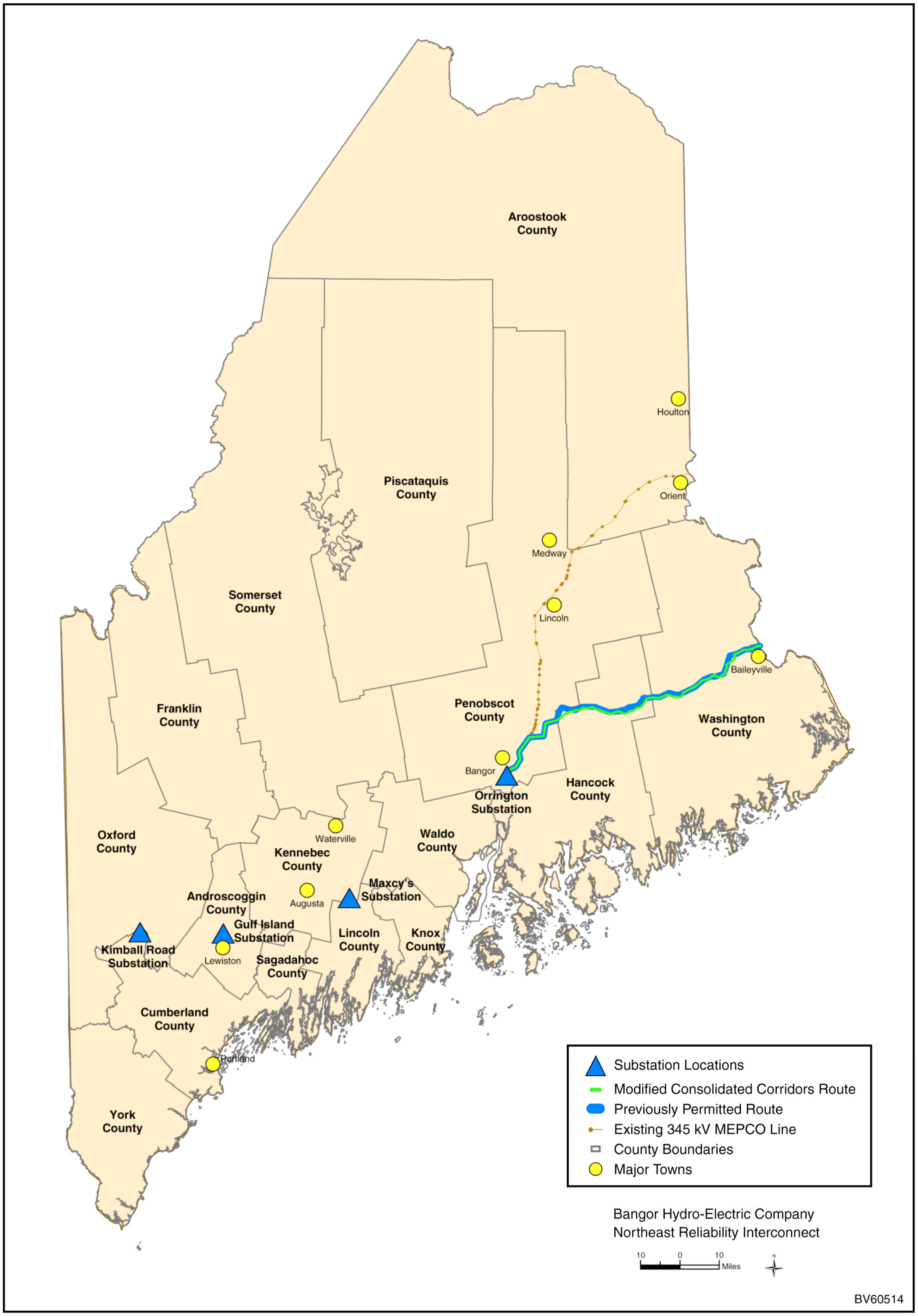

FIGURE 1.1-1 Locations of the Modified Consolidated Corridors Route, Previously Permitted Route, Existing MEPCO 345-kV Transmission Line, and Substations That Would Require Modification

Section 202(e) of the Federal Power Act before it could export electricity to Canada over the proposed 345-kV transmission line. DOE may authorize electricity exports to a foreign country if it determines that the proposed export would not impair the sufficiency of electric power within the United States and that it would not impede, or tend to impede, the coordination of regional transmission facilities. DOE also must comply with NEPA prior to authorizing electricity exports. Therefore, this EIS also will serve to satisfy DOE's NEPA responsibilities in determining whether to authorize exports over the proposed international transmission line.

1.2.2 Applicant's Purpose and Need

The following material reflects the views of the applicant regarding the merits of the proposed project:

BHE's stated purpose for the NRI is to improve the reliability and stability of the bulk electric transmission system of both the Maritimes area of Canada (New Brunswick, Nova Scotia, and Prince Edward Island) and New England, increase the import-export transmission capacity between Maine and New Brunswick, and reduce costly line losses.

> **About Reliability**
>
> Transmission system reliability incorporates dependability and security. Dependability relates to the continuity of electricity to customers. In the event of equipment failure, system security ensures that system failures are localized and that significant long-term damage is minimized (Central Maine Power 2005).

> **Independent System Operator New England (ISO NE)**
>
> Maine's bulk electrical system is operated by ISO NE, the not-for-profit corporation responsible for day-to-day reliable operation of New England's bulk power generation and transmission system. ISO NE is the Regional Transmission Operator. ISO NE is also responsible for the oversight and fair management of the region's wholesale electricity marketplace, as well as a comprehensive regional bulk power system planning process. The Northeast Reliability Interconnect (NRI) is included in ISO NE's Regional Transmission Expansion Plan, which includes projects that have been approved by ISO NE and New England Power Pool (NEPOOL) stakeholders as the priorities for maintaining system reliability.

The NRI would increase the north-to-south (New Brunswick to Maine) transfer capacity by 300 megawatts (MW) (700-MW capacity exists currently). The NRI also would increase a south-to-north (Maine to New Brunswick) transfer capacity to 400 MW on a more consistent basis than provided by the existing single tie-line. The transfer capacity of the present single tie-line to export power from Maine to New Brunswick ranges from zero to 150 MW, depending upon specific system conditions, including which generation units are in use. The NRI would thus enhance the sharing of generation capacity between the Maritimes and New England, thereby reducing reserve generation requirements, increasing the reliability of the overall transmission system, and allowing for expanded exports of energy to the Maritimes from the New England Power Pool (NEPOOL). This also would allow for long-term contracts for export energy and may allow utilities that are not directly connected to the U.S. electric grid (e.g., Eastern Maine Electric Cooperative [EMEC]) access to market-based power. The opportunity for NEPOOL to export power would most likely occur in the winter months during the Maritimes' period of peak demand. During

New England's peak summer use, Canada has surplus generating capacity that could be sold in the New England market. Increased trading of power would help balance supply with demand and increase the reliability of bulk electric transmission.

The proposed transmission line also would reduce transmission line losses in the overall regional system. Transmission line loss is electrical energy lost through heat as electricity flows through a wire. Such losses are inefficient and require production of more electricity to compensate for line losses. Line losses increase with distance and the amount of power sent through a line.

1.3 PUBLIC PARTICIPATION AND THE NEPA PROCESS

1.3.1 Cooperating Agencies

In accordance with the regulations implementing the procedural provisions of NEPA, specifically the *Code of Federal Regulations*, Title 40, Part 1501.6 (40 CFR 1501.6), DOE invites an agency to participate in the preparation of an EIS, either as a contributor in its area of expertise or as a cooperating agency, to ensure that any jurisdiction it may have by law will be adequately addressed in the document. The U.S. Department of the Interior’s U.S. Fish and Wildlife Service (USFWS) and the U.S. Department of Commerce National Oceanic and Atmospheric Administration’s National Marine Fisheries Service (NOAA Fisheries) are cooperating agencies in DOE’s EIS preparation but have no decisions to make based on it.

1.3.2 Public Scoping

DOE issued the “Notice of Intent to Prepare an Environmental Impact Statement and to Conduct Public Scoping Meetings and Notice of Floodplain and Wetlands Involvement; Bangor Hydro-Electric Company” in the *Federal Register* on November 2, 2004 (69 FR 63514). DOE also placed announcements in local newspapers. A project Web site maintained for DOE by Argonne National Laboratory (ANL) provides background information on the proposed project, including DOE’s NEPA process (http://web.ead.anl.gov/interconnecteis). This site is regularly updated as the preparation of the EIS progresses. DOE planned three public scoping meetings at Maine locations on November 17 (Baileyville) and November 18 (Lincoln and Brewer), 2004. No members of the public attended the Lincoln meeting; thus, no official records or transcript were made. Transcripts of the Baileyville and Brewer meetings are available at the Web site referenced above. In all, three individuals presented oral comments at the two public scoping meetings.

DOE also solicited written and electronic comments on the scope of the EIS in the Notice of Intent, at the scoping meetings, and electronically through the Web site. Three submissions of written comments were received during the scoping period, which closed on December 2, 2004.

The following issues were raised and are addressed in this EIS:

- The EIS should evaluate the impact of the project on bald eagles (*Haliaeetus leucocephalus*) that nest or feed within the general vicinity of the proposed transmission line corridor.

- The EIS should evaluate impacts on fish habitats, particularly identified Atlantic salmon (*Salmo salar*) streams and other water bodies that provide appropriate habitat that is or could be used by the Atlantic salmon, including impacts from transmission line construction, installation of AC mitigation for the M&N gas pipeline, and removal of forest vegetation where corridors cross streams.

- The EIS should carefully consider the temporary and permanent impacts of the proposed project on wildlife habitats, including impacts of habitat alteration and fragmentation, particularly on sensitive forest-interior bird species, and the effects of noise and disturbance, particularly on nesting birds in wetland areas.

In addition, commentors stated that the NRI would provide socioeconomic benefits to eastern Maine and the region (New England); for example, it would foster new business development and expansion in eastern Maine.

1.3.3 Issues outside the Scope of the EIS

Impacts of the Canadian transmission line that would connect to the NRI are outside the scope of this EIS. NEPA does not require an analysis of environmental impacts that occur within another sovereign nation that result from actions approved by that sovereign nation. E.O. 12114 was issued on January 9, 1979 (44 FR 1957). The E.O. requires Federal agencies to prepare an analysis of significant impacts from a Federal action in certain defined circumstances and exempts agencies from preparing analyses in others. The E.O. does not require Federal agencies to evaluate impacts outside the United States when the foreign nation is participating with the United States or is otherwise involved in the action (Section 2-3[b]).

In addition, the proposed Federal action is not an action that, for purposes of E.O. 12114, would require analysis of impacts outside the United States, as it would not affect the global commons (e.g., outer space or Antarctica); would not produce a product, emission, or effluent that is “prohibited or strictly regulated by Federal law in the United States because its toxic effects on the environment create a serious public health risk,” or which involves regulated or prohibited radioactive materials; and would not significantly affect natural or ecological resources of global importance designated for protection under Executive Order by the President.

The Federal action evaluated in this EIS is only to permit the transmission line to cross the U.S. border. Limiting NEPA reviews to the U.S. portion of the transmission line interconnection (1) is consistent with applicable Federal laws, including the generally held legal presumption that Acts of Congress do not ordinarily apply outside U.S. borders; (2) avoids the appearance of the assertion of extraterritorial control over actions that were approved by and occur within the lands of another sovereign nation; and (3) prevents interference in the foreign relations of the United States. The scope of the NEPA review is particularly appropriate here, because the transmission line to be built in New Brunswick has both been reviewed for the environmental impacts of the project and has been approved by Canada (the foreign sovereign).

Other topics outside the scope of this EIS are as follows:

- The development of emergency outage response plans, which is the purview of local public safety officials.

- The proposed transmission line presents no greater target for terrorists than any other high-voltage transmission line in the United States. Therefore, homeland security issues are not addressed in this EIS. A good general discussion of this subject can be found at http://www.globalsecurity.org/security/intro/power.htm and at http://www.globalsecurity.org/security/library/congress/2003_h/030904-gilbert.htm.

NB Power prepared an environmental impact assessment (EIA), a supplemental information report, and a comprehensive study report on the potential impacts of the proposed Canadian portion of the transmission line interconnection (AMEC 2001a,b; 2002). The Canadian EIA is equivalent to an EIS prepared under NEPA for a U.S. project and is subject to review by various provincial and Federal agencies in Canada, as well as by the public. The entire document can be found on the Web at http://transmission.nbpower.com/en/regulatory/EIA.html. The New Brunswick transmission line project has been approved and licensed by the National Energy Board of Canada (NEB 2003). For details, see http://transmission.nbpower.com/en/intlpowerline/nebipldec.pdf.

1.4 ORGANIZATION OF THIS ENVIRONMENTAL IMPACT STATEMENT

This NRI Draft EIS is organized as follows:

- Chapter 1 provides background information, the purpose of and need for the DOE and applicant actions, public scoping issues, issues outside the scope of the EIS, and EIS organization.

- Chapter 2 describes the alternatives considered in the EIS and common features of transmission line design and construction. Chapter 2 also provides a summary comparison of the environmental impacts of the alternatives and discusses measures to mitigate potential impacts.

- Chapter 3 describes the environment potentially affected by the proposed action.

- Chapter 4 discusses the potential environmental impacts of the alternatives (four alternative routes and the rescission of the Presidential permit).

- Chapter 5 identifies the unavoidable adverse impacts associated with the alternatives.

- Chapter 6 discusses significant irreversible and irretrievable commitments of natural and man-made resources.

- Chapter 7 discusses the relationship between short-term use of the environment and long-term productivity.

- Chapter 8 discusses the potential cumulative impacts of the alternatives.

- Chapter 9 identifies the major laws, regulations, and other requirements applicable to the project.

- Chapter 10 provides a list of agencies and individuals contacted during preparation of this EIS.

- Chapter 11 is an alphabetical listing of the references cited in the main text of the EIS.

- Chapter 12 lists the name, education, and experience of persons who helped to prepare the EIS. Also included are the subject areas for which each preparer was responsible.

- Chapter 13 presents a glossary of the technical terminology used in the EIS.

- Chapter 14 is a subject matter index that provides the page numbers where important terms and concepts are discussed.

- Appendix A contains copies of consultation letters regarding the preparation of this EIS that were sent to and received from Federal and State agencies and Tribes.

- Appendix B provides detailed maps showing the alternative routes and significant wildlife habitats.

- Appendix C provides supplemental hydrological information (e.g., a listing of the streams and rivers crossed by the alternative routes and lakes that occur within 1 mi [1.6 km] of the alternative routes).

- Appendix D provides a qualitative assessment of impacts on vertebrate species that occur in the project area.

- Appendix E provides the wetland and floodplain assessment.
- Appendix F provides the biological assessment for the bald eagle and Atlantic salmon.
- Appendix G provides the essential fish habitat assessment.
- Appendix H provides supplemental visual resources information (e.g., photographs and photosimulations).
- Appendix I contains the distribution list for this EIS.
- Appendix J provides the contractor disclosure statement.

2 PROPOSED ACTION AND ALTERNATIVES

This chapter describes the proposed action and the five alternatives that are analyzed in the EIS. It also describes other alternatives (two alternative routes and alternative technologies) that were considered but dismissed from detailed analysis. Descriptions of transmission line specifications; construction, operation, and maintenance activities; and schedule and mitigation common to all construction alternatives are also provided.

The five alternatives analyzed in this EIS are as follows:

1. Modified Consolidated Corridors Route,

2. Consolidated Corridors Route,

3. Previously Permitted Route (No Action),

4. MEPCO South Route, and

5. Rescission of the Presidential Permit PP-89.

These alternatives are described in more detail in Section 2.1. The first four are route alternatives (including the No Action Alternative) and could result in construction of the 345-kV transmission line. The rescission alternative could not result in construction of the line along any route. A summary comparison of the impacts of these analyzed alternatives is provided in Section 2.5.

DOE's proposed action is to grant the amendment to Presidential Permit PP-89 for construction of the line along the Modified Consolidated Corridors Route. This is the applicant's and DOE's preferred alternative. DOE could choose, however, to grant an amendment to PP-89 for any one, two, or three of the new routes (Modified Consolidated Corridors Route, Consolidated Corridors Route, and MEPCO South Route).

If DOE were to deny an amendment to the Presidential Permit, PP-89 would remain in effect and a transmission line could be constructed along the Previously Permitted Route, as analyzed under the Previously Permitted Route Alternative (equivalent to "No Action" on the part of the Department).

If DOE were to both deny the amendment to the Presidential Permit and rescind PP-89, no transmission line as proposed could be built.

2.1 ALTERNATIVES ANALYZED

2.1.1 Alternative Routes

Alternative routes between the two desired connection points are considered by the applicant for the purpose of selecting the transmission line corridor that is best, that is, that holistically optimizes considerations of impacts, practicality, viability, economics, reliability, etc. The four route alternatives presented in this EIS reflect the outcome of the applicant's selection process.

The four alternative routes, including the applicant's preferred transmission line route, are evaluated in detail in this EIS for their environmental impacts: (1) Alternative One, the Modified Consolidated Corridors Route, the proposed action and the applicant's and DOE's preferred route; (2) Alternative Two, the Consolidated Corridors Route; (3) Alternative Three, the Previously Permitted Route, also considered the No Action Alternative; and (4) Alternative Four, the MEPCO South Route (Figure 2.1-1). All of these routes have the same beginning and end points, namely the Orrington Substation and the crossing of the St. Croix River near Baileyville. Also, the initial 12.2 mi (19.6 km) from the Orrington Substation would be identical for all four routes (Figure 2.1-2). The applicant (BHE 2004) considered a number of factors when evaluating alternative routes, including concerns expressed by State and local authorities, local zoning and planning regulations, cost and engineering criteria, and environmental and land use considerations. Through its stakeholder outreach process, the applicant solicited and considered public comment regarding all of the route alternatives. DOE conducted public scoping meetings as described previously. The scoping process was designed to solicit concerns and suggestions from property owners, local residents, government agencies, Indian tribes, public interest groups, and other stakeholders. DOE has reviewed the methodology and rationale employed in the applicant's evaluation and, on the basis of that review, concludes that the alternative routes identified by the applicant are an acceptable range of reasonable alternatives.

2.1.1.1 Alternative One: Modified Consolidated Corridors Route (Preferred Alternative)

From the Orrington Substation, the Modified Consolidated Corridors Route would parallel the existing 345-kV MEPCO transmission line to Blackman Stream in Bradley (Figure 2.1-2). The Modified Consolidated Corridors Route would then proceed northeast within a new corridor until meeting Stud Mill Road and the M&N gas pipeline right-of-way (ROW); it would then proceed east-northeast, generally paralleling the M&N gas pipeline and Stud Mill Road to the international border near Baileyville, Maine (Figures 2.1-2 and 2.1-3). The Modified Consolidated Corridors Route would cross 3 counties and 17 municipalities or townships (Table 2.1-1). The total distance of the Modified Consolidated Corridors Route would be about 85 mi (137 km) and would consist of 15 mi (24 km) of new ROW, 58 mi (93 km) adjacent to the M&N gas pipeline and/or Stud Mill Road, and 12 mi (19 km) adjacent to the existing MEPCO

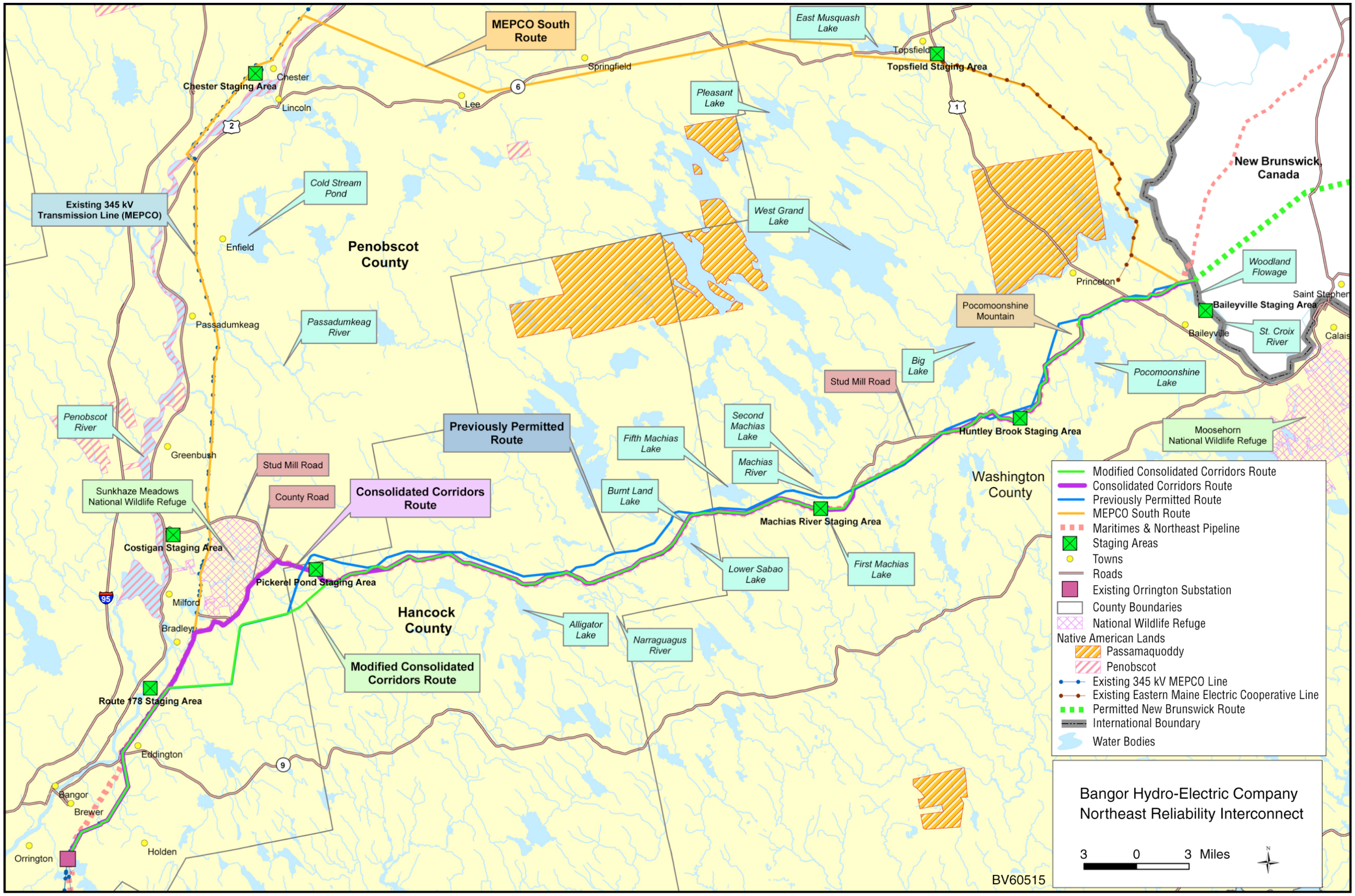

FIGURE 2.1-1 Alternative Route and Staging Area Locations (Source: Paquette 2005kk)

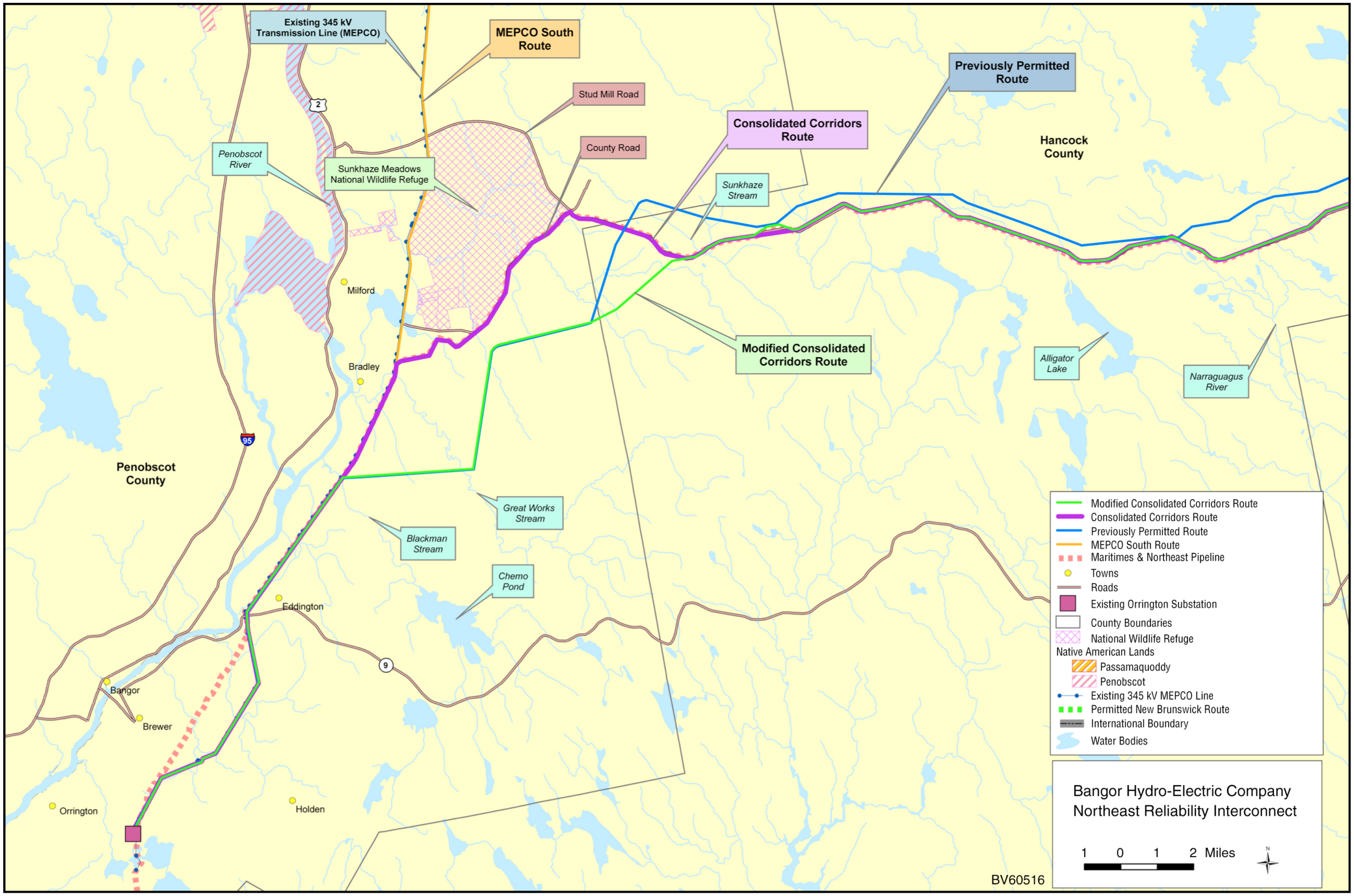

FIGURE 2.1-2 Location Where the Alternative Routes Initially Diverge (Source: Paquette 2005kk)

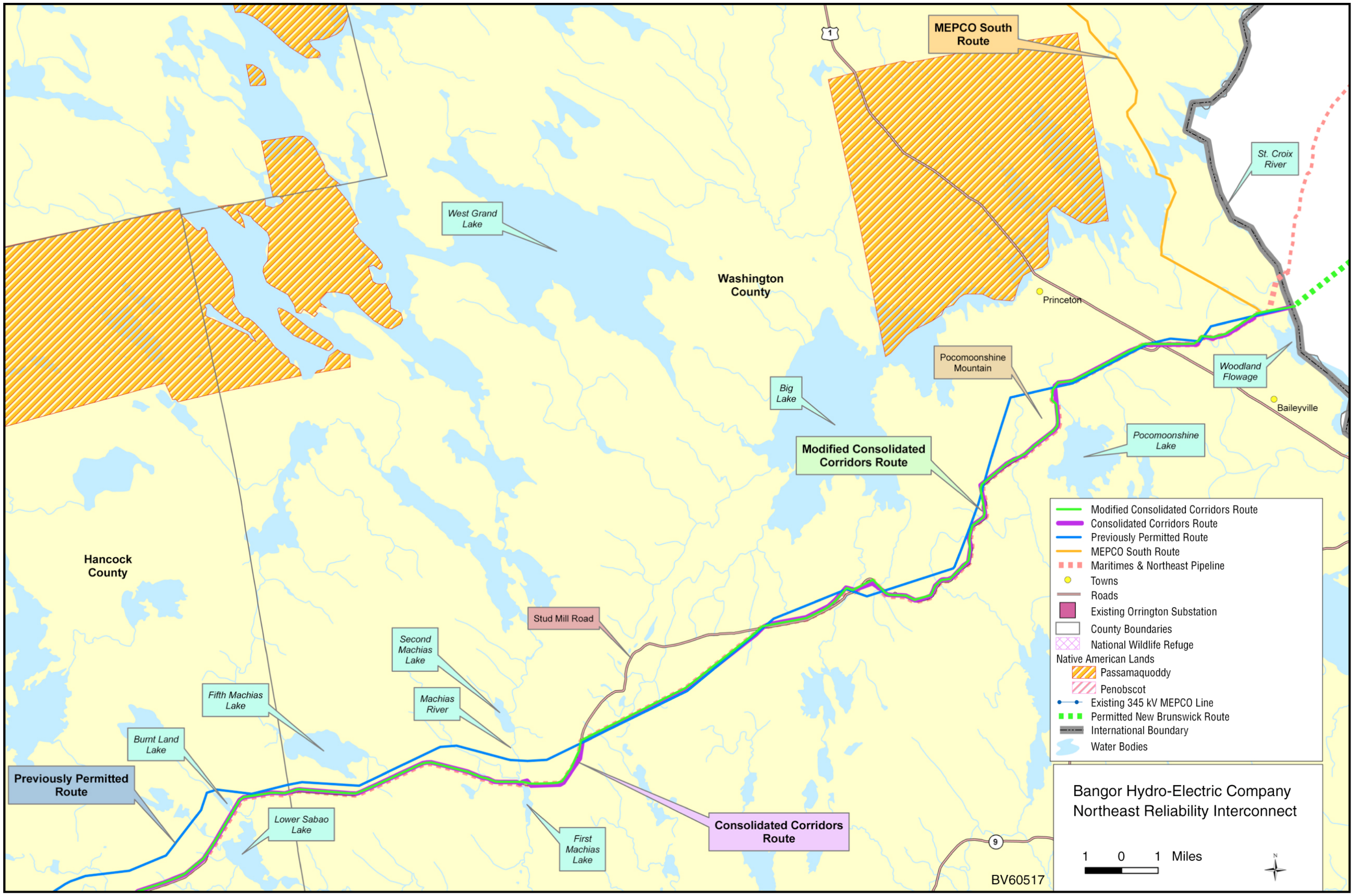

FIGURE 2.1-3 Location of the Alternative Routes within Washington County (Source: Paquette 2005kk)

TABLE 2.1-1 Counties and Municipalities Traversed by the Previously Permitted, Consolidated Corridors, and Modified Consolidated Corridors Routes

County	Municipality[a]	Type of Municipality[b]
Penobscot	Orrington	Town
	Brewer	City
	Holden	Town
	Eddington	Town
	Bradley	Town
	Milford	Town
	Greenfield	Town
Hancock	T32 MD	Unorganized township
	Great Pond	Town
	T34 MD	Unorganized township
	T35 MD	Unorganized township
Washington	T36 MD	Unorganized township
	T37 MD	Unorganized township
	T27 ED	Unorganized township
	Township No. 21	Unorganized township
	Princeton	Town
	Baileyville	Town

[a] ED = Eastern Division; MD = Middle Division; T = Township.

[b] Unorganized townships are not "municipalities" under Maine law. They have been referred to as such in this EIS, however, for convenience.

Source: DeLorme (2004).

345-kV transmission line (including portions that are co-located with the M&N gas pipeline and/or other transmission lines). Figure B.1-1 (Appendix B) provides a detailed map of the Modified Consolidated Corridors Route.

2.1.1.2 Alternative Two: Consolidated Corridors Route

The Consolidated Corridors Route would be similar to the Modified Consolidated Corridors Route, except where the Modified Consolidated Corridors Route deviates from it in two locations (Figures 2.1-2, 2.1-4, and 2.1-5). The first and longest route deviation occurs between Blackman Stream and Stud Mill Road southeast of Pickerel Pond (Figure 2.1-4).[1] The

[1] This divergence between the Modified Consolidated Corridors and the Consolidated Corridors Routes is referred to as the "Pickerel Pond Reroute" because of the divergence ending just southeast of Pickerel Pond.

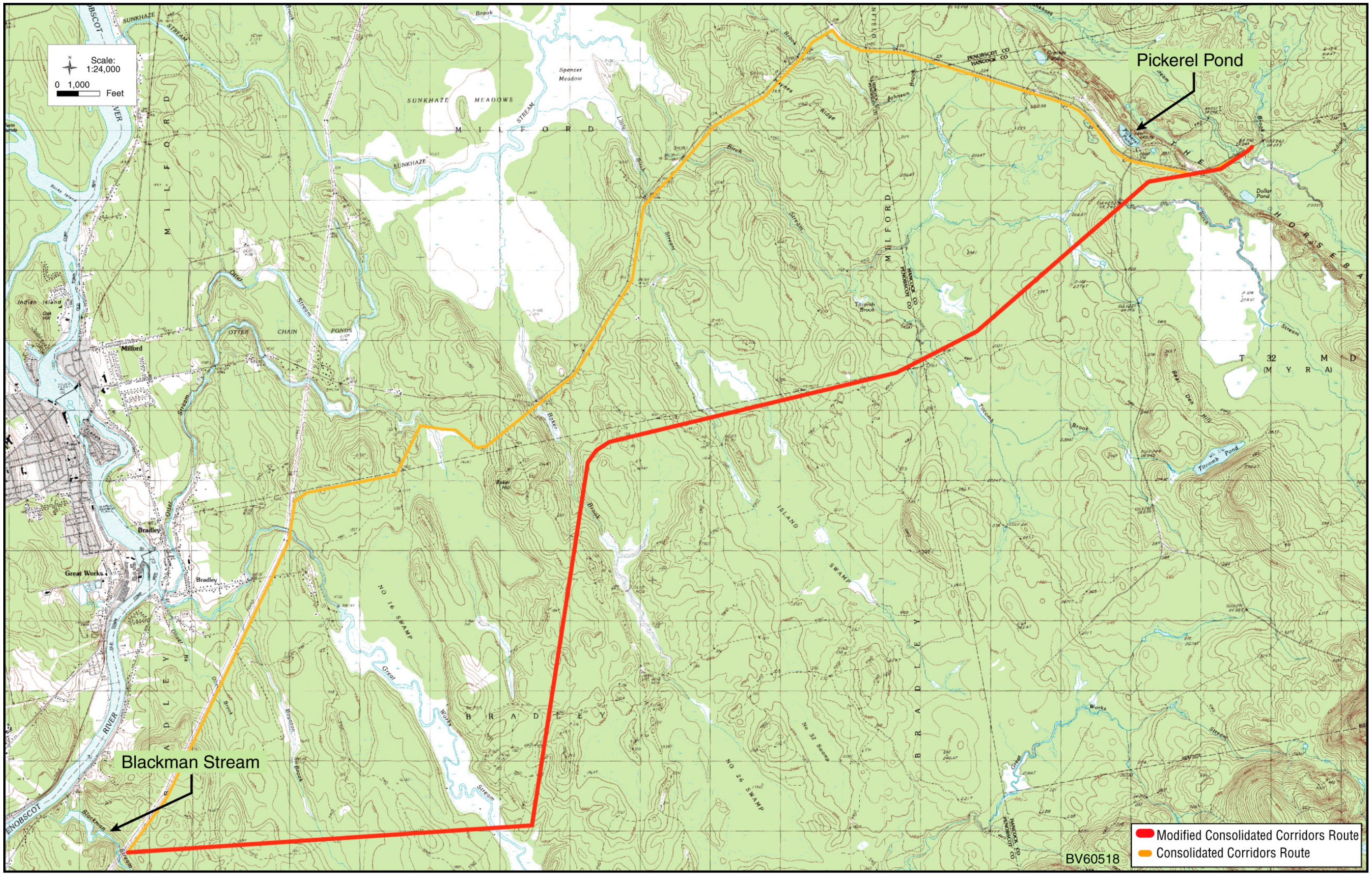

FIGURE 2.1-4 Modified Consolidated Corridors Route and Consolidated Corridors Route Divergence between Blackman Stream and the Pickerel Pond Area (Source: Paquette 2005e)

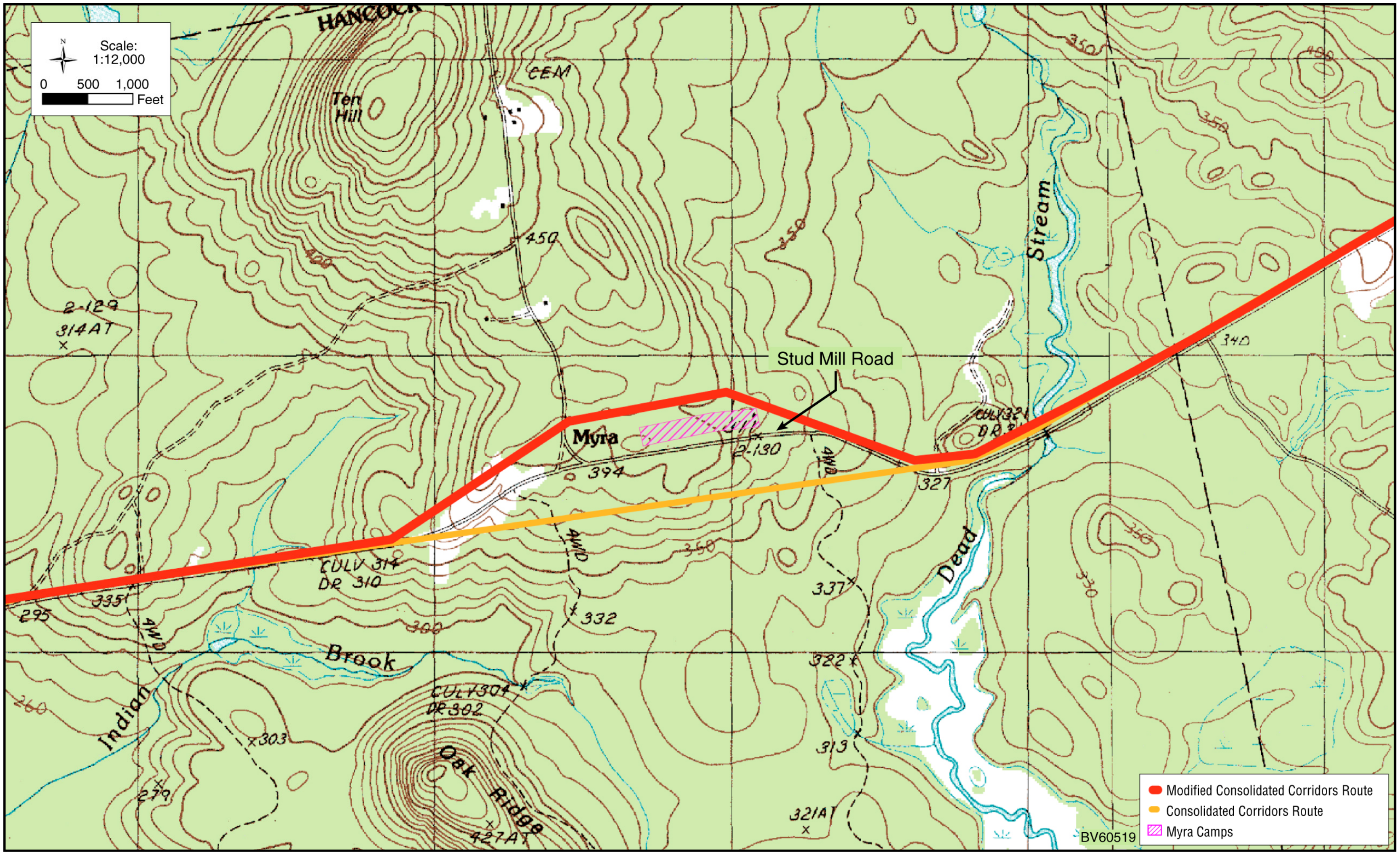

FIGURE 2.1-5 Modified Consolidated Corridors Route and Consolidated Corridors Route Divergence in the Area of Myra Camps (Source: Paquette 2005d)

second deviation occurs in the area of Myra Camps, just west of Dead Stream (Figure 2.1-5).[2] The Consolidated Corridors Route would pass around the south side of Myra Camps, whereas the Modified Consolidated Corridors Route would pass around the north side of Myra Camps. After this short deviation, the Consolidated Corridors Route and the Modified Consolidated Corridors Route would be identical to the international border near Baileyville, Maine. The Consolidated Corridors Route would cross the same counties and municipalities as the Modified Consolidated Corridors Route (Table 2.1-1). The Consolidated Corridors Route would traverse a total distance of about 85 mi (137 km) and would consist of 2 mi (3 km) of new ROW, 68 mi (109 km) adjacent to the M&N gas pipeline and/or Stud Mill Road, and 15 mi (24 km) adjacent to the existing MEPCO 345-kV transmission line (including portions that are co-located with the M&N gas pipeline and/or other transmission lines). Figure B.2-3 (Appendix B) provides a detailed map of the Consolidated Corridors Route where it differs from the Modified Consolidated Corridors Route.

2.1.1.3 Alternative Three: Previously Permitted Route (No Action)

The initial portion of the Previously Permitted Route from the Orrington Substation would be the same as the Modified Consolidated Corridors Route until it crosses the border between Penobscot and Hancock Counties (Figure 2.1-2). The Previously Permitted Route would then proceed to the east-northeast, generally paralleling the M&N gas pipeline and Stud Mill Road to the international border crossing near Baileyville, Maine (Figures 2.1-2 and 2.1-3). Although formerly known as the Stud Mill Road Route, the Previously Permitted Route would not be immediately adjacent to the road but would be separated by as much as 9,400 ft (2,865 m). The Previously Permitted Route would cross over Stud Mill Road 13 times, would parallel the road in several locations with about a 200-ft (61-m) separation, and would have an average separation of 2,500 ft (762 m). It would cross the same counties and municipalities as the Modified Consolidated Corridors Route (Table 2.1-1). The total distance of the Previously Permitted Route would be about 84 mi (135 km) and would consist of 62 mi (100 km) of new ROW, 10 mi (16 km) adjacent to the M&N gas pipeline and/or Stud Mill Road, and 12 mi (19 km) adjacent to the existing MEPCO 345-kV transmission line (including portions that are co-located with the M&N gas pipeline and/or other transmission lines). Figure B.3-1 (Appendix B) provides a detailed map of the Previously Permitted Route.

2.1.1.4 Alternative Four: MEPCO South Route

From the Orrington Substation, the MEPCO South Route would parallel the existing 345-kV transmission line to Chester, Maine (Figure 2.1-1). This route includes an initial crossing of the Penobscot River south of Lincoln. The route would then proceed southeast (recrossing the Penobscot River) to Route 6 east of Lee, Maine. The MEPCO South Route would then generally parallel, but not be co-located with, Route 6 until just west of Route 1 at Topsfield, Maine. The

[2] This divergence between the Modified Consolidated Corridors Route and the Consolidated Corridors Route is referred to as the “Myra Camps Reroute.”

route would then generally proceed southeast to the international border near Baileyville, Maine (Figure 2.1-1). The MEPCO South Route would cross 2 counties and 23 municipalities or townships (Table 2.1-2). The total distance of the MEPCO South Route would be about 114 mi (183 km) and would consist of 39 mi (63 km) of new ROW, 54 mi (87 km) adjacent to the existing MEPCO 345-kV transmission line (including portions that are co-located with the M&N gas pipeline and/or other transmission lines), and 21 mi (34 km) adjacent to an existing EMEC 69-kV transmission line (Figure 2.1-1). Figure B.4-1 (Appendix B) provides a detailed map of the MEPCO South Route.

TABLE 2.1-2 Counties and Municipalities Traversed by the MEPCO South Route

County	Municipality[a]	Type of Municipality[b]
Penobscot	Orrington	Town
	Brewer	City
	Holden	Town
	Eddington	Town
	Bradley	Town
	Milford	Town
	Greenbush	Town
	Passadumkeag	Town
	Enfield	Town
	Mattamiscontis Township	Township
	T2 R8 NWP	Unorganized township
	Chester	Town
	Lincoln	Town
	Winn	Town
	Lee	Town
	Springfield	Town
	Carroll Plantation	Town
Washington	Kossuth Township	Township
	Topsfield	Town
	Talmadge	Unorganized township
	Waite	Town
	Fowler Township	Township
	Baileyville	Town

[a] NWP = north of Waldo Patent; R = range; T = Township.

[b] Unorganized townships are not “municipalities” under Maine law. They have been referred to as such in this EIS, however, for convenience.

Source: DeLorme (2004).

2.1.2 Rescission of the Presidential Permit

Under the Rescission of the Presidential Permit Alternative, the presently permitted transmission line could not be constructed. Thus, it is reasonably foreseeable that the environmental status quo would continue and that there would be no environmental impacts related to the construction, operation, maintenance, and connection of a transmission line. It is possible, however, that BHE or another entity could take other actions to achieve the purpose of the proposed project if the currently permitted or proposed transmission line were not built. This EIS does not include speculation on other actions that could be taken in the event of a permit rescission, nor does it assess the impacts of those other actions.

2.2 ALTERNATIVES CONSIDERED BUT DISMISSED FROM DETAILED ANALYSIS

The applicant states that there is currently an excess generation capacity in Maine but a limited ability to move the energy to markets where it is needed. Therefore, BHE (2004) did not consider the potential to increase power generation as a reasonable alternative to the proposed transmission line. However, in addition to the four alternative routes described in Section 2.1.1, the applicant did consider two other alternative routes. The applicant also considered various engineering or system alterations (i.e., constructing some of the proposed transmission line underground, converting the existing 345-kV transmission line to direct current [DC] from AC, and uprating the existing 345-kV transmission line). On the basis of the applicant's alternative identification process, scoping comments, and DOE's own considerations, the following alternatives were dismissed from further analysis.

2.2.1 Alternative Routes

Two alternative routes considered but dismissed from further analysis were (1) the MEPCO Route to Orient, Maine (Point Lepreau via Keswick), and (2) Route 9 Route. Both of these alternative routes were considered in the original EIS (DOE 1995).

2.2.1.1 MEPCO Route to Orient, Maine

The MEPCO Route to Orient, Maine, alternative would parallel the existing MEPCO 345-kV line ROW from the Orrington Substation to the international border at Orient, Maine (Figure 1.1-1). The total distance of this route would be about 101 mi (163 km). After entering New Brunswick, the line would generally proceed southeast to the substation at the Point Lepreau Nuclear Generating Station.[3]

[3] In a letter sent to BHE, NB Power stated that it could not and would not construct the complementary Canadian portion of the MEPCO Route to Orient, Maine, because of increased costs and environmental impacts, coupled with the reduced system performance and benefits associated with this alterative route (Snowdon 2005).

Partly because the MEPCO Route to Orient would parallel the existing MEPCO line, it was eliminated as a reasonable alternative. It would not achieve the same degree of reliability that would be associated with constructing a second high-voltage line largely located within a separate ROW corridor. Also, because of the length of the MEPCO Route to Orient, line losses of energy would be significantly greater for this route compared with the other alternative routes. Several potential environmental impacts that would be notably greater than those associated with the range of potential impacts for the alternative routes analyzed were also a factor in dropping this alternative from further analysis, including (1) the highest acreage, number, and length of wetlands crossed by any of the alternative transmission line ROWs; (2) the highest number of temporary access road crossings of wetlands and water bodies; and (3) the greatest acreage of deer wintering areas crossed by any of the ROWs.

2.2.1.2 Route 9 Route

The Route 9 Route alternative would initially parallel the existing MEPCO 345-kV line from the Orrington Substation to the vicinity of Eddington, Maine. It would then generally parallel Route 9 (the major east-west highway between Bangor and Calais) to U.S. 1, where it would closely parallel U.S. 1 until meeting up with the M&N gas pipeline northwest of Baileyville and then generally follow the same route as the pipeline to the international border near Baileyville, Maine. The total distance of the Route 9 Route would be about 94 mi (151 km).

The Route 9 Route was eliminated as a reasonable alternative for the following reasons: (1) it would require the greatest amount of new ROW compared with the analyzed alternatives (i.e., it would be inconsistent with the MBEP's goal of co-locating the proposed transmission line with existing infrastructure projects); (2) river crossings of the Machias, Narraguagus, and Union Rivers would be more difficult and extensive than for the other alternative routes; (3) several large wetlands would have to be traversed (or there would be major route changes), especially in the area of the Whalesback esker and the Mopang, Crawford, and Meddybemps Lakes; (4) the corridor route would be more hilly and rugged, particularly west of the Machias River, than the other alternative routes (thus, for example, increasing the potential for erosion); (5) the route would have the greatest potential for visual impacts on residents, because it would have the largest number of dwellings within 600 ft (183 m)[4] compared with the analyzed alternatives; (6) the greatest number of dwellings would be displaced; (7) the acreage needed for clearing temporary access roads would be excessive; (8) other than the MEPCO Route to Orient, it would have the greatest acreage of deer wintering areas crossed by the ROW; (9) more recreational use and scenic resource features within the viewshed would be impacted by this route than by any other alternative route; and (10) the ROW would cross the greatest number of Outstanding River Segments.[5]

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4 During BHE's stakeholder process, 600 ft (183 m) was determined to be a reasonable maximum distance for the evaluation of visual impacts to homeowners in the proximity to the various route alternatives. Although subjective, this distance takes into consideration landscape, topography, and vegetation in the project area and was arrived at through a consensus of BHE's stakeholder group (about 40 interested parties).

5 Rivers declared by the Maine Legislature to provide irreplaceable social and economic benefits to people because of their unparalleled natural and recreational values.

2.2.2 Alternative Technologies

2.2.2.1 Underground Transmission System

Installing an AC transmission line underground may be a technically feasible alternative. However, because of the length of the line and characteristics of AC, there would be marked difficulty with insulation and power leakage through the soil. Accordingly, an AC underground system would not be practical. If an underground alternative were still considered, it would be a DC system, as is commonly used for power lines of this nature.

The high-voltage underground transmission line would be installed in a continuous trench. The land above and in the vicinity of the line would have to be maintained free of trees and shrubs to avoid direct interference by roots (ATC 2004). Improved access would also be required for the length of the line. One or more aboveground substations for power conditioning equipment could be needed. AC to DC (and back again) conversion stations would be required to switch between an underground and an overhead configuration. Both conversion stations would be located in Maine, as the Canadian portion of the line would remain AC. These transition stations generally require an area of about 110 ft by 120 ft (33.5 m by 36.6 m), or about 0.3 acres (0.1 ha) (BHE 2005).

Costs for an underground system are about 10 times more than for a comparable overhead system. With regard to the proposed project, BHE (2005) reported that the cost of installing the transmission lines underground for just the Narraguagus and Machias River crossings would be $11 million, compared with the overhead crossing cost of less than $1 million.[6]

2.2.2.2 Converting the Existing MEPCO Line from Alternating Current to Direct Current

Converting the existing MEPCO 345-kV AC transmission line to a high-voltage DC line would eliminate some of the reliability issues that currently limit transfers on the existing MEPCO line and would allow transfers up to the full thermal limit of the line. However, this option would not achieve the reliability improvements that would result from constructing an additional new line. Converting the existing AC line to DC would require adjustments to the existing transmission line to accommodate the DC and installation of AC/DC converters in Orrington, Maine, and New Brunswick. More importantly, energy losses also would occur from the conversion from AC to DC and then back to AC.

There would also be a permanent reliability impact of losing the BHE system resulting from loss of the line south of the Orrington Substation because of the lack of available short-circuit current to commutate (reverse every other cycle of an AC current to form a unidirectional

6 The applicant considered installing the NRI underground only at the two river crossings but did not consider an underground alternative for the entire transmission line.

current) the Orrington DC converter. In addition, there would be a change in system response caused by DC being controllable (versus free flowing for the AC system). Finally, each of the two required DC converter terminals would cost about the same as the entire NRI constructed as an AC system (Sloan 2005b).

2.2.2.3 Uprating the Existing MEPCO Line

Uprating involves increasing the amount of power transmitted through an existing circuit; this is usually accomplished by increasing either the voltage or the current. Uprating the MEPCO 345-kV transmission line would require system equipment changes, which could include increasing the conductor size and/or increasing the conductor elevation. The installation of larger conductors would require stronger support structures, not only for the increased weight of the conductors, but also to tolerate higher wind and ice loading. These upgrades would result in a complete rebuild of the MEPCO line. More importantly, uprating would not achieve the reliability provided by an additional new transmission line.

The existing MEPCO 345-kV transmission line is not thermally limited, but rather limited by the connected electrical transmission system. Therefore, uprating the MEPCO line would do little to change the overall electrical transmission system (Sloan 2005b), and it would not provide a redundant electrical path between Maine and New Brunswick.

2.3 TRANSMISSION LINE SPECIFICATIONS, CONSTRUCTION, OPERATION, MAINTENANCE, AND SCHEDULE COMMON TO ALL ALTERNATIVE ROUTES

2.3.1 Transmission Line Design Parameters

Table 2.3-1 lists the basic design parameters for the proposed AC transmission line. The transmission line would have a single-circuit configuration and would consist of two overhead shield wires and three phases with two conductor wires per phase. Table 2.3-1 lists the number of structures required and the average span between structures for each of the alternative routes. Self-supporting wood-pole H-frame structures (Figure 2.3-1) would be used as the tangent support structure (i.e., structures used where the line is essentially following a straight path). The length of the wood poles could range from 65 to 110 ft (20 to 33.5 m), but most would be 95 to 100 ft (29 to 30.5 m). Ten percent of their length (plus 2 ft [0.6 m]) would be buried. Thus, pole tops would be an average of 83 to 88 ft (25 to 27 m) above ground.

In addition to tangent structures, angle and dead-end structures would be required. These structures would consist of either three wood poles or three steel poles (Figures 2.3-2 through 2.3-7). The wood-pole angle and dead-end structures would use guy wires for support (Figures 2.3-2 through 2.3-5), while guy wires would not be required for the steel-pole structures (Figures 2.3-6 and 2.3-7). Dead-end structures would be required either (1) where the line makes

TABLE 2.3-1 Design Parameters for the NRI

Parameter	Value (or Description)[a]			
	MCCR[b]	CCR	PPR	MSR
Length of line (U.S. portion)	85 mi	85 mi	84 mi	114 mi
Voltage	345 kV			
Capacity	500 MW[c]			
Conductors	Standard 1,192.5 kcml[d] 45/7 ACSR[e] code "bunting" (two per phase) with a diameter of 1.302 in., a weight of 1.344 lb/ft, and a rated breaking strength of 32,000 lb			
Shield wires	Standard 7 No. 8 Alumoweld[f]			
Guy wires (if, and where, required)	Standard 7 No. 5 Alumoweld, 0.546-in. diameter			
Insulators – conductor	5.75-in. × 10-in. porcelain ball and socket or polymer composite units			
Insulators – shield wire	Porcelain pin-clevis type			
Number of structures (total)	608	636	563	885
Tangent (wood)	491	472	499	821
Angle and dead-end (wood)	110	86	64	60
Angle and dead-end (steel)	7	78	0	4
Average span length (ft)	731	706	786	680
Minimum vertical clearance to vegetation (ft)	15			

[a] To convert miles to kilometers, multiply by 1.609; to convert inches to centimeters, multiply by 2.54; to convert pounds to kilograms, multiply by 0.454; to convert feet to meters, multiply by 0.305.

[b] CCR = Consolidated Corridors Route, MCCR = Modified Consolidated Corridors Route, MSR = MEPCO South Route, PPR = Previously Permitted Route.

[c] Maximum capacity of 1,000 MW during emergency conditions.

[d] kcml = 1,000 circular mil(s); the wire size for multiple-stranded conductors. A mil is one thousandth of an inch (0.001 in.) or approximately 0.0254 millimeters.

[e] ACSR = aluminum conductor, steel reinforced.

[f] One shield wire may be replaced with an optical ground wire if BHE were to install fiber-optic communication as part of the project.

Sources: BHE (2004, 2005); Paquette (2004; 2005j,y,z,aa).

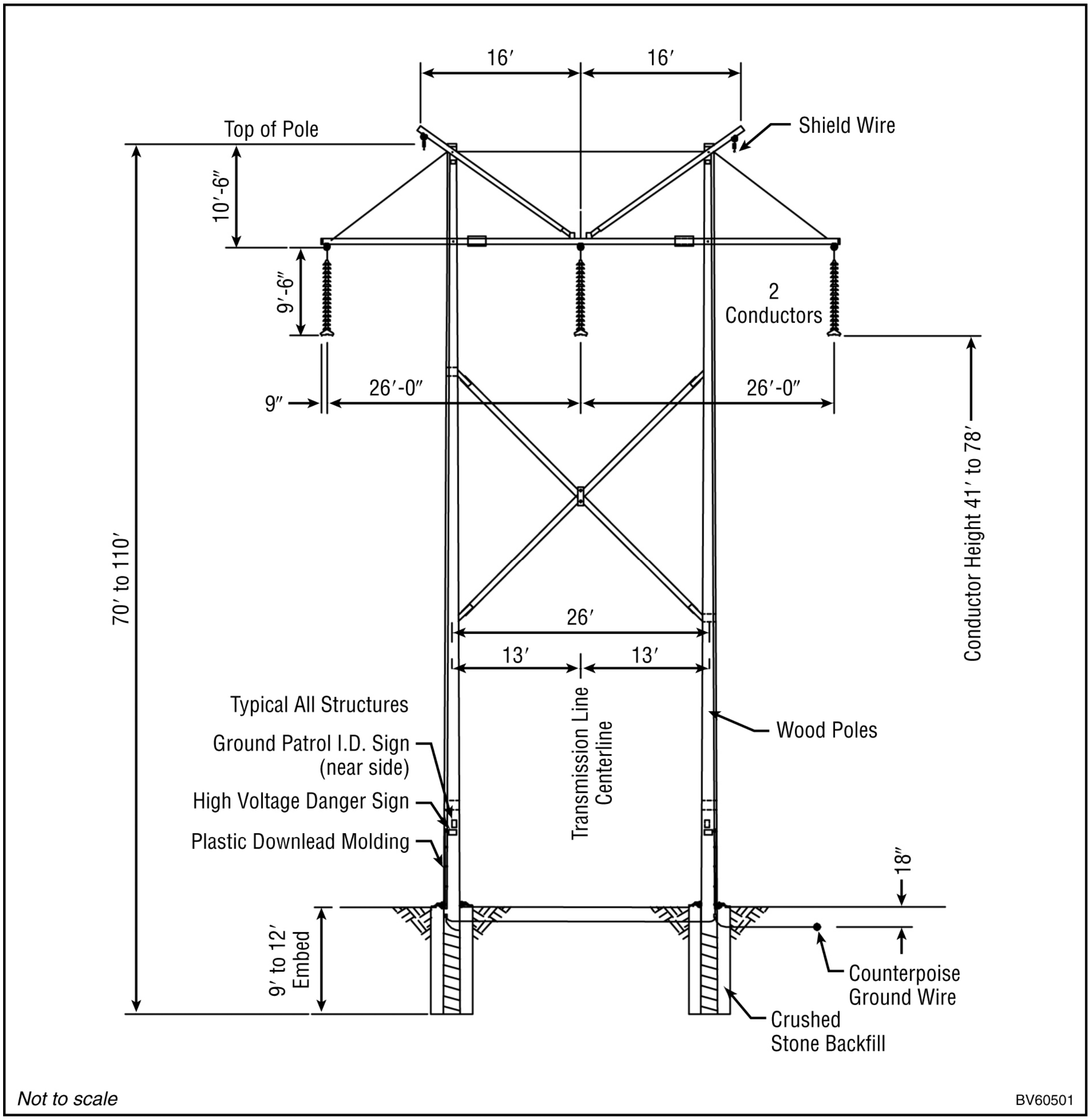

FIGURE 2.3-1 H-Frame Wood-Pole Tangent Support Structure (Source: Paquette 2005l)

an angle of 30 degrees or more, or (2) after 7 to 8 mi (11.3 to 12.9 km) of continuous suspension-type (tangent and light- and medium-angle) support structures to prevent the potential cascading (domino-like collapse) of all of the support structures in the event of a major accident. A dead-end structure would also be used for the last structure before the crossing of the St. Croix River.

The conductors would be protected from lightning strikes by grounding systems installed at each structure (counterpoise ground wires) and by two aerial ground wires (shield wires). The

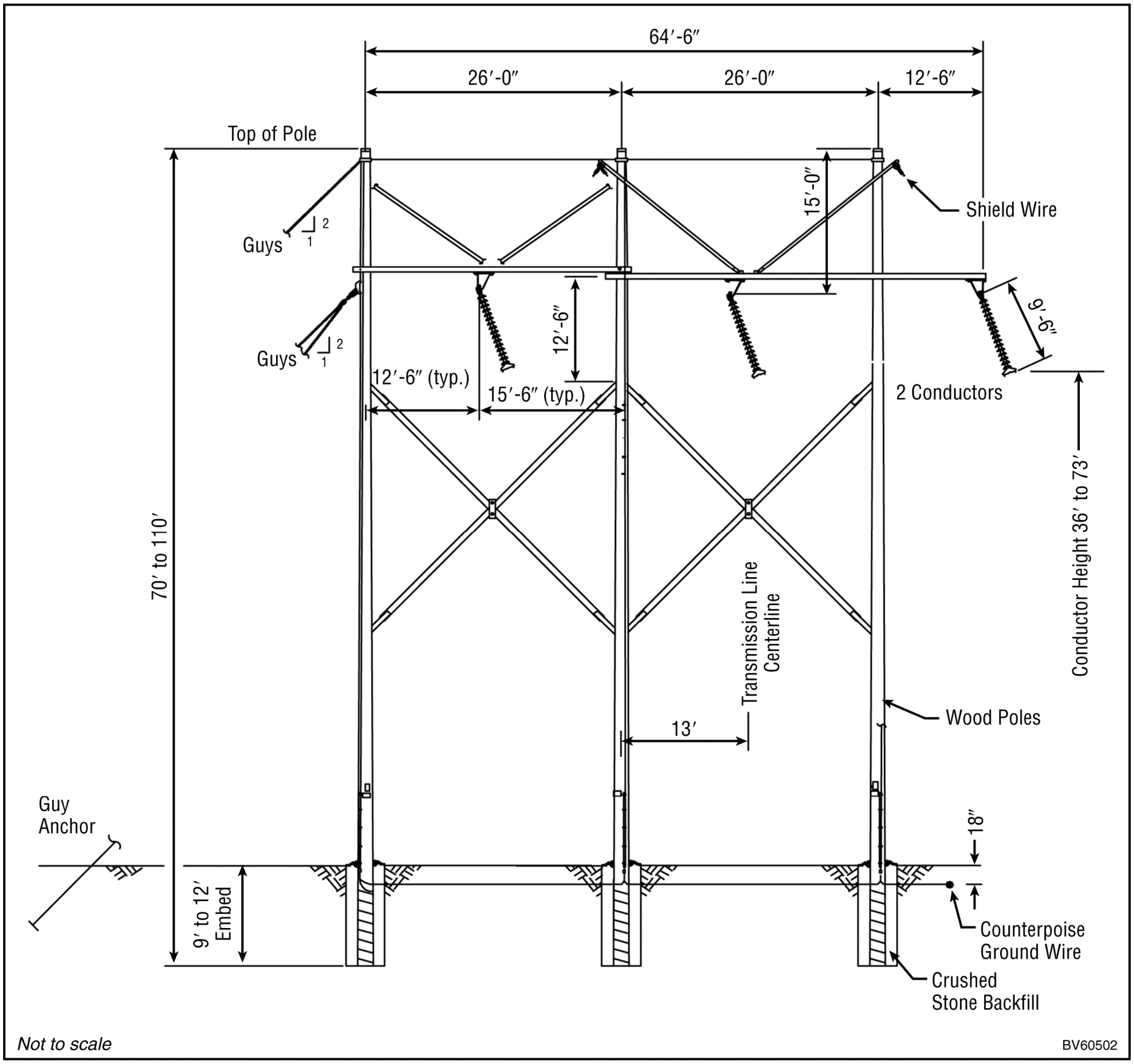

FIGURE 2.3-2 Light Angle Wood-Pole Support Structure (Source: Paquette 2005l)

transmission line would meet required horizontal and vertical clearance requirements as discussed below. Transmission line height would reflect requirements for protecting the line from interference due to tall trees. The amount of sag on a given conductor would be determined by a number of variables, including distance between towers, conductor weight, capacity, and temperature. Conductors also swing laterally. Side clearance would be determined on the basis of a worst possible condition (i.e., high temperature and high wind velocities). A minimum distance would be maintained between conductors of different phases or voltages to prevent “flashover,” defined as a sudden surge of voltage causing an arc between conductors. Conductor heights would range from 26 to 65 ft (7.6 to 19.8 m) above the ground.

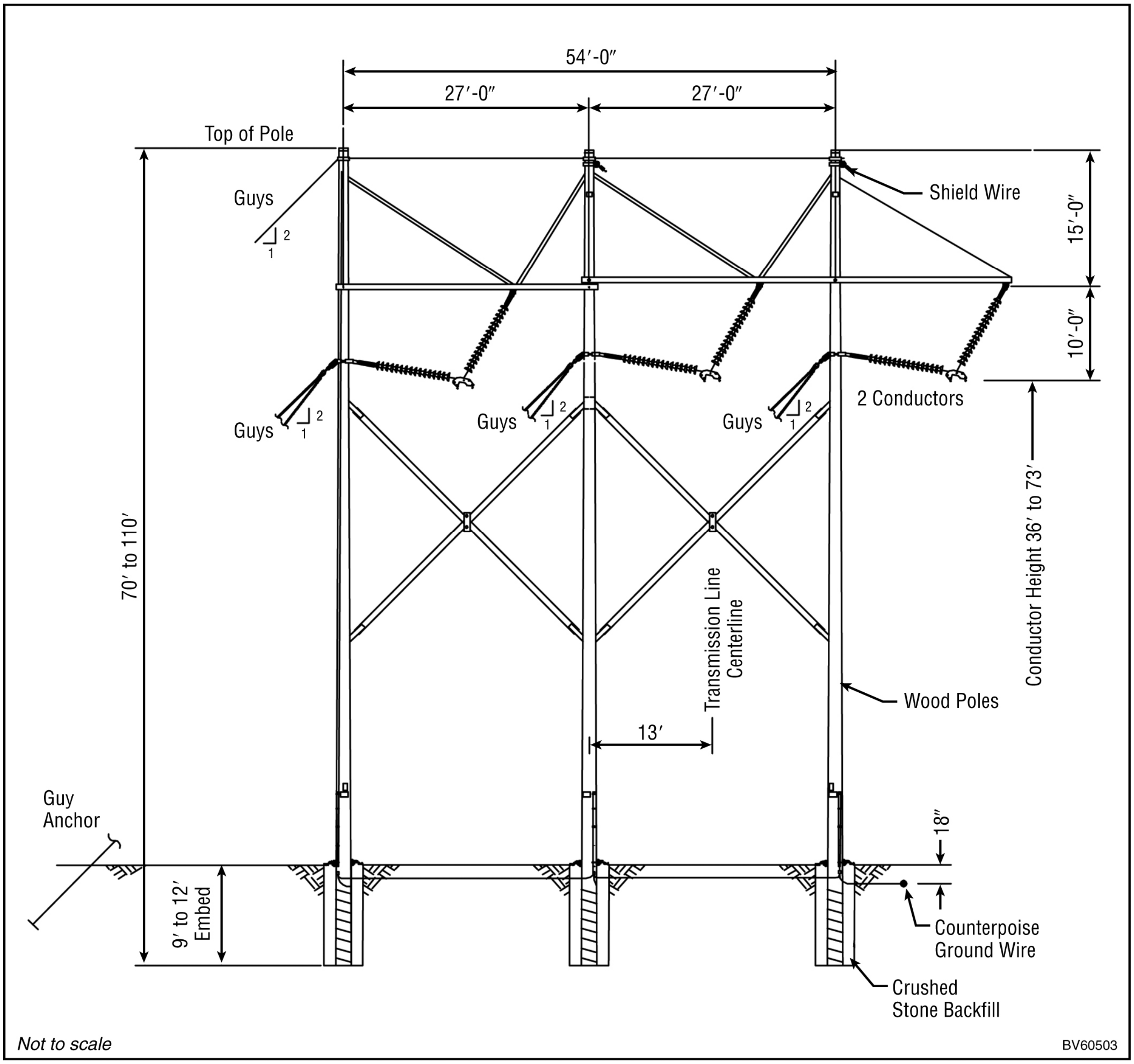

FIGURE 2.3-3 Light-Medium Angle Wood-Pole Support Structure (Source: Paquette 2005l)

The transmission line design would meet the National Electric Safety Code specifications for heavy-loading conditions (e.g., radial ice of 0.5 in. [1.3 cm] thickness and 4 lb/ft^2 [19.5 kg/m^2] of wind pressure) and extreme wind conditions (i.e., wind pressure of 23 lb/ft^2 [112 kg/m^2], equivalent to a wind speed of 90 mph [145 kph]). In addition, the transmission structures would be designed to withstand heavy icing as determined from a review of meteorological data (e.g., radial ice of 1.3 in. [3.3 cm] thickness) and longitudinal loading imbalance due to differential ice buildup and sheering.

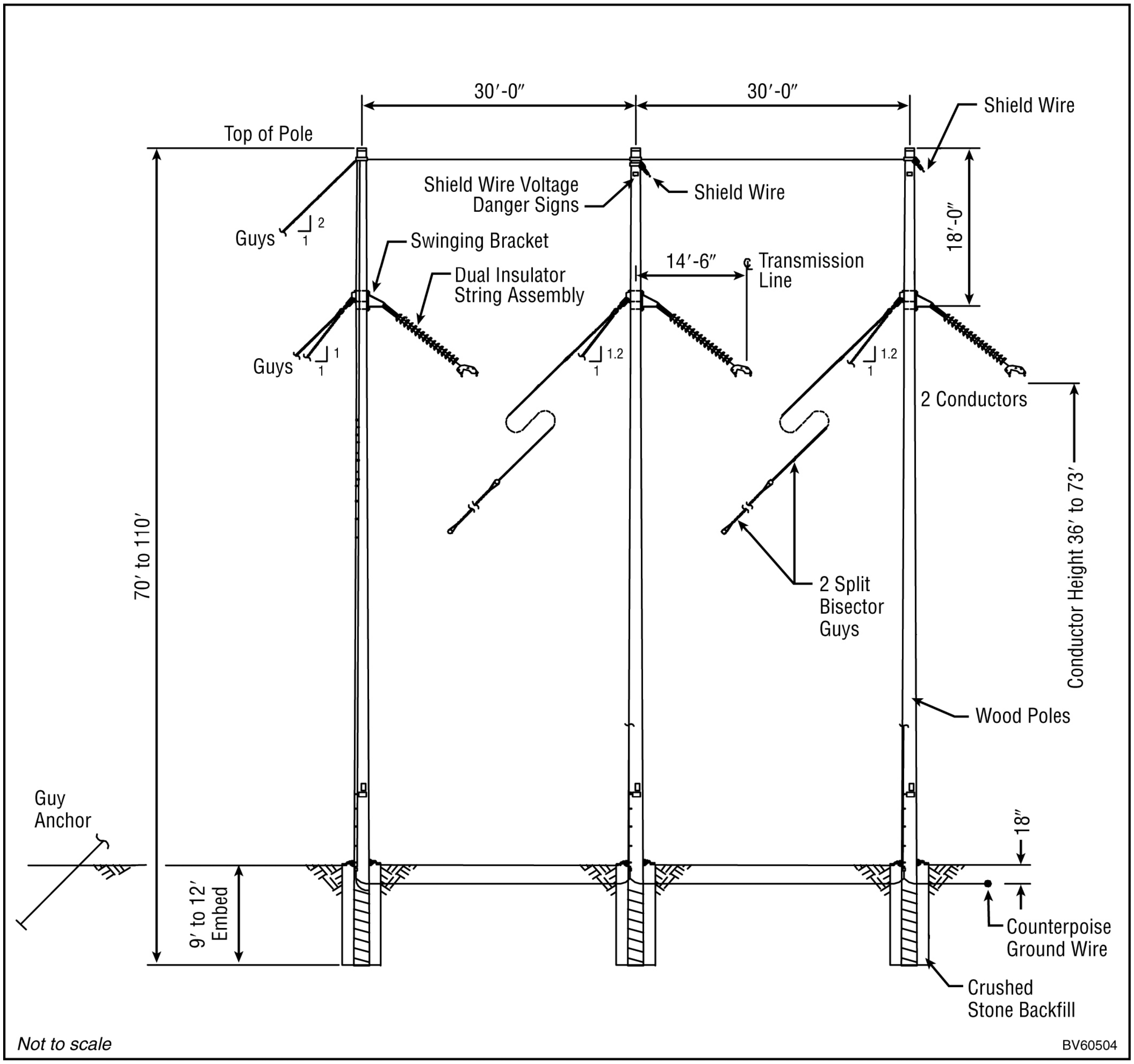

FIGURE 2.3-4 Heavy-Medium Angle Wood-Pole Support Structure (Source: Paquette 2005l)

2.3.2 ROW Configurations

The ROW widths for various segments of the transmission line routes would depend on the types of support structures and their proximity to existing utility ROWs or roads. The wood-pole H-frame support structure and its horizontal configuration of phases (a 26-ft [7.9-m] separation from the outside phase to the centerline) were used as the standard support structure design to estimate the ROW widths (Figure 2.3-8). The ROW width for a new corridor segment would be 170 ft (51.8 m). This width is based on the spacing of the conductors (26 ft [7.9 m]) and the desired clearances of the outside conductor to the edge of the ROW (e.g., to trees) to ensure a safe and reliable line.

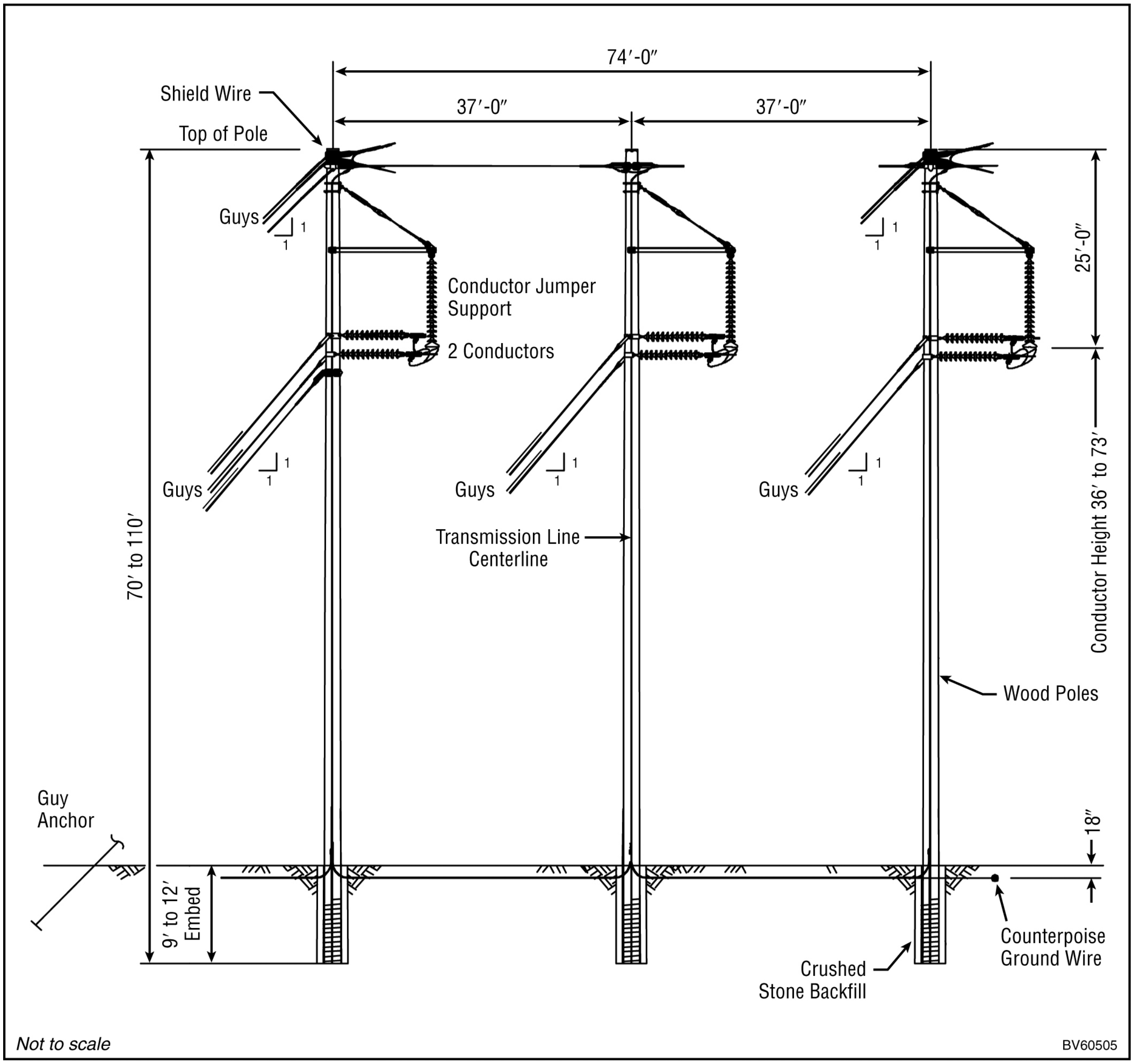

FIGURE 2.3-5 Wood-Pole Dead-End Support Structure (Source: Paquette 2005l)

Where the transmission line would be immediately adjacent to an existing cleared ROW or road, the required ROW width would be reduced on the side where the ROWs or road would be adjoining. Where the transmission line would parallel an existing transmission line, the ROW width would be based on the requirement of MEPCO to maintain a minimum of 100 ft (30.5 m) of separation between the centerlines of the two transmission lines (Figure 2.3-9). The distance to the edge of the opposite side of the ROW would be the required 85 ft (25.9 m). Where the M&N gas pipeline would be located between the two transmission lines, the centerline separation between the transmission lines would be 125 ft (38.1 m) (Figure 2.3-10).

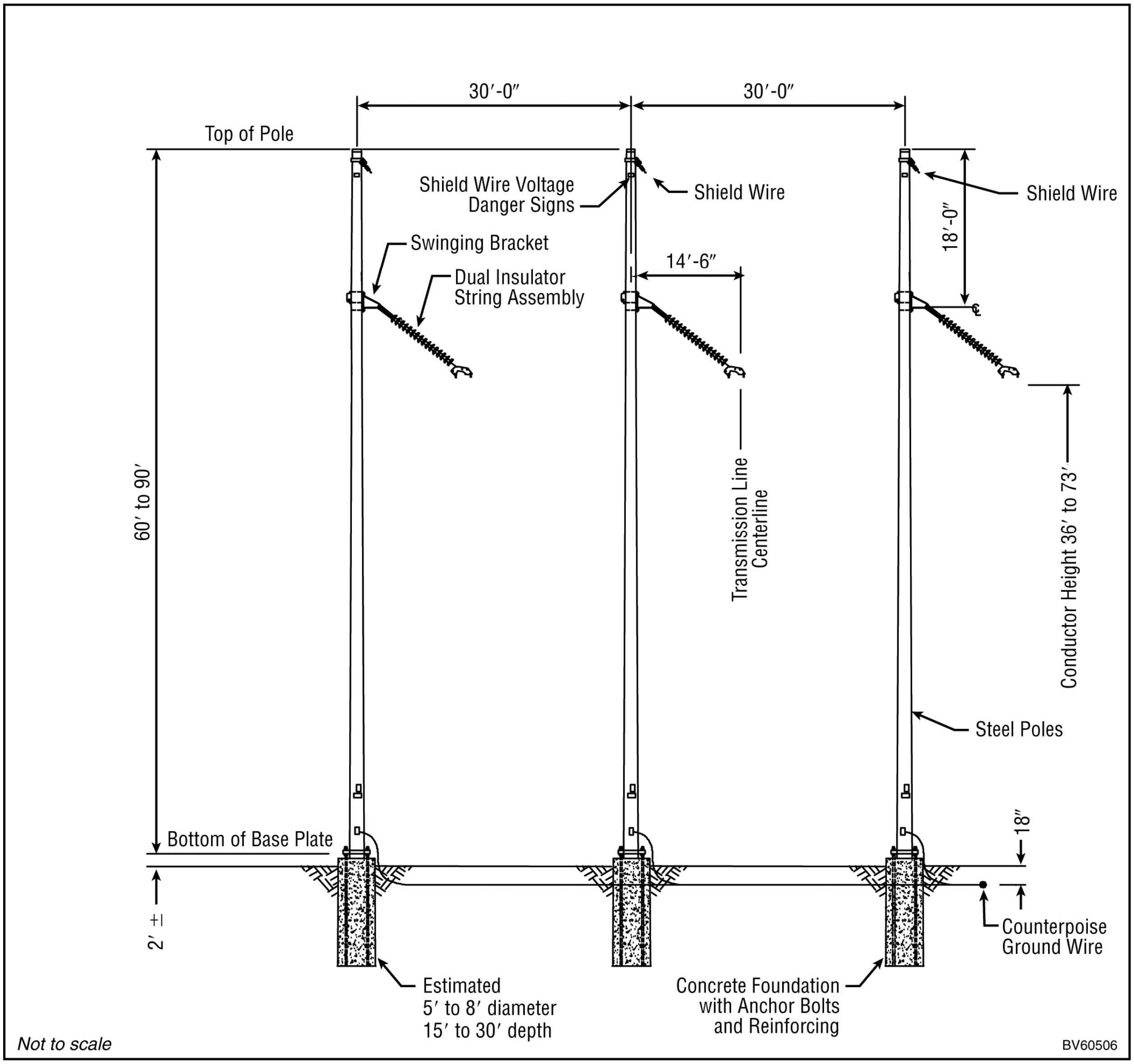

FIGURE 2.3-6 Heavy-Medium Angle Steel-Pole Support Structure (Source: Paquette 2005l)

Where the M&N gas pipeline or Stud Mill Road would be paralleled, the proposed transmission line ROW width would average 155 ft (47.2 m). This situation would occur whenever the NRI would parallel the M&N gas pipeline (Figure 2.3-11), parallel first the M&N pipeline and then Stud Mill Road (Figure 2.3-12), or parallel first Stud Mill Road and then the pipeline (Figure 2.3-13). This dimension is based on the requisite half-width of 85 ft (25.9 m) from the transmission line centerline to the forested side of the ROW and 70 ft (21.3 m) between the centerline of the transmission line and the edge of the pipeline ROW or Stud Mill Road (BHE 2005). Table 2.3-2 lists the lengths and percentages of the ROWs for the alternative routes that would be either a new ROW or adjacent to an existing ROW. The table also provides the total area within each alternative route.

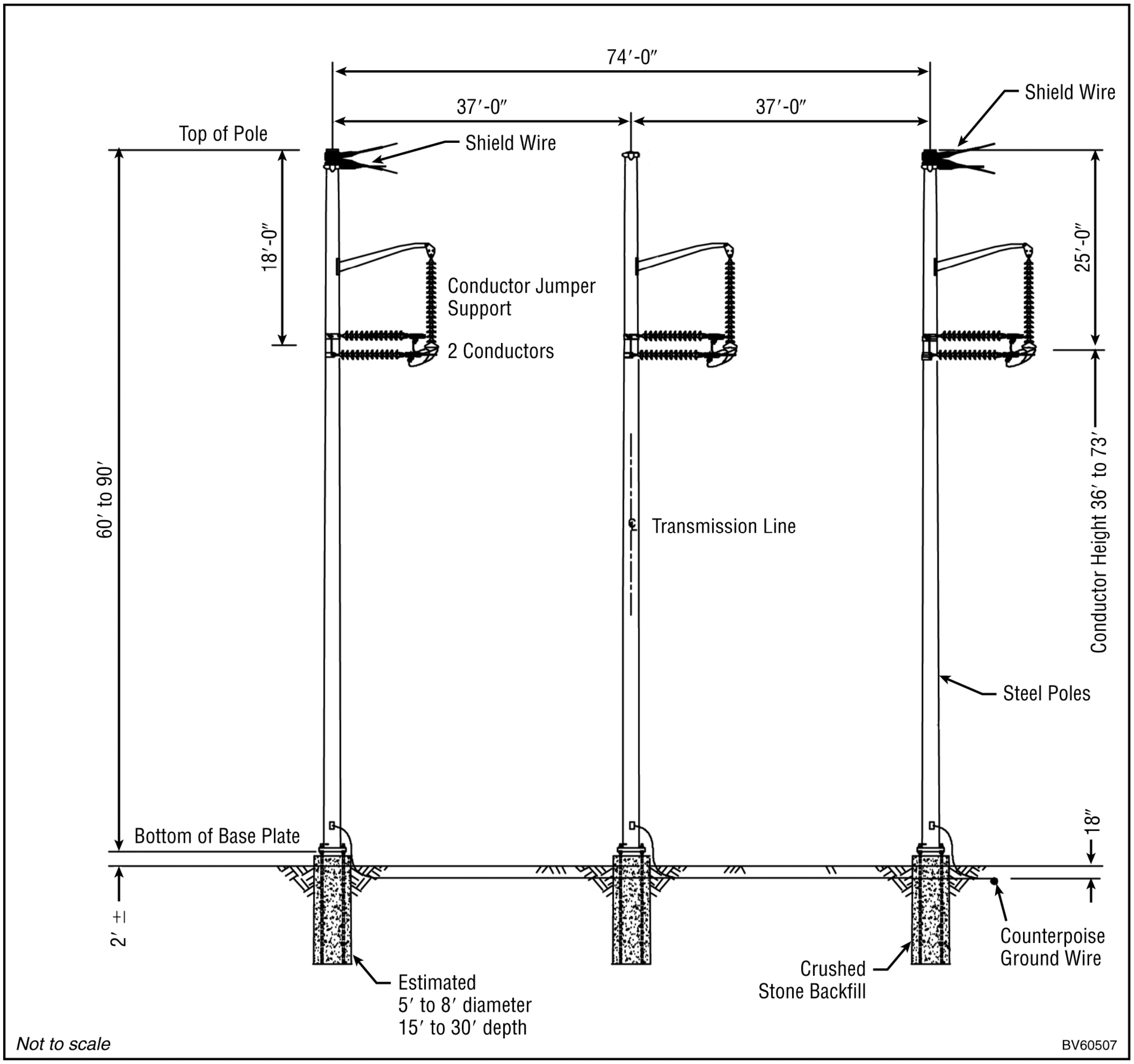

FIGURE 2.3-7 Steel-Pole Dead-End Support Structure (Source: Paquette 2005l)

2.3.3 Substation Alterations

Alterations to four substations within Maine would be required regardless of the alternative route selected (Paquette 2005m). The substations to be modified would be the Orrington Substation located in Orrington, the Maxcys Substation located in Windsor, the Gulf Island Substation located in Lewiston, and the Kimball Road Substation located in Harrison (Figure 1.1-1). Required changes to each substation are described below.

The Orrington Substation would require modifications both inside and outside the current fenced boundary. Modifications within the existing fence line would include the relocation of an

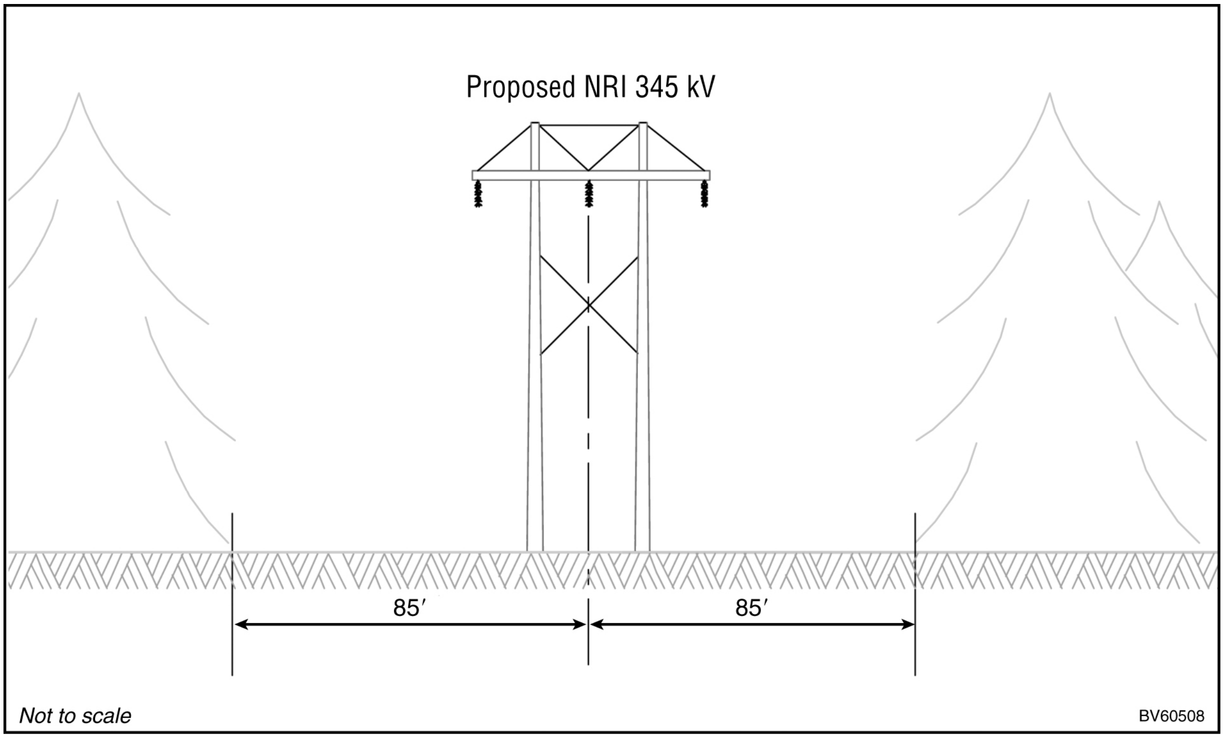

FIGURE 2.3-8 Placement of the NRI within a New ROW (Source: Paquette 2005a)

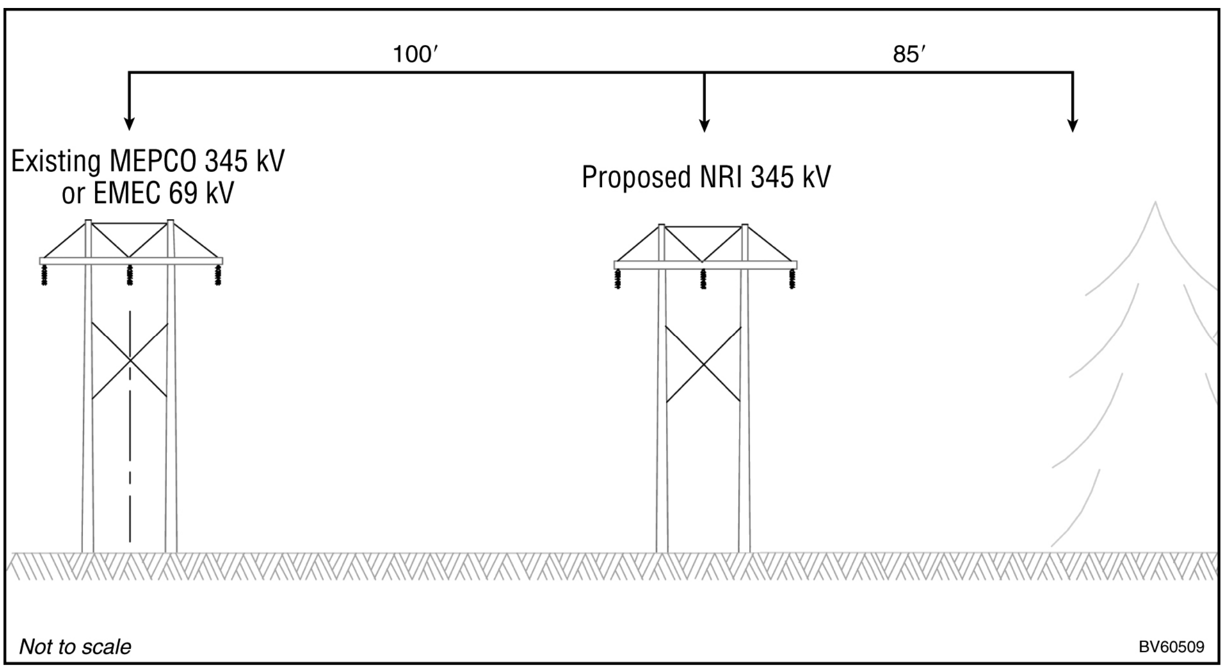

FIGURE 2.3-9 Placement of the NRI Adjacent to an Existing Transmission Line (Source: Paquette 2005a)

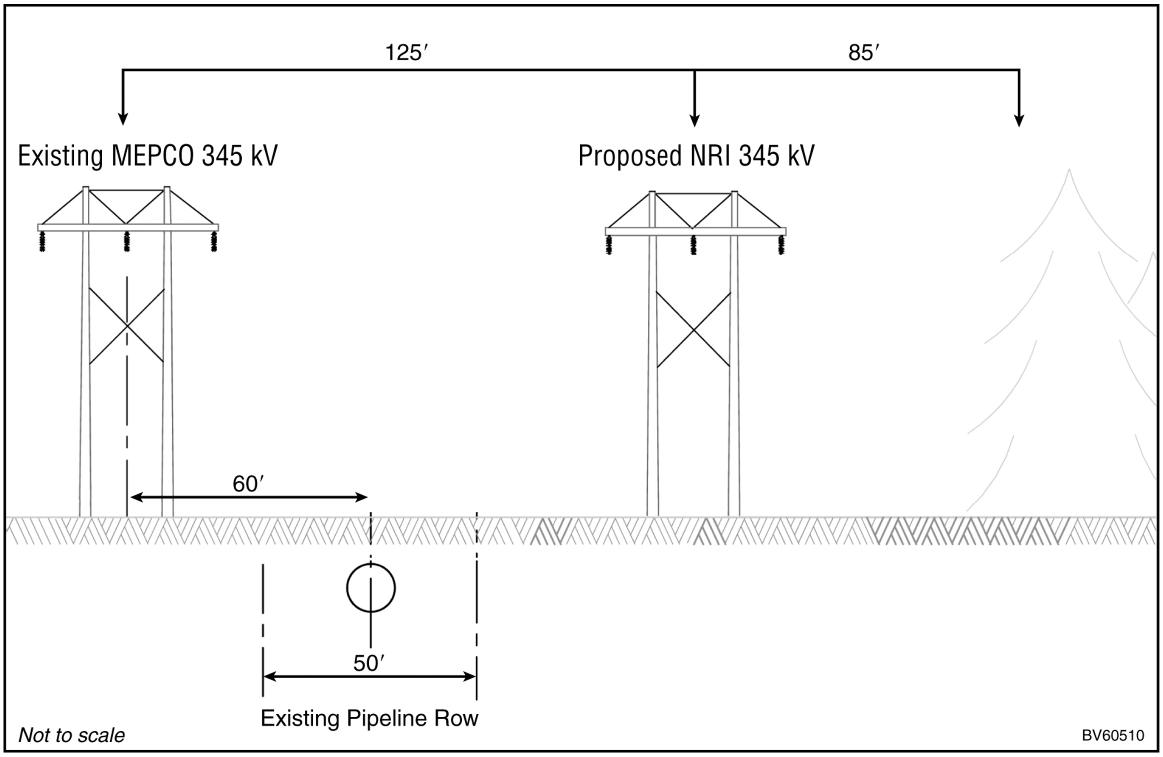

FIGURE 2.3-10 Placement of the NRI Adjacent to the Gas Pipeline and MEPCO Transmission Line (Source: Paquette 2005a)

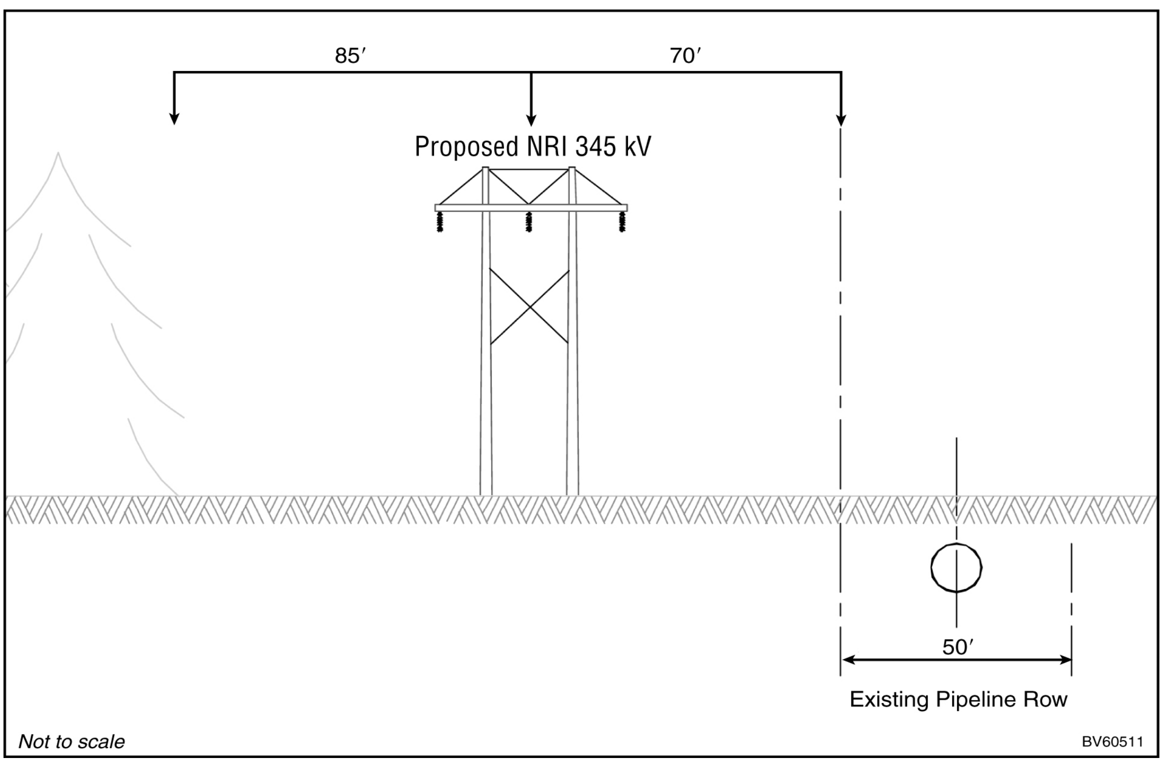

FIGURE 2.3-11 Placement of the NRI Adjacent to the Gas Pipeline (Source: Paquette 2005a)

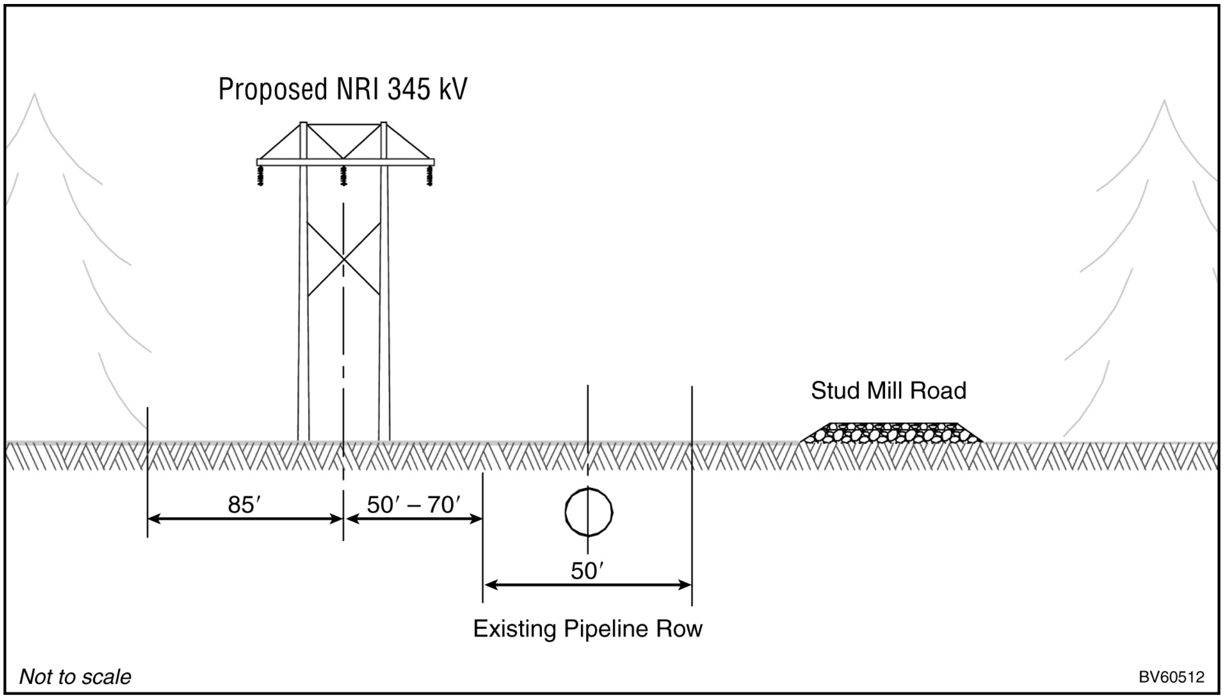

FIGURE 2.3-12 Placement of the NRI Adjacent to the Gas Pipeline and Stud Mill Road (Source: Paquette 2005a)

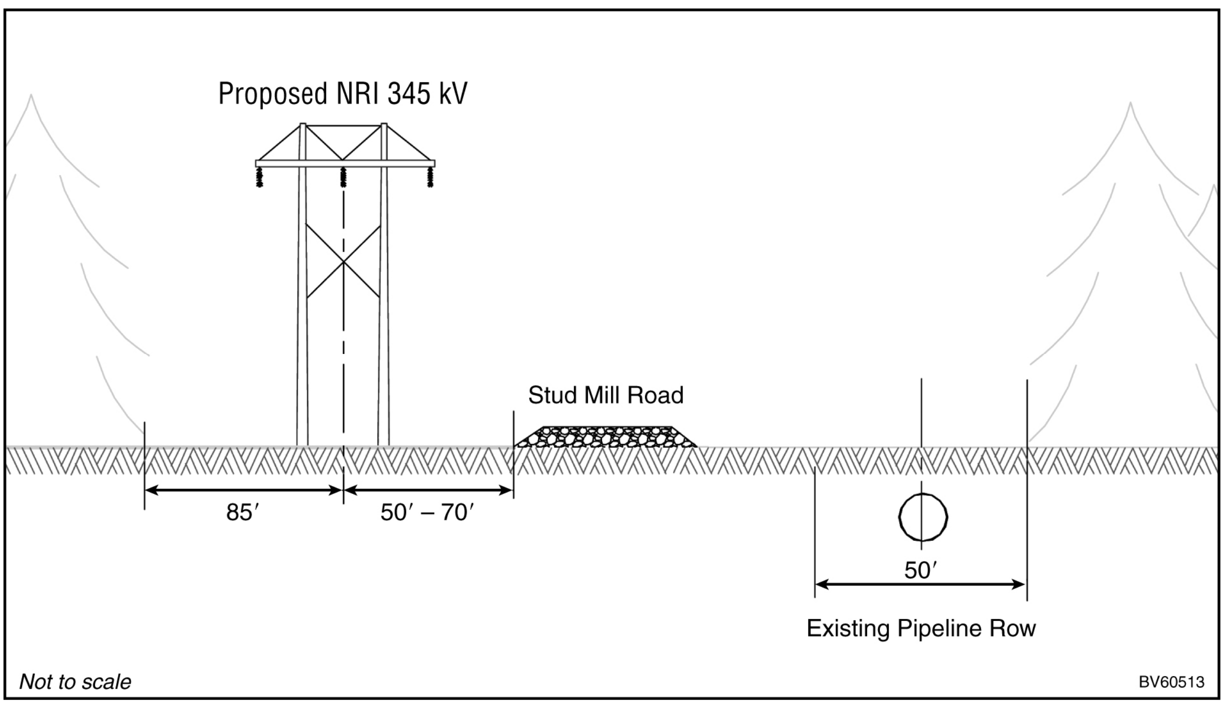

FIGURE 2.3-13 Placement of the NRI Adjacent to Stud Mill Road and the Gas Pipeline (Source: Paquette 2005a)

TABLE 2.3-2 Summary of NRI ROW Requirements by Alternative

Requirement	Alternative[a]			
	MCCR	CCR	PPR	MSR
ROW length (mi)[b,c]				
Total line	85	85	84	114
ROW configuration (mi)				
New ROW (170 ft wide[d])	15 (18%)	2 (2%)	62 (74%)	39 (35%)
Adjacent to M&N gas pipeline and/or Stud Mill Road (155 ft wide)	58 (68%)	68 (80%)	10 (12%)	0 (0%)
Adjacent to MEPCO line (100 ft wide)	5 (6%)	8 (10%)	5 (6%)	47 (41%)
Adjacent to M&N gas pipeline and MEPCO line (125 ft wide)	7 (8%)	7 (8%)	7 (8%)	7 (6%)
Adjacent to the EMEC[e] 69-kV line (100 ft wide)	0 (0%)	0 (0%)	0 (0%)	21 (18%)
Total ROW area (acres)	1,566	1,522	1,633	1,734

[a] CCR = Consolidated Corridors Route, MCCR = Modified Consolidated Corridors Route, MSR = MEPCO South Route, PPR = Previously Permitted Route.

[b] Values rounded to nearest whole mile, acre, or percent. Percentage values are percent of total ROW length.

[c] To convert miles to kilometers, multiply by 1.609; to convert feet to meters, multiply by 0.305; to convert acres to hectares, multiply by 0.405.

[d] Maximum width of new clearing required.

[e] EMEC = Eastern Maine Electric Cooperative.

Source: Paquette (2005j).

existing line, the addition of breakers and associated disconnect switches, the addition of a new dead-end structure and other miscellaneous components, and the expansion of the existing control house. The proposed project would also require the addition of series compensation on the line south of the substation. The construction of two short gravel access roads and the modification of an existing retention pond would be conducted outside the existing fence line (BHE 2005). These modifications would require approximately 0.8 acre (0.3 ha) of new substation area.

The Maxcys Substation would require the replacement of an existing breaker. This change would occur within the current fence line. The existing breaker would need to be replaced with a breaker of higher short-circuit current rating. The Gulf Island Substation would require a new capacitor bank within the current fence line. The Kimball Road Substation would also require a new capacitor bank. However, this would require a 0.2-acre (0.09-ha) expansion of the existing substation.

2.3.4 Transmission Line Construction

The construction of the NRI, including ROW clearing and installation of the structures, would be performed by independent contractors under close daily supervision by BHE engineering and environmental inspectors to ensure that work is performed as specified by permit and regulatory conditions and construction specifications. The general sequence of activities would be surveying; construction of access roads; ROW clearing; and support structure installation, framing, and stringing.

2.3.4.1 Surveying

The first operation to be completed would be a survey of the selected route. Surveying would establish the centerline and edges of the ROW. Generally, only a survey crew and small items of survey equipment would be required during this phase of the project. Establishing the centerline could require limited cutting of trees for line-of-sight staking, profiling, and distance measuring. Existing roads would be used to obtain access to the selected route. Most of the surveying work would proceed cross-country and on foot.

2.3.4.2 Construction of Access Roads

To the extent possible, existing roads would be used to gain access to project construction sites. The extensive network of timber haul roads that traverses much of the project area is one reason the applicant prefers the Modified Consolidated Corridors Route. In addition, the existing MEPCO corridor allows access to the initial 12.2 mi (19.6 km) of any of the alternative transmission line routes and would eliminate the need to construct new access roads within that area.

No new permanent access roads would be required for construction or maintenance of any of the alternative transmission line routes. However, some new temporary access roads would be required to reach the ROW construction area from existing roads. The new temporary access roads would be required primarily for installation of support structures, with some access roads constructed to facilitate the hauling of material from the ROW as part of clearing operations. It is preferable that there be at least one point of access for each 1.0 mi (1.6 km) along the route. The applicant assessed new temporary access roads by using mapped features, such as proximity to nearest major roadway and topography. Where the alternative routes would parallel existing roads (e.g., Stud Mill Road) or are crossed by public roads, few new access roads would be required. A width of 20 ft (6.1 m) was assumed for new temporary access roads (BHE 2004). The approximate clearing required for new temporary access roads would be as follows: Modified Consolidated Corridors Route — none; Consolidated Corridors Route — none; Previously Permitted Route — 21 acres (8.5 ha); and MEPCO South Route — 32 acres (13 ha) (BHE 2004, 2005).

2.3.4.3 ROW Clearing

Trees would be cleared within the ROW only where necessary in order to facilitate (1) staking, access, assembly, and erection of structures; (2) installation of conductors and shield wires; (3) provision of adequate clearance for energized lines; and (4) maintenance. Low-growth woody vegetation would be left undisturbed where possible. The clearing program would be planned and implemented to encourage growth of low-growing native plants that would both stabilize the ROW against erosion and minimize the growth of trees.

Because about 90% of each of the alternative ROWs is forested (including forested wetlands), vegetation clearing can be generally categorized as (1) clear-cutting or (2) several types of selective cutting. In addition to ROW clearing, danger trees (trees that could pose a threat to the operation of the line if they grew or fell into the conductor security zone before the next cutting cycle) would be cleared outside of the designated ROW. Generally, trees would be cut to 6 in. (15 cm) above the ground within cleared sections of the ROW. All logs would be removed from the ROW, while stumps would be removed only from support structure sites and from some temporary access road areas.

The applicant's normal cutting practice in forested areas would be used. First, the appropriate environmental safeguards would be established in the area to be cleared, primarily by placing appropriate erosion control measures to the extent practicable (TRC 2005a). Trees would then be cut. Clear-cutting involves the manual or mechanical cutting of all trees within the ROW. Low-growing shrubs and brush would be left to the extent practicable. All vegetation cut during initial clearing would be cleaned up and disposed of in accordance with the Maine Slash Law (BHE 2005). As part of land-clearing operations, much of the merchantable wood materials (e.g., sawlogs and pulpwood) would be salvaged. Tops of trees, cull material, and branches could be chipped on site and the chips hauled to local power plants for use as fuel. Trees less than 2 in. (5 cm) in diameter may be left on site to deter the formation of new drainage channels in areas susceptible to erosion. In areas of low erosion potential, such trees may be windrowed (i.e., heaped up as if by the wind) or mulched. Methods of handling cut trees and other woody materials are discussed as standard mitigation practices in Section 2.4. Following cutting and removal of the timber, the tree stumps of deciduous species may receive a basal application of approved herbicide applied by a low-pressure backpack applicator.

Table 2.3-3 summarizes the clearing and cutting practices that would be conducted within the ROW, including various types of buffers. Figure 2.3-14 illustrates the vegetation clearing and maintenance along the NRI.

Because of the limited reach of feller bunchers,[7] three access ways would be required within the 75-ft (23-m)-wide water body buffers. They would enable large trees across the ROW to be cut and removed with minimal additional ground disturbance and damage to remaining

[7] A feller buncher is a large logging machine similar to a backhoe with an attachment that cuts trees in place of a shovel. It consists of a standard heavy-equipment base with a tree-grabbing device equipped with a saw or other device at the bottom that cuts the tree off at the base and places it on the stack of cut trees.

TABLE 2.3-3 Summary of Clearing and Cutting Practices during ROW Construction and Maintenance

Location	Buffer Width	Clearing and Cutting during Construction[a]	Cutting during Maintenance[a]
Typical ROW areas with no restrictions	Not applicable	Cut at ground level all vegetation >2 in.[b] in diameter at breast height; remove or top[c] all other vegetation that is 8 to 10 ft[b] or taller.	Cut at ground level all capable trees that are 8 to 10 ft or taller; top all other vegetation that is 8 to 10 ft or taller.
Standard stream buffers where NRI parallels the existing MEPCO 345-kV line	25 ft on each side of the water body	Cut at ground level all capable trees[d] that are 8 to 10 ft or taller; no other vegetation is cut.	Cut at ground level all capable trees that are 8 to 10 ft or taller; no other vegetation is cut.
Standard stream buffers where NRI does not parallel the existing MEPCO 345-kV line	75 ft on each side of the water body	Cut at ground level all capable trees that are 8 to 10 ft or taller; no other vegetation is cut.	Cut at ground level all capable trees that are 8 to 10 ft or taller; no other vegetation is cut.
Atlantic salmon stream buffers	75 ft on each side of the water body	Top all capable trees that could grow to within 15 ft of a conductor in the next 3 to 4 years; no other vegetation is cut.	Top all capable trees that could grow to within 15 ft of a conductor in the next 3 to 4 years; no other vegetation is cut.
Visual buffers at the Narraguagus, Machias, and St. Croix Rivers	Varies from 75 to 500 ft	Top all capable trees that could grow to within 15 ft of a conductor in the next 3 to 4 years; no other vegetation is cut.	Top all capable trees that could grow to within 15 ft of a conductor in the next 3 to 4 years; no other vegetation is cut.

[a] Dead or danger trees are removed at any time.

[b] To convert inches to centimeters, multiply by 2.54; to convert feet to meters, multiply by 0.305.

[c] The tree would be cut at ground level if topping would not leave sufficient foliage to sustain the tree.

[d] Capable trees are those that could grow within the conductor clearance zone before the next management cycle.

Source: BHE (2005).

vegetation that would otherwise occur if the trees were hand cut and dragged out of the buffer with a cable (BHE 2005). One access way would be located at about the middle of the ROW and each of the other two would be located about halfway between the middle access way and an edge of the ROW. The access ways would be 10 to 12 ft (3 to 4 m) wide. The stream buffer access ways would differ from temporary access roads in that within the access ways, only trees that would prevent the harvesting equipment from performing its job or that would otherwise be seriously damaged by the equipment traveling along the access way would be removed. Also,

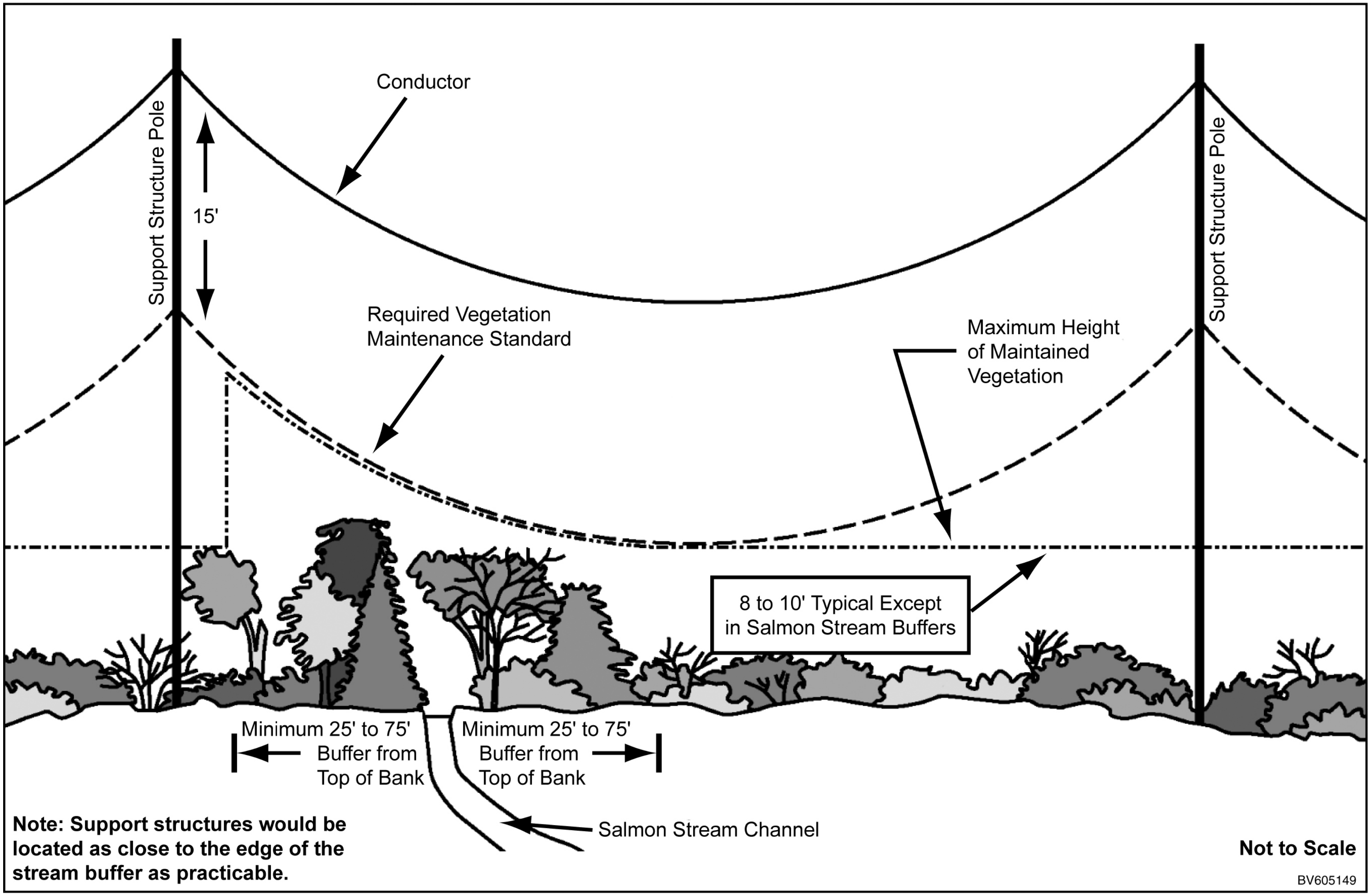

FIGURE 2.3-14 Specifications for Vegetation Clearing and Maintenance along the Proposed ROW (Source: TRC 2005a)

access ways would not require grading or the addition of any surfacing materials such as gravel (BHE 2005). The access ways would not extend closer than 25 ft (7.6 m) to the edge of the stream banks. The two outer access ways would be restored at the completion of clearing activities, while the central access way would be restored at the end of all construction activities in the area. The outer access ways would be allowed to revert to their original state (within maintenance requirements), while the middle access way would be maintained as low-growing vegetation to allow small vehicle access during ROW vegetation maintenance (BHE 2005).

2.3.4.4 Support Structure Installation, Framing, and Stringing

To accommodate installation of each support structure, a work area about 100 ft (30.5 m) wide and 170 ft (51.9 m) long, or 0.4 acre (0.16 ha), would be cleared of all woody growth except low shrubs and brush. All small woody plants would be removed from the immediate structure locations. The structural components would be placed in these work areas in preparation for construction and installation of the support structures. The support structures would be assembled on the ground and erected by a crane with a long boom.

Holes for support structure poles would be made with an auger or backhoe. Some blasting might be required if bedrock occurred at structure locations or, more rarely, for breaking or moving large boulders that restricted access by construction equipment (BHE 2005).

H-frame wood-pole structures would be directly embedded in the ground. A 9- to 12-ft (2.7- to 3.7-m)-deep foundation hole would be excavated at each pole location, and backfill would be placed around the pole after installation. Guy anchors for the wood-pole angle and dead-end structures would consist of steel anchor rods connected to a log buried in a trench about 7 ft (2.1 m) deep. Total construction time for a wood-pole support structure would be less than 1 day.

Steel-pole support structures could also be directly embedded in a similar manner except that some would be backfilled with concrete. They could also be installed on concrete bases, depending on site conditions. Foundation holes would be up to 30 ft (9 m) deep. Total construction time would be less than 4 days per steel-pole support structure.

After the support structures were in place, insulators would be installed and aerial shield (ground) wires and conductors strung. Conductors and shield wires would be pulled through the stringing blocks by tensioning equipment to keep them from coming in contact with the ground or other objects that could cause damage.

2.3.4.5 Construction Staging Areas

The same five staging areas (i.e., construction headquarters along the route where materials are received, stored, and shipped to the ROW) would be used during construction of the line along the Modified Consolidated Corridors Route, the Consolidated Corridors Route, or the Previously Permitted Route (BHE 2004, 2005; Paquette 2005b,f,g,bb,dd; Sloan 2005b). The following staging areas would be used: Route 178, Costigan Mill, Pickerel Pond, Machias River, and Huntley Brook Staging Areas. The Route 178 and Costigan Mill Staging Areas, along with the Chester, Topsfield, and Baileyville Staging Areas, would be used for the MEPCO South Route. Each staging area would be located adjacent to established roads with easy vehicle access. The staging areas have been previously disturbed by clearing, gravel pit operations, or for use as a staging area for commercial forestry practices or for construction of the M&N gas pipeline (BHE 2005). Only minimal vegetation clearing and light grading would be required within the staging areas (BHE 2005). These construction staging areas are described below. Descriptions of the staging areas for the MEPCO South Route are then presented. Figure 2.1-1 shows the locations of the staging areas.

2.3.4.5.1 Route 178 Staging Area. This site is about 9 mi (14.5 km) northeast of the Orrington Substation. It is located on the west side of State Route 178 in Bradley north of the entrance to the Penobscot Experimental Forest (Figure 2.1-1). The site area consists of about 5 acres (2 ha) of cleared and disturbed land.

2.3.4.5.2 Costigan Mill Staging Area. This 20-acre (8-ha) staging area would be located at a large industrial site located in Penobscot County, Maine, near the Town of Milford and the Community of Costigan (Figure 2.1-1). The industrial site is a former sawmill operation that produced softwood lumber from the early 1970s until it was closed in 2001. Most of the equipment has been removed, and some of the buildings have been demolished. There are no active operations at this time. The site consists of flat to gently rolling terrain; the primary surface material is filled and graded gravel. There are also areas of paved surface. The site has good drainage management, including a new retention pond. It is accessed by paved and gravel roads and has a functional railroad spur. The Costigan Mill Staging Area would be used for rail unloading and storage of utility materials (e.g., poles and wire).

2.3.4.5.3 Pickerel Pond Staging Area. This staging area, located at an abandoned air strip, is located near Pickerel Pond and is adjacent to Stud Mill Road (Figure 2.1-1). The site, which primarily consists of broken pavement and gravel, encompasses about 6 acres (2.4 ha).

2.3.4.5.4 Machias River Staging Area. This staging area would consist of about 6.5 acres (2.6 ha) of land along Stud Mill Road, about 0.25 mi (0.4 km) west of the Machias River (Figure 2.1-1). This former work-camp site is presently cleared. About 1 acre (0.4 ha) of the staging area is located north of Stud Mill Road; the remainder is south of it. This section was formerly used as a maintenance facility.

2.3.4.5.5 Huntley Brook Staging Area. This site is located near where Stud Mill Road crosses Huntley Brook (Figure 2.1-1). About 4.5 acres (1.8 ha) of presently cleared land would be used.

In addition to the Route 178 and Costigan Mill staging areas, the following areas may also be used for the MEPCO South Route.

2.3.4.5.6 Chester Staging Area. This 10-acre (4-ha) site is an inactive chip-burning facility in Chester, Maine. The plant has been dismantled and has a large yard for chip storage. The area is located near both proposed river crossings of the Penobscot River (Figure 2.1-1).

2.3.4.5.7 Topsfield Staging Area. This 6-acre (2.4-ha) site is the location of an old hayfield. The site is located along Route 1 and Route 6, the major transportation corridors in the region (Figure 2.1-1).

2.3.4.5.8 Baileyville Staging Area. This staging area, located near the terminus of the line, consists of two parcels, one of 16 acres (6.5 ha) and one of 28 acres (11.3 ha) (Figure 2.1-1). The staging area is the site of a now-closed oriented strand board mill. Each parcel has two large yards that can easily accommodate poles and other equipment.

2.3.5 Installation of AC Mitigation for the M&N Gas Pipeline

Any time a wire carrying AC is in the vicinity of a metal pipeline, the wire has the potential of inducing voltages in the pipeline.

The three means by which voltages from a transmission line could be induced in a pipeline are as follows:

- Electrostatic coupling (capacitive coupling) can be caused by the electrostatic field surrounding the energized line (conductor). This is of primary concern when a pipeline is under construction near an overhead transmission line.

- Electromagnetic coupling (transformer action) occurs when a current flows in an energized conductor. It produces an electromagnetic field at right angles to the conductor. When electromagnetic lines of force cut through another conductor (such as the pipeline), a voltage is induced in that conductor. These voltages (touch voltage) can be hazardous to anyone who comes in contact with the pipeline or appurtenances, and the voltages could potentially damage the pipeline or related facilities.

- Resistive coupling can occur during fault conditions on the transmission line. If lightning strikes an energized conductor, the resulting voltage rise will exceed the breakdown insulation level of the insulator at the nearest support structure. A flashover will occur from the conductor to the support structure and then to the structure ground, creating a fault current for a fraction of a second. The fault current would radiate from the ground near the support structure and could flow in the pipeline (Kirkpatrick 1995).

The last two items above could be a concern wherever the NRI would be located near (e.g., within 1 mi [1.6 km]), or parallel to, or would cross over the M&N gas pipeline. Therefore, AC mitigation would be required to protect worker and public safety as well as to minimize potential impacts on the integrity of the pipeline facilities (induced voltages can reduce the effectiveness of the cathodic [corrosion] protection employed by the pipeline). Key factors considered in the analysis of AC mitigation that could be required for the M&N gas pipeline include (1) design style and alignment of the transmission line, (2) steady-state and fault current levels in the transmission line, (3) desired distance from the pipeline, (4) electrical properties of the soil, and (5) specifications and design of the pipeline. The applicant uses the Current Distribution, Electromagnetic Fields, Grounding and Soil Structure Analysis software package, the internationally recognized computer model developed by Safe Engineering Services and Technologies, Ltd. (2005), to analyze both fault and steady-state conditions and to test the effectiveness of various mitigation solutions in order to assist Maritimes in the design of an AC mitigation plan for co-location of the NRI and M&N gas pipeline.

The AC mitigation technique under consideration for the M&N gas pipeline includes the installation of a zinc ribbon buried about 1.5 ft (0.5 m) deep above and parallel to the existing unprotected pipeline, the top of which is at least 3 ft (1 m) below the ground. The trench for the zinc ribbon would be created by either plowing or excavation. Following installation of the zinc ribbon, the trench would be backfilled. The ribbons would be attached to the pipeline at regular intervals (e.g., every 1,000 to 5,000 ft [305 to 1,524 m]). It is expected that the zinc ribbon would be installed wherever the NRI would be located near, or parallel to, or would cross over the M&N gas pipeline. Approximately 68 mi (109 km) of zinc ribbon would be required for the Modified Consolidated Corridors Route, Consolidated Corridors Route, or Previously Permitted Route, while about 45 mi (72 km) of zinc ribbon would be required for the MEPCO South Route (Paquette 2005mm,nn). However, the ribbon would be discontinuous in that it would not be installed where the existing pipeline crosses streams (Paquette 2005ee).

In addition to the zinc ribbon, ground mats would be installed at existing test stations along the pipeline. These stations, which resemble pipeline markers in appearance, are spaced at intervals of about every 1 mi (1.6 km) and are located directly above the pipeline. Ground mats would consist of a grounding material (e.g., coiled zinc ribbon) and crushed rock over an area up to 12 ft (3.7 m) in diameter around each test station. About 68 test stations would require ground mats for the Modified Consolidated Corridors Route, Consolidated Corridors Route, or Previously Permitted Route; the MEPCO South Route would require about 45 ground mats. In addition, four pipeline valve sites and the Baileyville Compressor Station would require some additional grounding. The edge of the NRI ROW would be greater than 150 ft (46 m) from the valve sites. The AC mitigation would be installed prior to energizing the NRI (Paquette 2005ee).[8]

[8] Maritimes would be responsible for overseeing the design, environmental permitting, procurement of materials, and installation of the AC mitigation (Paquette 2005mm).

2.3.6 Post-Construction Maintenance Practices

Post-construction maintenance would consist primarily of line inspection and vegetation management. Failure to adequately control vegetation within transmission line ROWs has been identified as a major cause of the August 14, 2003, electric power blackout in the eastern United States and has contributed to other regional outages in the past (FERC 2004). Growth rates of vegetation can vary due to differences in species, soil, site conditions, and climate conditions. Therefore, ROW inspections would be required periodically to determine if there are areas where trees may approach minimum clearances before the next scheduled vegetation maintenance period. Management of vegetation along the ROW would consist of removal of danger trees adjacent to the ROW and control of vegetation within the ROW. Management of vegetation within the ROW would involve use of an integrated vegetation management approach designed to encourage low-growing plant species and discourage tall-growing vegetation (TRC 2005b). The vegetation maintenance plan would ensure a minimum distance of 15 ft (4.6 m) between any object and the conductor during all phases of the maintenance cycle (BHE 2005).

Maintenance clearing generally would be performed on a 3- to 4-year cycle and would consist of some of the same types of activities as during the initial clearing. The post-construction vegetation management would include the following: (1) areas of selective clearing (e.g., riparian buffer zones, wetlands, areas near rare and uncommon natural areas, and areas containing special status species or other wildlife species of concern); (2) areas of side clearing along the edge of the ROW (e.g., removal of danger trees); and (3) areas of cutting and spraying within the ROW. (Buffer zones are protected areas of land along water bodies or wetlands that have sufficient width to reduce the movement of eroded soil or to maintain adequate shading.) ROW maintenance within buffer zones would be limited to cutting only those trees that could present a safety hazard to the transmission line before the next cutting period (4 years). Only the upper portion of evergreen trees that infringe on the wire security zone would be cut. For hardwoods, only those trees likely to reach the bottom limit of the wire security zone within 4 years would be removed. Cutting along the edge of the ROW would involve the removal of encroaching branches from each side of the ROW (i.e., side trimming).

Hand and mechanical vegetation cutting would be combined with optional foliar, basal, and cut-stump application of herbicides to maintain ROW vegetation. Only herbicides registered for use by the EPA, approved for use by the State of Maine, and determined by BHE's experience (or the experience of others) to be effective for foliar, basal and cut-stump applications would be used. Herbicides that may be used include Accord®, Arsenal®, and Krenite® (Paquette 2005r). The active ingredient in Accord is glyphosate. It is used to control grasses, herbaceous plants, brush, some broadleaf trees and shrubs, and some conifers. Glyphosate is absorbed by leaves and moves rapidly through the plant, preventing it from producing an essential amino acid (Information Ventures, Inc. 1995).

The active ingredient in Arsenal is imazapyr. It is used to control annual and perennial grass and broad-leaved weeds, brush, vines, and many deciduous trees. Imazapyr is absorbed by leaves and roots and accumulates within the active growing region of the plant. There it disrupts protein synthesis and interferes with cell growth and DNA (2′-deoxy-5′-ribonucleic acid) synthesis (Information Ventures, Inc. 1995).

The active ingredient in Krenite is fosamine ammonium, often referred to simply as fosamine. It is used to control and/or suppress woody plants. Applied as a foliar spray, it inhibits bud and leaf formation in the spring. Unlike the other two herbicides, Krenite affects only the parts of the plant that are sprayed; therefore, it can be used as a trimming agent (e.g., to control portions of trees that could otherwise infringe into the ROW and present a safety concern) (Pesticide Management Education Program 2001; Superior Forestry Service, Inc. 2001).

Areas that would receive selective cutting include riparian areas along streams and rivers and forested wetlands. Generally, riparian buffer zones would be 75 ft (23 m) wide on each side of a perennial or intermittent stream but would only be 25 ft (7.6 m) wide for the portion where the proposed project parallels the existing 345-kV line. Wetland buffer zones would extend 25 ft (7.6 m) from the edge of a wetland (BHE 2005). Within riparian and wetland buffer zones, only the vegetation within the actual conductor clearance zone within or immediately adjacent to the ROW would be removed. Table 2.3-3 summarizes the cutting practices that would occur within the various buffers during ROW maintenance. All clearing would be accomplished by hand or feller buncher machinery. No herbicides would be used within riparian and wetland buffer zones (BHE 2005).

About 5% of the clearing required for the alternative routes would be conducted within forested wetlands. ROWs in wetland types other than forested wetlands (e.g., scrub-shrub and emergent wetlands) generally would not require removal of vegetation. To the extent possible, clearing involving use of machinery in wetlands would be performed during the winter when the ground is frozen and snow cover is present. Manual cutting of trees could occur at any time of the year. No herbicides would be used within wetlands with standing water.

Selective cutting would also occur in visually sensitive areas (e.g., certain road crossings and viewpoints) and where known deer wintering areas would be bifurcated by the route. Clearing would leave the maximum amount of vegetation possible within the ROW without infringing on the conductor clearance zone. Construction of access roads and basal application of State-approved herbicides could occur following selective cutting in visually sensitive and deer wintering areas.

2.3.7 Schedule

Construction would begin with ROW clearing upon issuance of all required Federal, State, and local permits. ROW clearing is anticipated to begin in the winter in order to take advantage of frozen ground to minimize impacts, especially within wetlands. It is anticipated that the ROW would require about 6 months, support structures would require 8 months to install, and shield wires and conductors would require 8.5 months to install (Paquette 2005ii). To some extent, these activities could be conducted concurrently, and the use of additional crews could shorten the construction time. Substations would be modified as needed during the same period as the stringing operations. Site-specific mitigation and restoration activities would be carried out during all phases of construction. Plans call for the project to be completed and the line energized within 12 to 18 months of commencement of construction.

2.4 STANDARD MITIGATION

BHE's standard mitigation practices are documented in its Permit Application for Site Location of Development and Natural Resources Protection Act for the NRI that has been submitted to the MDEP (BHE 2005).[9] The permit application includes the erosion and sediment control plan, post-construction vegetation maintenance plan, and other mitigation measures. The following sections summarize the mitigation practices included in the proposed action. The mitigation practices are listed according to project phase (i.e., pre-construction, construction, site restoration, operation, and maintenance), although there could be overlap among the various phases. In addition to BHE's mitigation practices, Maritimes would follow its established mitigation practices when installing AC mitigation, as required (TRC 2002).

2.4.1 Mitigation Practices To Be Used for Pre-Construction Activities

- Structures would be located to avoid sensitive features such as riparian areas, water courses, and cultural resource sites, or to allow conductors to clearly span the features within limits of standard structure design.

- Before construction, all construction personnel would be instructed on the protection of cultural and ecological resources, including mitigation measures required by Federal, State, and local agencies. To assist in this effort, the construction contract would address (1) Federal and State laws on antiquities and plants and wildlife, including collection and removal, and (2) the importance of these resources and purpose and necessity of protecting them.

- All requirements of those entities having jurisdiction over air quality matters would be adhered to and any permits needed for construction activities would be obtained.

- The applicant would perform an aerial survey in the spring of 2006 to identify any new bald eagle nests that might have become established within 0.25 mi (0.4 km) of the ROW. If new nests are identified, BHE would consult with the Maine Department of Inland Fisheries and Wildlife (MDIFW) and USFWS to determine appropriate mitigation for potential impacts. Typically, disturbance of eagle nests is avoided by prohibiting construction activities within a 0.25-mi (0.4-km) radius of the nests when breeding and nesting activities

[9] The standard mitigation practices include best management practices (BMPs). BMPs are guidelines to reduce erosion and sedimentation of water bodies from logging activities. In the unorganized townships of Maine, these guidelines are law, enforced by the Land Use Regulation Commission (LURC).

occur (generally February 1 through May 15; continuing until August 31 if the nest is occupied).

- As appropriate, mitigation measures developed during consultation with the USFWS, NOAA Fisheries, and State and Tribal authorities would be followed.

- If required, the applicant would adhere to mitigation measures developed by NOAA Fisheries regarding essential fish habitat (EFH).

- Proposed access ways within stream buffers and water-wetland crossing locations, as well as other environmentally sensitive areas where activities would be restricted or prohibited, would be flagged and/or would have signs posted.

- Prior to any clearing or construction work in or near any sensitive natural areas, a "walk-through" would be conducted. Attendees at the walk-through would include (1) the contractor, (2) BHE and/or any designated representative, and may include (3) any assigned third-party inspector and/or other agency representatives (e.g., MDEP project manager, Atlantic Salmon Commission representative, or USFWS representative).

- To the extent practicable, BHE would use existing public roads, Stud Mill Road, and other smaller logging roads to access the ROW.

- Wetland and water body crossings would be identified prior to construction to minimize the span of a wetland or stream crossing and to avoid the more environmentally sensitive or wetter portions of a wetland or stream crossing.

- Temporary erosion and sedimentation control measures would be installed prior to ground disturbance, as determined through the site walk-through.

- Silt fence or other erosion control barriers would be installed around the perimeter of the work area, as necessary.

- All erosion control work conducted by a contractor would need to meet the acceptance review of BHE.

- Environmental training would be provided to both BHE and contractor personnel whose activities or responsibilities could impact the environment during construction. The environmental compliance officer and other inspectors, the BHE construction field supervisor(s), and all construction personnel would be expected to play an important role in maintaining strict compliance with all permit conditions to protect the environment during construction.

- Except at the Narraguagus and Machias River crossings, structure locations would be sited as close as possible to the buffer of an Atlantic salmon stream of special concern[10]; or, in the case of a tributary to Fletcher Brook, a taller structure would be used to create a conductor height that would allow for taller vegetation, thus minimizing trimming requirements.

- Structures would be located farther back from the Narraguagus and Machias River crossings to minimize the visual impact from these high-value recreational resources and Outstanding River Segments.

2.4.2 Mitigation Practices To Be Used for Construction Activities

- Blasting would be conducted in general conformance with appropriate Federal guidelines to limit peak particle velocity and ground vibration to safe levels.

- A preblast inspection of privately owned structures within 500 ft (152 m) of any blast site would be conducted, and each affected landowner would be notified about the blasting before it was conducted.

- Appropriate procedures for storage and transportation of blasting equipment and explosive materials, including appropriate signage indicating its location, would be used.

- Noise and air blast effects would be mitigated by the use of proper stemming techniques. No blasting would be conducted on Sundays. On other days, blasting would occur only from 7:00 a.m. to 7:00 p.m. or from sunrise to sunset, whichever was longer. Blasting would be conducted no more than four times per day in any one general location.

- As appropriate, the occurrence of flyrock from blasting would be limited by using blasting mats.

- Employees would be trained to promptly contain, report, and clean up any oil or hazardous material spill in accordance with BHE's spill contingency plan. Both the contractors' and BHE's environmental inspectors would ensure that all personnel working on the ROW follow the oil and hazardous material use requirements.

- Regulated materials would not be released onto the ground or into streams or drainage areas. Totally enclosed containment would be provided for all trash. All construction waste, including trash and litter, garbage, other solid waste,

[10] An Atlantic salmon stream of special concern is a stream or river identified by the Maine Atlantic Salmon Commission as being most important to the various life stages of the Atlantic salmon.

petroleum products, and other potentially hazardous materials, would be sent to a disposal facility authorized to accept these materials.

- Special status species or other species and habitats of concern would continue to be considered during post-EIS phases of project implementation in accordance with management policies set forth by the appropriate government agency. This might entail BHE's conducting surveys for plant or animal species of concern along the proposed transmission line route and associated facilities (i.e., access roads and staging areas) as agreed upon by the USFWS, NOAA Fisheries, MDIFW, MDEP, and BHE. In cases where special status species or other species of concern are identified, appropriate mitigation measures would be taken to avoid adverse impacts on the species and its habitat and may include altering the placement of access roads or support structures as practicable, monitoring construction activities, or implementing seasonal construction restrictions. The project would be designed and constructed in accordance with avian protection guidelines, as referenced in Section 4.5, Ecological Resources.

- Practices such as cleaning of construction equipment to prevent the introduction or spread of invasive species would be developed and followed in accordance with applicable requirements.

- Any new gravel placement and grading would be limited to that necessary to maintain a safe, reliable surface and would not result in any new impervious surface. No gravel would be placed in protected resources such as wetlands.

- The movement of equipment and materials within the transmission line ROW would be confined as much as possible to a single road or travel path.

- All ground-level vegetation and stumps left after cutting would not be removed, unless necessary to install a support structure.

- The support structure construction work area would not be grubbed or cleared of brush, unless leveling of the area was required. The only soil disturbance would be associated with the drilling-excavation of a hole for the installation of poles and, in some cases, with the need to level the work area or provide access along and adjacent to the ROW.

- In all sensitive areas, the pull line would be pulled across the resource by construction personnel walking the line across, to avoid unnecessary crossing of the resource by construction equipment.

- Work within inundated or saturated wetlands would be limited to the winter months (frozen conditions), as much as possible.

- Seepage and runoff from pole excavations would be pumped to a temporary sedimentation trap prior to discharge to a well-vegetated area where the water would be able to infiltrate the soil.

- Recommended widths for filter strips between disturbed areas and water resources would be used. These would range from a minimum of 75 ft (23 m) where there is no slope, to 165 ft (50 m) for a 70-degree slope.

- Construction equipment would not travel straight up or down any slopes with a grade steeper than 10%, except where necessary because of safety concerns and/or terrain constraints.

- Rivers, streams, and wetland areas would be crossed, where necessary, at right angles to the channel and/or at points of minimum impact. Natural drainage patterns would not be altered or restricted as a result of construction.

- If construction in unfrozen wetlands cannot be avoided, wide-tracked or balloon-tired equipment, timber corduroy or timber mat work areas, or sump combination would be required.

- Where support structures would be placed in wetlands, topsoil would be excavated first and stockpiled separate from subsoil. Soils would be replaced into the excavated area in the opposite order they were removed.

- No structures would be located within the 25-ft (7.6-m) or 75-ft (23-m) standard stream buffer areas, and no soil disturbance or vehicular traffic would be allowed other than that necessary to construct and utilize temporary equipment crossing bridges authorized during the walk-through. Cutting in standard stream buffers would be limited to only capable tree species (a tree that may grow into the clearance zone of the conductors within the next 3 to 4 years) that are greater than 8 to 10 ft (2.4 to 3.0 m) tall (dead or danger trees would be removed entirely). Cutting would be performed by hand or by a feller buncher, either by reaching into the buffer from outside the zone or from the three access ways that would be used for the 75-ft (23-m) stream buffer areas. Erosion control would be used, as appropriate.

- Salmon stream buffers would have the same construction limitations as standard stream buffers except that only those trees capable of growing into the clearance zone of 15 ft (4.6 m) from the conductors within the next 3 to 4 years would be topped or removed.

- A number of aboveground structures or techniques would be used to divert water out of access roads and work areas in order to prevent subsequent runoff and erosion. These could include water bars and sediment barriers such as silt fence, hay bales, and/or erosion control mix berms (primarily organic materials such as shredded bark, stump grindings, composted bark, or similar materials).

- No refueling or maintenance of equipment, including chain saws, would occur within buffer areas.

- Initial clearing of the area surrounding State rare species would be conducted during the winter with at least 6 in. (15 cm) of snow cover. Also, all tree species except young northern white cedar (*Thuja occidentalis*) up to 8 ft (2.4 m) tall would be removed. Vegetation maintenance in these areas would consist of hand cutting all trees other than northern white cedar that are less than 8 to 10 ft (2.4 to 3.0 m) tall. Those trees would be topped when reaching that height. No herbicides would be used within 50 ft (15 m) of these areas, and all cut woody debris would be removed from the ROW to ensure that the plants are not smothered.

2.4.3 Mitigation Practices To Be Used during Site Restoration

- In revegetation efforts, State-approved seed mixes would be used.

- Restoration measures would return the disturbed area to its original contour in order to allow revegetation with shrub and brush cover. The site would be revegetated with temporary and/or permanent seeding, as necessary, to stabilize the area.

- After pole installation, topsoil would be restored to the original surface grade, except where mounding around a structure would be necessary for structure stability.

- Nonstructural measures (hay or straw mulch, erosion control mix, matting, or seeding) would be used to cover exposed soil areas to prevent wind and water erosion. Such measures would be required on all exposed soils within 100 ft (30 m) of water resources within 48 hours of initial soil disturbance or before any predicted storm event. Mulch would also be applied immediately to areas that have been seeded.

- Site restoration would be conducted in a timely manner. Highest priority restoration areas would include, but not be limited to, all wetland and stream crossings; drainage ways or ditches; cut banks and slopes (more than 8%); around substation construction areas; around pole and anchor pole placements; and all temporary access roads, ROW travel lanes, yarding, and construction lay-down areas.

- All soil that would be excavated, mounded, or deposited during construction would be regraded or removed from the site. All regrading and redistribution of soil would be conducted to match existing grade.
- The banks of brooks, streams, and rivers would be restored to natural conditions.
- All construction mats used in wetlands would be removed, and any surface damage would be repaired, as needed.
- All areas severely rutted by construction equipment would be regraded and permanently revegetated.
- All areas of exposed soil would be permanently revegetated or otherwise permanently stabilized.
- Any brush burning would be conducted in compliance with local and State open burning permit requirements.

2.4.4 Mitigation Practices To Be Used during NRI Operation

- If necessary, site-specific landscaping may be put in place in selected areas to provide screening for year-round residents whose property abuts NRI operations. However, maintenance would still follow the standard practice of preventing any vegetation from reaching within 15 ft (4.6 m) of the conductors.
- Shield wires would be marked with highly visible devices, such as colored balls and/or flappers, at key water courses (i.e., the Penobscot River, Great Works Stream, Narraguagus River, Machias River, and St. Croix River, depending on selected route alternative).
- Flappers would also be used where the transmission line crosses through high-value habitat for waterfowl and wading birds, if not adjacent to an existing transmission line.
- BHE would respond to and resolve individual complaints of radio and television interference generated by the transmission line.
- Osprey nests would be allowed to remain in place on support structures unless there is a chance that they would come into contact with the conductor. If there is a risk of arcing or conductor contact, BHE would follow its existing guidelines for removing nests; removal would take place between September 1 and April 15, and only if birds are not actively using the nest. Nests would be relocated to nesting platforms when possible; otherwise, they

would be destroyed when removed. No permit would be required for this action. An annual report on all osprey nests moved or destroyed by BHE would be given to the MDIFW.

2.4.5 Mitigation Practices To Be Used during ROW Maintenance

- A visual screen of trees would be maintained at the Narraguagus and Machias River crossings and on the U.S. side of the St. Croix River crossing. Vegetation maintenance activities would be limited in these areas.

- All vegetation cut during routine maintenance would be cleaned up or otherwise handled in accordance with the Maine Slash Law.

- The following procedures would be implemented during all vegetation maintenance activities using herbicides: (1) they would be used in strict accordance with the manufacturer's EPA-approved labeling and would not be applied directly to water or other areas where surface water is present; (2) they would not be applied within water body buffers or applied within 25 ft (7.6 m) of wetlands that have water present at their surface; (3) they would not be mixed, transferred, or stored within 50 ft (15 m) of water bodies where a 25-ft (7.6-m) buffer is maintained, within 75 ft (23 m) of water bodies where a 75-ft (23-m) buffer is maintained, or within 50 ft (15 m) of wetlands that have water present at the surface; (4) they would not be applied, mixed, transferred, or stored within 50 ft (15 m) of known rare plant species or identified unique natural communities, within 100 ft (30 m) of any known wells or springs, or within 100 ft (30 m) of a home or other human dwelling; (5) they would not be applied during rain; (6) the foreman of every crew using herbicides would be licensed and remain in eye contact with all persons in his crew applying herbicides; (7) the herbicides would typically be mixed in a truck-mounted tank that would stay on access roads; (8) they would be applied in accordance with applicable regulations promulgated by the Maine Pesticides Control Act; and (9) each target tree would be only sprayed until the foliage was covered with little or no runoff.

- Vegetation maintenance activities with motorized equipment within moderate and high-value waterfowl and wading bird habitat would be prohibited between April 15 and July 15 each year to minimize the potential disruption of avian breeding and nesting activity.

- Vegetation maintenance in areas of unique natural areas would consist of hand cutting all capable species and topping other vegetation that is greater than 8 to 10 ft (2.4 to 3.0 m) tall. No herbicides would be allowed within 50 ft (15 m) of these areas.

- BHE would maintain an updated sensitive area database to note all sensitive areas along the ROW and their locations relative to the nearest support structure. These data would be incorporated into the Vegetation Maintenance Plan.

2.5 COMPARISON OF ALTERNATIVES

Table 2.5-1 at the end of this section presents a comparison of the alternatives on the basis of the analysis presented in Chapter 4.

The following resource areas were evaluated for potential impacts:

- Air quality,
- Land features,
- Land use,
- Hydrological resources,
- Ecological resources,
- Cultural resources,
- Socioeconomics,
- Minority and low-income populations (environmental justice),
- Visual resources, and
- Health and safety.

The following discussion emphasizes the environmental implications of choosing among the alternatives, organized by resource area. Impacts during construction (approximately 12 to 18 months) and operation (particularly maintenance) of the project are considered. The discussion is followed by Table 2.5-1, which provides a more quantitative look at the differences among alternatives. In general, the Rescission of the Presidential Permit Alternative has the least impact on the environment because it does not involve ground-disturbing activities or the introduction of a transmission line into the visual landscape.

2.5.1 Air Quality

No significant differences in air quality impacts would occur for any of the four route alternatives. Temporary localized fugitive dust emission impacts from construction activities would occur. Fugitive dust impacts would be tempered since as much construction as possible would be conducted in winter and since, in most cases, ground vegetation would not require removal. The use of vehicles and equipment during construction and maintenance would also result in short-term localized emission of air pollutants. During operation of the line, corona-produced ozone (O_3) would be less than 1.0 part per billion (ppb), well below the 8-hour and 1-hour O_3 standards of 80 ppb and 120 ppb, respectively. A conformity review is not required for the proposed project because the project area is not located within a nonattainment area for any of the criteria pollutants.

Under the Rescission of the Presidential Permit Alternative, BHE would not build the NRI. Therefore, there would be no impacts on air quality beyond those already occurring.

2.5.2 Land Features

The construction of the NRI along any of the alternative routes would not impact geologic resource availability. Construction of the alternative routes would require the excavation of approximately 7,933 yd^3 (6,069 m^3) of soil from the Previously Permitted Route, 9,097 yd^3 (6,959 m^3) of soil from the Modified Consolidated Corridors Route, 11,913 yd^3 (9,113 m^3) of soil from the Consolidated Corridors Route, and 12,347 yd^3 (9,445 m^3) from the MEPCO South Route. The amount of soil removed for any alternative route would be very small relative to the availability of the material in the region. Localized terrain changes could result from the installation of support structures, substation expansion, or establishment of new temporary access roads. These terrain changes would be localized to the individual locations of the support structures, the substation expansion area, and new temporary access roads. Because of the relatively flat terrain of most of the project area, topographic changes to the area would be negligible. Impacts on soils from localized erosion and compaction would be negligible because standard mitigation practices would be used to minimize soil erosion and promptly restore construction areas (Section 2.4). Because most of the construction activities in sensitive areas would be conducted in winter when precipitation occurs as snowfall and the soil surface is frozen, the potential for soil erosion or compaction as a result of construction would be minimized. None of the alternative routes are located in areas of relatively high seismic activity.

Under the Rescission of the Presidential Permit Alternative, BHE would not build the NRI. Therefore, there would be no impacts on land features (physiography, geology, and soils) beyond those already occurring.

2.5.3 Land Use

All four alternative routes would cross primarily through privately owned commercial forested land. ROW clearance and support structure installation are the main activities under the proposed action that could result in impacts on land use. The line length of each of the alternatives, except for the MEPCO South alternative, would be relatively similar (84 to 85 mi [135 to 137 km]). The MEPCO South line would be 114 mi (183 km) long.

Between about 1,391 and 1,513 acres (563 and 612 ha) of forested land could be impacted by ROW land-disturbing activities for the alternative routes, which is a very small fraction of the local acreage of timberlands (approximately 4.3 million acres [1.7 million ha])

within Hancock, Penobscot, and Washington Counties. The presence of the proposed project would not restrict the continuation of commercial forestry in areas adjacent to the ROW; however, the ROW area would be excluded from future timber production for the life of the project.

Between 28 and 86 acres (11 and 34 ha) of agricultural land (cropland, orchards, pastureland, and rangeland) could be impacted by the alternative routes. In the three-county area, there are more than 300,000 acres (120,000 ha) of land in farms. The MEPCO South Route would impact 86 acres (34 ha), while the other three routes would be at the low end of the range. The presence of the ROW would not restrict the continuation of agricultural land use, but it is probable that some support structures would need to be placed within agricultural lands. A support structure would exclude no more than 0.03 acre (0.01 ha) of agricultural land from production. Between 0.29 and 1.32 acres (0.12 and 0.53 ha) of agricultural land could be lost from production by the alternative routes because of constraints on farm equipment use in the immediate area of support structures (including guy wires).

Recreational activities in the project area include all-terrain vehicle (ATV) use, snowmobiling, canoeing, fishing, and hunting. The primary impact on recreational activities would be increased access and a change in the visual setting where recreation occurs. No land would be taken out of or removed from recreational use as a result of the proposed project. The Modified Consolidated Corridors, Consolidated Corridors, and Previously Permitted Routes would be within the viewshed of two Outstanding River Segments.

The proposed project could affect residential areas either visually or through displacement of dwellings by condemnation through BHE's eminent domain rights as a public utility. Up to 10 dwellings would be displaced for the MEPCO South Route, while no dwellings would be displaced for the Modified Consolidated Corridors Route. The Previously Permitted and Consolidated Corridors Routes would displace two and three dwellings, respectively. The number of dwellings within 600 ft (183 m) of the proposed project[11] would be 121 for the MEPCO South Route, 59 for the Consolidated Corridors Route, 40 for the Modified Consolidated Corridors Route, and 39 for the Consolidated Corridors Route.

No potentially limiting land use issues have been identified for the Modified Consolidated Corridors Route, Consolidated Corridors Route, or MEPCO South Route. The Previously Permitted Route crosses about 40 mi (64 km) of land owned by International Paper, and logging operations along this portion of the route could be disrupted. The Machias River

[11] The 600-ft (183-m) distance was selected during BHE's stakeholder process, for the purpose of evaluating visual impacts on landowners (Paquette 2005ll), and has been accepted by DOE as reasonable.

Project[12] could also preclude the Previously Permitted Route's proposed crossing location of the Machias River (Paquette 2005j).

Under the Rescission of the Presidential Permit Alternative, BHE would not build the NRI. Therefore, there would be no land use impacts beyond those already occurring.

2.5.4 Hydrological Resources

No adverse impacts on surface water or groundwater resources would occur from any of the alternative routes. All four alternative routes would span about the same number of streams and rivers. BHE would avoid placing structures within 75 ft (23 m) from the top of stream banks (25 ft [7.6 m] for the portion that would parallel the existing 345-kV transmission line). However, support structures would be placed as close to Atlantic salmon streams of special concern[13] as possible to minimize the amount of clearing required in order to maintain stream temperatures. The Modified Consolidated Corridors, Consolidated Corridors, and Previously Permitted Routes would cross two Outstanding River Segments. Support structures would be placed farther away from these streams to minimize visual impacts. However, because the crossing locations for these streams are relatively open, no changes in stream temperatures from the ROW are expected.

Restrictions on refueling and herbicide mixing locations would protect surface water and groundwater from contamination by fuel, lubricants, and herbicides during construction. Standard mitigation practices would be implemented along the length of the line for erosion and sedimentation control.

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12 The Machias River Project was a Nature Conservancy initiative to establish conservation protection for the Machias River shoreline. In 2003, a transaction involving the State of Maine, The Nature Conservancy, and International Paper was completed, creating a conservation corridor along the Machias River consisting of conservation easement and fee ownership. In the vicinity of Stud Mill Road, this conservation corridor was conveyed to the State of Maine as fee land (i.e., the State became the owner of the property). This corridor is approximately 2,500 ft (762 m) wide and extends north of Stud Mill Road to include the area of the crossing of the Previously Permitted Route (Sloan 2005c). At Stud Mill Road, International Paper retained a 1,000-ft (205-m)-wide utility corridor that was subsequently conveyed to ECHO Easement Corridor, LLC. This utility easement provides the right to construct and maintain most types of utility facilities, including electric transmission lines. The Modified Consolidated Corridors and Consolidated Corridors Routes would cross the Machias River within this utility easement. In contrast, the Previously Permitted Route would cross the Machias River within the Machias River conservation corridor, where there is currently no established utility easement. The absence of an existing utility easement at this location does not preclude the crossing of the river by the Previously Permitted Route. A stream crossing may be negotiated with the State, or this portion of the Previously Permitted Route could be rerouted to move the Machias River crossing approximately 3,400 ft (1,036 m) south to the ECHO Easement Corridor location (Sloan 2005c).

13 An Atlantic salmon stream of special concern is a stream or river identified by the Maine Atlantic Salmon Commission as being most important to the various life stages of the Atlantic salmon.

No support structures would be located in stream, and the placement of support structures elsewhere in floodplains is not expected to result in any increase in flood hazard. The support structure poles would not impede floodwater movement or reduce floodwater-storage capacity.

Under the Rescission of the Presidential Permit Alternative, BHE would not build the NRI. Therefore, there would be no impacts on hydrological resources beyond those already occurring.

2.5.5 Ecological Resources

Vegetation would be affected by clearing to establish the ROW, installation of support structures, creation of new temporary access roads, and installation of AC mitigation, as required. Forest clearing for the project would fragment habitat by creating a new ROW through contiguous forested habitats or by expanding the ROW width where the NRI would be co-located with existing facilities. The acreage of forest clearing for the ROW would be as follows: Modified Consolidated Corridor Route — 1,411 acres (570 ha); Consolidated Corridors Route — 1,391 acres (563 ha); Previously Permitted Route — 1,461 acres (591 ha); and MEPCO South Route — 1,513 acres (612 ha). The ROW would be maintained in a shrubland or old field condition. Standard mitigation practices would minimize the potential for adverse impacts from selective herbicide use.

The potential impacts on wildlife for each alternative route would be proportional to the total acreage of the ROW. Impacts from transmission line construction would be local and affect only individual animals. Impacts (beneficial or adverse) from the establishment of a ROW corridor on individual wildlife species are summarized in Appendix D. Population-level impacts on wildlife species are considered to be very unlikely. Herbicides would not be expected to adversely affect wildlife. The potential exists for birds to collide with the transmission line conductors and shield wires. This would be most likely to occur where the proposed project crosses through areas where birds would be most likely to congregate, such as waterfowl and wading bird habitats. The acreage of waterfowl and wading bird habitats that would be crossed by the proposed project would be as follows: Modified Consolidated Corridors Route — 133 acres (54 ha); Consolidated Corridors Route — 113 acres (45 ha); Previously Permitted Route — 93 acres (37 ha); and MEPCO South Route — 148 acres (60 ha).

Minimal adverse impacts on aquatic biota would be expected for any alternative route because standard mitigation practices would be used to minimize erosion and sedimentation, stream warming, and chemical contamination (e.g., by herbicides or fuel).

Impacts on wetlands would occur where forested wetlands are converted to scrub-shrub or emergent wetlands. The acreage affected would be as follows: Modified Consolidated Corridors Route — 70 acres (29 ha); Consolidated Corridors Route — 53 acres (21 ha); Previously Permitted Route — 103 acres (41 ha); and MEPCO South Route — 73 acres (29 ha). Only very minor permanent fills of wetlands would occur from support structure pole placement in wetlands. No impacts on wetlands with standing water from herbicide use are expected for any alternative route.

Impacts on special status species would be similar to those described for other biota, but any impacts could affect their populations because of the species' limited distribution and/or abundance. The establishment of a ROW would be potentially beneficial for some special status species and adverse for others (see Table 4.5-4). Potential adverse impacts from construction and maintenance of the ROW would be minimized or eliminated by the implementation of standard mitigation practices aimed at special status species. For example, ball markers and/or flappers would be placed on shield wires across the St. Croix River, Machias River, Narraguagus River, Great Works Stream, and Penobscot River to minimize the potential for bald eagles to collide with the wires, and standard mitigation practices would be employed at Atlantic salmon EFH streams to minimize erosion and sedimentation, protect stream banks, and maintain stream shading.

Under the Rescission of the Presidential Permit Alternative, BHE would not build the NRI. Therefore, there would be no impacts on ecological resources beyond those already occurring.

2.5.6 Cultural Resources

No impacts on cultural resources are expected for the Modified Consolidated Corridors Route. The route was modified to avoid the one significant historic property recorded during the archaeological survey for the proposed project. Impacts on cultural resources are possible, but unlikely, for the Consolidated Corridors and Previously Permitted Routes; impacts on cultural resources would be more probable, however, for the MEPCO South Route since the Penobscot River drainage has been identified as an area of high potential for containing significant archaeological material. A cultural resource survey and approval of the survey results by the Maine State Historic Preservation Officer (SHPO) would be required if the Consolidated Corridors Route, Previously Permitted Route, or MEPCO South Route were selected for the proposed project. Archaeological surveys may be required in areas designated for new temporary access roads and some staging areas. No cultural resources are expected in areas where AC mitigation may be required, since those areas were previously disturbed when the M&N gas pipeline was installed.

Under the Rescission of the Presidential Permit Alternative, BHE would not build the NRI. Therefore, there would be no impacts on cultural resources beyond those already occurring.

2.5.7 Socioeconomics

The construction of the Modified Consolidated Corridors, Consolidated Corridors, or Previously Permitted Routes would create approximately 120 direct (construction) jobs and approximately 110 indirect (service-related) jobs. The MEPCO South Route would create approximately 150 direct and 130 indirect jobs. The jobs created by the construction of the NRI would primarily benefit Hancock, Penobscot, and Washington Counties. No significant influx of population or stress to community services would be expected from project construction. No socioeconomic impacts would be expected from project operation because most jobs created would be filled by current residents.

Under the Rescission of the Presidential Permit Alternative, BHE would not build the NRI. Therefore, there would be no socioeconomic impacts beyond those already occurring.

2.5.8 Environmental Justice Considerations

The Modified Consolidated Corridors, Consolidated Corridors, and Previously Permitted Routes would not have a disproportionately high and adverse impact on minority or low-income populations. One minority census block group occurs within a small portion of the 2-mi (3.2-km) buffer along the MEPCO South Route. Standard mitigation practices would minimize potential impacts from noise, dust, and emissions during construction.

Under the Rescission of the Presidential Permit Alternative, BHE would not build the NRI. Therefore, there would be no impacts on environmental justice considerations beyond those already occurring.

2.5.9 Visual Resources

Visual impacts would occur primarily from the introduction of support structures and transmission line wires into the landscape. A transmission line along any of the alternative routes would be moderately incompatible, mildly contrasting, and, occasionally, a dominant feature in the landscape. This would be most notable in areas where more remote recreational activities occur. The MEPCO South Route would be visible to more residents than the other alternatives, given its closer proximity to more towns and roads along the Route 2 and Route 6 corridors. The Modified Consolidated Corridors, Consolidated Corridors, and Previously Permitted Routes would cross two Outstanding River Segments (Narraguagus and Machias Rivers). Standard mitigation practices would be used to minimize visual impacts at these two river crossings and at the U.S. side of the St. Croix River, which would be crossed by all four alternative routes.

Under the Rescission of the Presidential Permit Alternative, BHE would not build the NRI. Therefore, there would be no impacts on visual resources beyond those already occurring.

2.5.10 Health and Safety

Procedures are well established to reduce or eliminate the potential for shock hazards associated with operation of the NRI. AC mitigation would be required where the NRI would be located near, parallel to, or cross over the M&N gas pipeline.

Although each alternative route passes primarily though forested land, the MEPCO South Route would have the highest number of houses in close proximity to the transmission line. Electric field exposures at the edge of the ROW for all alternatives would be less than guidelines that have been established by several states. Magnetic field exposures at most residences for all routes would be well below average daily exposure to maximum magnetic fields (0.8 milligauss [mG]) from some common household and office appliances and machinery. No health effects would be expected from electric and magnetic field (EMF) exposure.

There are no noteworthy differences in potential noise impacts from any of the four alternative routes. Noise levels would increase above background during construction. Temporary construction noise increases would primarily impact residents and recreationists close to the ROW. Elevated noise would occur only during daytime. During operation, long-term noise from the corona effect on transmission lines would generally be lost in background noise.

The potential risk to people with pacemakers would be negligible for all alternative routes. The potential for radio and television interference from the proposed project would be negligible. What little potential there is would be slightly greater for the MEPCO South Route because it has more dwellings within 100 ft (30 m) of the ROW and has more highway crossings than the other alternative routes.

The potential human health risks from herbicide usage for maintaining the proposed project ROW would be negligible because of adherence to regulations and implementation of standard mitigation practices associated with the use of these products.

The potential for fatalities of, and injuries to, construction and maintenance workers would be slightly greater for the MEPCO South Route than for the other alternative routes because of its greater length, which would require more clearing and more support structures. Nevertheless, fatality risks would be less than 1 fatality for all alternative routes. Nonfatal occupational injuries and illnesses for construction of the NRI would be 9.7 for the MEPCO South Route and 6.9 for the other alternative routes; nonfatal injuries and illnesses during maintenance would be fewer than 1 per 10 full-time field personnel for all alternative routes. The use of standard mitigation practices for occupational health and safety compliance would reduce the potential for fatalities and injuries.

Under the Rescission of the Presidential Permit Alternative, BHE would not build the NRI. Therefore, there would be no impacts on health and safety beyond those already occurring.

TABLE 2.5-1 Summary of Key Project and Environmental Characteristics and Potential Impacts of the Proposed Action and Other Alternatives by Resource Area[a]

Resource Area (EIS Impact Analysis Section Number)	Modified Consolidated Corridors Route (Preferred Alternative)	Consolidated Corridors Route Alternative	Previously Permitted Route (No Action Alternative)	MEPCO South Route Alternative	Recission of Presidential Permit Alternative
Air Quality (4.1)					
Construction	Temporary localized fugitive dust emissions from construction activities would occur. These would be negligible, since as much construction as possible would be conducted during winter when the soil surface is frozen and since ground-level vegetation would be maintained to the extent possible. No conformity review required as the project area is in attainment with the EPA's NAAQS.				No impact on air quality. Current air quality trends would continue.
Operation	Impacts from operation and maintenance activities would be limited to vehicle emissions and dust from occasional travel on unpaved roads by BHE personnel or their contractors. Corona would generate less than 1 ppb of ozone in the immediate vicinity of the conductors.				
Land Features (4.2)					
Physiography	Negligible localized terrain changes could occur from installation of support structures, substation expansion, and establishment of new temporary access roads.				No impacts on land features.
Geology	Impacts on geologic resources would be negligible. The placement of poles, new temporary access roads, and substation expansions would require some disturbance and removal of near-surface material. (See *Land Use* for estimates of areas disturbed.) Foundations for wood-pole support structures would require direct embedment of poles, requiring excavation of pits. Blasting may be required in areas of shallow bedrock. Concrete fill or foundations would be required for steel-pole support structures.				
Soils	Impacts on soils from erosion and compaction would be negligible because of the use of standard mitigation practices to minimize soil erosion and to promptly restore construction areas (Section 2.4).				
Seismicity	Low seismic risk within the project area.				
Land Use (4.3)					
Total ROW length (mi)[b]	85	85	84	114	
Total ROW area (acres)[c]	1,566	1,522	1,633	1,734	

TABLE 2.5-1 (Cont.)

Resource Area (EIS Impact Analysis Section Number)	Modified Consolidated Corridors Route (Preferred Alternative)	Consolidated Corridors Route Alternative	Previously Permitted Route (No Action Alternative)	MEPCO South Route Alternative	Recission of Presidential Permit Alternative
Land Use (4.3) (Cont.)					
Length of new ROW (mi)	15	2	62	39	No impacts on existing land use.
Length adjacent to existing MEPCO or EMEC transmission lines (mi)	5	8	5	68	
Length adjacent to M&N gas pipeline and MEPCO transmission line (mi)	7	7	7	7	
Length adjacent to M&N gas pipeline and/or Stud Mill Road (mi)	58	68	10	0	
Number of support structures	608	636	563	885	
Number of support structure poles	1,333	1,436	1,190	1,834	
Permanent area occupied by all support structure poles (acres)	0.5	0.5	0.4	0.6	
Permanent additional area occupied by substation modifications (acres)	1.0	1.0	1.0	1.0	
Area requiring clearing for new temporary access roads (acres)	0	0	21	32	
Temporary area occupied by staging areas (acres)	42	42	42	57	

TABLE 2.5-1 (Cont.)

Resource Area (EIS Impact Analysis Section Number)	Modified Consolidated Corridors Route (Preferred Alternative)	Consolidated Corridors Route Alternative	Previously Permitted Route (No Action Alternative)	MEPCO South Route Alternative	Recission of Presidential Permit Alternative
Land Use (4.3) (Cont.)					
Temporary disturbance by installation of AC migitation over M&N gas pipeline (acres)[d]	82	82	82	54	
Forested lands within ROW (acres)	1,411	1,391	1,461	1,513	
Agricultural lands within ROW (acres)	30	28	28	86	
Agricultural lands within ROW lost from production (acres)	0.35	0.35	0.29	1.32	
Other land use within ROW (acres)	125	103	144	135	
Number of displaced dwellings	0	3	2	10	
Number of dwellings within 300 ft	14	20	10	47	
Number of dwellings within 600 ft	40	59	39	121	
Recreation	Recreational activities in the vicinity of the proposed project would primarily be impacted by a change in the visual setting of the recreation and by providing further access to recreational activities such as fishing, hunting, and ATV use.				
ATV impact areas (number of new or enhanced access areas)	0	0	19	1	

TABLE 2.5-1 (Cont.)

Resource Area (EIS Impact Analysis Section Number)	Modified Consolidated Corridors Route (Preferred Alternative)	Consolidated Corridors Route Alternative	Previously Permitted Route (No Action Alternative)	MEPCO South Route Alternative	Recission of Presidential Permit Alternative
Land Use (4.3) (Cont.)					
Land use conflicts	No conflicts identified.	No conflicts identified.	Potentially conflicts with commercial logging activities.	No conflicts identified.	
Hydrological Resources (4.4)					
Construction and maintenance impacts	No adverse impacts on groundwater or surface water resources. Construction activities would not occur within streams or rivers. Standard mitigation practices would minimize erosion and sedimentation, loss of stream shading, and potential for contamination from herbicides and fuels.				No hydrological resource impacts. Current hydrologic resource patterns would continue.
ROW crossings of stream (number)	67	66	65	66	
ROW crossings of Class AA streams (number)	13	10	18	5	
ROW crossings of Class A streams (number)	44	46	41	41	
Crossings of streams for new temporary access roads (number)	0	0	0	1	
Lakes within 1 mi of ROW (number)	24	25	22	11	
Floodplains	Negligible change in flood elevation or changes in flow-carrying capacity of streams because of support structure placement in floodplains.				
Ecological Resources (4.5)					
Terrestrial vegetation	Upland vegetation would be primarily affected by clear-cutting or selective cutting to establish the ROW and, where required, installation of AC mitigation.				No impacts on ecological resources.
Forest lands crossed by ROW (acres)	1,411	1,391	1,461	1,513	

TABLE 2.5-1 (Cont.)

Resource Area (EIS Impact Analysis Section Number)	Modified Consolidated Corridors Route (Preferred Alternative)	Consolidated Corridors Route Alternative	Previously Permitted Route (No Action Alternative)	MEPCO South Route Alternative	Recission of Presidential Permit Alternative
Ecological Resources (4.5) (Cont.)					
Disturbance of low-lying vegetation by installation of AC mitigation (acres)	82	82	82	54	
Wildlife	Impacts from transmission line construction would be temporary, local, and affect only individual animals. Impacts (beneficial or adverse) from the establishment of a ROW corridor on individual wildlife species are summarized in Appendix D of the EIS. Population-level impacts are considered to be very unlikely.				
Number of deer wintering areas crossed by ROW	2	1	2	1	
Area of deer wintering areas crossed by ROW (acres)	7.3	5.8	6.5	7.6	
Waterfowl and wading bird habitats crossed by ROW (acres)	133	113	93	148	
Aquatic biota	No adverse impacts on aquatic biota expected because of mitigation measures that would minimize the potential for erosion and sedimentation, stream warming, and chemical contamination (herbicides and fuel).				
Wetlands					
Number of NWI wetlands crossed by ROW	188	184	193	319	
Area of NWI wetlands crossed by ROW (acres)	133	108	152	173	
Length of NWI wetlands crossed by ROW (mi)	7.7	6.6	8.2	11.6	

TABLE 2.5-1 (Cont.)

Resource Area (EIS Impact Analysis Section Number)	Modified Consolidated Corridors Route (Preferred Alternative)	Consolidated Corridors Route Alternative	Previously Permitted Route (No Action Alternative)	MEPCO South Route Alternative	Recission of Presidential Permit Alternative
Ecological Resources (4.5) (Cont.)					
Number of wetland crossings for new temporary access roads	0	0	2	11	
Forested wetlands converted to scrub-shrub or emergent wetlands in ROW (acres)	70	53	103	73	
Forested wetlands converted to scrub-shrub or emergent wetlands for new temporary access roads (acres)	0	0	0	0.6	
Special status species	Impacts are not expected to produce population-level effects that are distinguishable from natural variations in numbers or caused from ongoing perturbations (such as commercial forestry operations). Mitigation measures would protect special status species.				
Number of EFH water bodies crossed by ROW	67	66	65	66	
Forested land converted to scrub-shrub land within 150 ft of EFH water bodies (acres)	82	89	92	65	
Number of Atlantic salmon distinct-population-segment water bodies crossed by ROW	31	32	27	0	
Number of Atlantic salmon streams of special concern crossed by ROW	9	9	9	0	

TABLE 2.5-1 (Cont.)

Resource Area (EIS Impact Analysis Section Number)	Modified Consolidated Corridors Route (Preferred Alternative)	Consolidated Corridors Route Alternative	Previously Permitted Route (No Action Alternative)	MEPCO South Route Alternative	Recission of Presidential Permit Alternative
Ecological Resources (4.5) (Cont.)					
Number of shortnose sturgeon habitats crossed by ROW	0	0	0	2	
Number of known bald eagle essential habitats crossed by ROW	0	0	0	1	
Cultural Resources (4.6)					
Potential for impacts on cultural resources	No impacts expected.	Impacts possible, but unlikely.	Impacts possible, but unlikely.	Impacts probable; Penobscot River drainage identified as an area of high potential for containing significant archaeological material.	No impacts on cultural resources.
Historic archaeological resources (number of sites within ROW)	0	0	0	1	
Historic archaeological resources (number of sites within 1 mi of ROW)	8	8	8	10	
Prehistoric archaeological resources (number of sites within ROW)	4	5	4	12	
Prehistoric archaeological resources (number of sites within 1 mi of ROW)	30	31	28	46	
NRHP sites (number of sites within ROW)	0	0	0	0	

TABLE 2.5-1 (Cont.)

Resource Area (EIS Impact Analysis Section Number)	Modified Consolidated Corridors Route (Preferred Alternative)	Consolidated Corridors Route Alternative	Previously Permitted Route (No Action Alternative)	MEPCO South Route Alternative	Recission of Presidential Permit Alternative
Cultural Resources (4.6) (Cont.)					
NRHP sites (number of sites within 1 mi of ROW)	0	0	0	1	
Significant sensitive soils within ROW (acres)	87	111	115	21	
Significant sensitive soils within 1 mi of ROW (acres)	2,843	3,496	3,334	1,763	
Number of locations possessing high and moderate archaeological sensitivity along each ROW	51	51	51	59	
Socioeconomics (4.7)					
Construction period	Socioeconomic impacts would be similar for these three alternative routes. The proposed project would result in the creation of approximately 120 direct (construction) jobs and approximately 110 indirect (service-related) jobs during construction. No influx of population or stress to community services would be expected.			The proposed project would result in the creation of approximately 150 direct and 130 indirect jobs during construction. No influx of population or stress to community services would be expected.	No socioeconomic impacts. Current socioeconomic trends would continue.
Operational period	No adverse socioeconomic impacts would be expected from project operation for any of the alternative routes.				

TABLE 2.5-1 (Cont.)

Resource Area (EIS Impact Analysis Section Number)	Modified Consolidated Corridors Route (Preferred Alternative)	Consolidated Corridors Route Alternative	Previously Permitted Route (No Action Alternative)	MEPCO South Route Alternative	Recission of Presidential Permit Alternative
Environmental Justice Considerations (4.8)					
Project impacts	No disproportionately high and adverse impacts on minority or low-income populations.			One minority census block group occurs within the 2-mi zone along the route. No disproportionately high and adverse impacts on minority or low-income populations.	Existing conditions would continue. No disproportionately high and adverse impacts on minority or low-income populations.
Native American lands crossed by ROW (acres)	0	0	0	4	
Visual Resources (4.9)					
Visual impacts	Visual impacts would occur from the introduction of support structures and transmission line wires into the landscape. Substation expansions would have negligible visual impact given that similar equipment already exists on site and because of existing development in the area of the substations.				The existing landscape and scenic integrity would continue.
Number of Outstanding River Segments crossed by ROW	2	2	2	0	
Health and Safety (4.10)					
Electric shocks	Industrywide standards are in place to eliminate or greatly reduce the potential for electric shocks for all alternative routes. AC mitigation would be required to reduce shock hazards for the M&N gas pipeline.				No health and safety impacts. EMF exposure from existing transmission lines and household appliances would continue. Current noise patterns would continue. No fatalities or injuries from construction or maintenance activities.
EMF effects	EMF exposure at the nearest residences would mostly be below the average daily exposure to maximum magnetic fields from common household appliances. Electric field exposures at the edge of the ROW would be below guidelines that have been established for several states. No health effects would be expected from this exposure.				
Noise effects	The primary effect of noise would be annoyance to the residents and recreationists nearest to the ROW during construction, and this impact would be short term. Long-term noise from corona effect on transmission lines would be generally lost in background noise. Noise from maintenance activities (such as tree trimming with chainsaws) would be localized, short lived, and infrequent.				

TABLE 2.5-1 (Cont.)

Resource Area (EIS Impact Analysis Section Number)	Modified Consolidated Corridors Route (Preferred Alternative)	Consolidated Corridors Route Alternative	Previously Permitted Route (No Action Alternative)	MEPCO South Route Alternative	Recission of Presidential Permit Alternative
Health and Safety (4.10) (Cont.)					
Cardiac pacemaker and radio/television interference	The potential risk to people with pacemakers and the potential for radio and television interference would be negligible for all alternative routes. What little potential there is would be slightly greater for the MEPCO South Route because it has more dwellings within 100 ft of the ROW and has more highway crossings than the other alternative routes.				
Herbicide use	The potential human health risks from herbicide usage would be negligible for all alternative routes because of regulations and standard mitigation practices associated with the use of these products.				
Project-related fatalities and injuries	The potential risk of occupational physical injuries or fatalities to construction and maintenance workers would be small (i.e., <1 death and <10 nonfatal injuries from construction and <0.1 death and <6 nonfatal injuries from maintenance). The potential risk of physical injuries or fatalities to the general public would be small and would primarily occur from indirect impacts such as snowmobile or ATV accidents while using the ROW.				

[a] Abbreviations: AC = alternating current, ATV = all-terrain vehicle, BHE = Bangor Hydro-Electric Company, EFH = essential fish habitat, EMEC = Eastern Maine Electric Cooperative, EPA = U.S. Environmental Protection Agency, MEPCO = Maine Electric Power Company, M&N = Maritimes & Northeast Pipeline, L.L.C., NAAQS = National Ambient Air Quality Standards, NRHP = *National Register of Historic Places*, NWI = National Wetlands Inventory, ppb = part(s) per billion, ROW = right-of-way.

[b] To convert miles to kilometers, multiply by 1.609; to convert acres to hectares, multiply by 0.405; to convert feet to meters, multiply by 0.305.

[c] Total area was determined by multiplying ROW length by ROW width on the basis of the following assumptions: (1) width of new ROW would be 170 ft; (2) width of ROW when adjacent to existing transmission line would be 100 ft; (3) width of ROW when adjacent to M&N gas pipeline and a transmission line would be 125 ft; and (4) width of ROW when adjacent to M&N gas pipeline and/or Stud Mill Road would be 155 ft.

[d] Installation of AC mitigation over the M&N gas pipeline is a connected action to the proposed project.

Sources: Information provided in this table was obtained from BHE (2004, 2005) and/or Paquette (2005a through 2005nn).

3 AFFECTED ENVIRONMENT

This chapter describes the environmental conditions of the proposed project area that could be affected by the construction, operation, and maintenance of the NRI alternative routes described in Chapter 2.[1] Information is presented on climate, air quality, geology, seismicity, soils, land use, hydrological resources, ecological resources, cultural resources, socioeconomic resources, environmental justice considerations, and visual resources. Information on noise and human health is included in the corresponding sections in Chapter 4.

The environmental conditions of all four alternative routes are identical for the first 12.2 mi (19.6 km) leading out of the Orrington Substation (Figure 2.1-2). After this segment, the Modified Consolidated Corridors, Consolidated Corridors, and Previously Permitted Routes would have similar environmental conditions. Portions of the alternative routes would be identical, while other portions would occur within a similar area that generally parallels Stud Mill Road (Figures 2.1-1 through 2.1-3). In contrast, most of the MEPCO South Route is not located within the same general area as the other alternative routes (Figure 2.1-1). Therefore, the affected environment of the MEPCO South Route would be the most dissimilar to that of the other alternative routes.

3.1 ATMOSPHERIC ENVIRONMENT

Construction of the proposed project may affect local air quality. Because as much of the construction as possible (regardless of alternative route) would occur in winter, climate differences among the alternative routes may affect construction schedules and any related air quality impacts.

3.1.1 Weather and Climate

Climatic conditions are important because they may affect construction schedules, fugitive dust generation, and so forth. The project area has warm to hot summers and relatively cold winters. The climate of the general project area (east-central Maine) is highly variable and subject to extreme ranges in temperature (diurnal and annual) and considerable diversity in weather from place to place. Minor climatic differences may occur along portions of the MEPCO South Route compared with the other alternative routes because it proceeds farther north than the other alternative routes (Figure 2.1-1). For example, a slight increase could be expected in both the number of days of subzero temperatures and the amount of snowfall (Gale Research Company 1985).

The average annual temperature in Maine is about 44ºF (6.7°C), with the highest recorded temperature reaching 105ºF (40.6°C) and the lowest dropping to –48ºF (–44.4°C).

[1] Unless cited otherwise, the information presented on the affected environment in the project area has been derived from information provided by DOE (1995) or BHE (2004, 2005).

Temperatures reach 90ºF (32.2°C) or more on an average of 2 to 7 days per year. The average length of the growing season is about 120 to 140 days. The last freezing temperature generally occurs in early May; the freeze-free season generally ends in September.

Annual precipitation in the project area averages 40.8 in. (103.6 cm) at Orono (western portion of alternative routes just south of Bradley) to 44.9 in. (114.0 cm) near Baileyville (eastern portion of alternative routes). Monthly precipitation totals can range from negligible to 10 in. (25 cm) or more. Measurable precipitation of 0.01 in. (0.025 cm) or more occurs on average 160 days per year. Storm systems are the main year-round moisture producers in Maine. Such systems are somewhat less active in summer. Thunderstorms occur 15 to 30 days per year. They can produce 1 to 2 in. (2.5 to 5 cm) of rain an hour and may result in minor washouts of roads and soil erosion. Flash floods occasionally occur in smaller streams during the summer. Floods most frequently occur in early spring when substantial rains and melting snow combine to produce heavy runoff. However, snowmelt is usually gradual enough to prevent serious flooding. Thus, widespread flooding is infrequent. Winter precipitation occurs primarily as snow. The range of regional snowfall for the NRI project area for the 2003 to 2004 season was between 26 and 75 in. (66 and 190 cm) (there is a seasonal increase of about 1 in. [2.5 cm] of snowfall for each 25-ft [7.6-m] increase in elevation). One or more inches of snow occurs on 20 to 30 days per year, with several yearly snowstorms of 5 in. (13 cm) or more. The snowfall season generally starts late October to early November and lasts until April or sometimes May. The snowiest month is January, which averages more than 20 in. (51 cm) of snow. Extended dry spells can occur in late summer or fall, creating potential forest fire hazards.

The equivalent water content of snowpack is the amount of water contained in the snow that is on the ground. Water in the snowpack will run off into streams, rivers, and lakes and recharge the groundwater system when it melts (Loiselle and Hodgkin 2002). The maximum observed water content was between 12 and 16 in. (30.5 and 40.6 cm) over much of Maine, whereas mean water content was between 5 and 7 in. (12.7 and 17.8 cm) (Loiselle and Hodgkin 2002). Most of the project area lies within the 14-in. (35.6-cm) maximum observed equivalent water content contour and between the 4- and 5-in. (10.2- and 12.7-cm) mean equivalent water content contours (Loiselle and Hodgkin 2002).

3.1.2 Air Quality

Air quality in a given area is a function of the air pollutant emissions in that area (e.g., type of pollutant, rate, frequency, duration, and location of release), atmospheric conditions, characteristics of the area itself (size of air shed and topography of the area), and the presence of pollutants transported from outside the area.

The Clean Air Act (CAA) established the principal framework for national, state, and local efforts to protect air quality in the United States (*United States Code*, Title 42, Sections 7401–7642 [42 USC §§ 7401–7642]). Under the CAA, the EPA has set standards known as National Ambient Air Quality Standards (NAAQS) for six criteria pollutants considered to be key indicators of air quality, namely, carbon monoxide (CO), nitrogen dioxide (NO_2), ozone (O_3), sulfur dioxide (SO_2), lead (Pb), and two categories of particulate matter

(PM_{10} and $PM_{2.5}$)[2] (Table 3.1-1). The NAAQS define concentration levels of air quality, with an adequate margin of safety, that protect the public health, including the health of sensitive populations such as asthmatics, children, and the elderly. National secondary ambient air quality standards define levels of air quality judged necessary to protect the public welfare from any known or anticipated adverse effects of a pollutant, including protection against decreased visibility and damage to animals, crops, vegetation, and buildings. The EPA is responsible for ensuring that these air quality standards are met or attained in cooperation with State, Tribal, and local governments. As delegated by the EPA, the MDEP's Bureau of Air Quality is responsible for protecting Maine's air quality.

Air Quality Standards

National Ambient Air Quality Standards (NAAQS) are established by the EPA for criteria pollutants for the purpose of protecting public health and welfare as required by the CAA.

Prevention of Significant Deterioration (PSD) is an air pollution permitting program for new or modified sources designed to ensure that ambient air quality does not degrade beyond the NAAQS levels or beyond specified incremental amounts above prescribed base levels.

Conformity of General Federal Actions requires that no department, agency, or instrumentality of the Federal government shall engage in, support in any way, provide financial assistance for, license or permit, or approve any activity that does not conform to an applicable state implementation plan (40 CFR 51, Subpart W).

Areas that meet the NAAQS are said to be in "attainment." The air quality in attainment areas is managed under the Prevention of Significant Deterioration (PSD) Program of the CAA. The goal of this program is to maintain a level of air quality that continues to meet the standards. Areas that do not meet one or more of the standards are designated as "nonattainment" areas for criteria pollutant(s). For regulatory purposes, remote or sparsely populated areas that have not been monitored for air quality are listed as "unclassified" and are considered to be in attainment. Overall, the air quality along the proposed routes is considered good because of the rural character of the area and the small incidence of major pollutant sources (BHE 2004,2005). The project area is currently characterized as being in attainment with NAAQS (EPA 2004a,b).

3.2 LAND FEATURES

This section summarizes the topography, geology, seismicity, and soil conditions in the project area. This information is used for evaluating how water and potential contaminants move through the subsurface, evaluating erosion impacts, and predicting subsidence or landslides. Information about seismicity is used to determine potential impacts on the proposed project from earthquakes.

[2] PM_{10} = particulate matter with a mean aerodynamic diameter of 10 micrometers (µm) or less, which is considered respirable; $PM_{2.5}$ = particulate matter with a mean aerodynamic diameter of 2.5 µm or less. Both are significant contributors to haze. Smaller particles are generally considered to be more harmful to human health because they can penetrate more deeply into the lungs than larger particles and tend not to be expurgated or expectorated. A µm is one millionth of a meter.

TABLE 3.1-1 National and State of Maine Air Quality Standards

Pollutant	Averaging Time	National (and Maine) Primary Standards	National Secondary Standards
SO_2	Annual arithmetic mean	0.03 ppm (0.022 ppm)	–[a]
	24 hours	0.14 ppm (0.088 ppm)	–
	3 hours[b]	0.05 ppm (0.0439 ppm)	0.5 ppm
$PM_{2.5}$	Annual[c] (3-year average)	15 µg/m^3 (–)	Same as primary
	24 hours[d]	65 µg/m^3 (–)	–
PM_{10}	Annual arithmetic mean[e]	50 µg/m^3 (40 µg/m^3)	Same as primary
	24 hours[b]	150 µg/m^3 (150 µg/m^3)	–
CO	8 hours[b]	9 ppm (9 ppm)	–
	1 hour[b]	35 ppm (35 ppm)	–
O_3	8 hours[f]	0.08 ppm (–)	Same as primary
	1 hour[g]	0.12 ppm (0.12 ppm)	Same as primary
NO_2	Annual arithmetic mean	0.053 ppm (0.053 ppm)	Same as primary
Pb[h]	Quarterly average	1.5 µg/m^3 (1.5 µg/m^3)	Same as primary

[a] A dash indicates that no standard exists.

[b] Not to be exceeded more than once per year.

[c] To attain this standard, the expected annual arithmetic mean $PM_{2.5}$ concentrations from single or multiple community-orientated monitors must not exceed 15.0 µg/m^3.

[d] To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-orientated monitor within an area must not exceed 65 µg/m^3.

[e] To attain this standard, the expected annual arithmetic mean PM_{10} concentration at each monitor within an area must not exceed 50 µg/m^3.

[f] To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average O_3 concentrations measured at each monitor within an area over each year must not exceed 0.08 part per million (ppm).

[g] The standard is attained when the expected number of days per calendar year with maximum hourly concentrations above 0.12 ppm is $\leq$ 1 as determined by 40 CFR Part 50, Appendix H.

[h] Ambient air monitoring for lead has been discontinued in Maine because the concentration of lead in air is well below the NAAQS.

Sources: EPA (2004b); MDEP (2005).

3.2.1 Surface Topography

The surface topography of the project area is dominated by glacially sculpted remnants, such as drumlins, kames, and eskers,[3] along with bedrock outcropping. Most of the area crossed by the alternative routes is characterized by low-to-moderate relief with broad ridges, shallow sweeping valleys, and occasional mountains with elevations ranging from 150 to 1,500 ft (46 to 457 m) above mean sea level.

Physiography and Geology

Physiography is the physical geography of an area, or the description of its physical features.

A *physiographic province* is a region in which the landforms are similar in geological structure and differ significantly from the landform patterns in adjacent regions.

Geology deals with the materials that make up the planet earth and the processes that act on them.

The terrain crossed by the alternative routes changes from east to west. In the east, the terrain is characterized by the flat lowland of the St. Croix River valley and a few knobs of exposed bedrock outcrops. The terrain rises in a westerly direction, and the number of bedrock outcrops (many in the form of mountains and ridges) increases.

Landslides would not pose potential hazards to a transmission line in the project area because of the relatively flat terrain crossed by the proposed route. No landslides are known from the project area. Ground subsidence would not be a hazard because the rock types in the project area are not susceptible to dissolution and there are no underground mines in the area (FERC 1998).

3.2.2 Bedrock Geology

Sedimentary, igneous, and metamorphic rocks are the three main types of bedrock found in the project area. More than 75% of the project area is underlain by sedimentary rocks (e.g., sandstones, siltstones, and limestones) and metamorphic rocks (e.g., slate) of Silurian and Devonian ages. These two types of bedrock occur primarily in the eastern and western ends of the project area. In the central portion of the project area, the bedrock is primarily igneous rocks of Devonian age (e.g., granites). In the project area, the bedrock is either exposed or buried by a layer of glacial till at depths up to 50 ft (15 m).

3.2.3 Surficial Geology

The surficial geology of the project area is dominated by glacial till. The glacial till is a heterogeneous mixture of sand, silt, clay, and boulders that was deposited during the retreat of the last glaciers approximately 13,000 years ago during the Wisconsinan Glaciation.

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3 Drumlins are elongated or oval hills of glacial till; kames are short ridges, hills, or mounds of stratified drift deposited by glacial meltwater; and eskers are long, narrow ridges or mounds of sand, gravel, and boulders deposited by a stream flowing on, within, or beneath a stagnant glacier.

Several glaciofluvial channels and their associated eskers are crossed by the alternative routes, including the Sunkhaze Stream, the Narraguagus River, and the Machias River (Figure 2.1-1). Prominent esker segments in the area include the Whalesback and the Horseback (Figure 2.1-1). The eskers and glaciofluvial channels usually contain coarse-grained sand and gravel. Glaciomarine deposits were laid down in the St. Croix and Penobscot River valleys after the last glacier retreated. These deposits are commonly composed of clayey silts and present a flat to gently sloping landscape.

Mineral resources within the project area include widely distributed deposits of sand, gravel, clay, and crushed and dimension stone (FERC 1998).

Rock Types

Sedimentary: Rocks formed by consolidation of loose sediment that has accumulated in layers through deposition by wind, water, or ice. Sandstone is an example.

Igneous: Rocks formed by the solidification of molten magma. Examples are *volcanics* (rocks formed near the earth's surface by the rapid cooling of molten magma from a volcano) and *intrusives* (formed when molten material solidified deep in the earth). Examples are basalt (a volcanic) and granite (an intrusive).

Metamorphic: Rocks formed from preexisting rocks by mineralogical, structural, and chemical changes in temperature, pressure, and shearing stress. Metamorphism occurs deep in the earth's crust, below the zone of weathering and sedimentation. Metamorphic rocks are sometimes referred to simply as *metamorphics*. An example is slate.

Soil types in the project area vary widely, ranging from excessively drained gravels to very poorly drained swamps and bogs. In addition, organic soils occur in depressions and lowlands within glacial till, glaciofluvial, and glaciomarine areas, and thin drift occurs in areas of outcrops and bedrock (Table 3.2-1). Figure 3.2-1 shows the surficial geology that occurs along the alternative routes.

TABLE 3.2-1 Soil Types Occurring in the Project Region

Soil Type	Description
Glacial till	A mixture of sand, silt, clay, and stones forming sandy loam, stony loam, or stony silty loam. Found on hills, ridges, and till plains.
Glaciomarine sediments	Silt, clay, and local sand, forming silty loam, fine sand loam. Found mainly on coastal lowlands and major river valleys.
Thin drift	Thin surficial deposits overlying bedrock or outcrops; soil may contain a high percentage of bedrock fragments or stone.
Glaciofluvial materials	Near previous drainage channels and eskers, composed of sand and gravel.
Organic soils	Peat, muck, clay, and silts in swamps, marshes, bogs, and floodplains along rivers and streams.

Source: DOE (1995).

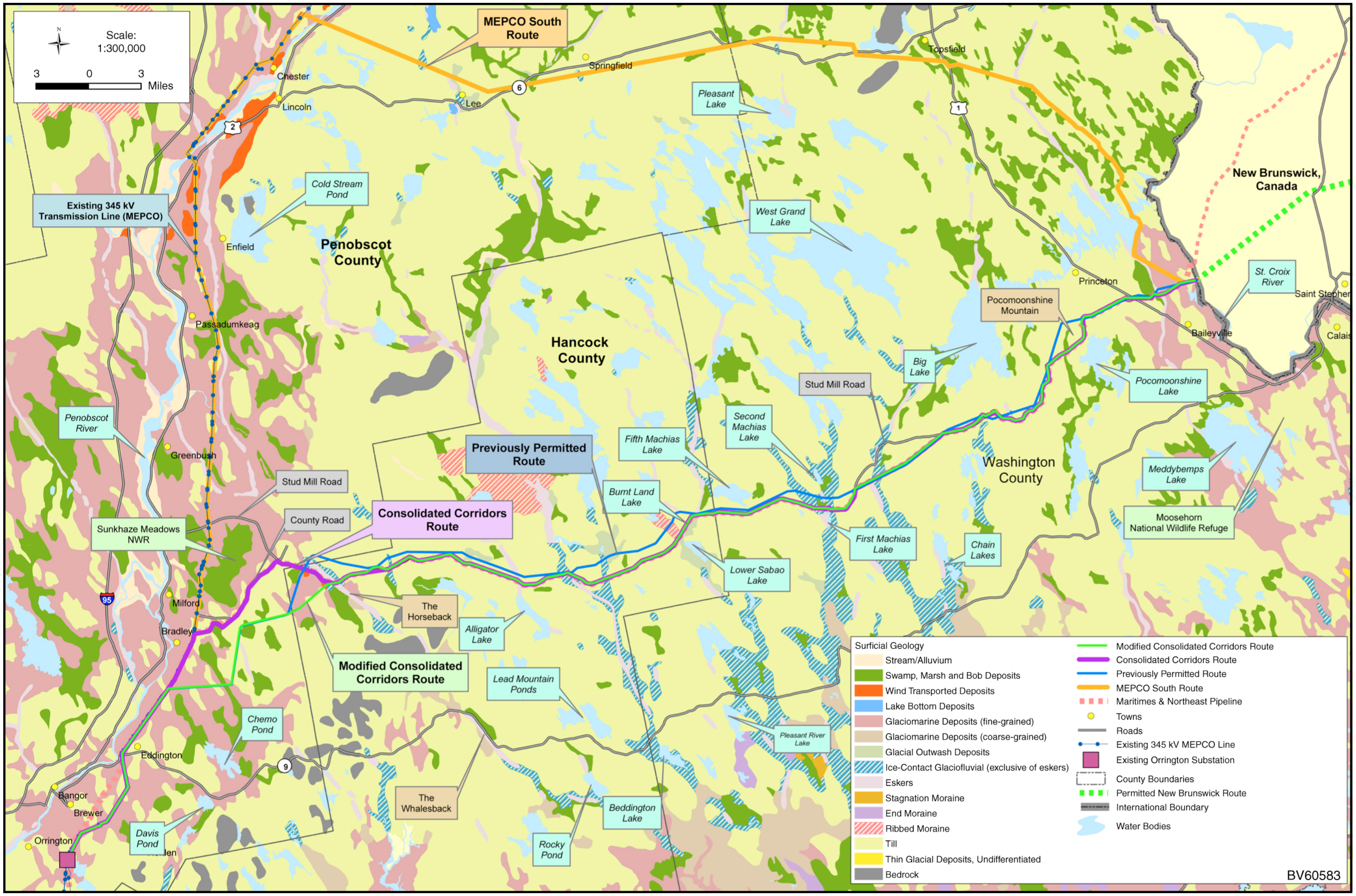

FIGURE 3.2-1 Surficial Geology in the Region of the Alternative Routes

3.2.4 Seismicity Hazards

Earthquakes have been reported from all counties in Maine (including those through which the NRI would cross) (Berry 2001). The largest historic earthquake in Maine occurred near Eastport in 1904, with a Modified Mercalli Intensity estimated at VII. The largest measured earthquake was on June 15, 1973, just on the Quebec side of the border with northern Oxford County, Maine; it had a Richter magnitude of 4.8. Events with magnitudes of less than 5 typically do not cause property damage. Most earthquakes are of small magnitude, and no Maine earthquake has caused significant damage (Berry 2001). The NRI would be located within an area where no structural damage from an earthquake would be expected (DOE 1995).

Modified Mercalli Intensity Scale

The Modified Mercalli Intensity Scale is a measure of the shaking strength of an earthquake at different locations in the region where an earthquake is felt. Earthquake intensities are characterized in terms of how the shaking affects people and buildings. The scale has 12 degrees of shaking, with XII being the most severe.

Richter Scale

The magnitude of an earthquake is a measure of the energy released during the event. It is measured on the Richter scale, which runs from 0.0 upwards, with the largest earthquake recorded having a magnitude of 8.6. The Richter scale is logarithmic, so a quake of magnitude 5.0 is 10 times more destructive than a quake of magnitude 4.0. Earthquakes greater than magnitude 6.0 can be regarded as significant, with the likelihood of damage to nearby structures not designed to withstand such forces.

3.3 LAND USE

This section covers land use, land ownership, and land use planning for areas covered by the alternative routes. Generally, land uses within the project area consist of forested timberlands; agricultural lands; residential, commercial, and industrial lands; recreational lands; and infrastructure (transportation and utility corridors).

Many portions of the NRI project area fall under the jurisdiction of the Maine Land Use Regulation Commission (LURC), which provides planning and zoning authority to the State's unorganized territories, comprised of more than 10 million acres (4 million ha) of the State of Maine that are largely undeveloped.

3.3.1 Forestry

About 17.7 million acres (7.2 million ha) or 90% of the State of Maine is forest land. All but 3% of this amount is classified as timberland (forest land capable of producing commercial crops of wood and not restricted from harvest) (McWilliams et al. 2005). The area of forest land in Maine has remained stable since the 1970s. Most of Maine's forests are naturally regenerated stands that are managed extensively. Approximately 562,000 acres (227,000 ha) are harvested annually (McWilliams et al. 2005). Harvesting rotation intervals are 20 to 80 years (McWilliams et al. 2005).

Approximately 92% of the three-county NRI project area is forested, and 97% of this is classified as timberlands (Table 3.3-1).

TABLE 3.3-1 Areas of Land Classifications (acres[a]) by County

County	Timberland	Reserved and Unproductive Forest	Total of Forested Land[b]	Nonforested Land	Total Land Area[b]
Hancock	855,500	61,200	916,800	99,400	1,016,100
Penobscot	1,958,700	42,500	2,001,200	172,100	2,173,300
Washington	1,481,300	48,200	1,529,500	114,300	1,643,800
Totals	4,295,500	151,900	4,447,500	385,800	4,833,200

[a] To convert acres to hectares, multiply by 0.405.

[b] Totals may not add up due to rounding.

Source: McWilliams et al. (2005).

Commercial forestry (for timber, pulp, and paper production and biomass for energy production) is the dominant land use within forested lands, accounting for approximately 34% of the 2002 Maine gross state product (NEFSA 2004). Forest lands also provide recreational opportunities, as well as wildlife habitat and watershed protection (LURC 1997).

As indicated in Table 3.3-2, most of the forested land within the three counties is privately owned and controlled primarily by land management and pulp and paper companies (LURC 1997). Approximately 5% of the forested land in the three-county area is Federal, Tribal, State, or local government land.

3.3.2 Agriculture

In the 2002 Census of Agriculture (USDA 2004), there were 1,292 farms on 309,150 acres (125,109 ha) of land in Hancock, Penobscot, and Washington Counties. This represents approximately 6% of the total three-county area. This acreage includes cropland, woodland crops (such as Christmas trees and maple trees for syrup), orchards, pastures, and rangelands. The average farm size in these three counties ranges from approximately 150 to 380 acres (61 to 154 ha), with the median size ranging from 70 to 100 acres (28 to 40 ha) (USDA 2004). Within the three-county area, high-quality farmland (areas with higher than statewide averages of prime or unique farmlands) occurs primarily within the Penobscot River basin (American Farmland Trust 1996). For example, Penobscot County has an estimated 113,836 acres (48,068 ha) of prime farmland compared with only 16,491 acres (6,674 ha) for Washington County (Maine.gov 2003a,b). However, the Penobscot River basin is also experiencing a high rate of urban conversion (American Farmland Trust 1996).

While agriculture is limited in Maine because of the limited presence of suitable soils, the distance to markets, and the expanse and importance of forest products (LURC 1997), two major agricultural crops in the project area are blueberries and cranberries, with much of the production occurring in Washington County (LURC 1997; University of Maine Cooperative Extension 2005).

TABLE 3.3-2 Forested Land Ownership (acres[a]) by County

County	Federal Land	State or Local Government Land	Forest Industry	Nonindustrial Private	Total
Hancock	28,000	36,000	328,900	523,900	916,800
(timberland only)	0	36,000	323,100	496,400	855,500
Penobscot	0	81,300	716,800	1,203,000	2,001,100
(timberland only)	0	69,600	708,900	1,180,200	1,958,700
Washington	36,000	36,500	387,900	1,069,100	1,529,500
(timberland only)	30,800	30,900	373,800	1,046,100	1,481,600

[a] To convert acres to hectares, multiply by 0.405.

Source: McWilliams et al. (2005).

For example, Washington County accounted for almost 81% of the statewide cranberry harvest from 2001 to 2004 (University of Maine Cooperative Extension 2005). Nearly all of the agricultural lands that would be crossed by the alternative routes are currently crossed by existing transmission lines (BHE 2004).

3.3.3 Other Uses

Residential, urban (developed), commercial, industrial, and nonforested lands, as well as transportation and utility corridors, cover the remaining types of land use within the three-county area and would account for no more than 8% of all the land use types that would be crossed by any of the alternative routes. Most of the residential and commercial development occurs near the Bangor metropolitan area and along the I-95 corridor. Most commercial and industrial development in the project area is in support of the forest industry. In the general vicinity of the project area, the Maine Army National Guard has used portions of land owned by International Paper and the State to conduct training exercises.

The number of dwellings (excluding seasonal camps) within 600 ft (183 m)[4] of any of the alternative routes ranges from 35 for the Previously Permitted Route to 121 for the MEPCO South Route (Table 3.3-3). Most of the dwellings along the Modified Consolidated Corridors, Consolidated Corridors, and Previously Permitted Routes are in the towns of Brewer, Holden,

4 Distances of 300 ft (91 m) and 600 ft (183 m) of dwellings from the ROW are used for purposes of impacts evaluation because electrical utilities in Maine have condemnation rights; however, those rights are precluded if there is a dwelling within 300 ft (91 m) of land that is being considered for condemnation, even if the land being considered is not owned by the owner of the dwelling. The 600-ft (183-m) distance was selected during BHE's stakeholder process, for the purpose of evaluating visual impacts on landowners (Paquette 2005ll), and has been accepted by DOE as reasonable.

TABLE 3.3-3 Number of Dwellings and Camps Present near the Proposed ROWs

	Alternative Routes[a]			
Distance from ROW	MCCR	CCR	PPR	MSR
Dwellings				
0 to 300 ft[b]	10	20	10	47
300 to 600 ft	26	39	25	74
Camps[c]				
0 to 300 ft	4	0	0	0
300 to 600 ft	0	0	4	0

[a] CCR = Consolidated Corridors Route, MCCR = Modified Consolidated Corridors Route, MSR = MEPCO South Route, PPR = Previously Permitted Route.

[b] To convert feet to meters, multiply by 0.305.

[c] Seasonal campground buildings.

Source: Paquette (2005x).

and Eddington, and for the Consolidated Corridors Route, are also in the towns of Bradley and Milford. The dwellings near the MEPCO South Route also occur within these towns, as well as within Greenbush, Passadumkeag, Enfield, Chester, Lincoln, Lee, and Springfield.

Native Americans own and use lands present in the three-county area, including lands owned by the Passamaquoddy Tribe and the Penobscot Indian Nation (Figure 2.1-1). Approximately 4 acres (1.6 ha) of submerged Native American lands belonging to the Penobscot Indian Nation would be crossed by the MEPCO South Route along the Penobscot River. No other Native American lands would be crossed by the other alternative routes (BHE 2004; Paquette 2005j).

Several transportation and utility corridors exist in the project area. The main roads associated with the proposed project include I-95, Route 6, and Stud Mill Road. Stud Mill Road is a private haul road owned by International Paper. This logging road connects the Penobscot and the St. Croix River valleys and provides access to many recreational opportunities. Utility corridors include the existing MEPCO 345-kV transmission line from the Orrington Substation to Orient, Maine; other smaller lines in the western portion of the project area; the EMEC transmission line in the eastern portion of the MEPCO South Route area that serves the area in Maine between Houlton and the southeastern tip of Maine (Figure 1.1-1); and the M&N gas pipeline that closely parallels Stud Mill Road.

3.3.4 Recreation and Tourism

The tourism and recreation industry follows directly behind the forestry industry in economic importance in Maine. Recreational opportunities include outdoor activities, such as sightseeing, hunting and fishing, hiking, camping, wildlife viewing, canoeing and kayaking, and motorized recreation use (such as ATV and snowmobile use). Recreation in the State of Maine typically occurs on private lands because public lands represent a small fraction of land available for recreation. Private forest owners generally allow recreational use of their lands, except where such use would conflict with current cutting operations.

Federal lands near the alternative routes include Moosehorn National Wildlife Refuge in Washington County and Sunkhaze Meadows National Wildlife Refuge near Milford (Figure 2.1-1). Public lands within the three-county area mostly include lands owned and managed by the Maine Department of Conservation (MDOC), Bureau of Parks and Lands, such as Cobscook Bay State Park in Washington County and Duck Lake Unit in Hancock County. The Nature Conservancy manages Marble Fen and Sebois River Gorge in Penobscot County, both of which are public lands, for the State. The MDOC also has conservation easements along the Machias River. The Machias River Project was a Nature Conservancy initiative to establish conservation protection for the Machias River shoreline. In 2003, a transaction involving the State of Maine, The Nature Conservancy, and International Paper was completed, creating a conservation corridor along the Machias River consisting of conservation easement and fee ownership. In the vicinity of Stud Mill Road, this conservation corridor was conveyed to the State of Maine as fee land (i.e., the State became the owner of the property). This corridor is approximately 2,500 ft (762 m) wide and extends north of Stud Mill Road. The number of acres of public lands crossed by the alternative routes would be as follows: Modified Consolidated Corridors Route — 85 acres (34 ha); Consolidated Corridors Route — 28 acres (11 ha); Previously Permitted Route — 82 acres (33 ha); and MEPCO South Route — 57 acres (23 ha).

Two National Natural landmarks occur in the area of the alternative routes. National Natural Landmarks are natural areas of outstanding biological and geologic features, may be publicly or privately owned, and are designated by the Secretary of the Interior with concurrence of the owner. The Passadumkeag Marsh and Boglands National Nature Landmark is located in Penobscot County, and Meddybemps Heath National Landmark is located in Washington County (NPS 2004a,b). Neither of these landmarks, which are both privately owned, would be crossed by the alternative routes.

Water bodies represent an important aspect of recreational opportunities in the State. All ponds and lakes larger than 10 acres (4 ha) are owned by the State (although not included in the statistics of State ownership) and are allowed to be used by the public. The number of lakes within 1 mi (1.6 km) of the alternative routes ranges from 11 for the MEPCO South Route, to 22 for the Previously Permitted Route, 24 for the Modified Consolidated Corridors Route, and 25 for the Consolidated Corridors Route (BHE 2004; Paquette 2005j).

Recreational facilities available in Maine include a variety of camps (campgrounds, primitive campsites, and sporting camps), boat launches, rafting bases, and ski resorts. The Pickerel Pond Youth Conservation Center is located off Stud Mill Road near Sunkhaze Meadows

National Wildlife Refuge. It is a youth camp that promotes fishing, hunting, and conservation (Sloan 2005a). Myra Camps, privately owned hunting camps, are located to the east of Pickerel Pond, also off Stud Mill Road. The number of camps present in the immediate vicinity of the alternative route is included in Table 3.3-3.

Motorized recreational opportunities include power boats for the larger water bodies, snowmobile use during the winter months, and ATV use. Both snowmobiles and ATVs use established ATV trails and other corridors (e.g., utility corridor ROWS, utility access roads, and timber haul roads).

3.4 HYDROLOGICAL RESOURCES

Hydrological resources could be affected if support structures and other facilities would be located within or adjacent to water bodies, or if these facilities affect surface water runoff patterns, surface soil erosion, or groundwater recharge and discharge.

3.4.1 Surface Water

The project area has extensive surface water resources. Surface stream drainage is poorly developed on the glaciated landscape, and there are many ponds and lakes in glacial kettles. Most major rivers in the project area flow southward to the Gulf of Maine.

Three of the alternative routes (Modified Consolidated Corridors, Consolidated Corridors, and Previously Permitted Routes) cross the North Coastal rivershed, which includes the East Machias River, the Machias River, the Narraguagus River, and the Union River subbasins; the Penobscot rivershed; and the St. Croix rivershed. The MEPCO South Route only crosses the Penobscot and St. Croix riversheds. The number of major stream and river crossings for each alternative route would be as follows: Modified Consolidated Corridors Route — 67; Consolidated Corridors and MEPCO South Routes — 66; and Previously Permitted Route — 65. The streams and rivers that would be crossed by the alternative routes are listed in Tables C-1 and C-2 (Appendix C). Appendix B contains detailed route maps that show the streams and rivers crossed by the alternative routes. Section 3.4.5 and Appendix G provide additional discussion of project-area streams that may be utilized by Atlantic salmon.

The lowest stream flows in the project area occur in winter, and the highest occur in spring. Dry conditions were widespread in Maine during 1999 to 2002, with a severe drought in 2001 to 2002. These dry conditions were reflected in low stream-flow levels and groundwater levels (USGS 2004).

The Water Quality Control Board of the MDEP has classified the rivers and streams of Maine into four categories according to water quality. Class AA is the highest quality classification, followed by Classes A, B, and C. The classifications of the water bodies that would be crossed by the alternative routes are listed in Tables C-1 and C-2 (Appendix C), and the classification system is described in more detail in Table C-3 (Appendix C). The number of

Class AA water bodies that would be crossed by each alternative route would be 13 for the Modified Consolidated Corridors Route, 10 for the Consolidated Corridors Route, 18 for the Previously Permitted Route, and 5 for the MEPCO South Route. Some of these include multiple crossings of the same water body (Table C-1, Appendix C).

The Natural Resources Protection Act (NRPA) also has classified some of Maine's rivers and streams into Classes A, B, C, and D in terms of unique natural and recreational characteristics and on the basis of resource values of geologic/hydrologic features, critical ecological resources, scenery, history, degree of river development, fisheries, and recreational boating, with Class A being the highest rating. The classified water bodies crossed by the alternative routes are listed in Tables C-1 and C-2 (Appendix C), and the NRPA classification system is described in more detail in Table C-4 (Appendix C) (MDOC and NPS 1982). The only Class A streams crossed by the alternative routes are the St. Croix River (all four routes) and the Narraguagus and Machias Rivers (all routes except the MEPCO South Route).

The Maine Legislature declared that certain rivers, because of their unparalleled natural and recreational values, provide irreplaceable social and economic benefits to the people in their existing state. These rivers are designated as Outstanding River Segments. Outstanding River Segments that would be crossed by all alternatives except the MEPCO South Route are the Narraguagus and Machias Rivers. The Allagash River is the only designated Wild and Scenic River in Maine; however, none of the alternative routes would cross the Allagash River or any of its tributaries.

The Grand Falls Flowage would be the only "lake" crossed by any of the alternative routes (MEPCO South Route east of Princeton, Figure 2.1-3). It is actually a reservoir system that was created by damming a portion of the St. Croix River. Between 12 and 25 lakes and large ponds are located within 1 mi (1.6 km) of the alternative routes and thus could be affected by siting and construction of support structures and other facilities. These ponds and lakes are listed in Table C-5 (Appendix C).

Floodplains are associated with the numerous streams within the Penobscot, Union, Narraguagus, Machias, East Machias, and St. Croix River watersheds that would be crossed by the alternative routes. The wetland and floodplain assessment (Appendix E) provides more detailed information on the floodplains within the project area.

3.4.2 Groundwater

Groundwater occurs in the bedrock and within glacial till, glaciofluvial deposits, and glaciomarine deposits. The glaciofluvial deposits are composed primarily of sand and gravel and are the major source of groundwater in Hancock, Penobscot, and Washington Counties. High-yield aquifers are commonly located in the vicinity of rivers, streams, and other surface water bodies.

The water table in the project area is shallow, ranging from a few feet to 20 ft (6.1 m) below land surface, and fluctuates from low in summer to high in late fall. The bedrock aquifer is composed of fractured igneous and metamorphic rock. Well depths may range from 20 to 800 ft (6 to 244 m) (FERC 1998). Domestic wells are normally shallow (5 to 25 ft [1.5 to 7.6 m] deep). Higher-yielding overburden wells (e.g., those used by municipalities) are generally 30 to 150 ft (9 to 46 m) deep (FERC 1998).

Only limited groundwater quality data are available for the State of Maine. Well water within the project area is generally of good quality because it is buffered from pollution by vegetative cover and a general lack of development.

The towns and unincorporated areas traversed by the alternative routes are sparsely populated except for residential areas near the existing MEPCO 345-kV line. Therefore, the use of groundwater resources for drinking water or industrial uses is limited. No wells are located close to the ROWs for any of the alternative routes.

3.5 ECOLOGICAL RESOURCES

This section describes the ecological resources within the project area that could be affected by construction, operation, and maintenance of the NRI.

Ecological Resources

Ecological resources include plant and animal species and the habitats on which they depend (e.g., forests, fields, wetlands, streams, and lakes).

3.5.1 Terrestrial

3.5.1.1 Vegetation

The vegetation of the project area (Hancock, Penobscot, and Washington Counties) is largely eastern boreal and temperate deciduous forest. Spruce-fir is the most prevalent forest type, consisting of a mixture of softwoods and hardwoods (LURC 1997). Table 3.5-1 lists the major tree species. Maine’s forests have a low diversity of shrub species (McWilliams et al. 2005). The amount of forest and nonforest lands within the three counties is listed in Table 3.5-2.

Terrestrial vegetation may be affected by a variety of factors associated with the construction and maintenance of the ROW and associated infrastructure. Effects may include injury or loss of individual plants and habitat disturbance.

General vegetative cover types that occur in the project area include early successional and clear-cut areas, spruce-fir forests, white pine-mixed hardwood forests, forested wetlands, scrub-shrub wetlands, and emergent wetlands (TRC 2002). Wetlands are addressed in Section 3.5.3 and in the wetland and floodplain assessment (Appendix E). Early successional habitats (whose vegetation is dominated by grasses and forbs) are found throughout the project area and include fallow fields, hayfields and other agricultural lands, and existing ROWs

TABLE 3.5-1 Major Tree Species That Occur within the Area of the Alternative Routes

Softwoods	Hardwoods
Balsam fir (*Abies balsamea*)	American beech (*Fagus grandifolia*)
Black spruce (*Picea mariana*)	Black cherry (*Prunus serotina*)
Eastern hemlock (*Tsuga canadensis*)	Gray birch (*Betula populifolia*)
Eastern larch (*Larix laricina*)	Northern red oak (*Quercus rubrum*)
Northern white cedar (*Thuja occidentalis*)	Paper birch (*Betula papyrifera*)
Red pine (*Pinus resinosa*)	Pin cherry (*Prunus pensylvanica*)
Red spruce (*Picea rubens*)	Poplar, bigtooth aspen (*Populus grandidentata*)
White pine (*Pinus strobus*)	Poplar, quaking (*Populus tremuloides*)
White spruce (*Picea glauca*)	Red maple (*Acer rubra*)
	Sugar maple (*Acer saccharum*)
	White ash (*Fraxinus americana*)
	Yellow birch (*Betula alleghaniensis*)

Source: University of Maine (1997).

TABLE 3.5-2 Forest and Nonforest Land in Hancock, Penobscot, and Washington Counties, 2003

	Land Area (acres)[a]		
County	Forest Land (Timberland)	Nonforest Land	Total
Hancock	916,800 (855,500)	99,400	1,016,200
Penobscot	2,001,200 (1,958,700)	172,100	2,137,300
Washington	1,529,500 (1,481,300)	114,300	1,643,800

[a] To convert acres to hectares, multiply by 0.405.

Source: McWilliams et al. (2005).

(e.g., for transmission lines and gas pipelines). These areas are frequently disturbed by tilling, harvesting, and/or vegetation maintenance practices.

As discussed in Section 3.3.1, about 92% of the three-county project area is forested, and 97% of this is classified as timberland, which is forest land capable of producing crops of wood and not restricted from harvest. The alternative routes cross mostly privately owned and managed timberlands consisting of a patchwork mosaic of recent clear-cuts, young second- and third-growth stands, and older managed stands of different forest types (Table 3.5-3). Consequently, ongoing forestry practices have affected, and will continue to affect, the character of this landscape. Table 3.5-4 lists the acreage of forest land (including managed and unmanaged forests) by stand-size class (i.e., a group of forest trees of sufficiently uniform species

TABLE 3.5-3 Timberland Acres by Forest-Type Group in Hancock, Penobscot, and Washington Counties, 2003[a]

Forest-Type Group	Hancock County	Penobscot County	Washington County
White-red pine	79,400	239,000	169,400
Spruce-fir	361,900	642,400	628,800
Exotic softwoods[b]	0	6,200	0
Oak-pine	3,900	24,800	16,900
Oak-hickory	30,000	17,800	0
Elm-ash-red maple	11,400	77,100	23,900
Northern hardwoods[c]	260,700	708,700	372,300
Aspen-beech	108,300	254,600	256,400
Nonstocked[d]	0	0	13,600
Total	855,500	1,958,700	1,481,300

[a] To convert acres to hectares, multiply by 0.405.

[b] Non-native coniferous species, such as loblolly pine, yellow pine, and Douglas fir.

[c] Northern hardwoods are dominated by sugar maple, beech, and birch.

[d] Nonstocked = forest land that is <10% stocked with live trees.

Source: McWilliams et al. (2005).

TABLE 3.5-4 Acres of Forest Land by Stand-Size Class in Hancock, Penobscot, and Washington Counties, 2003[a]

Stand-Size Class[b]	Hancock County	Penobscot County	Washington County
Sawtimber	264,100	515,100	341,700
Poletimber	392,900	817,600	535,900
Sapling and Seedling	259,800	668,500	638,300
Nonstocked[c]	0	0	13,600
Total	916,800	2,001,200	1,529,500

[a] To convert acres to hectares, multiply by 0.405.

[b] See the Glossary (Chapter 13) for definitions of each of the stand-size classes.

[c] Nonstocked = forest land that is <10% stocked with live trees.

Source: McWilliams et al. (2005).

composition, age, and condition to be considered a homogeneous unit for management purposes) in the three counties. The amount of forest land within the proposed ROWs ranges from about 87% for the MEPCO South Route to 91.5% for the Consolidated Corridors Route. This is within the State forest land average of 90%.

The Maine Natural Areas Program (MNAP), within the MDOC, maps the locations of rare, threatened, and endangered plants and rare and exemplary natural communities in Maine. Significant wildlife habitats have also been identified under the NRPA administered by the MDEP. The significant wildlife habitats that occur within 1.0 mi (1.6 km) to either side of the alternative routes[5] include (1) habitats for Federally listed or State listed threatened and endangered species; (2) high- and moderate-value deer wintering areas and travel routes; and (3) high- and moderate-value waterfowl (ducks, geese, and mergansers) and wading birds (bitterns, herons, egrets, ibis, rails, coots, and moorhen) habitats, including nesting and feeding areas. The rare or exemplary botanical features and significant wildlife habitats located within or adjacent to the alternative routes are shown on the detailed route maps in Appendix B and tabulated in Table 3.5-5. The Modified Consolidated Corridors and Consolidated Corridors Routes would cross a domed bog ecosystem just southwest of Sunkhaze Stream (Figure B.1-1e, Appendix B). The Modified Consolidated Corridors, Consolidated Corridors, and Previously Permitted Routes would cross the kettle hole bog-pond ecosystem near Sunkhaze Stream and a low sedge-buckbean fen lawn and raised level bog ecosystem at Sawtelle Heath east of State Route 1 (Figure B.1-1m, Appendix B).

Mapped special status plant species are addressed in Section 3.5.4.

TABLE 3.5-5 Significant Habitats within the ROWs for the Alternative Routes

	Alternative Route[b]			
Habitat[a]	MCCR	CCR	PPR	MSR
Rare natural communities (acres)	7.4	3.4	7.9	0.0
Deer yards (number)	2	1	2	1
Deer yards (acres)	7.3	5.8	6.5	7.6
Waterfowl and wading bird habitats (acres)	133	113	93	148

[a] To convert acres to hectares, multiply by 0.405.

[b] CCR = Consolidated Corridors Route, MCCR = Modified Consolidated Corridors Route, MSR = MEPCO South Route, PPR = Previously Permitted Route.

Sources: BHE (2004); Paquette (2005j).

[5] These dimensions have their origins in the practice of siting transmission lines, whereby a 2.0-mi (3.2-km)-wide corridor of uncertainty is typically selected for the working corridor width wherein a final transmission line route can be situated without the need for further regulatory review.

3.5.1.2 Wildlife

A high diversity of wildlife species occurs in the project area because of the variety of habitat types present. However, wildlife diversity has decreased in areas where even-age softwood stands have been developed for the logging industry (Ota and Restino 2001). The MDIFW actively manages numerous game species. These include black bear (*Ursus americanus*), moose (*Alces alces*), white-tailed deer (*Odocoileus virginianus*), furbearers, upland gamebirds, and waterfowl (MDIFW 2004). Wildlife could be disturbed during construction and may also be affected by the presence and maintenance of the NRI.

Wildlife may be affected as a result of habitat loss or fragmentation, disturbance by construction activities and noise, and injury by interactions with construction vehicles. In addition, birds may be affected by collisions with the NRI.

3.5.1.2.1 Mammals. Table D-1 (Appendix D) lists the mammal species that could occur within the project area. The relative abundance and habitat preference for each species are also provided. One of the significant wildlife habitats within the project area is wintering areas for white-tailed deer known as deer yards. Deer conserve energy during winter by moving into these traditional wintering areas. The softwood canopy cover in deer yards maintains warmer than average temperatures and greatly reduces wind speed. The softwood cover also intercepts much of the snowfall. The remaining ground accumulations of snow become firmly packed, which makes traveling much easier for deer and decreases their energy demands. Deer yards that occur along each of the alternative routes are shown on the detailed route maps in Appendix B. No more than two deer yards would occur within any of the alternative routes (Table 3.5-5).

3.5.1.2.2 Birds. More than 330 bird species have been reported from Maine (Mainebirding 2003). Nearly 200 species have been reported on or near the Sunkhaze Meadows National Wildlife Refuge (USFWS 2000) (Figure 2.1-2), while 220 species have been reported from the Moosehorn National Wildlife Refuge (USFWS 1994) (Figure 2.1-1). Table D-2 (Appendix D) lists the bird species that could occur within the project area. The relative abundance, habitat preference, and seasonal residency for each species are also provided. The diversity of species in the project area is probably a reflection of the habitat mosaic that exists because of timber and other management activities.

Waterfowl (e.g., ducks, geese, and swans) habitats and wading bird (e.g., bitterns, herons, egrets, rails, and coots) habitats are considered significant wildlife habitats in Maine. Mapped waterfowl and wading bird habitats that occur along each of the alternative routes are shown on the detailed route maps in Appendix B. Waterfowl and wading bird habitats that occur within the ROWs for each alternative route range from 93 to 148 acres (38 to 60 ha) (Table 3.5-5).

3.5.1.2.3 Amphibians and Reptiles. Table D-3 (Appendix D) lists the amphibian and reptile species that range within the project area. The relative abundance and habitat preference for each species are also provided. No significant wildlife habitats are identified for these species in the project area.

3.5.2 Aquatic

Aquatic biota may be affected by habitat alteration or disturbance, sedimentation, stream warming, and exposure to herbicides during maintenance activities.

Representative warmwater, coldwater, and migratory fish species that occur in the project area are presented in Table 3.5-6. About one-third of Maine's existing resident fish species were introduced, and many of the species present in the project area were introduced as a result of legal sport and forage fish introductions and illegal sport and bait fish introductions. These include the rainbow trout (*Onchorhynchus mykiss*), brown trout (*Salmo trutta*), smallmouth bass (*Micropterus dolomieu*), and largemouth bass (*M. salmoides*) (Halliwell 2003).

TABLE 3.5-6 Representative Fish Species That Could Occur in the Project Area

Warmwater Species	Coldwater and Migratory Species
Chain pickerel (*Esox niger*)	American eel (*Anguilla rostrata*)[a]
Muskellunge (*Esox masquinongy*)	Alewife (*Alosa pseudoharengus*)[a]
Northern pike (*Esox lucius*)	American shad (*Alosa sapidissima*)[a]
Golden shiner (*Notemigonus crysoleucas*)	Blueback herring (*Alosa aestivalis*)[a]
Common shiner (*Luxilus cornutus*)	Brook trout (*Salvelinus fontinalis*)
Creek chub (*Semotilus atromaculatus*)	Brown trout (*Salmo trutta*)
Brown bullhead (*Ameiurus nebulosus*)	Lake trout (*Salvelinus namaycush*)
Banded killifish (*Fundulus diaphanus*)	Atlantic salmon (*Salmo salar*)[a]
Threespine stickleback (*Gasterosteus aculeatus*)	Landlocked salmon (*Salmo salar*)
Ninespine stickleback (*Pungitius pungitius*)	Lake whitefish (*Coregonus clupeaformis*)
White perch (*Morone americana*)	Round whitefish (*Prosopium cylindraceum*)
Largemouth bass (*Micropterus salmoides*)	Burbot (*Lota lota*)
Smallmouth bass (*Micropterus dolomieu*)	Blacknose dace (*Rhinichthys atratulus*)
Black crappie (*Pomoxis nigromaculatus*)	Longnose dace (*Rhinichthys cataractae*)
Redbreast sunfish (*Lepomis auritus*)	Longnose sucker (*Catostomus catostomus*)
Pumpkinseed (*Lepomis gibbosus*)	White sucker (*Catostomus commersoni*)
Yellow perch (*Perca flavescens*)	

[a] Migratory species.

Source: TRC (2002).

The brook trout (*Salvelinus fontinalis*) is the principal coldwater game fish in the project area, occurring in many of the streams crossed by the alternative routes. The project area also contains brown trout streams. Most brown trout stream habitat is shared with brook trout, but brown trout are also found in some streams too warm for brook trout. The principal warmwater game fish in the NRI project area include smallmouth and largemouth bass, yellow perch (*Perca flavescens*), brown bullhead (*Ameiurus nebulosus*), white perch (*Morone americana*), burbot (*Lota lota*), and chain pickerel (*Esox niger*).

The larger rivers and several of their tributaries in the project area are capable of supporting several migratory fish species. The American eel (*Anguilla rostrata*) is a catadromous fish species (species that return to the sea for spawning) that occurs in the project area. Anadromous fish species (species that return from the sea to freshwater streams and rivers for spawning) include the Atlantic salmon (*Salmo salar*), blueback herring (*Alosa aestivalis*), alewife (*A. pseudoharengus*), and American shad (*A. sapidissima*). The alewife is the most numerous of the anadromous fish migrating up Maine's coastal streams and rivers (including the St. Croix River) and is an important food resource for the bald eagle (*Haliaeetus leucocephalus*). Wild populations of Atlantic salmon, Federally listed as endangered, were found in all of the watersheds crossed by the proposed project before the installation of dams on the St. Croix, Machias, Narraguagus, and Penobscot Rivers. Although this species currently does not spawn in the immediate vicinity of the alternative routes, potential spawning habitat still occurs in many of the streams crossed by the alternative routes. More detailed information on the Atlantic salmon is presented in Section 3.5.4 and in the EFH assessment (Appendix G).

3.5.3 Wetlands

Wetlands within the project area are primarily palustrine emergent, open water, scrub-shrub, and forested. These wetlands include inland marshes, wet meadows, peatlands, shrub swamps, forested swamps (both deciduous and evergreen), forested floodplain wetlands, and vernal pools (MDEP 2005). Riverine wetlands are common within the channels of water bodies. The wetlands that would be crossed by the alternative routes include wetlands of special significance. These include wetlands that contain a critically imperiled or imperiled natural community, provide significant wildlife habitat, are located near Great Ponds, or are subject to flooding.

Wetlands

The USFWS defines wetlands as areas that are transitional between terrestrial and aquatic systems and have a water table usually at or near the substrate surface or a substrate that is covered by shallow water (Cowardin et al. 1979). The U.S. Army Corps of Engineers (USACE 1987) defines wetlands as areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soils conditions. Wetlands generally include swamps, marshes, bogs, fens, and similar areas.

Table 3.5-7 provides an overview of the wetland resources that occur within each alternative route. More detailed information on the wetlands is provided in the wetland and

TABLE 3.5-7 Overview of Wetland Resources within the ROWs for the Alternative Routes

	Alternative Route[a]			
Wetland Parameter	MCCR	CCR	PPR	MSR
Number of wetlands crossed	188	184	193	319
Length of route crossing wetlands (mi)[b]	7.7	6.6	8.2	11.5
Area of wetlands within ROW (acres)[c]	133	108	152	173
Forested wetlands within ROWs (acres)	70	53	103	73

[a] CCR = Consolidated Corridors Route, MCCR = Modified Consolidated Corridors Route, MSR = MEPCO South Route, PPR = Previously Permitted Route.

[b] To convert miles to kilometers, multiply by 1.609.

[c] To convert acres to hectares, multiply by 0.405.

Sources: BHE (2004); Paquette (2005j)

floodplain assessment (Appendix E), including detailed maps showing the locations of wetlands along the alternative routes.

3.5.4 Special Status Species

Special status plant and wildlife species are subject to regulations under the authority of Federal and State agencies. They include those species that are listed, or are being considered for listing, as threatened or endangered by the USFWS or by NOAA Fisheries (i.e., Federally endangered, threatened, proposed, or candidate species) or that are listed as threatened, endangered, or of special concern by the State of Maine. Regulations pertinent to the NRI include the Endangered Species Act (ESA), Bald and Golden Eagle Protection Act, Migratory Bird Treaty Act, the Magnuson-Stevens Fishery Conservation and Management Act, and the Maine Endangered Species Act.

Table D-4 in Appendix D provides a list of the Federally and State listed special status species that could be present within the project area. It includes information on the distribution and habitat of these species and designates the basis for their listing. No critical habitats for the Federally listed species occur within the project area. The list of species identified in Table D-4 was developed from various sources, including consultation with the USFWS and NOAA Fisheries and through Web sites maintained by the MDIFW and the MNAP. No Federally listed plant species occur in the project area, although more than 30 State listed plant species could be present in the project area. Four State listed aquatic invertebrates also occur in the project area. The Federally endangered Atlantic salmon occurs within the watersheds crossed by the Modified Consolidated Corridors, Consolidated Corridors, and Previously Permitted Routes, while the Federally endangered shortnose sturgeon (*Acipenser brevirostrum*) occurs in the Penobscot River, which would be crossed twice by the MEPCO South Route. Several State listed bird species and the Federally threatened bald eagle occur in the project area. The range for two Federally endangered mammal species (Eastern timber wolf [*Canis lupus lycaon*] and Eastern cougar [*Felis concolor couguar*]) includes the project area, but the potential for their occurrence is remote (Table D-4, Appendix D).

Additional information on the Atlantic salmon and bald eagle, identified by the USFWS and/or NOAA Fisheries as species that might be affected by the project, are presented below and in the biological assessment (Appendix F) and EFH assessment (Appendix G). Appendix A contains copies of consultation letters received from the USFWS and NOAA Fisheries.

Terms Applicable to Special Status Species

Endangered species: Any Federal species listed by the USFWS or NOAA Fisheries that is in danger of extinction throughout all or a significant portion of its range, or any State species listed by the MDIFW or MNAP that is in danger of extirpation within Maine.

Threatened species: Any Federal species listed by the USFWS or NOAA Fisheries or State species listed by the MDIFW or the MNAP that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range or the State of Maine, respectively.

Candidate species: A species for which the USFWS or NOAA Fisheries currently has substantial information on hand to support the biological appropriateness of proposing to list the species as endangered or threatened.

Critical habitat: Specific Federally designated area on which is found those physical and biological features essential to the conservation of a listed species.

Species of special concern: Any species or subspecies native to Maine that has entered a long-term decline in abundance or is vulnerable to a significant decline because of low numbers, restricted distribution, dependence on limited habitat resources, or sensitivity to environmental disturbance.

3.5.4.1 Atlantic Salmon (*Salmo salar*)

The Gulf of Maine distinct population segment (DPS) for the Atlantic salmon has no State listing but is Federally listed as endangered. Watersheds that could be used by this population segment include the Sheepscot, Ducktrap, Narraguagus, Pleasant, Machias, East Machias, and Dennys Rivers. Atlantic salmon populations in the Kennebec River and its tributaries and the main stem of the Penobscot River are not part of the Gulf of Maine DPS because native populations were thought to be extirpated in the Kennebec River, and the Penobscot River has received substantial supplemental stocking of Atlantic salmon from Canadian rivers.

The Atlantic salmon spawns in late fall, with eggs hatching in early spring. Young Atlantic salmon spend 1 to 3 years in their stream rearing habitat, go to sea in spring (they may migrate as far as Greenland), and return to spawn after one to four winters at sea. Adults may spawn in more than 1 year, although severe post-spawning mortality is normal. Freshwater habitats for the Atlantic salmon are rocky runs and pools of small to large rivers. Eggs are laid in gravel-bottomed riffles in a nest (redd) and covered with gravel. Normal egg development requires water temperatures less than 50ºF (less than 10ºC), with an optimum temperature of 43ºF (6ºC). Rearing habitat includes shallow riffle areas interrupted by pools and deeper riffles. Parr (young freshwater salmon with distinctive vertical bars) require cover such as large rocks.

Adults eat fishes and crustaceans when at sea, but do not feed in freshwater. Young consume primarily invertebrates.

The Atlantic salmon was nearly extirpated from New England in the 1800s because of habitat loss and degradation from dam construction and logging. The endangered status for the DPS relates to its small spawning range in the rivers, low abundance of spawning individuals, poor marine survival, habitat degradation (e.g., sedimentation and water withdrawals), diseases, and genetic impacts on salmon from aquaculture facilities. The Gulf of Maine DPS is declining steadily. The number of smolts (juvenile salmon that are migrating to the sea) leaving rivers is not increasing at the same rate as parr abundance is increasing (the parr increase is due to stocking hatchery-raised fry in the habitats). The estimated total returns (i.e., adults returning from the sea for spawning) in 2002 were estimated at <50 fish for the entire Gulf of Maine DPS.

The Modified Consolidated Corridors, Consolidated Corridors, and Previously Permitted Routes cross the Narraguagus River, Machias River, and the East Machias River watersheds. Within these watersheds, the following streams are considered Atlantic salmon streams of special concern: Narraguagus River, two tributaries to Fifth Machias Lake, a tributary to Fletcher Brook, Machias River, a tributary to Dead Stream, Lanpher Brook, Huntley Brook, and Joe Brook (Bartlett 2004; BHE 2005). No Atlantic salmon streams of special concern would be crossed by the MEPCO South Route. Table 3.5-8 provides an overview of the Atlantic salmon streams crossed by the alternative routes. More detailed information on the Atlantic salmon is presented in the biological assessment (Appendix F) and EFH assessment (Appendix G).

3.5.4.2 Bald Eagle (*Haliaeetus leucocephalus*)

The bald eagle is both Federally listed and State listed as threatened (it was proposed for Federal delisting in 1999). This species occurs throughout Maine, inhabiting shore lands and uplands adjacent to coastal waters, lakes, and large rivers. The bald eagle is a year-round resident

TABLE 3.5-8 Overview of Atlantic Salmon Streams Crossed by the Alternative Routes

	Number per Alternative Route[a]			
Parameter	MCCR	CCR	PPR	MSR
Distinct population segment water bodies	31	32	27	0
Essential fish habitat water bodies	67	66	65	66
Atlantic salmon streams of special concern	9	9	9	0
Atlantic salmon spawning and rearing areas	0	0	0	0

[a] CCR = Consolidated Corridors Route, MCCR = Modified Consolidated Corridors Route, MSR = MEPCO South Route, PPR = Previously Permitted Route.

Sources: BHE (2004); Bartlett (2004); Paquette (2005j).

> **Essential Habitat**
>
> Because of a 1988 amendment to the Maine Endangered Species Act, the MDIFW may designate areas as "Essential Habitat" for species listed as endangered or threatened, and develop guidelines for these essential habitats (MDIFW 2004).
>
> Essential habitats are defined as areas currently or historically providing physical or biological features essential to the conservation of an endangered or threatened species in Maine, and which may require special management considerations. Essential habitat has only been designated for bald eagle nest sites, roseate tern nesting areas, and feeding and brood-rearing areas for the least tern and piping plover. Only essential habitat for the bald eagle occurs in the project area.

of Maine, occurring as part of a resident population and as a migrant from elsewhere. It commonly roosts communally, especially in winter. Breeding habitat mostly includes areas close to (i.e., within 3 mi [5 km]) coastal areas, bays, rivers, lakes, or other bodies of water that reflect the availability of primary food sources such as fish, waterfowl, and seabirds. In winter, bald eagles may occur in areas where waterfowl concentrate, or they may congregate in areas with abundant dead fish. They may also occur in areas without open water if other food sources (e.g., rabbit or deer carrion) are readily available. Low rates of reproduction have been the major obstacle to the bald eagle's recovery in Maine (MDIFW 2003). Habitat loss and disturbance at nest sites, environmental contamination, and human-caused deaths and injuries are the primary threats to the bald eagle. Nevertheless, Maine's bald eagle population continues to expand, and each spring new nest locations are usually found (Bartlett 2004).

The locations of bald eagle nesting sites near the alternative routes can be found on the detailed maps for the alternative routes presented in Appendix B. One State-designated essential habitat for the bald eagle would be crossed by the MEPCO South Route (Figure B.4-1, Appendix B), while none would be crossed by the other alternative routes. The number of bald eagle essential habitats less than 1 mi (1.6 km) from the alternative routes are six each for the Modified Consolidated Corridors, Consolidated Corridors, and Previously Permitted Routes. These occur near the Penobscot River (Figure B.1-1b), Alligator Lake (Figure B.1-1g), and Pocomoonshine Lake (Figure B.1-1m). Eleven essential bald eagle habitats occur within 1 mi (1.6 km) from the MEPCO South Route. Most of these occur near the Penobscot River (Figures B.4-1b, B.4-1d, B.4-1k, B.4-1l, B.4-1m, and B.4-1n), with two at Grand Falls Flowage and one along the St. Croix River (Figure B.4-1x). Further information on the bald eagle is presented in the biological assessment (Appendix F).

3.6 CULTURAL RESOURCES

This section discusses cultural resources in the vicinity of the four alternative routes. Cultural resources include archaeological sites and historic structures and features that are protected under the National Historic Preservation Act of 1966 (NHPA) as amended (16 USC § 470) and its implementing regulations (36 CFR Part 800). Cultural resources also include traditional cultural properties that are important to a community's practices and beliefs and are necessary for maintaining a community's cultural identity. Cultural resources that meet the eligibility criteria for listing on the *National Register of Historic Places* (NRHP) are considered "significant" historic properties and must be taken into consideration during the planning of Federal projects. Federal agencies are required to consider the effects of their actions on sites, areas, and other resources (e.g., plants) that are of religious significance to Native Americans, as established under the American Indian Religious Freedom Act (Public Law [P.L.] 95-341). Native American graves and burial grounds, including human remains, sacred and funerary objects, and objects of cultural patrimony, are protected by the Native American Graves Protection and Repatriation Act (P.L. 101-601).

The archaeological record of Maine dates back to approximately 11,500 years ago and is typically described using the following cultural periods: Paleoindian (ca. 11,500 to 9,500 radiocarbon years before present (BP),[6] Archaic (ca. 9,500 to 3,000 BP), Ceramic (3,000 to 450 BP), and Historic or Contact (450 BP to present).[7] The Paleoindian Period is the period least represented in the archaeological record and consequently the least understood. People living during this period were hunters and gatherers who were highly mobile, likely moving with the herds of caribou and other big game species they hunted. Archaeological evidence consists mostly of isolated spear points diagnostic of the period and short-term campsites. The Archaic Period is characterized by a shift in hunting strategies from larger to smaller game and fish. Artifacts include chipped stone tools, groundstone tools, and evidence of mortuary practices, such as the presence of grave goods and red ochre sprinkled over the tops of grave sites. The Ceramic Period is characterized by the first evidence of pottery, although hunting and gathering remained the predominant lifestyle. Many of these sites are either coastal shell middens or adjacent to water bodies in the interior. It is not until the end of this period that evidence of horticulture emerges for the area, mostly, however, for the southern part of Maine (Clark et al. 2004). Finally, the Historic Period begins with European contact and written historical accounts to accompany the archaeological record.

Clark et al. (2004) provide a summary of archaeological investigations conducted in the vicinity of the alternative routes in southeastern Maine. Although little is known archaeologically in this predominantly undeveloped part of Maine, a fair amount of research has been conducted over the last 100 years along the Penobscot River drainage, which is an area of high potential for archaeological remains.

The most important surveys for assessing the impact of the NRI on cultural resources are those conducted for the Previously Permitted Route (Cox 1989), the M&N gas pipeline from Milford to Baileyville (TRC 2002), and the Modified Consolidated Corridor Route (Clark et al. 2004). Each of these surveys included portions of the alternative routes in the Stud Mill Road area, and each survey concluded that the area has a relatively low potential for containing significant archaeological sites. Cox (1989) recorded three small prehistoric sites, one of which was considered potentially significant. Five locations containing historic material and one prehistoric site were recorded during the pipeline survey (TRC 2002). No prehistoric sites and one potentially significant historic property were recorded during the latest survey for the

6 "Before present" (BP) is a year numbering system used for past times that relates dates to the year 1950. For example, 12,000 BP means 12,000 years before 1950.

7 The NRHP typically applies to significant sites, structures, and objects more than 50 years in age; however, there are exceptions for those sites, structures, and objects of exceptional significance.

Modified Consolidated Corridor Route (Clark et al. 2004). No specific archaeological survey information regarding the MEPCO South Route is available, although a portion of this route closely parallels the Penobscot River and would cross it at two locations. This area has been identified by the Penobscot Nation as an area of concern regarding archaeological sites during route location meetings (Dana 2003).

In addition to information obtained through past archaeological surveys and the resulting recorded sites, the history of past ground disturbance also plays a role in determining the potential impact on significant cultural resources. The amount and type of previous disturbance varies by route and includes ROW clearing (for existing electricity transmission and gas pipeline corridors), recreational use (campsites and ATV trails), existing roads (temporary or permanent), timber harvesting areas, and historical use areas (such as mills or airports, including those proposed for staging areas as described in Section 2.3.4). Previously disturbed areas are not likely to contain intact archaeological deposits and, therefore, if any archaeological sites happen to be present within these areas, they are less likely to be considered significant. Wetland areas along the alternative routes may, depending on their age and origin (beaver activity and construction runoff), contain archaeological deposits that have not been surveyed because of difficulty in accessing the site.

The NRHP lists 299 properties within Hancock, Penobscot, and Washington Counties. None of these properties is located within the ROW for any of the alternative routes. One property is within 1 mi (1.6 km) of the MEPCO South Route.

DOE has consulted with Native American Tribes to obtain information about traditional cultural properties in the area, as well as other concerns that Native American groups might have regarding the effect of the project on cultural resources. Appendix A contains letters initiating formal consultation with the Aroostook Band of Micmacs, the Houlton Band of Maliseet Indians, the Passamaquoddy Tribe, the Penobscot Indian Nation, and the Pleasant Point Passamaquoddy Reservation. In addition, members of the Penobscot Indian Nation, the Houlton Band of Maliseets, and the Passamaquoddy Tribe have been present at BHE meetings on the siting alternatives. No specific traditional cultural properties have been identified along the alternative routes during government-to-government consultations or during the siting meetings. A general concern about impacts on archaeological sites has been expressed by the Penobscot Indian Nation, especially along the Penobscot River drainage, and by the Passamaquoddy Tribe. DOE also wrote to the Eastern Regional Office of the Bureau of Indian Affairs (see Appendix A).

Table 3.6-1 presents an overview of cultural resources within the ROWs for the alternative routes.

3.7 SOCIOECONOMICS

Socioeconomic data for the NRI are presented for a region of influence (ROI) composed of Hancock, Penobscot, and Washington Counties. The ROI captures the area within which NRI construction, operations and maintenance workers for each of the alternative routes would spend

TABLE 3.6-1 Overview of Cultural Resources within the ROWS for the Alternative Routes

	Alternative Route[a]			
Cultural Resources Parameter	MCCR	CCR	PPR	MSR
Number of historic archaeological resources within ROW	0	0	0	1
Number of historic archaeological resources within 1 mi of ROW[b]	8	8	8	10
Number of prehistoric archaeological sites within ROW	4	5	4	12
Number of prehistoric archaeological sites within 1 mi of ROW	30	31	28	46
Number of NRHP sites[c] within ROW	0	0	0	0
Number of NRHP sites within 1 mi of ROW	0	0	0	1
Significant sensitive soils within ROW (acres)[b, d]	87	111	115	21
Significant sensitive soils within 1 mi of ROW (acres)	2,843	3,496	3,334	1,763
Number of locations possessing high and moderate archeological sensitivity along the ROW[e]	51	51	51	59

[a] CCR = Consolidated Corridors Route, MCCR = Modified Consolidated Corridors Route, MSR = MEPCO South Route, PPR = Previously Permitted Route.

[b] To convert miles to kilometers, multiply by 1.609; to convert acres to hectares, multiply by 0.405.

[c] NRHP = *National Register of Historic Places*.

[d] Significant sensitive soils = the types of soils that tend to have higher numbers of prehistoric archaeological sites. These are generally better drained soils that early settlers preferred as campsites. Soil sensitivity refers to soil properties such as permeability.

[e] High and moderate archaeological sensitivity = based on "Phase I" surveys, which include a review of previous studies, proximity to water, topography, aspect, and geographical information system (GIS) data or a combination thereof.

Sources: BHE (2004; Paquette (2005j).

their wages and salaries, and the expected location of many of the vendors that would supply materials, equipment, and services to the proposed project. The ROI is used for the assessment of the impacts of NRI construction and operation of each alternative route on population, employment, income, and housing.

3.7.1 Population

In 2000, the population within the ROI was 230,651. On the basis of the average annual population growth rate of 0.1% over the period 1990 to 2000, population in the ROI is expected to reach 231,800 by 2005 (Table 3.7-1). Population in the ROI grew at a rate slightly lower than the annual rate of 0.4% for the State over the same period. Within the ROI in 2000, 90,864 persons (40% of the ROI population) lived within the Bangor Metropolitan Statistical Area (MSA), which consists of parts of Penobscot and Waldo Counties. Most of the remaining population resided in other incorporated areas, such as Ellsworth (population of 6,456), Lincoln

TABLE 3.7-1 Population within the ROI for the Northeast Reliability Interconnect

Entity	1990	2000	Average Annual Growth Rate (%) 1990 to 2000	2005[a]
Bangor MSA[b]	91,629	90,864	-0.1	90,500
Hancock County	46,948	51,791	1.0	54,400
Penobscot County	146,601	144,919	-0.1	144,100
Washington County	35,308	33,941	-0.4	33,300
ROI	228,857	230,651	0.1	231,800
Maine	1,227,928	1,274,923	0.4	1,299,100

[a] ANL projections.

[b] MSA = metropolitan statistical area, ROI = region of influence (Hancock, Penobscot, and Washington Counties).

Source: U.S. Bureau of the Census (2005a).

(5,221), Bar Harbor (4,820) and Calais (3,447) (U.S. Bureau of the Census 2005a). The average annual population growth rate within the Bangor MSA was –0.1% over the period 1990 to 2000. Annual average growth rates in Penobscot and Washington Counties were slightly negative over the same period, with a small increase in population in Hancock County. Growth rates in many smaller communities in the ROI were negative over this period.

3.7.2 Employment

Employment in the ROI was 90,701 in 2002 and, based on the average annual employment growth rate of 1.5% over the period 1992 to 2002, is expected to reach 92,100 in 2005 (Table 3.7-2). Dominant employment sectors are services (46% of total ROI employment), wholesale and retail trade (21%), manufacturing (11%), and agriculture (10%); these sectors accounted for 87% of the total employment in the ROI (Table 3.7-2).

Lumber production and the operation of timber tracts employed a small number of people in each of the three counties in 2002: approximately 50 each in Hancock and Penobscot Counties and approximately 200 in Washington County (U.S. Bureau of the Census 2005b).

3.7.3 Unemployment

Unemployment in the ROI has steadily declined from a peak rate of 7.8% in 1994 to a December 2004 rate of 5.3% (Table 3.7-3) (U.S. Bureau of Labor Statistics 2005a).

TABLE 3.7-2 Employment by Industry within the ROI for the Northeast Reliability Interconnect, 2002

Sector	Hancock County	Penobscot County	Washington County	ROI Total	Share of ROI Total (%)
Agriculture[a]	1,827	1,809	5,787	9,423	10
Mining	10	0	10	20	<1
Public utilities	60	609	60	729	1
Construction	1,566	2,308	298	4,172	5
Manufacturing	1,963	6,273	1,369	9,605	11
Transportation and warehousing	308	2,277	217	2,802	3
Trade	3,794	13,052	1,758	18,604	21
Finance, insurance and real estate	815	2,578	374	3,767	4
Services	8,529	29,555	3,460	41,544	46
Other	10	15	10	35	<1
Total	18,882	58,476	13,343	90,701	

[a] Includes lumber production employment.

Sources: U.S. Bureau of the Census (2005b); USDA (2005).

TABLE 3.7-3 Unemployment Rates (%) within the ROI for the Northeast Reliability Interconnect

Period	Hancock County	Penobscot County	Washington County	ROI	State
1994 to 2004 (average)	5.5	3.6	9.4	5.1	4.9
2004 (Dec. 2004)	7.4	3.4	7.9	5.3	4.7

Source: U.S. Bureau of Labor Statistics (2005a).

Unemployment in Washington County was particularly high in the 1990s, reaching 12.5% in 1994. December 2004 unemployment rates in Washington County (7.9%) and Hancock County (7.4%) are fairly high compared with the State average (4.7%).

3.7.4 Income

Personal income in the ROI stood at $6.65 billion in 2002, and on the basis of the average annual personal income growth rate of 1.6% over the period 1990 to 2002 in the ROI, is expected to reach $7.0 billion in 2005 (Table 3.7-4). With income growth exceeding population growth in the 1990s, personal income per capita within the ROI rose over the period, from $23,800 in 1990 to $28,213 in 2002. Within the ROI, $4.16 billion in total annual personal income was produced in Penobscot County in 2002 (63% of the ROI total), with $1.67 billion produced in Hancock County and $0.82 billion in Washington County. Among the three counties, Hancock County had the highest per capita income at $31,541 and Washington County had the lowest at $24,298 in 2002. Personal income growth rates over the period 1990 to 2002 varied from 2.2% in Hancock County to 1.1% in Washington County, although per capita incomes were growing faster in Penobscot County (1.6%) and Washington County (1.5%) than in Hancock County (1.2%).

3.7.5 Housing

Housing within the ROI showed modest growth of 1.0% per year over the period 1990 to 2000 (Table 3.7-5), with more than 11,800 new housing units added during this period. On the basis of the average annual population growth rate of 0.1% over the period 1990 to 2000, 200 new housing units are expected in 2005. Excluding housing used for seasonal and recreational purposes, vacancy rates in 2000 stood at 2.8% for owner-occupied housing and 8.5% for hotels and motels; the overall vacancy rate for all housing types was 7.0%.

TABLE 3.7-4 Personal Income (2005 dollars) within the ROI for the Northeast Reliability Interconnect

Parameter	1990	2002	Average Annual Growth Rates (%) 1990 to 2002	2005[a]
Hancock County				
Total personal income ($ millions)	1,288	1,666	2.2	1,800
Personal income per capita ($)	27,443	31,541	1.2	32,700
Penobscot County				
Total personal income ($ millions)	3,476	4,164	1.5	4,400
Personal income per capita ($)	23,713	28,801	1.6	30,200
Washington County				
Total personal income ($ millions)	715	818	1.1	900
personal income per capita ($)	20,244	24,298	1.5	25,400
ROI				
Total personal income ($ millions)	5,480	6,648	1.6	7,000
Personal income per capita ($)	23,800	28,213	1.4	29,400

[a] ANL projections.

Source: U.S. Department of Commerce (2005).

TABLE 3.7-5 Housing Characteristics within the ROI for the Northeast Reliability Interconnect

Parameter	1990	2000	2005[a]
Hancock County			
Owner occupied	13,876	16,550	16,700
Rental	4,466	5,314	5,400
Total unoccupied units	12,054	12,081	12,200
Total units	30,396	33,945	34,300
Penobscot County			
Owner occupied	37,679	40,554	40,500
Rental	16,384	17,542	17,500
Total unoccupied units	7,296	8,751	8,700
Total units	61,359	66,847	66,800
Washington County			
Owner occupied	10,568	10,969	10,900
Rental	2,850	3,149	3,100
Total unoccupied units	5,706	7,801	7,800
Total units	19,124	21,919	21,800
ROI			
Owner occupied	62,123	68,073	68,100
Rental	23,700	26,005	26,000
Total unoccupied units	25,056	28,633	28,700
Total units	110,879	122,711	122,900

[a] ANL projections.

Source: U.S. Bureau of the Census (2005a).

Within the ROI, over the period 1990 to 2000, housing growth in Hancock (1.1%) and Washington Counties (1.4%) was slightly higher than the ROI average of 1.0%, with a slightly lower-than-average rate for Penobscot County (0.9%). As a result of this growth, 3,549 were added in Hancock County, 5,488 in Penobscot County, and 2,795 in Washington County. On the basis of population data projections for 2005 and vacancy rates for 2000, 725 rental units in Hancock County are expected to be vacant in 2005, 756 in Penobscot County, and 1,623 in Washington County.

3.8 ENVIRONMENTAL JUSTICE CONSIDERATIONS

E.O. 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations" (59 FR 7629, February 16, 1994) requires Federal agencies to incorporate environmental justice as part of their missions. Specifically, it directs these agencies to address, as appropriate, any disproportionately high and adverse human health or environmental effects of their actions, programs, or policies on minority and low-income populations.

The analysis of the impacts of the proposed project on environmental justice issues follows guidelines described in the Council on Environmental Quality's (CEQ's) *Environmental Justice Guidance under the National Environmental Policy Act* (CEQ 1997). The analysis method has three parts: (1) a description of the geographic distribution of low-income and minority populations in the affected area (discussed below); (2) an assessment of whether the impacts of construction and operation would produce impacts that are high and adverse (see Section 4.8, Environmental Justice Considerations); and (3) if impacts are high and adverse, a determination as to whether these impacts disproportionately impact minority and low-income populations (see Section 4.8, Environmental Justice Considerations).

The project area for the analysis of the impacts on minority and low-income populations was identified as about a 2-mi (3.2-km) zone along the alternative routes (1 mi [1.6 km] on either side of each route).[8] This zone is also roughly the area within which the potential impacts of the NRI would be most likely to affect the general population. These include noise, dust, and vehicle emissions during construction and electromagnetic field effects (EMF) during operations. A single zone was analyzed for the Modified Consolidated Corridors, the Consolidated Corridors, and the Previously Permitted Routes because of the close proximity of these three routes to each other, particularly within the populated areas. Although there may be visual impacts of the NRI on minority and low-income populations, it is unlikely that the potential impacts on these population groups would be any different from those impacts affecting the population as a whole. The analysis does not, therefore, consider a separate project area for the analysis of visual impacts to minority and low-income populations. The affected area for visual resources is described in Section 3.9.

A description of the geographic distribution of minority and low-income groups within the project area was based on demographic data from the 2000 Census (U.S. Bureau of the Census 2005a). The following definitions were used to define minority and low-income population groups:

- **Minority.** Persons are included in the minority category if they identify themselves as belonging to any of the following racial groups: (1) Hispanic, (2) Black (not of Hispanic origin) or African American, (3) American Indian or Alaska Native, (4) Asian, or (5) Native Hawaiian or Other Pacific Islander. Persons may classify themselves as being of multiple racial origins (up to six racial groups as the basis of their racial origins). The term minority includes all persons in the individual racial groups, as well as those classifying themselves in multiple racial categories, except those who classify themselves as not of Hispanic origin and as White or "Other Race" (U.S. Bureau of the Census 2005a).

- **Low-Income.** Individuals who fall below the poverty line are classified as low-income. The poverty line takes into account family size and age of

[8] These dimensions have their origins in the practice of siting transmission lines, whereby a 2.0-mi (3.2-km)-wide corridor of uncertainty is typically selected for the working corridor width wherein a final transmission line route can be situated without the need for further regulatory review.

> individuals in the family. In 1999, for example, the poverty line for a family of five with three children below the age of 18 was $19,882 (U.S. Bureau of the Census 2005a). For any given family below the poverty line, all family members are considered as being below the poverty line for the purposes of analysis without consideration of individual income variations within the family.

The CEQ guidance cited above states that low-income and minority populations should be identified where either (1) the low-income or minority population of the affected area exceeds 50%, or (2) the low-income or minority population percentage of the affected area is meaningfully greater than the low-income or minority population percentage in the general population or other appropriate unit of geographic analysis.

This EIS applies both criteria in using the Census Bureau data for census block groups in the 2-mi (3.2-km) zone, wherein consideration is given to the low-income or minority population that is more than 50% or 20 percentage points higher than in the counties through which each route would pass (the reference geographic unit).

Data in Table 3.8-1 show the minority and low-income composition within the 2-mi (3.2-km) zone for the alternative routes on the basis of 2000 Census data and CEQ guidelines. Individuals identifying themselves as Hispanic are included in the table as a separate entry. However, as Hispanics can be of any race, this number also includes individuals identifying themselves as being a part of one or more of the other population groups listed in the table. Less than 3% of the population within the zone for the Modified Consolidated Corridors, Consolidated Corridors, and Previously Permitted Routes can be classified as minority, with almost 11% of the zone population classified as low-income. For the MEPCO South Route, less than 3% of the population in the zone can be classified as minority and a little more than 12% classified as low-income.

Figures 3.8-1 and 3.8-2 show the spatial distribution of the minority and low-income populations in Hancock, Penobscot, and Washington Counties, respectively. There are no census block groups within the 2-mi (3.2-km) zone of the Modified Consolidated Corridors, Consolidated Corridors, and Previously Permitted (No Action) Routes where the minority or low-income populations exceed 50% of the total population in the block group or where the minority or low-income populations exceed the state average by more than 20 percentage points. The MEPCO South Route would not intersect any low-income population census block groups, but would cross one minority population census block group.

3.9 VISUAL RESOURCES

The placement of support structures and other facilities, as well as ROW clearings, could affect the visual aesthetics of some areas, and thus impact the quality of recreational and other activities.

TABLE 3.8-1 Minority and Low-Income Population Characteristics in the Three-County Area of the Alternative Routes, 2000

	Modified Consolidated Corridors, Consolidated Corridors, and Previously Permitted Routes[a]		MEPCO South Routea	
Parameter	Census Block Groups Total	2-mile (3.2 km) Zone Total	Census Block Groups Total	2-mile (3.2 km) Zone Total
***Minority Population*[b]**		Population Numbers		
1. Total population	52,555	7,709	107,116	9,101
2. White	51,073	7,494	104,161	8,851
3. Total minority	1,483	215	2,954	250
4. Hispanic or Latino	263	38	516	45
5. Not Hispanic or Latino	1,220	178	2,439	205
6. One race	860	125	1,619	134
7. Black or African American	141	24	308	27
8. American Indian or Alaska Native	423	51	721	55
9. Asian	253	42	499	44
10. Native Hawaiian or Other Pacific Islander	9	2	25	2
11. Other race	34	6	66	6
12. Two or more races	360	53	820	71
		Percentage by Area		
Minority within block group and zone	2.8	2.8	2.8	2.8
Minority within Hancock County	3.8		NA[c]	
Minority within Penobscot County	2.8		2.8	
Minority within Washington County	6.8		6.8	
		Population Numbers		
Low-Income Population	5,969	833	12,929	1,112
		Percentage by Area		
Low-income within block group and zone	11.4	10.8	12.1	12.2
Low-income within Hancock County	13.1		NA	
Low-income within Penobscot County	10.0		10.0	
Low-income within Washington County	18.5		18.5	

[a] Data were estimated by multiplying the total minority and low-income population in the census block groups through which each route would pass by the ratio of land area in the census block groups in the zone to total land area in the census block groups.

[b] Row 6 = Rows 7 + 8 + 9 + 10 + 11, Row 5 = Rows 6 + 12, Row 3 = Rows 4 + 5, Row 1 = Rows 2 + 3 (Totals may be different because of rounding errors).

[c] NA = not applicable; the route does not include this county.

Source: U.S. Bureau of the Census (2005a).

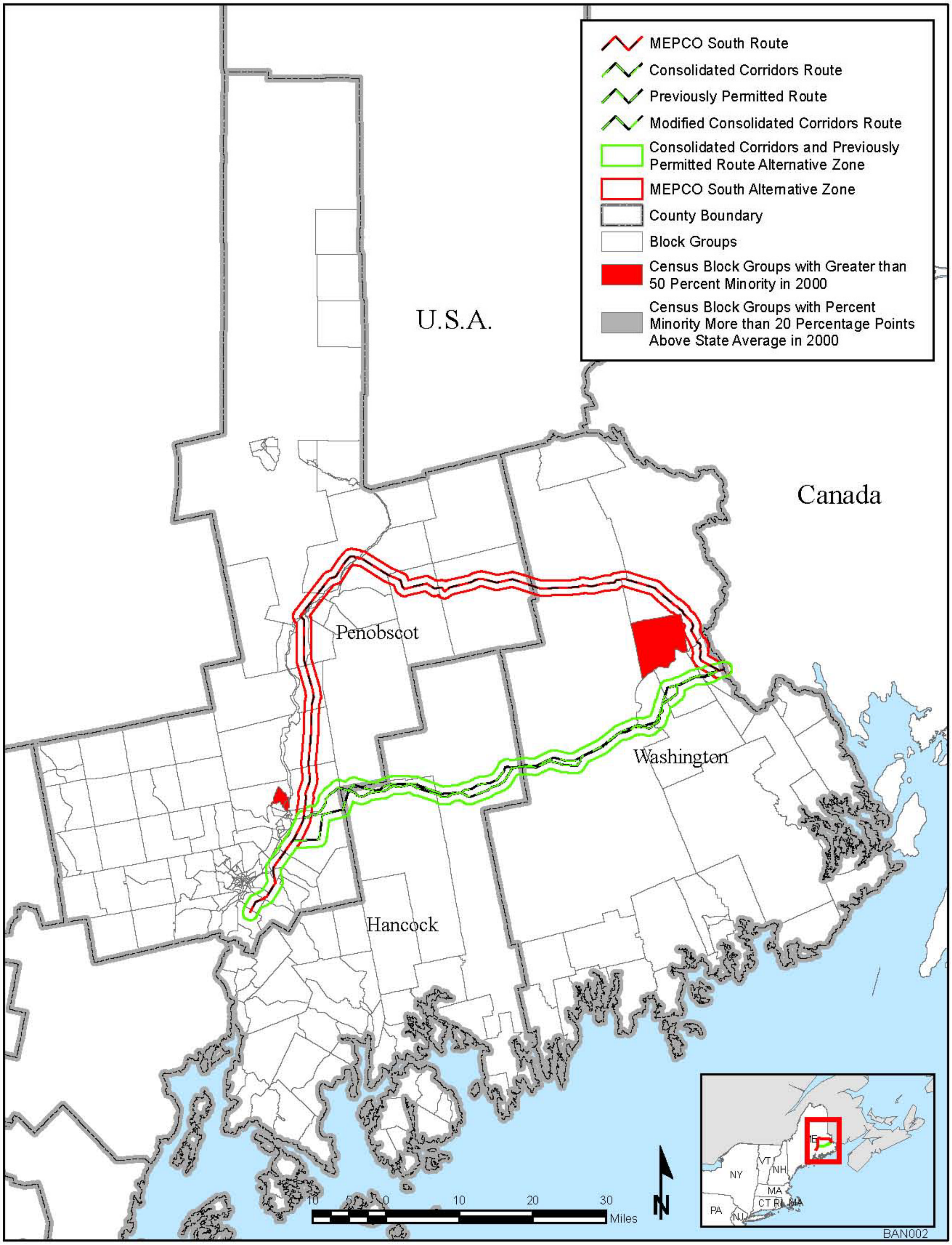

FIGURE 3.8-1 Minority Population Concentrations in Census Block Groups in Hancock, Penobscot, and Washington Counties (Source: U.S. Bureau of the Census 2005a)

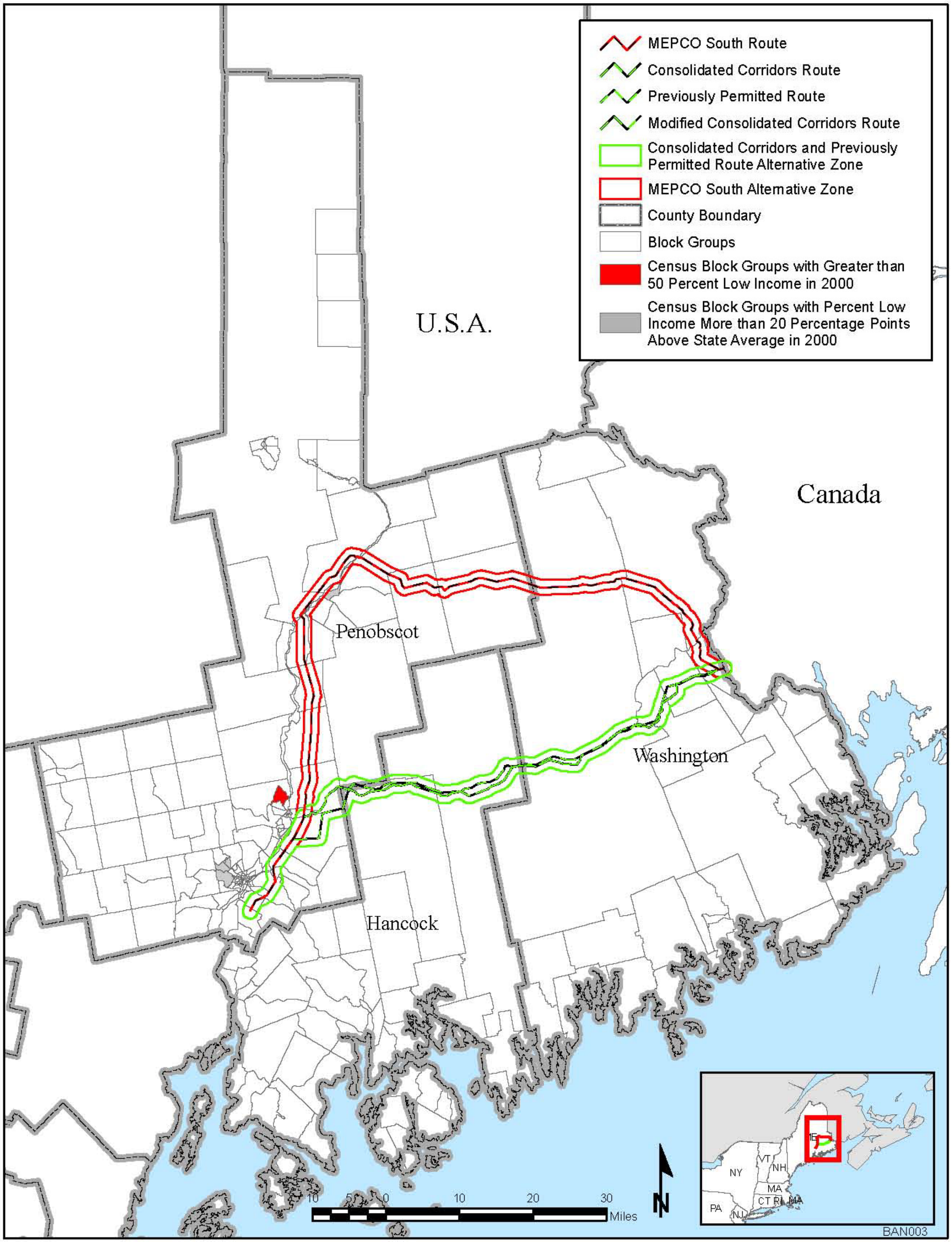

FIGURE 3.8-2 Low-Income Population Concentrations in Census Block Groups in Hancock, Penobscot, and Washington Counties (Source: U.S. Bureau of the Census 2005a)

3.9.1 Scenic Quality

For this EIS, a visual inventory of the areas through which each alternative route would pass was established. In the inventory, discrete areas were rated as (1) Class A (lands of outstanding or distinctive diversity or interest); (2) Class B (lands of common or average diversity or interest), or (3) Class C (lands of minimal diversity or interest). The classification for an area was based on landforms, vegetation, water, color, adjacent scenery, scarcity, and cultural modifications.

Much of the change in scenic quality as a result of past human activity along the southwestern portion of the Modified Consolidated Corridors, Consolidated Corridors, and Previously Permitted Routes occurs between the Orrington Substation and Great Works Stream (see Figure 2.1-2). The landscape in this area has undergone extensive man-made modifications associated with homes, roads, transmission lines, commercial developments, and farmlands (Figures H-1, H-3, and H-5, Appendix H). Similar but less significant changes in scenic quality occurred at the eastern end of these alternative routes, near Baileyville (Figure H-31, Appendix H). Other changes to the scenic quality in the area for these routes occurred as a result of the M&N gas pipeline ROW and Stud Mill Road, which often run parallel to each other through privately owned forested land from County Road on the eastern perimeter of the Sunkhaze Meadows National Wildlife Refuge to Baileyville (Figures H-7, H-9, H-11, and H-13, Appendix H). Various camps, gravel pits, logging roads and trails, and logged areas are also scattered in various locations across the area.

Other areas in the vicinity of the Modified Consolidated Corridors, Consolidated Corridors, and the Previously Permitted Routes are either pristine or relatively undisturbed, with few year-round residents. Recreational activities in these areas include fishing, hunting, canoeing, rafting, hiking, snowmobiling, and ATV use.

On the basis of these descriptors, the scenic quality of the area through which the Modified Consolidated Corridors, Consolidated Corridors, and Previously Permitted Routes would pass is rated as Class A for those few portions of the line not in close proximity to semiurban areas along Routes 1A and 2. The landscape is rated Class C in the vicinity of the semiurban areas and other areas where land has been disturbed.

The MEPCO South Route has numerous variations in scenic quality. In addition to the changes in scenic quality between the Orrington Substation and Great Works Stream described above, there are visual variations along Route 2 and Route 6 where the MEPCO South Route would be located close to residential and commercial developments. The route would be located close to the towns or municipalities of Brewer, Milford, Enfield, West End, Lincoln, Lee, Springfield, Carroll, Topsfield, and Waite. Although much of the remaining area along Route 2 and Route 6 is rural in character, there are very few pristine natural environments present. Extensive farmland, forestry activities, gravel pits, and access roads have changed the character of the visual environment. Portions of the MEPCO South Route would also follow existing transmission lines along the western and eastern ends of the route.

On the basis of these descriptors, the scenic quality of the area through which the MEPCO South Route would pass is rated as Class A for those portions of the line not in close proximity to semiurban areas. In the vicinity of the semiurban areas and other areas noted where land has been disturbed, the landscape is rated Class C.

3.9.2 Distance Zones

Because changes in form, line, color, and texture associated with changes in scenic quality become less perceptible with increasing distance to viewers, the distance zone in which the project is readily perceptible has an important influence on the overall visual impact of the project. Distance zones were applied to the visual environment of each alternative transmission line ROW. The foreground-middleground zone is the area between the viewer and a distance of 3 to 5 mi (5 to 8 km); the background zone includes the area from 3 to 5 mi (5 to 8 km) from the viewer up to 15 mi (24 km); and the seldom seen zone is the area greater than 15 mi (24 km) beyond any given viewing point. Because of the fairly uniform vegetation and featureless topography in the majority of the project area, the NRI would primarily be visible from only the foreground-middleground distance zone for all four alternative routes.

3.9.3 Visual Sensitivity

Public concern for change in scenic quality along the route is measured in terms of high, medium, or low sensitivity to changes in the landscape from key observation points. Sensitivity ratings for the NRI take into account the type of user, the amount of use, the level of public interest, adjacent land uses, and duration of time spent by the viewer along the alternative routes.

Table 3.9-1 presents key observation points along each alternative route where the transmission line could be seen.[9] Photographs of all but two locations identified in Table 3.9-1 are presented in Appendix H.

The southwestern section of each alternative route; portions of the MEPCO South Route close to Milford, Enfield, West End, Lincoln, Lee, Springfield, Carroll, Topsfield, and Waite; and portions of each alternative route close to Baileyville have been substantially altered by human activity (e.g., homes, roads, and industrial and commercial activities). Because the landscape features are not unique, the visual sensitivity for these portions of the project area can be classified as low.

The majority of the alternative routes (other than those areas mentioned above) would be located in isolated areas with few year-round residents. Although there is a moderate level of recreational use of these areas, many of these recreational activities occur in areas that are either

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9 A key observation point is a point located along a commonly traveled route or other likely observation point where the angle of observation, number of viewers, length of viewing times, relative project size, season of use, and light conditions make the transmission line highly visible to the public.

TABLE 3.9-1 Key Observation Points, Use Rates, and Viewer Sensitivity Data for the Alternative Routes

Key Observation Point[a]	Location	Use Rates	Visual Sensitivity[b]	Appendix H Figure
Modified Consolidated Corridors, Consolidated Corridors, and Previously Permitted Routes				
Route 1A Crossing	Near Brewer	20,640[c]	L	H-1
Eastern Avenue Crossing	Near Holden Center	<500[d]	L	H-3
Route 9 Crossing	Near Eddington	6,090[c]	L	H-5
Eagle Mountain	Near Stud Mill Road	<50[e]	H	H-7
Stud Mill Road	Near Jimmies Mountain	<50[e]	H	H-9
Machias River Crossing	Stud Mill Road	<50[e]	H	H-11
Pocomoonshine Lake	Near Stud Mill Road	<50[e]	H	H-13
Route 1 Crossing	Baileyville	5,940[d]	M	NA[f]
St. Croix River Crossing	North of Baileyville	<50[e]	H	H-15
MEPCO South Route				
Route 1A Crossing	Near Brewer	20,640[c]	L	H-1
Eastern Avenue Crossing	Near Holden Center	<500[d]	L	H-3
Route 9 Crossing	Near Eddington	6,090[c]	L	H-5
Stud Mill Road Crossing	North of Bangor	<50[e]	M	H-17
Route 2 Crossing	Southwest of Lincoln	3,250[d]	M	H-19
Penobscot River Crossing	South of Lincoln	<50[e]	H	H-21
Route 2 Crossing	Northeast of Lincoln	6,240[d]	M	H-23
Route 6 Crossing	West of Springfield	3,040[d]	M	H-25
Route 6 Crossing	East of Carroll	1,150[d]	M	H-27
Route 6 Crossing	West of Topsfield	1,420[d]	M	H-29
Route 1 Crossing	South of Topsfield	2,150[d]	M	H-31
Grand Falls Flowage Crossing	Northeast of Baileyville	<50[e]	H	NA
St. Croix River Crossing	North of Baileyville	<50[e]	H	H-15

[a] A key observation point is a point located along a commonly traveled route or other likely observation point where the angle of observation, number of viewers, length of viewing time, relative project size, season of use, and light conditions make the transmission line highly visible to the public. Appendix H includes photographs and photosimulations from most of the key observation points.

[b] H = high, M = medium, L = low.

[c] Annual average daily traffic counts for 2003 (DOT 2005).

[d] Annual average daily traffic counts for 1999 (DOT 2005).

[e] Data show daily visitation rates for 2004 (Hall 2005).

[f] NA = not available

pristine or relatively undisturbed by human activity. Recreational activities include fishing, hunting, canoeing, rafting, hiking, and ATV use. Other local activities are limited to those related to agriculture, forestry, transportation, and gas pipeline facilities. Although only a relatively small number of people visit these portions of the route corridors, the uniqueness of the landscape features is sufficiently high to potentially result in a high level of visual sensitivity to the transmission line.

4 ENVIRONMENTAL CONSEQUENCES

This chapter discusses the environmental consequences associated with the five alternatives described in Chapter 2 — (1) the Modified Consolidator Corridors Route (the applicant's and DOE's preferred alternative), (2) the Consolidated Corridors Route, (3) the Previously Permitted Route (the No Action Alternative), (4) the MEPCO South Route, and (5) the Rescission of the Presidential Permit — and includes a discussion of the impacts from the installation of AC mitigation for the M&N gas pipeline (a connected action). The impacts discussion is presented for the resource areas presented in Chapter 3, plus health and safety (including noise). The CEQ's regulations require that an EIS contain a description of the environmental effects (both positive and negative) of the analyzed alternatives. CEQ regulations (40 CFR 1508.8) distinguish between direct and indirect effects. Direct effects are caused by an action and occur at the same time and place as the action. Indirect effects are reasonably foreseeable effects caused by the action that occur later in time or farther in distance. Both direct and indirect effects are addressed in this chapter.

4.1 AIR QULITY

This section evaluates the impacts of construction, operation, and maintenance of the proposed project on the air quality and climate along each alternative route.

4.1.1 Methodology

The potential for air quality impacts was evaluated by analyzing the expected nature and magnitude of air emissions generated during construction activities. The air quality impacts discussion focuses on the construction phase of the project as the primary activity with the potential to impact air quality. This evaluation includes potential air emissions that could occur during construction of each alternative from fugitive dust (dust that escapes from a construction site) and vehicle and equipment exhaust. Mitigation measures to avoid potential nuisance dust conditions and minimize construction equipment impacts are also discussed.

4.1.2 Potential Impacts

4.1.2.1 Alternative Routes

4.1.2.1.1 Potential Impacts on Weather and Climate. The construction and operation of the proposed project along any of the alternative routes would not alter the climate of the project area. Although the openness of a ROW could result in more extreme temperatures, greater winds, convective heat loss, and greater amounts of precipitation (including snow) reaching the ground within the ROW, these areas potentially experiencing microclimatic changes would be proportional to the amount of new ROW required for each alternative route. Thus, the areas where microclimatic changes would occur would be greatest for the Previously Permitted Route (1,278 acres [517 ha]), least for the Consolidated Corridors Route (41 acres [17 ha]), and intermediate for the Modified Consolidated Corridors and MEPCO South Routes (309 acres [125 ha] and 804 acres [325 ha], respectively).

4.1.2.1.2 Potential Impacts on Air Quality. The principal sources of emissions associated with construction of the proposed project would include (1) fugitive dust from land clearing, drilling, excavation (including some explosives blasting), earthmoving, traffic, and wind erosion of exposed ground surfaces, and (2) exhaust from construction equipment and vehicles. At any time, construction would occur within small segments, last only a few days or less, and then cease. Similar, but less extensive, impacts would occur from site maintenance activities. These activities could generate a release of fugitive dust (PM_{10} and $PM_{2.5}$) and combustion products (oxides of nitrogen [NO_x], CO).

The greatest project-related impact on air quality would be from fugitive dust generated during clearing and construction activities. Fugitive dust would be highest in the immediate vicinity of construction activities and along unpaved roads; however, levels would decrease rapidly within a few thousand feet (Etyemezian et al. 2003). Dust emissions would vary substantially from day to day depending on weather, level of activity, and specific operation. Even temporary impacts on air quality from fugitive dust emissions during construction would be controlled by standard mitigation practices to avoid temporary exceedances of the PM_{10} and $PM_{2.5}$ standards. Standard mitigation practices used to mitigate air quality impacts during construction would include mulching exposed soil areas until these areas are revegetated. Furthermore, clearing and construction to the extent feasible during winter, coupled with revegetation during other seasons as construction progresses, would minimize fugitive dust emissions. Ground-cover vegetation would also be maintained to the extent practicable. In addition, Maritimes would follow its established mitigation procedures (TRC 2002) when installing AC mitigation (see Section 2.3.5).

The use of construction vehicles and equipment would also result in the emission of criteria air pollutants (other than O_3). All construction and vehicle use would be limited to the proposed project ROW and substations, staging areas, access roads, and, as applicable, the M&N gas pipeline ROW. Impacts from vehicle and equipment emissions would be minor and transitory because of the mobility of the sources and short work schedule anticipated for any particular site. Thus, these emissions would neither cause nor contribute to any violations of air quality standards. Given that the construction would be temporary (e.g., only 1 day or less per support structure location) and most of the adjacent land is primarily commercial forest land, only minor air quality impacts are expected to occur from construction, including construction vehicle use. Periodic crew vehicles and gas-powered equipment would be required to perform vegetation maintenance within the ROW. Air emissions from these sources would be less extensive than during construction.

The potential would exist for trace amounts of O_3 production resulting from corona effects, that is, the electrical breakdown of air into charged particles around the conductors, as explained in Section 4.10.2.1.4. During damp or rainy weather (the peak conditions for corona effects), the O_3 produced from this type of transmission line is less than 1.0 ppb in the immediate vicinity of the conductors (DOE 2005). This is considerably below the 8-hour and 1-hour O_3 standards of 80 ppb and 120 ppb, respectively (Table 3.1-1). Corona would be minimized by line design.

In summary, impacts on ambient air quality from fugitive dust emissions or the release of gaseous pollutants would be localized and temporary for all alternative routes. All of the alternative routes are located in attainment areas. Therefore, a conformity review is not required for the proposed project. Compliance with State permit provisions and the use of standard mitigation practices and mitigation to control fugitive dust generation and emissions would ensure that Maine ambient air quality standards were not violated. Given the limited emissions that would occur from the proposed project, it would not be subject to New Source Review permitting under the CAA.

4.1.2.2 Rescission of the Presidential Permit

Under the Rescission of the Presidential Permit Alternative, BHE would not build the NRI. Therefore, there would be no impacts on air quality beyond those already occurring.

4.2 LAND FEATURES

This section evaluates the potential impacts on the surface topography, geology, and soil resources within each alternative route from the construction, operation, and maintenance of the four alternative transmission line routes. Construction activities represent the principal means by which these resources could be affected, because they may alter surface topography and physically disrupt the structure of soils. The types of impacts can include the physical disturbance and excavation of soils and surficial geological resources, compaction, erosion, and contamination. This section also addresses the potential earthquake hazard to the proposed project.

4.2.1 Methodology

The main elements considered in assessing impacts on physiographic, geologic, and soil resources were the amount and location of land disturbed during construction. Land could be disturbed during grading for new temporary access roads, excavating for support structures, substation expansions, staging of equipment in designated areas, and installation of AC mitigation, and the degree to which an alternative may adversely affect resources within the designated area of concern.

4.2.2 Potential Impacts

4.2.2.1 Alternative Routes

The surface topography, geology, and soils within each alternative route would be similarly affected by construction activities. Compared with the scale of the landscape that would be crossed by the proposed project, the change in surface topography caused by the construction and operation of the transmission line would be insignificant. The removal of geologic material that would be required for substation expansions and possibly upgrading of existing access roads would be very small relative to the availability of the material in the region. Stone and gravel resources to be used to backfill support structure foundations holes and, as necessary, for access road upgrades would be acquired locally. Supply pits have the capacity to supply the project without the need for new sources of stone and gravel. Sand and gravel resources are ample in the general area; thus, the use of sand and gravel for the proposed project would not strain the supplies of these materials for other local construction needs.

The installation of support structure poles would vary with local surface geology. For most areas that are overlain with soil and glacial deposits, excavation would be conducted with earth augers or backhoes. However, in very dense glacial till and bedrock, excavation would be performed by means of drilling and blasting. Each wood pole would require the excavation of up to 180 ft^3 (5.1 m^3) based on a surface area of 15 ft^2 (1.4 m^2) and a depth up to 12 ft (3.7 m), while each steel pole would require the excavation of up to 450 ft^3 (12.7 m^3) based on a surface area of 15 ft^2 (1.4 m^2) and a depth up to 30 ft (9.1 m). Therefore, on the basis of the number and types of support structures required (Table 2.3-1), the total excavation required for support structure installation is provided in Table 4.2-1. The wood poles would be placed in excavated holes and backfilled with the excavated material or crushed stone that is tamped in place. Excavated holes for the steel poles would be either backfilled with concrete or else the poles would be attached to concrete bases. Excess excavated materials would be disposed of on site with regard for drainage, erosion, and revegetation considerations.

The placement of the support structures and temporary access roads would require some disturbance and removal of near-surface material. Because of the low relief (relatively flat landform) of most of the project area, the potential for slope failure would be negligible. Each of the alternative routes would avoid prominent topographic features such as Pocomoonshine Mountain. Avoiding such prominent topographic features would contribute to mitigation of potential visual impacts.

Localized minor terrain changes might result from the construction of new temporary access roads, the installation of pole structures, and the modification of the substations. The applicant has mitigation measures in place to minimize soil impacts (Sections 2.4.1 and 2.4.3).

Most soil disturbance would occur during the construction phase of the project. The degree of impact and its duration would depend on construction activities, soil characteristics at the construction site, and construction season. Most soil disturbances would be limited to the

TABLE 4.2-1 Excavation and Surface Area Disturbance Required for the Alternative Routes

Alternative Route[a]	Soil Excavation for Support Structures (yd^3)[b]	Disturbance for AC Mitigation (acres)[b]	Disturbance for Temporary Access Roads (acres)
MCCR	9,097	82	0
CCR	11,913	82	0
PPR	7,933	82	21.3
MSR	12,347	54	32.4

[a] CCR = Consolidated Corridors Route, MCCR = Modified Consolidated Corridors Route, MSR = MEPCO South Route, PPR = Previously Permitted Route.

[b] To convert cubic yards to cubic meters, multiply by 0.765; to convert acres to hectares, multiply by 0.405.

Sources: BHE (2004, 2005); Paquette (2005dd,mm,nn).

footprint of individual support structures or other facilities, along temporary access roads, and where AC mitigation is installed. The potential for soil disturbance would be highest for the MEPCO South Route and lowest for the Previously Permitted Route (Table 4.2-1). Increases in erosion are likely to occur when the soil is exposed or disturbed and would occur until sufficient revegetation has occurred to replace soil-retaining ground cover (i.e., 1 year or less). Except for the footprint of the support structures and other NRI facilities and the trench for installation of AC mitigation, ground-cover vegetation would normally not have to be removed. The potential for erosion of disturbed soils would be greatest during heavy rainfall or during spring snowmelt conditions. Soil compaction could also occur as a result of vehicle traffic on access roads and heavy equipment use within work areas for construction and installation of support structures. However, most of the construction activities in sensitive areas would be conducted in winter when the soil surface is frozen and when precipitation events take the form of snowfall. Thus, the potential for soil erosion or compaction as a result of construction would be minimized. In addition, erosion and sediment controls would be utilized (Sections 2.4.1 and 2.4.2) during all construction activities to further reduce the extent and magnitude of soil erosion from construction areas. Thus, impacts from soil disturbance would be expected to be negligible.

Installation of AC mitigation could disturb soil structure, increase erosion, or compact local soils. Removal of vegetation, trenching, grading, and backfilling can destabilize the soil surface and increase erosion potential (FERC 1998). The approximate areas disturbed for AC mitigation are provided in Table 4.2-1 for each alternative route. Soil erosion is expected to be minor and temporary as the trench required to install the zinc ribbon would be 18 in. (46 cm) deep and less than 3 ft (1 m) wide and would be backfilled as work progresses. Maritimes has erosion control measures in place to control soil erosion (TRC 2002).

Within the new temporary access roads, lack of vegetation would promote erosion of fine particles. The acreages occupied by new temporary access roads for each alternative route are provided in Table 4.2-1. If these roads were not properly located, graded, and maintained, concentrated runoff could cause gully erosion. However, adverse impacts would not be expected because the access roads would only be needed for a short period. Upon completion of use, the new temporary access road areas would be regraded to their approximate original ground contours, seeded, and mulched (Section 2.4.3).

In addition to physical disturbance, soils could be contaminated during construction and maintenance of the proposed project (fuel and herbicide spills). However, because standard mitigation practices would be used and any accidental spills would be promptly cleaned up as required (Section 2.4.2), chemical impacts on soils would be small. In addition, the herbicides that would be used bind tightly to soil (Information Ventures, Inc. 1995); thus, only the immediate area of the spill would be affected. Herbicides would be applied in accordance with label and application permit directions and stipulations.

Overall, the impacts on the physiographic, geologic, and soils resources are expected to be minimal and localized to the proposed project work areas.

The alternative routes are located in areas of relatively low seismic activity. In addition, transmission lines are designed to withstand a considerable amount of bending and twisting; therefore, seismic activity in the project area would have little or no effect on the NRI.

4.2.2.2 Rescission of the Presidential Permit

Under the Rescission of the Presidential Permit Alternative, BHE would not build the NRI. Therefore, there would be no potential impacts on land features (physiography, geology, and soils) beyond those already occurring.

4.3 LAND USE

4.3.1 Methodology

Potential impacts on land use were evaluated for each alternative route by examining the amount of land that would be disturbed by construction, the current land use of the potentially disturbed areas, and the compatibility of the transmission line ROW and facilities with current land use designations. Land disturbance activities for the NRI project would include ROW clearing and the construction and installation of new temporary access roads, staging areas, erosion controls, and support structures. Additional activities would include expanding substation areas and adding AC mitigation to the existing M&N gas pipeline.

4.3.2 Potential Impacts

4.3.2.1 Alternative Routes

ROW clearance and support structure installation are the main activities under the proposed action that could result in impacts on land use. The line length of each of the alternatives, except for the MEPCO South Route, would be relatively similar (84 to 85 mi [135 to 137 km]). The MEPCO South line would be 114 mi (183 km) long. The following discusses the potential impacts on various types of land uses that could occur along the alternative routes.

Less than 0.03% of the forest land within the three-county area of Hancock, Penobscot, and Washington Counties (Tables 3.5-4 and 3.5-5) would be affected by development of the ROW for any of the four alternative routes. Table 4.3-1 lists the acres of forested land (both managed and unmanaged) that would be impacted by ROW clearing for the alternative routes. The cleared trees could be used for commercial purposes (BHE 2004). The land within the ROW would be removed from commercial forest production. However, the presence of the proposed project would not restrict the continuation of commercial forestry in areas adjacent to the ROW. The Previously Permitted Route crosses about 40 mi (64 km) of land owned by International Paper, and logging operations along this portion of the route could be disrupted.

TABLE 4.3-1 Acres of Land Use Affected by the Alternative Routes[a]

	Alternative Route[b]			
Land Use	MCCR	CCR	PPR	MSR
Forested	1,411	1,391	1,461	1,513
Agricultural[c]	30	28	28	86
Other[d]	125	103	144	135
Total	1,566	1,522	1,633	1,734

[a] To convert acres to hectares, multiply by 0.405.

[b] CCR = Consolidated Corridors Route, MCCR = Modified Consolidated Corridors Route, MSR = MEPCO South Route, PPR = Previously Permitted Route.

[c] Acres of agricultural land crossed by the ROW. Production within most of the acreage could continue.

[d] Other land use includes built-up lands, such as urban, industrial, and residential lands.

Sources: BHE (2004); Paquette (2005j).

A small amount of agricultural land would be impacted by the proposed action for any of the alternative routes (Table 4.3-1). In the three-county area, there are more than 300,000 acres (120,000 ha) of land in farms (USDA 2004), and less than 0.03% of this agricultural land would be affected by any of the four alternatives. The presence of the ROW would not restrict the continuation of agricultural land use. It is probable that some support structures would be placed within agricultural lands. Although each support structure pole would occupy only about 15 ft^2 (1.4 m^2), up to 0.03 acre (0.01 ha) of agricultural land per support structure would be excluded from production because of constraints on farm equipments use within the immediate area of the support structures, including guy wires (Gustafson et al. 1980). Total acreage lost from production could be conservatively estimated by multiplying the percentage of the ROW that is agricultural land by the number of support structures for each alternative route. Thus, maximum acres lost to production would, in the aggregate, only be 0.35 acre (0.14 ha) for the Modified Consolidated Corridors and Consolidated Corridors Routes, 0.29 acre (0.12 ha) for the Previously Permitted Route, and 1.32 acres (0.53 ha) for the MEPCO South Route.

Impacts on recreational land use would be predominantly visual and experiential (Section 4.9) because no land would be taken out of or removed from recreational use as a result of the proposed project. Similarly, no State or Federal lands (including National Natural Landmarks) would be affected by construction or operation of any of the alternative routes. The Modified Consolidated Corridors, Consolidated Corridors, and Previously Permitted Routes would be within the viewshed of Outstanding River Segments on the Narraguagus and Machias Rivers. The types of outdoor activities described in Section 3.3 (e.g., fishing, hiking, camping, wildlife viewing, canoeing, snowmobiling, and ATV use) could be affected by the visual presence of the transmission line and its ROW in certain areas.

Establishment of the ROW could increase the amount of snowmobiling and ATV use since transmission line ROWs are frequently used for such activities. In particular, the Previously Permitted Route would create 19 potential ATV impact areas (e.g., new access areas connecting established trails). Only one new access area would be established for the MEPCO South Route and none for the Modified Consolidated Corridors or Consolidated Corridors Routes. The ROW corridors could also provide increased access for hunting. The indirect impacts of increases in these activities on other natural and cultural resources are discussed in Sections 4.5 and 4.6.

Residential land use could be affected by the proposed action either visually (a transmission line located within the viewshed of a residence) or through property being taken by condemnation through BHEs eminent domain rights as a public utility. Ten dwellings could be displaced by the MEPCO South Route. The Modified Consolidated Corridors Route would not displace any dwellings, and the Previously Permitted and Consolidated Corridors Routes would displace two and three dwellings, respectively. It is possible, however, that route adjustments could be made to avoid some of these properties.

Table 3.3-3 lists the number of dwellings that occur within 600 ft (183 m) of the alternative routes. The value or attractiveness of these dwellings could be affected by their proximity to the ROW. Potential impacts would be highest for the MEPCO South Route (with 121 dwellings) and least for the Previously Permitted Route (with 35 dwellings). Recreational land use in campgrounds could also be affected in four seasonal camps that are in the vicinity of the Modified Consolidated Corridors and the Previously Permitted Routes.

Approximately 4 acres (1.7 ha) of submerged Native American lands would be crossed by the ROW for the MEPCO South Route near the Penobscot River. Because of the nature of these lands (submerged) and on the basis of discussions between the applicant and the Penobscot Indian Nation (BHE 2005), use of these 4 acres (1.7 ha) of submerged land would not be expected to be affected by the MEPCO South Route. No Native American lands are crossed under the other alternatives (BHE 2005; Paquette 2005j).

Additional areas of disturbance that would affect land use include the construction of new temporary access roads, substation expansions, and AC mitigation. Substation expansions and AC mitigation would occur in previously disturbed areas and, therefore, would not be expected to affect existing land use. The construction of new temporary access roads would not result in any permanent change in land use. Estimated acreages required for new temporary access roads are none for the Modified Consolidated Corridors and Consolidated Corridors Routes, 21 acres (8.5 ha) for the Previously Permitted Route, and approximately 32 acres (13 ha) for the MEPCO South Route. These areas would need to be cleared for temporary access during construction of the transmission line but would be returned to preexisting conditions upon completion of construction activities (Section 2.4.3). Thus, only a temporary, short-term effect, if any, on land use would be expected for the construction of temporary access roads, and no land use impacts would be expected for any substation expansions or for AC mitigation.

Other lands, such as residential, commercial, and transportation and utility corridors, are also present in the proposed project area (Table 4.3-1). Most of these areas would be unaffected by the presence of a new transmission line.

4.3.2.2 Rescission of the Presidential Permit

Under the Rescission of the Presidential Permit Alternative, BHE would not build the NRI. Therefore, there would be no land use impacts beyond those already occurring.

4.4 HYDROLOGICAL RESOURCES

This section discusses the potential impacts of the proposed project on hydrological resources in the project area for each alternative. The discussion is divided into potential impacts on surface water and potential impacts on groundwater.

4.4.1 Methodology

Potential impacts on hydrological resources were evaluated by determining activities that could change the quantity and quality of surface and groundwater. To evaluate impacts on surface waters, consideration was given to (1) the number and types of water bodies that would be crossed by the alternative routes, and (2) the number of water bodies crossed or impacted by related actions (e.g., construction of new temporary access roads and AC mitigation for the M&N gas pipeline) and the physical effects of the crossings on water quality and flow, if any. Potential impacts on groundwater were based on the likelihood of an action associated with construction or maintenance of the proposed project physically altering or contaminating groundwater resources.

4.4.2 Potential Impacts

4.4.2.1 Alternative Routes

4.4.2.1.1 Potential Impacts on Surface Water. Potential impacts on local surface waters from construction of the proposed project could include degradation of water quality and alteration of flow regimes. During the construction phase, clearing of vegetation, support structure installation, placement of temporary access roads, installation of AC mitigation, and movement of construction vehicles and equipment could disrupt soils and promote soil erosion and sedimentation.

While a similar number of stream crossings would occur under each alternative route, the Previously Permitted Route would cross the greatest number of Class AA streams (Table 4.4-1). The applicant would span the streams and rivers and avoid placing support structures within

TABLE 4.4-1 Summary of Stream Crossings for the Alternative Routes

Alternative Route[a]	No. of Stream Crossings	No. of Class AA[b] Crossings	No. of Class A[c] Crossings
MCCR	67	13	44
CCR	66	10	46
PPR	65	18	41
MSR	66	5	41

[a] CCR = Consolidated Corridors Route, MCCR = Modified Consolidated Corridors Route, MSR = MEPCO South Route, PPR = Previously Permitted Route.

[b] Class AA = highest classification for rivers and streams; applies to waters that are outstanding natural resources and that should be preserved because of their ecological, social, scenic, or recreational importance (MDEP 2004).

[c] Class A = second-highest classification for rivers and streams (MDEP 2004).

Source: BHE (2004).

stream buffer zones (Section 2.4.2). BHE would avoid placing support structures within 75 ft (23 m) from the top of stream banks (25 ft [7.6 m] for the portion that would parallel the existing 345-kV transmission line). However support structures would be placed as close as possible to Atlantic salmon streams of special concern in order to maximize conductor height near the streams. This would minimize the amount of clearing required, which would help to maintain stream temperatures. Construction-related water use would not require withdrawals from regional surface water sources (BHE 2005).

No AC mitigation would be installed within streams or rivers; therefore, no in-stream disturbance would occur from this connected action. In addition, Maritimes would follow its established mitigation practices when installing AC mitigation (TRC 2002). Grand Falls Flowage would be the only lake crossed by any of the alternative routes (MEPCO South). It would be crossed at one of its narrowest areas (although this would require a span of about 1,150 ft [350 m]), and the crossing would be conducted similar to a stream or river crossing. Other ponds and lakes could be indirectly affected if streams that drain into such water bodies receive high sediment loads from construction areas or overland runoff of contaminants. Such impacts would be short-term and minor.

Because standard mitigation practices for erosion control and vegetation management protocols would be followed (Sections 2.4.2 and 2.4.3), only negligible impacts on water bodies would occur from erosion and sedimentation regardless of the alternative route. Erosion control measures would include the use of siltation fencing, hay bales, and geotextile fabric in areas where erosion is likely to occur, together with selective clearing within stream buffer zones. In addition, because the vast majority of the ROW would remain vegetated during construction, there would be no significant change in storm water runoff characteristics such as peak discharge rates. Thus, no special mitigation measures would be necessary to control peak flow from the ROW. These standard mitigation practices would minimize the potential for water bodies to be affected during construction.

In upland areas, both the refurbished and new temporary access roads could promote soil erosion, resulting in increased sediment loads in local brooks and streams. These impacts would be transient. Because erosion and sediment control measures would be implemented (Sections 2.4.2 and 2.4.3), the impacts caused by the new temporary access roads would be minor and localized. Only the MEPCO South Route would require a stream crossing for a new temporary access road; none would be required for the other alternative routes. Standard mitigation practices would be employed to minimize or avoid impacting water quality at the stream crossings (Sections 2.4.2 and 2.4.3).

Fuel and oil spills could occur during service and maintenance of equipment and vehicles, especially in the staging areas. However, the applicant has an oil and hazardous material spill containment plan in place that would minimize the potential threat of surface water contamination (BHE 2005).

Tree removal from shoreline locations can raise water temperatures, primarily through the removal of shade. The water bodies most at risk are low-order streams rather than larger, main-stem rivers (Lansky 2004). Deforestation can result in a 3.6 to 9.0°F (2 to 5°C) warming of small streams (Sweeney 1993). Because ROW stream crossing widths would affect relatively short segments of streams (up to 170 ft [52 m]), they would have little impact on stream temperatures. Loss of shading generally gains importance only if it occurs where other activities are also causing losses in riparian shading (BPA 2000). The applicant has standard mitigation practices in place to minimize impacts within stream buffers, such as selective removal of trees or portions of trees to minimize impacts on riparian vegetation (Section 2.4.2). Therefore, thermal warming of streams is not expected for any of the alternative routes.

During operation, potential impacts on hydrological resources would primarily occur from ROW maintenance. The potential for erosion and sedimentation is less than that for construction because removal of ground vegetation would not be required and only capable and danger trees would be removed. Potential stream contamination could occur from herbicide application. However, the herbicides that would be used to maintain the NRI ROW (i.e., imazapyr, glyphosate, and fosamine) are strongly adsorbed to soil (Information Venture, Inc. 1995). Also, herbicides would not be applied within stream buffer zones and would only be applied selectively in other areas (Section 2.4.5). Herbicides would be applied in accordance with label and application permit directions and stipulations. Therefore, their potential to contaminate surface waters would be negligible for any of the alternative routes.

No support structures would be located in streams. Because of the small footprint that a support structure would possess (15 ft^2 [1.4 m^2] per pole), the placement of structures in floodplains would not be expected to result in any increase in flood hazard either as a result of increased flood elevation or because of changes in the flow-carrying capacity of the floodplain. The support structure poles would not exacerbate flooding since they would not impede floodwater movement or reduce floodwater storage capacity. Also, very few support structure poles would be located in floodplains. For example, 13 poles would be placed within mapped 100-year floodplains for the Modified Consolidated Corridors Route (BHE 2005). In accordance with MDEP's Site Location Law, the NRI would not cause or increase flooding or cause a flood hazard to any structure and would not have an unreasonable effect on runoff infiltration. Substation modifications would be designed, constructed, and maintained so that flooding extent and frequency of flooding to downstream water bodies would not be increased and so that the 100-year flood elevation would not be adversely affected (BHE 2005). Impacts on floodplains and flooding are therefore expected to be insignificant. A detailed analysis of potential floodplain impacts is provided in the wetland and floodplain assessment in Appendix E.

4.4.2.1.2 Potential Impacts on Groundwater. Groundwater could be affected as a result of alterations of localized groundwater recharge rates due to soil compaction during clearing and grading. Trench excavation for AC mitigation could intersect shallow groundwater but would not be expected to adversely affect groundwater quality, quantity, or flow characteristics. For all alternative routes, some blasting for support structure holes may be necessary in areas where bedrock is exposed or close to the surface. Rock fracturing during blasting can affect the properties of bedrock aquifers that transmit water in fractures. The effect, however, has been shown to be confined to the immediate area of the detonation, thus minimizing potential impact on groundwater systems outside the construction ROW (FERC 1998).

During construction, collected water may need to be removed from support pole structure holes, from the AC mitigation trench in areas where there is a high water table, or following heavy precipitation events. This dewatering could minimally lower the water table in the immediate vicinity of the holes (e.g., within a few feet), but because this effect would be highly localized and temporary, there would be no impacts on nearby water users. Dewatering impacts would be minimized by discharging all water into well-vegetated upland areas or properly constructed dewatering structures that would allow the water to infiltrate back into the ground and return to the aquifer (BHE 2005; FERC 1998). Construction activities would not involve on-site subsurface wastewater disposal (BHE 2005).

The storage and use of fuel, lubricants, and other fluids during the construction phase of the facilities could create a potential contamination hazard. Spills or leaks of hazardous fluids could contaminate groundwater and affect aquifer use. This impact would be minimized or avoided by restricting the location of refueling activities and by requiring immediate cleanup of spills and leaks of hazardous materials (BHE 2005). Oil and diesel fuel would be stored in clearly marked tanks at the staging areas, and these areas would be provided with secondary containment structures. Construction equipment would be maintained regularly, and the source of leaks would be identified and repaired. Any soil contaminated by fuel or oil spills would be removed and disposed of by a contractor to an approved disposal site (BHE 2005). Lubricating oils and concrete curing compounds are potentially hazardous wastes that may be associated with construction activities. These would be placed in containers within secondary containment structures on site and disposed of at a licensed treatment and/or disposal facility in accordance with local or State regulations and in compliance with manufacturer's recommendations (BHE 2005). Any potentially contaminating materials would be removed before they could migrate downward to the groundwater (BHE 2005).

The potential for any herbicide to reach groundwater depends on factors like soil adsorption, soil characteristics, degradation rate of the herbicide, use rate, and climatic conditions (DuPont 2005). The herbicides that may be used to maintain the NRI ROW (i.e., imazapyr, glyphosate, and fosamine) strongly adsorb to soil (Information Venture, Inc. 1995). The potential impacts would be further minimized by prohibiting the application of herbicides in sensitive areas, such as where the sand and gravel aquifers are exposed and where water supply wells are located (TRC 2005b). Herbicides would be applied in accordance with label and application permit directions and stipulations (Section 2.4.5). Therefore, their potential to contaminate groundwater would be negligible for any of the alternative routes.

4.4.2.2 Rescission of the Presidential Permit

Under the Rescission of the Presidential Permit Alternative, BHE would not build the NRI. Therefore, there would be no impacts on hydrological resources beyond those already occurring.

4.5 ECOLOGICAL RESOURCES

This section discusses the potential effects on ecological resources from the construction, operation, and maintenance of the proposed project for each alternative route.

4.5.1 Methodology

Direct and indirect impacts on ecological resources were evaluated on the basis of (1) expected changes in habitat quantity, (2) the nature and quality of habitats adjacent to construction footprints, (3) changes in the quality and characteristics of habitats in the affected area, (4) the potential magnitude of changes to habitat quality and quantity, (5) the temporal characteristics of when impacts could occur, (6) the expected duration of impacts, (7) the sensitivity of biological resources that could be affected by changes in habitat quality or quantity, and (8) the rarity and importance of affected resources.

4.5.2 Potential Impacts

4.5.2.1 Alternative Routes

Differences in potential impacts among the alternative routes would primarily relate to factors such as line length, ROW widths, and specific habitats through which each route would traverse. Potential impacts on ecological resources for the first 12.2 mi (19.9 km) from the Orrington Substation to Blackman Stream would be the same for all four alternative routes, which are identical along this segment (Figure 2.1-2). Once past this segment, the nature of potential impacts on ecological resources would be relatively similar for the Modified Consolidated Corridors and Consolidated Corridors Routes, since these routes would only separate from each other southeast of the Sunkhaze Meadows National Wildlife Refuge (Figure 2.1-2) and near Myra Camps (Figure 2.1-5). The Previously Permitted Route (No Action Alternative) is located within the same general corridor as the Modified Consolidated Corridors and Consolidated Corridors Routes. However, the Previously Permitted Route has several lengthy separations from the other two routes (Figures 2.1-2 and 2.1-3). Within these separations, the Previously Permitted Route would be within a new corridor (i.e., not co-located with either the M&N gas pipeline or Stud Mill Road). The MEPCO South Route would be most dissimilar to the other routes because much of it would be located in a different corridor area (Figure 2.1-1).

4.5.2.1.1 Potential Impacts on Terrestrial Vegetation. Regardless of which alternative route is selected, during construction, vegetation would be directly affected by (1) clear-cutting or selective cutting to establish the ROW, (2) clearing of areas for support structures, (3) installation of new temporary access roads, (4) substation expansions, and, where required, (5) installation of AC mitigation for the M&N gas pipeline. Forests (both managed and unmanaged) represent the dominant plant community along each alternative route. The forested areas that would be impacted are common to abundant in the area. Impacts on nonforested habitats (e.g., agricultural areas, nonforested wetlands, and other open lands) would be relatively minor and short term. Following construction, any nonforested areas that were disturbed would be revegetated.

Effects on vegetation outside the construction footprint could include trampling, crushing, or accidental removal of plant species; increased exposure to direct sun and weather; change in plant community composition and diversity; changes in soil moisture, nutrient level, and soil structure due to compaction; and increase in invasive weeds (BPA 2000). The potential effects would be greatest during the growing season; nevertheless, many species would be expected to recover from these impacts by the following growing season (BPA 2000).

Habitat Fragmentation

Habitat fragmentation is the division of a large, contiguous area of habitat into smaller patches that are isolated from one another.

Habitat fragmentation is currently present along all alternative routes and would be one of the environmental consequences of the construction of the proposed project.

Fragmentation may result from human disturbances (e.g., logging, ROW construction, and agriculture) or natural events (e.g., forest fires, ice storms, and major disease or pest infestations).

Approximately 90% of each alternative route is composed of managed and unmanaged forest habitat. Forest clearing for the project would fragment habitat by creating a new ROW through contiguous forested habitats or by expanding the ROW width where the NRI would be co-located with existing facilities. The expansion would not be considered new fragmentation; therefore, there would be fewer impacts than for a new ROW area. The Previously Permitted and MEPCO South Routes would have 62 and 39 mi (100 and 63 km) of new ROWs, respectively. The Modified Consolidated Corridors Route would have 15 mi (24 km) of new ROW, while the Consolidated Corridors Route would have only 2 mi (3 km) of new ROW. When a forested area is fragmented to create a ROW, trees adjacent to the opening are exposed to microclimatic conditions which, under extreme conditions, can cause the foliage to sunburn or the trees to freeze. The trees that now make up the new forest edge may also be vulnerable to being blown down by winds if their root masses are not strongly developed (BPA 2000). This would vary by species. For example, the shallow roots of balsam fir and red spruce make them susceptible to windthrow, whereas the deep taproot of white pine makes it extremely windfirm (University of Maine 1997). The potential for this to occur along any of the alternative routes would be more likely for new ROW areas where essentially two new forest edges would be established. As previously discussed, the Previously Permitted and MEPCO South Routes would have significantly more new ROW than the Modified Consolidated Corridors and Consolidated Corridors Routes.

Soil disturbance can provide microhabitat sites for establishment of invasive plant species that may become management problems in the ROW and/or the surrounding forest (Williams 1995). Invasive species can threaten the existence of many native plants and greatly reduce plant diversity (BPA 2000). Maine's most problematic terrestrial invasive species include several species of honeysuckle (*Lonicera* spp.), Japanese knotweed (*Fallopia japonica*), Japanese barberry (*Berberis thunbergii*), common buckthorn (*Rhamnus cathartica*), Oriental bittersweet (*Celastrus orbiculata*), and multiflora rose (*Rosa multiflora*). Three additional terrestrial species can also invade wetland habitats: common reed (*Phragmites australis*), glossy buckthorn (*Frangula alnus*), and purple loosestrife (*Lythrum salicaria*) (MNAP 2004).

Other possible adverse construction effects could include deposition on plants of dust and other particulates from the operation of vehicles and large machinery. This deposition could inhibit photosynthesis and, if long term, result in plant mortality. The potential for fugitive dust impacts and soil compaction would be largely limited to the immediate footprint of the construction vehicles, construction sites, and temporary access roads, and would not be uniformly distributed or widespread throughout the length and width of a ROW. Vegetation that could be affected by fugitive dust would be largely limited to that immediately adjacent to the construction areas and temporary access roads. However, because construction activities at any one point would be short term and travel along access roads would be limited, adverse impacts on vegetation from dust should be negligible.

In addition, soil compaction caused by heavy machinery could destroy the ground flora and indirectly damage (by reducing soil aeration and altering soil structure) roots of trees (even of trees outside the ROW whose roots extend into the ROW). Impacts due to soil compaction would be mitigated (Section 2.4.2).

The acreage of forest clearing for each alternative route that would be converted to scrub-shrub or herbaceous habitats would be similar for all four routes (Table 4.5-1). Table 4.5-1 also presents the acreage of clearing or disturbance that would be required for new temporary access roads, substation expansions, staging areas, and AC mitigation for each alternative. The impacts resulting from new temporary access roads and AC mitigation would be short term and reversible, since those areas would be restored following completion of construction. While most impacts in staging areas would also be short term and reversible, some of the habitats within some of the staging areas are already disturbed (Section 2.3.4). Staging areas would be stabilized following their use (BHE 2005). The substation expansions would result in a permanent loss of habitat. Because some staging areas are being used or have been recently used for other activities, the habitats in these areas are currently disturbed. Therefore, their use for ROW construction would not be expected to result in additional habitat impacts.

No rare natural communities would be located within the ROW for the MEPCO South Route. Within the ROWs for the other alternative routes, the acreage of rare natural communities would be as follows: Modified Consolidated Corridors Route — 7.4 acres (3.0 ha); Consolidated Corridors Route — 3.4 acres (1.4 ha); and Previously Permitted Route — 7.9 acres (3.2 ha). Although some of these areas may be reduced in size or modified, the applicant has mitigation measures in place to minimize potential impacts on these areas (Section 2.4.2). For example, to the extent practicable, support structures would not be placed within rare natural communities, and construction activities within these areas would be closely monitored. Rare natural communities adjacent to any of the alternative ROWs would not be destroyed or modified by construction activities.

Commercial forest land within the project area goes through a cutting cycle that includes a 20- to 80-year period of reforestation (McWilliams et al. 2005). The vegetation within the ROWs

TABLE 4.5-1 Area Potentially Impacted by ROW Access Roads, Substation Expansions, Staging Areas, and AC Mitigation

Activity (Extent of Impact)	Area (acres) per Alternative[a,b]			
	MCCR	CCR	PPR	MSR
Total ROW acreage (permanent)	1,566	1,522	1,633	1,734
Acreage of new ROW (permanent)[c]	309	41	1,278	804
Forest clearing (permanent)[d]	1,411	1,391	1,461	1,513
New access roads (temporary)	0.0	0.0	21	32
Substation expansions (permanent)	1.0	1.0	1.0	1.0
Staging areas (temporary)	42.0	42.0	42.0	57.0
AC mitigation (temporary)	82	82	82	54

[a] CCR = Consolidated Corridors Route, MCCR = Modified Consolidated Corridors Route, MSR = MEPCO South Route, PPR = Previously Permitted Route.

[b] To convert to hectares, multiply by 0.405.

[c] New ROW would exist where the NRI would not parallel existing ROWs.

[d] Forests would be converted to scrub-shrub or herbaceous habitats.

Sources: BHE (2004, 2005); Paquette (2005j,ll,mm).

would, however, be maintained in an early successional state, with maintenance performed on an average 4-year cycle by selective hand cutting and herbicide application (Section 2.3.6). The herbicides that would be used to control woody vegetation within the ROW would be approved by the EPA and the Maine Board of Pesticides Control. Herbicides would be applied only by means of selective basal spray by workers using hand-held applicators rather than a broadcast application throughout the ROW. In comparison with herbicide use, mechanical methods to control vegetation generally cause a loss of diversity, reduce wildlife habitat (e.g., habitat becomes cyclic rather than stable), and increase the potential for petroleum product pollution. Selective basal herbicide application is an ecologically desirable means of encouraging the development of relatively stable shrublands, thereby decreasing the number of invading tree seedlings, and could potentially reduce the amount of future herbicide usage (Dreyer and Niering 1986).

The degree to which herbicides affect nontarget vegetation depends on (1) which specific herbicide is used (whether it is selective or nonselective), and (2) whether the herbicide comes in contact with nontarget vegetation (from application technique, drift, water or soil movement, and accidental spills or applications) (BPA 2000) (see Section 2.3.6). The herbicides that would be used bind tightly to soil (Information Ventures, Inc. 1995); therefore, their effects are primarily limited to foliar contact. Potential effects on nontarget plants would be limited to only those plants very near treated areas that are in a sensitive growth stage at the time of contact (Giesy et al. 2000).

In addition, mitigation measures (e.g., no herbicide use within stream buffers or wetlands with standing water) (Section 2.4.5) would further minimize potential herbicide effects.

4.5.2.1.2 Potential Impacts on Wildlife. Construction of a transmission line could directly affect wildlife as a result of (1) habitat loss, alteration, or fragmentation; (2) disturbance and/or displacement from noise and construction activities; (3) mortality from collisions with conductors and shield wires; (4) obstruction to movement; and (5) chronic or acute toxicity from herbicide or fuel spills. The nature of potential qualitative project impacts on individual wildlife species is summarized in Tables D-1 (mammals), D-2 (birds), and D-3 (reptiles and amphibians) of Appendix D. A qualitative assessment of potential impacts was made on the basis of whether the proposed project would increase preferred habitat (beneficial impact), decrease preferred habitat (detrimental impact), not notably alter preferred habitat (neither a net beneficial nor adverse impact), or have seasonally variable impacts. Wildlife species least likely to be affected by the NRI, either beneficially or adversely, would be habitat generalists.

The creation of edge habitat along the boundary between two habitats can (1) increase predation and parasitism of vulnerable forest interior animals in the vicinity of edges; (2) have negative consequences for wildlife by modifying their distribution and dispersal patterns; (3) be detrimental to species requiring large undisturbed areas, because increases in edge are generally associated with concomitant reductions in habitat size and possible isolation of habitat patches and corridors (habitat fragmentation); or (4) increase local wildlife diversity and abundance.

During construction, more mobile species would be displaced from the ROW area to similar habitats nearby; less mobile species, such as small mammals, reptiles and amphibians, and bird eggs and nestlings, could be destroyed. Displaced animals would likely have lower reproductive success because nearby areas are typically already occupied by other individuals of the species that would be displaced (Riffell et al. 1996). As summarized by Earth & Environmental Limited (AMEC 2002), increasing the concentration of wildlife in an area may result in a number of adverse effects, including potential mortality of the displaced animals from depletion of food sources, increased vulnerability to predators, increased potential for the propagation of diseases and parasites, increased intra- and inter-species competition, and increased potential for poaching. Some displaced wildlife would return to the newly disturbed areas shortly after construction is completed.

Principal sources of noise during construction would include truck traffic, operation of construction equipment, and blasting. Construction noise would be expected to temporarily disturb the behavior of local wildlife, causing some individuals to leave the area. Disturbed wildlife would be expected to return to the area after completion of construction activities. Because of existing noise associated with logging operations and associated truck traffic, local wildlife species may be habituated to temporary increases in noise levels.

Vegetation cutting during scheduled ROW maintenance would cause short-term disturbance of wildlife in the immediate vicinity of such activities. Animals that inhabit shrubs and small trees within the ROW would be displaced to adjacent habitats. The relatively low frequency of this activity (i.e., once every 3 to 4 years) would reduce the severity of the impact.

The herbicides that would be used as part of the ROW maintenance program (fosamine, glyphosate, and imazapyr) are considered practically nontoxic to wildlife (BPA 2000) (see Section 2.3.6). Thus, any adverse toxicological threat from herbicides to wildlife is unlikely. The response of wildlife to herbicide use is attributable to habitat changes resulting from treatment rather than direct toxic effects of the applied herbicide on wildlife.

The following discussion addresses potential impacts on mammals, birds, and reptiles and amphibians. Emphasis is given to species that have significant wildlife habitats within the project area (white-tailed deer and waterfowl and wading birds) or other species groups (such as raptors) that are prone to being impacted by transmission lines. Special status species are discussed separately in Section 4.5.2.1.8.

Overall, the effects of the proposed project on wildlife are expected to be minor at the population level and may not be detectable above natural population fluctuations and from fluctuations resulting from other activities in the area (e.g., logging and hunting).

4.5.2.1.3 Potential Impacts on Mammals. Almost half of the mammal species that occur within the region would either not be affected or experience only a minor beneficial or adverse impact because of the alteration of forested habitats to shrub or field habitats (Table D-1, Appendix D). Mammal species that could be adversely affected by the proposed project include those more dependent upon forest interiors (e.g., long-tailed shrew [*Sorex dispar*]). However, because the project area is located mostly within commercial timberlands subject to logging, forest interior specialists would be uncommon to rare. In particular, forest interior specialists would not be expected where the alternative routes would be co-located with existing ROWs or where the routes would pass through recently harvested areas. Other mammal species that could be adversely impacted include those that are arboreal or otherwise dependent upon trees (e.g., squirrels). Some forest species such as marten (*Martes americana*) and fisher (*M. pennanti*) are adversely affected by ROW clearings, which inhibit normal movements of these species (Merriam 1988; DOE 1995).

Mammal species most likely to benefit from the proposed project are those that prefer or require some open areas, edge habitat, and/or shrubs and small trees such as the woodchuck (*Marmota monax*), meadow jumping mouse (*Zapus hudsonicus*), coyote (*Canis latrans*), red fox (*Vulpes vulpes*), long-tailed weasel (*Mustela frenata*), and moose (*Alces alces*). Gravel roads through forests have been found to be positively correlated with bat activity in late spring and summer in eastern Maine (Zimmerman and Glanz 2000), since these areas provide productive foraging areas and/or travel corridors. The NRI would provide similar conditions.

Potential impacts on white-tailed deer are a primary consideration because tree removal could affect deer wintering habitat. Current commercial timber management activities in the vicinity of the proposed route include clear-cutting, selective harvesting, and herbicide applications. Loss of deer wintering habitat is the primary reason for low densities of deer in northern and eastern Maine (MDIFW 2002). Lower temperatures and higher winds in deer yards that are transected by a ROW impose greater thermoregulatory stresses on individual deer. Snowdrifts can be deeper in a ROW than in a deer yard, and they can increase the metabolic costs of travel and cover potentially important sources of winter browse. A ROW can serve as a potential barrier to deer movement within a deer yard or it can directly reduce the amount of yard available to overwintering deer. This could force deer to use suboptimal habitat, which could lead to debilitating stress.

Clearing and subsequent maintenance of a ROW through a deer yard would result in a loss of winter habitat for white-tailed deer. Another negative influence of the ROW on deer is the easy access it provides to the deer yard for humans (including snowmobiles) (Doucet et al. 1981). However, a ROW through a deer yard may increase browse production, especially toward the end of the maintenance cycle. During a harsh winter, this could be a critical survival factor for deer (Doucet et al. 1987).

Although the ROI for all four alternative routes is primarily forested, few deer wintering areas would be affected by construction of any of the routes. One deer wintering area would be crossed by either the MEPCO South Route or the Consolidated Corridors Route, while two would be crossed by the other routes (Table 3.5-5). The potential impact would be minor, especially if the NRI would only cross through the edge of a deer yard. For example, the total acreage for the two deer yards crossed by the Modified Consolidated Corridors Route would be more than 282 acres (114 ha), whereas the ROW portion of the Modified Consolidated Corridors Route would occupy only 7.3 acres (3.0 ha) of these deer yards (BHE 2005). In addition, other deer yards that are located near all of the alternative routes would be unaffected by NRI construction.

4.5.2.1.4 Potential Impacts on Birds. Potential project impacts on bird species are listed in Table D-3 (Appendix D). Open land habitat species such as the red-tailed hawk (*Buteo jamaicensis*), American kestrel (*Falco sparverius*), osprey (*Pandion haliaetus*), brown-headed cowbird (*Molothrus ater*), and yellow warbler (*Dendroica petechia*) may increase in numbers. An increase in brown-headed cowbird populations could adversely affect other species. The brown-headed cowbird is a brood parasite, laying its eggs in the nests of other species, especially of warblers, vireos, and sparrows. Nests along the forest edge could also be more vulnerable to predators such as raccoon (*Procyon lotor*). For example, depredation of artificial avian nests in a forest-field edge in Illinois was found to be 75% by the second day after nest placement and 99% by the sixth day (Bollinger and Peak 1995). If birds are disturbed sufficiently during the nesting season, then nest or brood abandonment might occur, and the eggs and young of displaced birds would be more vulnerable to cold or predators. The density of several forest-dwelling bird species has been found to increase within a forest stand soon after the onset of fragmentation as a result of displaced individuals moving into remaining habitat (Hagan et al. 1996).

Certain raptors, including the barred owl (*Strix varia*) and northern goshawk (*Accipiter gentilis*), could be adversely affected by loss of forest cover and habitat fragmentation. As the ROW becomes more densely vegetated toward the end of each 3- to 4-year maintenance cycle, bird species diversity would probably increase. Several forest species that might also use the ROW for foraging include the broad-winged hawk (*Buteo platypterus*) and ruffed grouse (*Bonasa umbellus*).

Confer and Pascoe (2003) found that ROWs in forested areas support high production of shrubland birds and do not exert a measurably harmful effect on forest-nesting birds. Selective herbicide application on the ROW sustained shrubland vegetation and supported high densities and high nesting success. Selective herbicide use (e.g., cut-stump treatments) encourages the development of shrub habitat without negatively impacting birds nesting in such habitats (Marshall and Vandruff 2002).

Potential impacts on waterfowl and shorebirds could primarily occur from impacts on habitat or changes in habitat. Construction could cause short-term changes in water quality from increases in siltation and sedimentation related to ground disturbance. The potential for such impacts would be lessened by conducting construction in wetlands in winter, as practicable, and by prohibiting activities with motorized equipment in moderate- and high-value waterfowl and wading bird habitats between April 15 and July 15 to minimize the potential disruption of avian breeding and nesting activities (Section 2.4). Long-term impacts could result from habitat alterations (i.e., changing forested wetlands to scrub-shrub and emergent wetlands within the ROW). This could have a slight beneficial impact on most waterfowl and shorebird species.

The acreages of waterfowl and wading bird habitats located within the ROWs for the alternative routes are provided in Table 3.5-5. The transmission line would have only a minor impact on waterfowl and wading bird habitats since the preferred habitat for most species (e.g., emergent wetlands, ponds, and lakes) would not be affected by the proposed project (Table D-2, Appendix D). However, the potential for waterfowl and wading birds to collide with the transmission line could be assumed to be related to the extent of preferred habitats crossed by the line and the extent of other waterfowl and wading bird habitats within the immediate area.

Meyer and Lee (1981) concluded that, while waterfowl (in Oregon and Washington) were especially susceptible to colliding with transmission lines, no adverse population or ecological results occurred because all the species affected were common and because collisions occurred in less than 1% of all flight observations. A similar conclusion was reached by Stout and Cornwell (1976), who suggested that less than 0.1% of all nonhunting waterfowl mortality nationwide was due to collisions with transmission lines. An informal study of a wetland near the Orrington Substation revealed no waterfowl mortality over several years, despite the fact that this wetland is crossed by 18 transmission lines (DOE 1995).

A few studies have examined the potential for collisions by raptors with transmission conductors and support wires. During 1 year of examination of the foraging activities of raptors in a New Hampshire ROW corridor, Denoncour and Olson (1984) did not find any mortality of hawks. Raptors have several attributes that decrease their susceptibility to collisions with transmission lines: (1) they have keen eyesight; (2) they soar or use relatively slow flapping flight; (3) they are generally maneuverable while in flight; (4) they learn to use utility poles and structures as hunting perches or nest sites and become conditioned to the presence of lines; and (5) they do not fly in groups (like waterfowl), so their position and altitude are not determined by other birds. Therefore, raptors are not likely to collide with transmission lines unless distracted (e.g., while pursuing prey) or when other environmental factors (e.g., weather) contribute to increased susceptibility (Olendorff and Lehman 1986).

The shield wire is often implicated as the primary culprit in bird losses involving higher voltage lines because birds fly over the more visible conductor bundles only to collide with the relatively invisible, thin shield wire (Faanes 1987; Thompson 1978). Young inexperienced birds, as well as migrants in unfamiliar terrain, appear to be more vulnerable to wire strikes than resident breeders. Also, many species appear to be most highly susceptible to collisions when alarmed, pursued, searching for food while flying, engaged in courtship, taking off, landing, when otherwise preoccupied and not paying attention to where they are going, and during night and inclement weather (Thompson 1978).

Some mortality resulting from bird collisions with the transmission lines is considered unavoidable. However, anticipated mortality levels are not expected to result in long-term loss of population viability in any individual species or lead to a trend toward listing as a rare or endangered species, because mortality levels are anticipated to be low and spread over the life of the transmission line. A variety of mitigation measures, such as those outlined in *Avian Protection Plan (APP) Guidelines* (APLIC and USFWS 2005), would minimize impacts to birds. The applicant plans to use marker balls and/or flappers to reduce potential bird collisions with the NRI (Section 2.4.4). Table 4.5-2 lists the stream crossings where ball markers would be installed. Brown and Drewien (1995) summarized other studies that showed that markers reduced bird collision mortality by 28 to 89%.

There would be no impact on raptors from electrocution when landing on the structures because the spacing between the conductors and ground wire on top of the structures would exceed the wing span of the bald eagle (the largest raptor likely to occur in the area of the alternative routes).

Active osprey nests are often observed on support structures of the existing 345-kV transmission line. New support structures associated with the proposed project that would be

TABLE 4.5-2 Water Body Crossings Where Ball Markers Would Be Used to Mitigate Potential Bird Collisions

	Water Body Crossing				
Alternative Route	Penobscot River	Great Works Stream	Narraguagus River	Machias River	St. Croix River
Modified Consolidated Corridors	–[a]	X	X	X	X
Consolidated Corridors	–	–	X	X	X
Previously Permitted	–	X	X	X	X
MEPCO South	X (2 crossings)	–	–	–	X

[a] A dash indicates that the route does not cross the water body.

Sources: BHE (2005); Paquette (2005cc).

located near larger streams, such as the Narraguagus River, would become candidate sites for osprey nests. The applicant has mitigation measures in place should osprey nests become a hazard to the birds or to safe operation of the transmission line (Section 2.4.4).

4.5.2.1.5 Potential Impacts on Amphibians and Reptiles. Amphibians and reptiles could be affected by habitat loss or alteration and by encounters with construction equipment. Overall, most amphibian and reptile species that range within the study area would either (1) not be affected by the proposed project, or (2) experience only minor beneficial or detrimental impacts (Table D-3, Appendix D). Those species most likely to be adversely affected by forest removal are the wood frog (*Rana sylvatica*) and northern ringneck snake (*Diadophis punctatus edwardsi*). A species most likely to benefit from the establishment of a ROW is the eastern smooth green snake (*Opheodrys v. vernalis*).

4.5.2.1.6 Potential Impacts on Aquatic Resources. Installation of support structures near water bodies and clearing of the transmission line ROW would be the principal potential sources of project impacts on aquatic biota. Potential impacts could include changes in water surface flow patterns, deposition of sediment in surface water bodies, changes in water quality or temperature regimes, loss of riparian vegetation, and changes in human access to water bodies. The severity of impacts would depend upon such factors as season of construction, stream size, corridor width to be cleared, construction procedures, and quality of the existing habitat.

Turbidity and sedimentation from erosion are part of the natural cycle of physical processes in water bodies, and most fish populations have adapted to short-term changes in these parameters. However, if sediment loads are unusually high or last for extended periods of time, adverse impacts can occur. Increased sediment can decrease fish feeding efficiency, levels of invertebrate prey, and fish spawning success. Deposition of fine sediment onto spawning gravels can adversely affect the survival of incubating fish eggs, alevin (a trout or salmon hatched out of its egg, but still attached to its yolk sac), and fry.

All alternative routes would cross coldwater fish streams (e.g., brook trout streams) in addition to those that are Atlantic salmon DPS and/or EFH or shortnose sturgeon water bodies. Information on the Atlantic salmon streams for each alternative route is summarized in Table 3.5-8, and an EFH assessment for the Atlantic salmon is provided in Appendix G. The MEPCO South Route would cross shortnose sturgeon habitat (the Penobscot River) twice. Potential impacts on fishes and other aquatic biota would be negligible because of mitigation measures that the applicant would undertake to minimize erosion and streamside disturbances, as well as to maintain stream shading (Sections 2.4.1 through 2.4.3).

In general, stream temperature alteration is reported to be one of the most significant impacts from clearing of riparian vegetation. For a stream to support coldwater species, such as brook trout, the water temperature should not exceed about 68ºF (20ºC) for more than short periods of time or distances. Removal of tall trees from stream banks can increase exposure of the stream to the sun, which can increase water temperature. Coldwater species may avoid such areas. The normal reaction of fish exposed to stressful temperatures is to move along the temperature gradient until preferred temperatures are encountered. Fish could avoid elevated temperatures by swimming upstream or downstream to areas of groundwater inflow, to deep holes, or to shaded areas.

Only a short linear width of riparian vegetation at any stream crossing (e.g., 100 to 170 ft [30 to 52 m], plus topping or removal of adjacent danger trees) would require clearing for the transmission line. Thermal conditions of larger streams would be generally unaltered regardless of ROW exposure, since they are mostly unshaded. Therefore, stream-warming impacts on any of the larger streams (e.g., 10 ft [3 m] wide or wider) crossed by any of the alternative routes would not be expected. Nevertheless, some thinning of trees would be required at several narrower streams that do have a shading canopy. As a result, those streams could experience some degree of localized stream warming. These streams would likely be affected for 1 to 2 years until overhanging vegetation, shrubs, or alders become established along their banks.

To minimize the potential for stream warming or siltation and sedimentation that could result from bank disturbance, the applicant would adhere to the standard mitigation practices listed in its erosion and sedimentation control plan (TRC 2005a) and post-construction vegetation maintenance plan (TRC 2005b). These mitigation measures are summarized in Sections 2.4.1 and 2.4.2.

During operation of the transmission line, aquatic systems may be adversely affected by maintenance activities, primarily vegetation control. However, vegetation control near stream crossings would be infrequent (occurring no more often than once every 3 to 4 years) and at a much lower activity level than would occur during construction. Only selected trees might have to be removed or trimmed. Control of vegetation within streamside buffer zones would be accomplished by manual techniques. Therefore, erosion of stream banks from maintenance activities would be expected to be negligible. Accidental release of toxicants (e.g., gasoline, lubricants, and herbicides) would not be expected because heavy machinery would not be used near streams, and no herbicides would be used within the 75-ft (23-m) stream buffer zones (Section 2.4.5).

Among the herbicides that the applicant is considering (Paquette 2005a), fosamine and imazapyr are considered practically nontoxic to fish, while glyphosate (formulations for terrestrial uses) is considered slightly toxic to freshwater invertebrates and moderately toxic to fish (BPA 2000). Thompson et al. (2004) and Wojtaszek et al. (2004) found that aerial applications of glyphosate do not pose a significant risk of acute effects or growth effects to larval stages of amphibians in forest wetland environments. Studies summarized by Wojtaszek et al. (2004) indicate that terrestrial or aquatic uses of glyphosate pose minimal risks to aquatic organisms. Therefore, potential impacts from selected land application of herbicides for NRI maintenance would be even more protective of aquatic and wetland biota, since there would be no herbicide application within aquatic habitats (Section 2.4.5).

Indirect impacts on fisheries can occur from increased public access via the ROW. Fisheries could be impacted by increased fishing pressure or by human activity (ATV use), which could disturb vegetation and soils and thus cause erosion and related stream impacts (Galvin 1979). However, this should be a minor impact where the ROW would be co-located with roads or existing ROWs, or where they would be located close to logging trails that already provide stream access. Nevertheless, construction of the proposed route would add additional access points to many of the streams that the line would cross, regardless of the alternative route.

No impacts on aquatic resources would be created from the installation of AC mitigation, since in-stream activities are not anticipated as part of the mitigation action (Paquette 2005ee).

4.5.2.1.7 Potential Impacts on Wetlands. Appendix E presents a wetland and floodplain assessment for the proposed project. The following summarizes the potential impacts on wetlands that could occur from the proposed project.

Potential impacts on wetlands resulting from construction and maintenance of the proposed transmission line include (1) alteration of hydrology (Section 4.4); (2) alteration of vegetative community structure; (3) disruption of soils (Section 4.2); and (4) subsequent reduction or modification in wetland functions, including those related to the maintenance of water quality, ecosystem support (e.g., nutrient cycling and primary production), wildlife habitat, and species diversity.

Although wetland areas would be avoided to the maximum extent possible, not all such areas could be avoided. Thirty-four support structures would be located within wetlands for the Modified Consolidated Corridors Route (Paquette 2005s). The number of support structures that could be located within wetlands for the other alternative routes (Table 4.5-3) was based on the number of structures required for the alternative and the percentage of the route length that is composed of wetlands. This would present a conservative estimate of the number of structures within wetlands. The actual number of structures would probably be less, as adjustments could be made during the final micrositing process.

The most significant impact on wetlands would occur in areas when forested wetlands were cleared and subsequently converted to scrub-shrub or emergent wetlands (Table 4.5-3). The least modification to forested wetlands would occur for those located adjacent to streams, because within the 75-ft (23-m) stream buffer zones, only the portion of the trees that would infringe upon the conductor clearance zone would generally be cut. Maximum retention of woody vegetation and minimal on-ground disturbance would occur in these areas in order to protect stream integrity (Section 2.4.2). A very small total amount of wetland fill would also be required for support structure poles (Table 4.5-3). A number of wetlands of special significance (Section 3.5.3) would also be located within the ROWs of the alternative routes. No adverse functional changes in wetland functions would be anticipated for any of the alternative routes.

Mitigation measures are in place that would restrict the distance from wetlands within which herbicide application would be allowed (Section 2.4.5). Furthermore, there is a very low probability of wetland contamination by the herbicides because of their restricted movement through soil (American Cyanamid Company 1988; Monsanto Company 1995; BPA 2000). Thus, no impacts on wetlands from herbicide use would be expected for any alternative route.

TABLE 4.5-3 Impacts of the NRI on Wetlands

	Alternative Route[a]			
Parameter	MCCR	CCR	PPR	MSR
Forested wetland converted to scrub-shrub wetland (acres)[b]	70	53	103	73
Number of support structures in wetlands	34	29	36	51
Number of poles in wetlands	73	62	77	109
Wetland area filled by support structure poles (acre)	0.03	0.02	0.03	0.04

[a] CCR = Consolidated Corridors Route, MCCR = Modified Consolidated Corridors Route, MSR = MEPCO South Route, PPR = Previously Permitted Route.

[b] To convert acres to hectares, multiply by 0.405.

Sources: BHE (2004); Paquette (2005j,s,t).

4.5.2.1.8 Potential Impacts on Special Status Species. This section evaluates the potential impacts on special status species, including Federally and State listed threatened and endangered species and species considered of special concern in Maine (Table D-4, Appendix D). While many of the special status species listed in Table D-4, Appendix D, were historically collected from the project area or have ranges that encompass a portion of one or more of the alternative routes, many of these species are not expected to be present within the ROWs of the alternative routes. For those special status species that might be present, impacts would be similar to those previously discussed for other vegetation, wildlife, and aquatic biota. Because the distribution and/or abundance of special status species are limited, any impact could affect the viability and survival of these species in the area.

Habitat availability is a primary limiting factor for some of the special status species (Table D-4, Appendix D). Therefore, habitat alteration related to project construction and subsequent ROW maintenance could contribute to the decline of some species (e.g., those preferring forested habitats) or to an increase in others (e.g., those preferring shrublands and fields). Table 4.5-4 presents the potential impacts on special status species resulting from the establishment and maintenance of the ROW for each alternative route. Potential adverse impacts from construction and maintenance of the ROW would be minimized or avoided by the implementation of appropriate mitigative measures (Sections 2.4.2 and 2.4.5).

DOE initiated informal consultation with the USFWS and NOAA Fisheries requesting information on species protected under the ESA, and both agencies are cooperating in the preparation of the EIS (see Appendix A). Of particular concern to these regulatory agencies are potential impacts on the Atlantic salmon and the bald eagle. Impacts on these species are addressed in detail in the biological assessment (Appendix F) and, for the Atlantic salmon, the EFH assessment (Appendix G). All streams and rivers that would be crossed by the alternative routes are considered EFH. The potential for impacts on EFH would be greatest where forested

TABLE 4.5-4 Potential Impacts on Special Status Species from ROW Establishment

Species[a]	Alternative Route: Modified Consolidated Corridors	Consolidated Corridors	Previously Permitted (No Action)	MEPCO South
Plants				
Allegheny vine *Adlumia fungosa*	ROW construction could potentially alter or eliminate preferred habitat (e.g., wet woods).	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors	No impact expected; no recent records within the potentially affected area.
Nantucket shadbush *Amelanchier nantucketensis*	ROW may provide suitable habitat (fields, edges, thickets).	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors
Swamp birch *Betula pumila*	Clearing during ROW construction could remove some individuals in forested wetlands.	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors
Swarthy sedge *Carex adusta*	ROW may provide suitable habitat (open areas).	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors
Bicknell's sedge *Carex bicknellii*	ROW may provide suitable habitat (fields, meadows).	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors
Orono sedge *Carex oronensis*	ROW may provide suitable habitat (fields, meadows, clearings).	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors
Dioecious sedge *Carex sterilis*	No impact expected; only historical records along route, preferred habitats (gravelly river shores, fens) would not be affected.	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors

TABLE 4.5-4 (Cont.)

Species	Alternative Route: Modified Consolidated Corridors	Consolidated Corridors	Previously Permitted (No Action)	MEPCO South
Sparse-flowered sedge *Carex tenuiflora*	ROW construction could potentially alter or eliminate habitat.	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors
Sheathed sedge *Carex vaginata*	No impact expected; white cedar swamps rare and could be avoided during construction.	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors
Wiegand sedge *Carex wiegandii*	ROW construction could potentially reduce habitat quality if trees near peatlands removed.	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors
Prickly hornwort *Ceratophyllum echinatum*	ROW may provide suitable habitat (still waters in nonforested areas).	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors
Northern wild comfrey *Cynoglossum virginianum*	ROW may provide suitable habitat (forested borders and openings).	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors
Awned sedge *Cyperus squarrosus* var. *boreale*	No impact expected; habitat (riverbanks and stream shores) would not be impacted and species unlikely to be encountered.	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors	No impact expected; not known to occur within the potentially affected area.

TABLE 4.5-4 (Cont.)

Species	Alternative Route: Modified Consolidated Corridors	Consolidated Corridors	Previously Permitted (No Action)	MEPCO South
Ram's-head lady's-slipper *Cypripedium arietinum*	No impact expected, as only historical records from potentially affected area.	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors
Showy lady's-slipper *Cypripedium reginae*	Forest clearing, particularly in deer yards, could reduce or eliminate local populations.	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors
Hyssop-leaved fleabane *Erigeron hyssopifolius*	No impact expected; preferred habitat (river shores, rocky summits, outcrops) would not be impacted.	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors
Fall fimbry *Fimbristylis autumnalis*	No impact expected; preferred habitat (pond shores) would not be impacted.	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors
Bog bedstraw *Galium labradoricum*	No impact expected as species occurs in both forested and open habitats.	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors
Common mare's-tail *Hippuris vulgaris*	No impact expected; ROW would not cross lakes or affect any small ponds that may be crossed.	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors

TABLE 4.5-4 (Cont.)

Species	Alternative Route: Modified Consolidated Corridors	Consolidated Corridors	Previously Permitted (No Action)	MEPCO South
Long-leaved bluet *Houstonia longifolia*	No impact expected; preferred habitat (river shore ledges) would not be impacted.	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors
Alpine clubmoss *Huperzia selago*	ROW may provide suitable habitat (disturbed sites near water and coniferous woods).	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors	No impact expected; not known to occur within the potentially affected area.
Vasey rush *Juncus vaseyi*	ROW may provide suitable habitat (various nonforested wetlands).	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors
American shore-grass *Littorella uniflora*	No impact expected; preferred habitat (shores and margins of lakes and ponds) would not be impacted.	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors
Swamp fly-honeysuckle *Lonicera oblongifolia*	No impact expected; preferred habitat (open areas of cedar swamps) would not be impacted.	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors
White adder's-mouth *Malaxis monophyllos* (= *brachypoda*)	ROW construction could potentially reduce bog habitat quality or quantity.	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors

TABLE 4.5-4 (Cont.)

Species	Alternative Route			
	Modified Consolidated Corridors	Consolidated Corridors	Previously Permitted (No Action)	MEPCO South
Smooth sandwort *Minuartia glabra*	No impact expected; preferred habitat (open granitic ledges of small mountains) would not be impacted.	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors
Canada mountain-ricegrass *Oryzopsis canadensis*	ROW construction could potentially alter or eliminate habitat (rocky woods).	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors	No impact expected; not known to occur within the potentially affected area.
Alga-like pondweed *Potamogeton confervoides*	No impact expected; preferred habitat (ponds) would not be impacted.	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors
Indian grass *Sorghastrum nutans*	ROW may provide suitable habitat (prairies and wood borders).	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors
Water awlwort *Subularia aquatica*	No impact expected; preferred habitat (ponds and lakes) would not be impacted.	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors
Small purple bladderwort *Utricularia resupinata*	No impact expected; preferred habitat (pond, lake, and river shores) would not be impacted.	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors

TABLE 4.5-4 (Cont.)

Species	Alternative Route: Modified Consolidated Corridors	Consolidated Corridors	Previously Permitted (No Action)	MEPCO South
New England violet *Viola novae-angliae*	No impact expected; preferred habitat (slate ledges of Penobscot River) would not be impacted.	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors
Water stargrass *Zosterella dubia*	No impact expected; preferred habitat (quiet waters) would not be impacted.	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors
Invertebrates				
Yellow lampmussel *Lampsilis cariosa*	No impact expected; not known to occur within the potentially affected area.	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors	No impact expected; preferred habitat (ponds, lakes, slow-moving sections of streams and rivers) would not be impacted.
Tidewater mucket *Leptodea ochracea*	No impact expected; does not occur within potentially affected areas.	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors
Pygmy snaketail *Ophiogomphus howei*	No impact expected; preferred habitat (medium to large unpolluted rivers) would not be impacted.	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors

TABLE 4.5-4 (Cont.)

Species	Alternative Route: Modified Consolidated Corridors	Consolidated Corridors	Previously Permitted (No Action)	MEPCO South
Tomah mayfly *Siphlonisca aerodromia*	No impact expected; not known to occur within the potentially affected area.	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors	No impact expected; preferred habitat (sedge-dominated floodplains) would not be impacted by construction.
Fishes				
Shortnose sturgeon *Acipenser brevirostrum*	No impact; does not occur within potentially affected area.	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors	No impact expected; Penobscot River would not be affected by the two transmission line crossings.
Atlantic salmon *Salmo salar*	No adverse impact expected because of mitigation required at stream crossings.	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors
Birds				
Upland sandpiper *Bartramia longicauda*	No impact expected; preferred habitat (large open grassy areas) would not be impacted.	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors
Sedge wren *Cistothorus platensis*	No impact expected; preferred habitat (wet meadows) would not be impacted.	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors

TABLE 4.5-4 (Cont.)

Species	Alternative Route: Modified Consolidated Corridors	Consolidated Corridors	Previously Permitted (No Action)	MEPCO South
Bald eagle *Haliaeetus leucocephalus*	No habitat impact expected; potential for individuals to collide with conductors or shield wires.	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors
Mammals				
Eastern timber wolf *Canis lupus lycaon*	No impact expected; potential to occur within the potentially affected area unlikely. Individuals could readily relocate away from impact areas.	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors
Eastern cougar *Felis concolor couguar*	No impact expected; possibility of impact occurring within the potentially affected area unlikely. Individuals could readily relocate away from impact areas.	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors	Same as Modified Consolidated Corridors

[a] See Table D-4 (Appendix D) for Federal or State listing status.

Sources: MDIFW (2003); MNAP (2002); NatureServe (2005).

riparian areas (both wetland and upland forests) within 150 ft (46 m) of EFH water bodies (Table 4.5-5) would be altered to scrub-shrub habitats in order to provide adequate conductor clearance: 82 acres (33 ha) for 57 streams crossed by the Modified Consolidated Corridors Route; 89 acres (36 ha) for 59 streams crossed by the Consolidated Corridors Route; 92 acres (37 ha) for 59 streams crossed by the Previously Permitted Route; and 65 acres (26 ha) for 55 streams crossed by the MEPCO South Route. Among these totals, no Atlantic salmon DPS water bodies would be crossed by the MEPCO South Route. Potential impacts on these water bodies would be negligible because of mitigation that would be employed to minimize erosion, protect stream banks, and maintain stream shading (Sections 2.4.1, 2.4.2, and 2.4.5). More detailed assessments of potential impacts on Atlantic salmon are presented in the biological assessment (Appendix F) and EFH assessment (Appendix G).

Among the alternative ROWs, only one essential bald eagle habitat (i.e., nest site) occurs within the MEPCO South Route. However, bald eagle nests occur within most municipalities that the alternative routes would traverse. Mitigative measures (e.g., construction timing and route avoidance) would be taken near essential eagle habitats. Bald eagles could potentially collide with the transmission lines. The potential would be the same for all four routes for the St. Croix River crossing. The MEPCO South Route would cross the Penobscot River at two locations, which would present a further potential for bald eagles to be affected by that alternative. For the other alternative routes, the crossings of the Great Works Stream (Modified Consolidated Corridors and Previously Permitted Routes only), Narraguagus River, and Machias River would be potential locations where bald eagles could be impacted by the transmission line. Placing marker balls on the shield wires over these streams would minimize impact potential (Section 4.5.2.1.4).

Overall, construction and operation of the proposed project are not likely to adversely affect bald eagles. A biological assessment for the bald eagle is presented in Appendix F.

TABLE 4.5-5 Impacts of the NRI on Forested Riparian Areas of Essential Fish Habitat Water Bodies

	Alternative Route[a]			
Parameter	MCCR	CCR	PPR	MSR
Forested land converted to scrub-shrub land (acres)[b,c]	82	89	92	65
Number of water bodies	57	59	59	55

[a] CCR = Consolidated Corridors Route, MCCR = Modified Consolidated Corridors Route, MSR = MEPCO South Route, PPR = Previously Permitted Route.

[b] Includes wetland and upland forests within 150 ft (46 m) of EFH water bodies.

[c] To convert acres to hectares, multiply by 0.405.

Source: Paquette (2005j).

4.5.2.2 Rescission of the Presidential Permit

Under the Rescission of the Presidential Permit Alternative, BHE would not build the NRI. Therefore, there would be no impacts on ecological resources beyond those already occurring.

4.6 CULTURAL RESOURCES

4.6.1 Methodology

Potential impacts on cultural resources (archaeological sites, historic structures and features, and traditional cultural properties) were evaluated on the basis of previous survey results from the project area, the potential of the area to contain sites, the presence of recorded sites, the significance evaluations of known sites (determinations of eligibility for listing on the NRHP), and levels of previous disturbance (see Section 3.6). Impacting factors for the NRI project that could affect cultural resources include ROW clearance and support structure installation; access road construction; staging area upgrades; expansion of substation areas; and the addition of AC mitigation, as required, to the existing M&N gas pipeline.

4.6.2 Potential Impacts

4.6.2.1 Alternative Routes

4.6.2.1.1 Right-of-Way Clearance and Support Structure Installation. No impacts on cultural resources are anticipated from the construction of the Modified Consolidated Corridors Route. The Maine SHPO has approved the archaeological survey conducted for this route and has concurred that the Modified Consolidated Corridors Route would not adversely affect cultural resources (Shettleworth 2005). One significant historic property was recorded during the survey, and the route was modified to avoid impacting the site. This strategy was acceptable to the SHPO (Shettleworth 2005). However, should archaeological remains be unexpectedly uncovered during any ground-disturbing activities resulting from the proposed project (e.g., along the corridor, within staging areas, during substation expansion), work would be stopped immediately in the vicinity of the find, and the SHPO and a qualified archaeologist contacted to determine its significance. No historic structures have been identified within the project area or within viewing distance of the transmission line corridor. No traditional cultural properties have been identified within the project area under this alternative.

Impacts on cultural resources are possible from construction of the Consolidated Corridors Route, although they are unlikely since this alternative primarily would be the same as the Modified Consolidated Corridors Route and no impacts are anticipated along that route. The areas where the two routes diverge (between Blackman Stream and the Pickerel Pond area

[Figure 2.1-4] and near Myra Camps [Figure 2.1-5]) have not been surveyed along the Consolidated Corridors Route and could contain archaeological remains. If this alternative route is chosen, a cultural resource survey would need to be conducted in these two areas and the results approved by the Maine SHPO. Any sites recorded during the survey would need to be evaluated for significance, and impacts on sites determined to be significant would need to be avoided or mitigated. No historic structures have been identified within the project area or within viewing distance of the transmission line corridor. No traditional cultural properties have been identified within the project area for this alternative.

Impacts on cultural resources from construction of the Previously Permitted Route are possible but unlikely. Much of this route was previously surveyed in 1989 and additional portions were surveyed for the M&N pipeline in 1999 (see Section 3.6). If this alternative route is chosen, a cultural resource survey would need to be conducted in any areas not previously surveyed and the results approved by the Maine SHPO. Any sites recorded during the survey would need to be evaluated for significance, and impacts on sites determined to be significant would need to be avoided or mitigated. No historic structures have been identified within the project area or within viewing distance of the transmission line corridor. No traditional cultural properties have been identified within the project area under this alternative.

Impacts on cultural resources from construction of the MEPCO South Route are possible. Although the corridor has not been surveyed, the area along the Penobscot River has been identified as an area of high potential for containing significant archaeological material (Dana 2003). While no traditional cultural properties have been identified within the project area under this alternative, concern was raised over possible impacts on archaeological sites by the Penobscot Indian Nation and the Passamaquoddy Indian Tribe (BHE 2005). If this alternative route is chosen, a cultural resource survey would need to be conducted and the results approved by the Maine SHPO and the Tribes. Any sites recorded during the survey would need to be evaluated for significance, and impacts on sites determined to be significant would need to be avoided or mitigated. One historic site has been identified within the project area or within viewing distance of the transmission line corridor (Paquette 2005j). If this alternative route is selected, this site would need to be evaluated for significance and possible impacts on the site. If the site were to be determined significant, specific impacts would need to be identified and mitigated.

4.6.2.1.2 Access Road Construction. No new permanent access roads would be needed for any of the alternative routes. However, new temporary access would be required for two of the alternative routes. As stated in Chapter 2, about 21 acres (8.5 ha) of temporary access roads would be needed for the Previously Permitted Route, and more than 32 acres (13 ha) would be needed for the MEPCO South Route. These areas would likely require surveys before the new temporary access roads are developed. Sites recorded during surveys would need to be evaluated for significance, and impacts on sites determined to be significant would need to be avoided or mitigated.

4.6.2.1.3 Substation Alterations. For all of the alternative routes, four substations require modification. Modifications to two of the substations would be completed within the current fenced area, and no additional land disturbance would be required. The other two substations, however, would require expansion outside the current fenced area. The Orrington Substation would require a 0.8-acre (0.3-ha) expansion, while the Kimball Road Substation would require a 0.2-acre (0.08-ha) expansion. Depending on the extent of disturbance already present near these two substations, a cultural survey may be necessary before any modifications occur outside the fenced areas.

4.6.2.1.4 Staging Areas Construction. All five staging areas that would be used for the Modified Consolidated Corridors, Consolidated Corridors, and Previously Permitted Routes were previously cleared and disturbed and have been previously surveyed.

Five staging areas would also be used for the MEPCO South Route (Section 2.3.4.5). These include the Route 178 and Costigan Mill staging areas that would also be used for the other three alternative routes.

The Costigan Mill staging area is located on an industrial site that was previously filled, graded, and partially paved; thus, it is sufficiently disturbed such that it would not likely contain intact archaeological deposits. A high level of previous disturbance is not indicated at the other staging areas. The Chester staging area, used only for the MEPCO South Route, could contain archaeological material because of its location near the Penobscot River. This staging area could require an additional survey for cultural resources unless proof of previous ground disturbance can be obtained.

4.6.2.1.5 AC Mitigation. As required, the installation of AC mitigation for the M&N gas pipeline would take place within the existing pipeline corridor, an area that has been previously disturbed. Therefore, no impacts to cultural resources are expected for any of the alternative routes.

4.6.2.2 Rescission of the Presidential Permit

Under the Rescission of the Presidential Permit Alternative, BHE would not build the NRI. Therefore, there would be no impacts on cultural resources beyond those already occurring.

4.7 SOCIOECONOMICS

This section discusses the potential effects of the proposed project on the existing socioeconomic environment for the ROI consisting of Hancock, Penobscot, and Washington Counties.

4.7.1 Methodology

Potential direct socioeconomic impacts for the proposed project were evaluated by using data provided by BHE (Paquette 2005i) on on-site construction employment, employee residential locations, and cost and schedule. Cost data included detailed labor expenditures in the various occupational categories and materials and equipment costs required for construction of the transmission line along the alternative routes. Expenditures for AC mitigation equipment associated with the M&N gas pipeline are also included. In addition to direct (on-site) impacts of project construction and operation, there may also be indirect impacts in the ROI associated with wage and salary expenditures and material procurement. To calculate potential indirect impacts, construction workforce and materials expenditure data for each alternative route were used in conjunction with IMPLAN® input-output regional data (MIG, Inc. 2005) for the ROI. IMPLAN is an input-output-based modeling tool that estimates employment and income multipliers for those sectors in the ROI in which NRI labor and material expenditures would occur.

Socioeconomic impacts were evaluated for population, employment and income, and housing. Given the similarities in the locations of the Modified Consolidated Corridors, Consolidated Corridors, and Previously Permitted Routes, these impacts are presented together in the following sections.

4.7.2 Potential Impacts

4.7.2.1 Alternative Routes

Because of their specialized skills, at least two-thirds of the direct workers required to build the NRI, particularly linemen and crew supervisory staff, were assumed to temporarily move into the ROI for each of the alternative routes (Paquette 2005s). Similarly, only a small number of project-related engineering and construction management staff were assumed to be located in the ROI during the construction period. Given the relatively short duration of various construction activities (Section 2.3.7), it was assumed that the majority of these workers would only reside in the ROI for between 4 and 7 months (Paquette 2005i,hh), making it unlikely that relocated workers would be accompanied by their families. Impacts of the project on population would, therefore, be minimal. Minor impacts are expected to occur on local housing markets as it was assumed that only half of the in-migrating workers would occupy local rental housing that is already vacant, and half would occupy hotels and motels. With only a small number of temporary in-migrants, impacts on local public services, including police and fire protection, educational and other local government services, and health and medical resources, would be minimal and well within the capacity of the existing local community infrastructure. Because no new jobs and income would be created in the ROI to operate or maintain the transmission line, there would be no in-migration or population impacts expected during the operational lifetime of the project.

Construction of the NRI would create a small amount of additional indirect economic employment and income in the ROI. These impacts are largely associated with direct labor expenditures required for the project, with a large proportion of engineering and construction management labor expenditures, expenditures associated with ROW easements, and expenditures on materials used to build the line (e.g., support structures, conductors, and shield wires) occurring outside the ROI. No additional employment or income would be generated from line operations.

Construction of the NRI along the Modified Consolidated Corridors, Consolidated Corridors, and Previously Permitted (No Action) Routes would use between 1,391 and 1,461 acres (563 and 591 ha) of forested land, and 1,513 acres (612 ha) would be used for the MEPCO South Route. Although the majority of this land within the alternative ROWs is currently commercial timberland, given that nearly 4.3 million acres (1.7 million ha) of the three counties are considered timberlands (Table 3.5-2), the removal of this land is not expected to impact logging employment and income, or local employment and income in the ROI.

Socioeconomic impacts for the Modified Consolidated Corridors, Consolidated Corridors, and Previously Permitted (No Action) Routes would be almost identical (Table 4.7-1). Construction of a line along any of these routes would create 120 direct jobs, and wage and salary expenditure and material procurement expenditures would produce an additional 110 indirect jobs in the ROI. Construction along any of these routes would produce about $4.7 million in direct income and an additional $3.1 million in indirect income in the ROI. Construction activities would impact the ROI employment growth rate for 2006 by no more than 0.01 percentage point.

Socioeconomic impacts for the MEPCO South Route are also presented in Table 4.7-1. Construction of the MEPCO South Route would create 150 direct jobs, and wage and salary expenditure and material procurement would produce an additional 130 indirect jobs in the ROI. Construction along the MEPCO South Route would produce $5.8 million in direct income and an additional $3.5 million in indirect income in the ROI. Construction activities on the MEPCO South Route would impact the ROI employment growth rate for 2006 by more no than 0.01 percentage point.

4.7.2.2 Rescission of the Presidential Permit

Under the Rescission of the Presidential Permit Alternative, BHE would not build the NRI. Therefore, there would be no socioeconomic impacts beyond those already occurring.

4.8 ENVIRONMENTAL JUSTICE CONSIDERATIONS

4.8.1 Methodology

The analysis considers impacts on all resource areas associated with the proposed transmission line construction and operation. If high and adverse impacts on the general

TABLE 4.7-1 Economic Impacts Related to the Alternative Transmission Line Routes in 2006

Parameter	Modified Consolidated Corridors, Consolidated Corridors, and Previously Permitted Routes (No Action)	MEPCO South Route
Construction		
Jobs (number)		
Direct	100	140
Total	190	250
Labor income ($ millions 2005)		
Direct	3.8	5.2
Total	6.4	8.4
AC mitigation		
Jobs (number)		
Direct	20	10
Total	40	30
Labor income ($ millions 2005)		
Direct	0.9	0.6
Total	1.4	0.9
Total (construction plus AC mitigation)		
Jobs (number)		
Direct	120	150
Total	230	280
Labor income ($ millions 2005)		
Direct	4.7	5.8
Total	7.8	9.3

Sources: Paquette (2005i,gg,ll,mm).

population are identified for a particular resource area, disproportionality would be determined by comparing the location of the high and adverse impacts with the location of minority and low-income populations. Specifically, there would be disproportionate impacts on the minority or low-income populations if any high and adverse impacts occurred in any census block group where the minority or low-income populations exceeded 50% of the total population in the block group, or where the minority or low-income populations exceeded the state minority or low-income average by more than 20 percentage points.

If, however, analyses in each resource area determine that impacts on the general population are not adverse as a result of the proposed action and alternatives, it can be concluded that no disproportionately high and adverse impacts on minority and low-income populations would occur, regardless of the location of those populations.

Minority and low-income populations located in proximity to the NRI could potentially be affected during transmission line construction, operation, and maintenance, specifically by (1) noise, dust, and equipment emissions during construction, and (2) as electromagnetic field (EMF) effects during operations. In order to include the areas in which these impacts might occur, the analysis of environmental justice impacts considered the potential for impacts within a 2-mi (3.2-km) zone along each alternative route. Given the similarities in the routes that would be taken by the Modified Consolidated Corridors, Consolidated Corridors, and Previously Permitted (No Action) Routes, these impacts are presented together when discussing potential impacts.

4.8.2 Potential Impacts

4.8.2.1 Alternative Routes

One single census block group, located along the western edge of the 2-mi (3.2-km) zone along the MEPCO South Route, includes the Passamaquoddy Indian Reservation and has a minority population that exceeds 50% of the total census block group population (Figure 3.8-1). Only a small portion (about 4 acres [1.6 ha]) of the 2-mi (3.2-km) zone is located within the Reservation. The following section describes the potential environmental effects of the proposed project in terms of any special circumstances or mechanisms through which low-income or minority populations may experience disproportionately high and adverse human health or environmental effects.

Potential impacts on minority or low-income populations of the MEPCO South Route within the single census block group include noise, dust, and vehicle emissions during construction. Although there are no residences or other buildings used by the public situated in that portion of the census block group located in the 2-mi (3.2-km) zone, temporary accommodation might be located in the area for recreation or subsistence activities. Project construction activities could potentially disrupt recreation and subsistence in this area, while noise and dust emissions during construction could potentially produce harmful human health effects that would disproportionately affect minority and low-income populations in this area. Noise, dust, and vehicle emissions during construction, however, are not expected to be high under any circumstances. Standard mitigation practices used to control emissions would reduce these to negligible amounts.

EMF effects occurring during project operation along the MEPCO South Route are another impact that might potentially affect minority or low-income populations in the single census block group. Although temporary accommodation used for recreation or subsistence activities might be located in that portion of the census block group located in the 2-mi (3.2-km) zone where elevated exposure to EMFs may occur, there are no residences or other buildings used by the public in this area. EMF impacts are therefore expected to be low.

Within the single census block group located in the Passamaquoddy Indian Reservation, visual impacts of the NRI are likely to be low. This is because visual resources in the area are of low quality, there are no key observation points located in the area, and visitation rates are low; therefore, viewer sensitivity to any changes in scenic quality as a result of the construction of the NRI would be low.

Even though there are potential adverse impacts of NRI construction or operation of the MEPCO South Route in the single census block group, given that these impacts are low, none of these impacts would disproportionately affect low-income or minority populations.

No census block group along any of the other alternative routes has a minority or low-income population that exceeds 50% of the total block group population, or that exceeds the state minority or low-income average by 20 percentage points. There are, therefore, no impacts of NRI construction or operation that would disproportionately affect low-income or minority populations for any of the alternative routes. Thus, there would be no disproportionately high and adverse impacts on minority or low-income populations.

4.8.2.2 Recission of the Presidential Permit

Under the Rescission of the Presidential Permit Alternative, BHE would not build the NRI. Therefore, there would be no impacts on environmental justice consideration beyond those already occurring.

4.9 VISUAL RESOURCES

This section evaluates the potential impacts of the alternative routes on visual resources.

4.9.1 Methodology

The potential for impacts on visual resources was evaluated by using the following evaluation criteria as provided in *Assessing and Mitigating Impacts to Scenic and Aesthetic Uses* (MDEP 2003)[1] to assess the impact of the proposed project within the viewshed of a scenic resource along each alternative route:

- *Landscape compatibility*. The extent to which the proposed activity would differ significantly from existing surroundings in terms of color, form, line, and texture;

- *Scale contrast.* The size and scope of the project at a given location; and

[1] Many of the terms and evaluation procedures used in that publication are based on the Bureau of Land Management (BLM) Visual Resource Management (VRM) system guidelines (BLM 1986a,b).

- *Spatial dominance.* The degree to which the project would dominate the composition of the landscape, landforms, water, or sky in a particular landscape.

On the basis of these criteria, viewer expectation is an important aspect of the evaluation of visual impacts. Generally, visibility impacts from roadways are not considered to be as sensitive as views from recreational use areas or residences. The duration and role of specific views to individuals is critical to evaluating and interpreting the significance of potential impacts.

To evaluate the impacts of the alternative routes on road users, data from key observation points established along the routes were used (Section 3.9). These points were located in the foreground-middleground zone established for each route, which is the area between the viewer and a distance of 3 to 5 mi (5 to 8 km). Figures H-1 through H-16 (Appendix H) are photographs and photosimulations at key observation points for the Modified Consolidated Corridors, Consolidated Corridors, and Previously Permitted (No Action) Routes, while Figures H-1 through H-6 and H-15 through H-32 (Appendix H) are those for the MEPCO South Route. The photographs show the current visual environment at these points, while the photosimulations show artistic renderings of the addition of the NRI at these points.

Given the similarities in the corridor within which the Modified Consolidated Corridors, Consolidated Corridors, and Previously Permitted Routes would be located (Figure 2.1-1), the potential impacts for these three alternative routes are presented together in the following discussion.

4.9.2 Potential Impacts

4.9.2.1 Alternative Routes

A transmission line constructed along any of the alternative routes would affect the visual environment, although the significance of the impact for each route would vary depending on the location at which the transmission line would be viewed and the surrounding environmental setting. Both ends of the Modified Consolidated Corridors, Consolidated Corridors, and Previously Permitted (No Action) Routes, and numerous portions of the MEPCO South Route, would be located in semiurban and agricultural settings. At the western end of these routes, each line would also be adjacent to an existing transmission line. Although the line along these portions of each route would be located close to the viewing population, the presence of other structures and economic activity, and, in particular, the existing line, would mean that the proposed line would not be incompatible with, create any significant additional contrast with, or generally dominate the present landscape.

For the majority of their lengths, the Modified Consolidated Corridors, Consolidated Corridors, and Previously Permitted (No Action) Routes would pass through commercial forest lands that contain various recreational use areas and would be adjacent to Stud Mill Road, which is used by recreationists and also used as an access road for logging activities. Because of the mixed use of the land in the area of the alternative routes and because of the presence of Stud Mill Road and the adjacent ROW for the M&N gas pipeline, the transmission line would be only moderately incompatible with, or contrast with, the landscape within the foreground-middleground zone, although it would dominate the landscape in certain locations where the routes cross ridgelines and areas of open water and wetlands.

A transmission line along any alternative route would be moderately incompatible, mildly contrasting, and, occasionally, a dominant feature of the landscape. However, the line would largely be constructed with wooden H-frame structures, which would reduce the impact of the line on the visual environment. Natural light and background landscape elements would be visible around the structures, and given their construction type, the visual impression of the support structures would also lessen considerably with distance from the line.

Between the Orrington Substation and Great Works Stream, the NRI would be located adjacent to one or more existing transmission lines. The photographs and photosimulations illustrate that the addition of the NRI would generally not be a prominent addition to the visual landscape (Figures H-1 through H-3, Appendix H). Because of the proximity of the line to the existing transmission lines, views seen by road users from key observation points on either side of the transmission corridor would not be likely to differ substantially among alternative routes. However, the location of the routes is close to a number of residences in the corridor; thus, the line would be a dominant aspect of the landscape in these locations. The similarity in the heights of the forest cover and the support structures would reduce any incompatibility with, contrast with, or dominance over the visual landscape by the line.

The Pickerel Pond Reroute, which is the major difference between the Modified Consolidated Corridors and Consolidated Corridors Routes (Figure 2.1-4), was selected in part to avoid visual impacts. The Modified Consolidated Corridors Route would avoid potential visual impacts at the Sunkhaze Meadows National Wildlife Refuge and the Pickerel Pond Youth Conservation Center, which promotes fishing, hunting, and conservation (Sloan 2005a). The Consolidated Corridors Route would be adjacent to the southeastern and eastern border of Sunkhaze Meadow National Wildlife Refuge and would be near Pickerel Pond (Figure 2.1-2). Therefore, the Consolidated Corridors Route would pose a potential visual impact.

Potential visual impacts of concern include viewshed disturbances along Outstanding River Segments. Both the Narraguagus and Machias Rivers have Outstanding River Segments that could be adversely affected by all but the MEPCO South Route (which crosses no Outstanding River Segments). Figures H-11 and H-12 (Appendix H) illustrate the impact of the addition of the NRI at the Machias River crossing. The applicant has mitigation plans in place to minimize viewshed disturbances for these two Outstanding River Segments by locating the support structures farther away from the rivers than they otherwise would be located (Section 2.4.5).

For the Modified Consolidated Corridors, Consolidated Corridors, and Previously Permitted (No Action) Routes between Great Works Stream and the eastern end of Stud Mill Road at Route 1, the photographs and photosimulations (Figures H-7 through H-14, Appendix H) illustrate that the addition of a transmission line would be an incompatible, contrasting, and dominant addition to the existing landscape for persons involved in recreational activities and those using Stud Mill Road. In addition to being visible from Stud Mill Road, which the routes would closely parallel, the NRI would also be visible from a number of locations popular with recreationists, notably Eagle Mountain, Jimmie's Mountain, Narraguagus River, Machias River, and Pocomoonshine Lake. Viewer sensitivity to the Modified Consolidated Corridors, Consolidated Corridors, and Previously Permitted (No Action) Routes along the Stud Mill Road section of each route is likely to be high given the remoteness of the area. To the northeast of Baileyville, in the vicinity of the St. Croix River, the photograph and photosimulation (Figures H-15 and H-16, Appendix H) illustrate that the addition of a transmission line would be a dominant and contrasting addition to the existing landscape for persons involved in recreational activities, particularly boaters and anglers. However, although these routes are located close to recreational areas, these areas (e.g., Machias River) do not have particularly high use or visitation rates (see Table 3.9-1). The applicant would undertake mitigation measures to minimize visual impacts at the Narraguagus, Machias, and St. Croix River crossings. These would primarily involve placement of the support structures farther away from the Narraguagus and Machias Rivers. At the Narraguagus River, these would be located 290 ft (88 m) from the west bank and 500 ft (152 m) from the east bank. At the Machias River, these would be 210 ft (64 m) from the west bank and 360 ft (110 m) from the east bank. The St. Croix River stream crossing would be treated like a 75-ft (23-m) stream buffer for a trout stream (BHE 2005).

For the length of the MEPCO South Route between the Orrington Substation and Lincoln, the photographs and photosimulations (Figures H-1 through H-6 and H-17 through H-22, Appendix H) illustrate that the NRI would generally not be an incompatible and contrasting addition to the visual landscape. For the majority of this part of the route, the line would be located adjacent to one or more existing transmission lines and would not represent a significantly incompatible or contrasting aspect of the visual landscape. However, the NRI would be close to a number of residences and would therefore be a dominant aspect of the landscape as seen from these residences.

Along the length of Route 6 between Lincoln and Route 1 south of Topsfield, the photographs and photosimulations (Figures H-23 through H-32, Appendix H) illustrate that the line would generally not be an incompatible and contrasting addition to the visual landscape. For some of these locations, however, depending on the locations of residences, the line might represent a dominant addition to the visual landscape. At the majority of key observation points, the line would be visible from county roads where the line would represent a change in the visual landscape. However, given the height of the forest cover relative to the height of the support structures and conductors in this location, the impact of the transmission line on the visual landscape would be insignificant.

At locations northwest of Baileyville, in the vicinity of Grand Falls Flowage, the NRI would be co-located with the existing EMEC 69-kV transmission line. These two transmission lines would be dominant and contrasting additions to the visual landscape for persons involved in recreational activities at a number of locations, particularly boaters and anglers. Similarly, in the vicinity of the St. Croix River, the photograph and photosimulation illustrate that the addition of a transmission line would be a dominant and contrasting addition to the existing landscape

(Figures H-15 and H-16, Appendix H). Section 2.4.5 includes mitigation measures that the applicant would undertake to minimize visual impacts at the St. Croix River (e.g., letting the vegetation grow within 15 ft [4.6 m] of the conductors).

Given its length and closer location to local roads and residences, the MEPCO South Route would be seen by many more viewers. However, given the co-location of the route with existing transmission lines and other human activities, sensitivity to the NRI along this alternative would be lower at key observation points. The NRI would create less incompatibility with, contrast with, or dominance of the present visual landscape here than along the other alternative routes. Sensitivity to a line at the Penobscot River, Grand Falls Flowage, or St. Croix River might, however, be high, given the uniqueness of these locations for recreational activities. The line would likely create incompatibility or contrast with, or dominance of, the present visual landscape. However, although the route would be located close to recreational areas, these areas do not have particularly high use or visitation rates (see Table 3.9-1).

4.9.2.2 Rescission of the Presidential Permit

Under the Rescission of the Presidential Permit Alternative, BHE would not build the NRI. Therefore, there would be no visual resource impacts beyond those already occurring.

4.10 HEALTH AND SAFETY

Health and safety issues related to the construction, operation, and maintenance of transmission lines center on the potential effects from induced current and/or spark discharges, EMF, audible noise, O_3 production, use of herbicides for control of vegetation, and physical hazards. Homeland security issues are not examined as part of this EIS because the proposed transmission line presents no greater target for terrorists than any other high-voltage transmission line in the United States. The following discussion details the health and safety concerns relevant to the proposed project.[2]

4.10.1 Methodology

Generally, health and safety issues would be similar for all alternative routes. Potential differences among routes would primarily relate to the number of dwellings near the lines, ROW acreage requiring initial clearing and periodic maintenance, and amount of AC mitigation required for the M&N gas pipeline. The EMF impact analysis evaluated the potential electric and magnetic field levels from operation of the transmission line and identified the exposure to potential receptors at various distances from the ROW. In general, the farther removed a person

[2] Changes in EMF because of substation alterations associated with the proposed project would not be detectable at the substation fence lines. Therefore, the health and safety assessment related to EMF is limited to the operation of the proposed transmission line.

is from a transmission line, the lower the EMF strength.[3] Similarly, the noise impact analysis evaluated the potential noise levels generated during construction and operation of the proposed project and identified potential receptors for each of the alternative routes. The effects of construction and maintenance of the transmission line on worker and public safety were also evaluated on the basis of literature information on the health hazards for the proposed herbicides and statistics on public and worker fatality rates and worker injury rates that would be applicable to transmission lines.

4.10.2 Potential Impacts

4.10.2.1 Alternative Routes

4.10.2.1.1 Electric Shock Hazards. The greatest hazard from a transmission line is direct electrical contact with the conductors. However, this is more likely to occur from lower voltage transmission lines because they are closer to the ground compared with higher voltage lines. Physical contact between a grounded object and the conductor is not always necessary for electrical contact to be made, as under certain circumstances arcing can occur across an air gap (BPA 2001). The electric field created by a high-voltage transmission line extends from the energized conductors to other conducting objects such as the ground, vegetation, buildings, vehicles, and persons. Potential field effects can include induced currents, steady-state current shocks, spark-discharge shocks, and, in some cases, field perception and neurobehavioral responses.

- *Induced currents.* When a conducting object, such as a vehicle or person, is placed in an electric field, currents and voltages are induced. For example, it is not unusual for a fluorescent light tube to glow in the vicinity of high-voltage lines. The magnitude of the induced current depends on the electric field strength and size and shape of the object. The induced currents and voltages represent a potential source of nuisance or hazardous shocks near a high-voltage transmission line.

- *Steady-state current shocks.* Steady-state currents are those that flow continuously after a person contacts an object, such as a vehicle, and provides a path to ground for the induced current. The effects of these shocks range from involuntary movement in a person to direct physiological harm. Steady-state current shocks occur in instances of direct or indirect human contact with an energized transmission line.

- *Spark-discharge shocks.* Induced voltages appear on objects such as vehicles when there is an inadequate ground. If the voltage were sufficiently high, a spark-discharge shock would occur as contact is made with the ground.

[3] The EMF strength is inversely proportional to the square of the distance from the line. (Thus, at 300 ft [91 m], the EMF strength would be one-ninth the strength at 100 ft [30 m].)

Spark-discharge shocks that create a nuisance could occur in instances of carrying or handling conducting objects, such as a metal irrigation pipe, under transmission lines.

- *Field perception and neurobehavioral responses.* When the electric field under a transmission line is sufficiently strong, it can be perceived by hair raising on an upraised hand. This is the effect of harmless levels of static electricity, similar to the effect of rubbing stockinged feet on a carpet.

The proposed transmission line would have the required ground clearance to reduce the potential for induced-current shocks. In addition, any permanent structures in the ROW, such as fences and metal buildings, would be grounded. Features reducing the level of potential for induced current in objects would also reduce the level of a possible induced-current shock.

When an overhead high-voltage line is near, parallels, or crosses an underground metal pipeline, AC voltages may be transmitted to the pipeline by conductive or inductive interference. Consideration must be given to the safety of workers and to the public who may come into contact with the aboveground portions of the pipeline such as valves and test stations. These exposed structures could cause a potential shock hazard when touched if the soil is at a significantly different potential. Nevertheless, pipelines and transmission lines can be located in close proximity to one another as long as appropriate measures are taken to mitigate potential adverse impacts of the transmission line on the pipeline.

As required, AC mitigation would be installed for the M&N gas pipeline to reduce the shock potential to industry standards (15 V/m), the let-go current threshold (threshold above which sustained muscular contraction would occur, thereby preventing a person from being able to let go of an energized object) (Southey and Dawalibi 1998). This mitigation would be required for all of the alternative routes. A discussion of the proposed AC mitigation is presented in Section 2.3.5.

The proposed line would be constructed in accordance with industry and BHE standards to minimize hazardous shocks from direct or indirect human contact with an overhead energized line (BHE 2005). Thus, the proposed project is not expected to pose a steady-state current shock hazard to humans.

In accordance with BHE's transmission line standards (BHE 2005), the magnitude of the electric field would be low enough that spark-discharge shocks would occur rarely, if at all. The potential for nuisance shocks would be minimized through standard grounding procedures. Carrying or handling conducting objects, such as a metal irrigation pipe or any other long metallic objects, under transmission lines can result in nuisance spark discharges. The primary hazard with irrigation pipes or any other long metal objects, however, is electrical flashover from the conductors if the object is inadvertently brought close to the conductors. The transmission line would be constructed with adequate ground clearance to reduce this hazard.

Perception of the field associated with the transmission line would not be felt beyond the edge of the ROW. Persons working under the ROW might feel the field. Studies of short-term exposure to electric fields have shown that fields may be perceived (e.g., felt as movement of arm hair) by some people at levels of about 2 to 10 kV/m. However, studies of controlled, short-term exposures to even higher levels in laboratory studies have shown no adverse effects on normal physiology, mood, or ability to perform tasks (DOE 2005). The International Commission on Non-Ionizing Radiation Protection Guidelines recommend that short-term exposures to the general public be limited to 4.2 kV/m (ICNRP 1998). The exposures associated with the proposed action (discussed in the following section) would exceed this recommended limit only at the point of maximum conductor sag. Exposures would be less than or equal to 1.2 kV/m at the edge of the ROW for all alternatives.

> **Electric Fields**
>
> Electric field strength is measured in volts per meter (V/m) or in kilovolts per meter (kV/m). 1 kV = 1,000 V. Electric field strengths associated with transmission lines are generally < 10 kV/m and decrease rapidly with distance from the ROW.

4.10.2.1.2 Electric Field Effects.[4] As previously discussed, an electric field is generated by the voltage on the conductors of the transmission line and occupies the space between the conductors and other conducting objects. With the proposed line operating at 345 kV with any load, the calculated electric field at the left side of the ROW (facing the ROW from the Orrington Substation) at midspan would vary from about 0.23 kV/m to almost 1.2 kV/m (depending on whether there would be ROW sharing with existing lines). At the left edge of the ROW where the proposed line would share the ROW with existing transmission lines, the operation of the new line would leave the electric field virtually unchanged. At the right edge of the ROW (facing the ROW from the Orrington Substation), the field would be almost 1.2 kV/m along the entire route. This would be an increase from 0.13 kV/m (the current electric field level is approximately 185 ft [56 m] from the centerline of the existing 345-kV line). The electric field intensities would vary with location. The maximum ground-level intensities would be encountered only within a small portion of the ROW (e.g., less than 5%, at the point of maximum conductor sag) (DOE 1995). The maximum electric field within the ROW where the NRI would parallel the existing 345 kV line would be less than 7.0 kV/m (at a location between the two lines), while the maximum electric field where the NRI would be located within a separate ROW would be 5.5 kV/m (at a location under either of the outside conductors). The AC electric field intensities for the NRI would fall below 1.0 kV/m within about 100 ft (30 m) from the centerline of the ROW (where no ROW line sharing exists or off the eastern side where ROW line sharing would exist).

Field and laboratory animal studies have generally shown minimal or no impacts from power-frequency electric field strengths of 30 kV/m or less (DOE 1995). Other than stimulation

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4 The electric and magnetic fields that would be associated with the NRI were assumed to be equivalent to those calculated for the Previously Permitted Route presented by DOE (1995), because line design would be identical and ROW location would be similar to identical. The additional ROW spacing where the M&N gas pipeline would be located between the existing 345-kV line and the NRI (125 ft [38 m] rather than 100 ft [30 m]) would have a minimal influence on the calculated electric and magnetic fields (e.g., much less than the difference that would occur as a result of different power loads). The M&N gas pipeline would be located between the existing 345-kV line and the NRI for the majority of the 12-mi (19-km) distance between the Orrington Substation and Blackman Stream (Figure 2.1-2).

arising from electric charge induced on the surface of the body, the effects of exposures up to 20 kV/m are few and innocuous, while no effects on reproduction or development in animals have been observed at strengths greater than 100 kV/m (WHO 1998). Long-term exposure to the electric field in the proposed ROW would be unlikely; it is improbable that humans would remain in the ROW for more than a few hours. Little evidence exists of any significant biologic or health effects from electric fields at the strengths associated with transmission lines (Sagan 1992).

> **Magnetic Fields**
>
> Magnetic fields are measured in units of gauss (G) or tesla (T). Gauss is the unit most commonly used in the United States, while tesla is the internationally accepted scientific term. 1 T = 10,000 G. Magnetic field strengths associated with transmission lines and electrical appliances are generally in the milligauss (mG) or microtesla (µT) range. 1 µT = 10 mG.

4.10.2.1.3 Magnetic Fields. A magnetic field is generated by the current (movement of electrons) in the conductors, and the strength of the field depends on the current, design of the line, and the distance from the line. The ambient 60-hertz (Hz) magnetic field is about 0.1 milligauss (mG). At the edge of the NRI ROW, the magnetic field would be as high as 33 mG. Within new ROW segments, the magnetic fields up to 600 ft (180 m)[5] from the edge of the ROW (at 100-ft [30-m] intervals) would be 7.3, 3.0, 1.7, 1.0, 0.7, and 0.5 mG, respectively. However, where the NRI and the existing 345-kV line would occur within a shared corridor, the magnetic fields up to 600 ft (180 m) from the eastern edge of the ROW (at 100-ft [30-m] intervals) would be 4.3, 1.4, 0.6, 0.3, 0.2, and 0.1 mG, respectively. These magnetic fields are similar to maximum magnetic fields as a function of distance reported for 230- and 500-kV lines (NIEHS 2002a).

At distances of about 300 ft (90 m) from the edge of the ROW, the magnetic fields would be similar to typical background levels found in most homes (NIEHS 2002a). About 50% of homes average 0.6 mG or less (NIEHS 2002a). Sources of residential magnetic field exposures include distribution lines, building wiring, and appliances. The International Commission on Non-Ionizing Radiation Protection Guidelines recommend that magnetic field exposures to the general public be limited to 50 mG (ICNRP 1998).

Because electric fields do not penetrate the body, it is generally assumed that any biological effect from exposure to power-frequency fields must be due to the magnetic component of the field, or to the electric fields and currents that these magnetic fields induce in the body (Moulder 2004). Public concern exists over the potential adverse health effects that may be caused by long-term exposure to magnetic fields. Over the past several decades, a number of studies of this topic have raised questions about cancer and reproductive effects from exposure to magnetic fields. The consensus of scientific panels reviewing this research is that the evidence does not support a cause-and-effect relationship between magnetic fields and any adverse health

[5] A distance of 600 ft (180 m) from the edge of the ROW was analyzed in the EIS for the Previously Permitted Route (DOE 1995). It is also the distance selected for the visual resource assessment for residents by the applicant (BHE 2005). Therefore, this distance was also selected for assessing magnetic fields for the NRI.

outcomes (e.g., AMA 1994; NRC 1997; NIEHS 2002b). Some research continues of the statistical association between magnetic field exposure and a rare form of childhood leukemia known as acute lymphocytic leukemia. A review of this topic by the World Health Organization (WHO 2001) concluded that this association is very weak.

Magnetic fields are classified as possibly carcinogenic to humans (WHO 2001). This classification denotes an agent for which there is limited evidence of carcinogenicity in humans and less than sufficient evidence of carcinogenicity in experimental animals. Other agents with this classification include coffee, gasoline engine exhaust, and welding fumes (WHO 2001). This classification is the weakest of the three categories ("carcinogenic to humans" [e.g., asbestos, tobacco, and gamma radiation], "probably carcinogenic to humans" [diesel engine exhaust, sun lamps, and ultraviolet radiation], and "possibly carcinogenic to humans") used by the International Agency for Research on Cancer to classify potential carcinogens based on published scientific evidence (WHO 2001).

Havas (2000) stated that the epidemiological evidence indicates that there is an association between extremely low-frequency EMF and some forms of childhood and adult cancer. The association seems to be one of promotion rather than initiation. Ahlbom et al. (2000) did not find any evidence for an increased risk of childhood leukemia at residential magnetic field levels less than 4 mG, but did find a statistically significant relative risk of 2 for childhood leukemia for children with residential exposures greater than 4 mG during the year prior to diagnosis. Less than 1% of the subjects were in the highest exposure category. However, there have been no reproducible laboratory findings demonstrating biological effects of magnetic fields below 1,000 mG (Ahlbom et al. 2000). Li et al. (2002) concluded that prenatal maximum magnetic field exposure above a certain level (possibly around 16 mG) may be associated with increased miscarriage risks. A nonsignificantly increased risk of brain cancer was observed among men who had ever held a job with an average magnetic field exposure greater than 6 mG relative to those with exposures less than 3 mG, with a cumulative time-weighted index score of magnetic field exposure being significantly related to one type of brain cancer (i.e., glioblastoma multiforme). This supports the hypothesis that occupational magnetic field exposure increases the risk of brain cancer (Villeneuve et al. 2002).

Because no human health hazards from exposure to magnetic fields from transmission lines have been proven to exist, it is impossible to rationally define a safe distance or safe exposure level (Moulder 2004). Although no Federal standards exist for magnetic fields for transmission lines, two States do have such guidelines. In Florida, the magnetic field level at the edge of the ROW can vary between 150 to 250 mG (depending upon line voltage and whether it is an existing or new ROW). The guideline for New York is 200 mG at the edge of the ROW (NIEHS 2002a). The expected EMF strengths at the edge of the ROW for the NRI would fall well within these guideline levels. Consequently, the operation of the NRI is not anticipated to cause adverse health effects due to magnetic field exposure. Although the NRC (1997) noted that power-frequency fields have not been proven scientifically to be harmful, they did recommend the adoption of a policy of prudent avoidance.

A discussion of the experimental investigations of EMF effects (particularly at the cellular level) is beyond the scope of this EIS. More information on these studies can be obtained in recent EMF reviews by the NRC (1997) and NIEHS (2002b).

Regardless of the alternative route, the NRI would generally contribute only a small portion of the total magnetic field exposure that a person would receive. People residing near the NRI would be among those most likely to receive magnetic field exposure from the line. Table 4.10-1 lists the number of dwellings within 600 ft (180 m) from each alternative route. Thirty-five of the dwellings occur within the initial 12.2-mi (19.6-km) segment from the Orrington Substation, which would be identical for all four alternative routes. The number of residents exposed to elevated magnetic fields would be highest for the MEPCO South Route and least for the Modified Consolidated Corridors and Consolidated Corridors Routes. Less than half of the dwellings for any of the alternative routes would be within 300 ft (91 m) of the ROW.

TABLE 4.10-1 Dwellings within 600 Feet of the NRI ROW for the Alternative Routes

Distance from Edge of ROW (ft)[a]	Number of Dwellings for the Alternative Routes[b,c]			
	MCCR	CCR	PPR	MSR
0 to 100	4 (4)	6 (4)	4 (4)	20 (4)
100 to 200	5 (5)	9 (5)	5 (5)	16 (5)
200 to 300	5[d] (1)	5 (1)	1 (1)	11 (1)
300 to 400	5 (5)	10 (5)	5 (5)	17 (5)
400 to 500	8 (7)	14 (7)	11[d] (7)	22 (7)
500 to 600	13 (13)	15 (13)	13 (13)	35 (13)
Total:	40 (35)	59 (35)	39 (35)	121 (35)

[a] To convert feet to meters, multiply by 0.305.

[b] CCR = Consolidated Corridors Route, MCCR = Modified Consolidated Corridors Route, MSR = MEPCO South Route, PPR = Previously Permitted Route.

[c] Numbers in parentheses are for the initial 12.2-mi (19.6-km) segment leading out of the Orrington Substation that would be identical for all alternative routes.

[d] Includes four seasonal camps.

Source: Paquette (2005x).

> **Noise**
>
> Noise is defined as sound that is undesirable because it interferes with speech, communication, or hearing; is intense enough to damage hearing; or is otherwise annoying.

4.10.2.1.4 Audible Noise and Ozone Effects. Audible noise would occur from construction and maintenance activities and, to a lesser extent, operation of the proposed project. The physical unit most commonly used to measure sound is the decibel (dB). The higher the energy carried by the sound, the louder the perception of that sound, and thus the higher the dB rating of the sound. A sound level of just above 0 dB is approximately the threshold of human hearing and is barely audible under extremely quiet listening conditions. Normal speech has a sound level of approximately 60 dB. The dB scale is logarithmic, meaning that a 60-dB sound is perceived as approximately twice as loud as a 50-dB sound (not a 30-dB sound). Humans can barely perceive loudness changes of less than 2 to 3 dB.

The second important characteristic of sound is its tone or frequency, which is the number of times per second the air vibrates, measured in Hertz (Hz). The human ear is most sensitive to frequencies in the 1,000- to 4,000-Hz range. To account for the variable response of the human ear to different tones, decibels may be adjusted to A-weighted decibels [dB(A)]. The dB(A) represent the human hearing response to sound.

The predominant noise sources in the semiurban areas (particularly near Bangor) include traffic and aircraft, and wind in the trees. High ambient noise levels in these areas are 60 to 70 dB(A). In more remote areas, high noise levels from more infrequent traffic or aircraft would be 40 to 50 dB(A) (Shafer et al. 1990).

Construction and maintenance activities would occur during daytime hours when noise is tolerated more than at night. Potential impacts on ambient noise would be expected to be temporary and intermittent in nature. Construction activities would include a wide array of activities, including temporary access road construction, ROW clearing, grading, drilling, blasting, cleanup, and revegetation. Many of the noise sources associated with NRI construction would be consistent with ongoing forest harvesting operations that are common in the project area. The noise levels generated by construction equipment would vary significantly, depending on such factors as type, model, size, and condition of the equipment; construction schedule; and condition of the area where the work is being conducted. In addition to daily variations in activities, major construction projects are accomplished in several different stages and areas. Each stage has a specific equipment mix, depending on the work to be accomplished.

Average noise levels for typical construction equipment range from 74 dB(A) for a roller to 101 dB(A) at a pile driver (upon impact). Most construction equipment (e.g., front-end loaders, concrete mixers, cranes, generators, graders, shovels, and trucks) have noise levels between 81 and 88 dB(A) at 50 ft (15 m), 68 to 74 dB(A) at 250 ft (76 m), and 61 to 68 dB(A) at 500 ft (152 m) (HMMH 1995). Construction-related noise levels would exceed the EPA (1974) guideline for residential L_{dn}[6] noise [55 dB(A)] for a distance of about 1,640 ft (500 m). These

6 L_{dn} is defined as the A-weighted average sound level during a 24-hour period with a 10-dB weighting applied to nighttime sound levels.

distances are conservative, as noise levels would be attenuated by factors such as air absorption and ground effects due to terrain and vegetation.

Noise levels associated with construction-related vehicular traffic (e.g., hauling of materials and construction equipment in and out of construction sites and worker commutes) would increase and decrease rapidly. The peak pass-by noise level of a heavy truck operating at 50 mph (80 kph) would be about 83 dB(A). On the basis of an 8-hour daytime shift, the noise level (L_{dn}) at 50 ft (15 m) for one truck per hour would be 46 dB(A) and for 10 trucks per hour would be 56 dB(A) (Menge et al. 1998). These noise levels would decrease notably with distance. Noise levels would be reduced by approximately 6 dB(A) for each doubling of distance from the source. For example, a 75-dB(A) noise heard at 50 ft (15 m) from the source would be reduced to 69 dB(A) at 100 ft (30 m) away from the source. Again, this does not include the additional attenuation of noise by woody vegetation, structures, or terrain elevations. Therefore, except for receptor locations in close proximity to the road, noise levels would be below the EPA guideline of 55 dB(A) as L_{dn} for residential zones (EPA 1974).

The blasting sound level limit at any protected location would not exceed 129 dB for one blast per day or 123 dB for the four blasts per day limit (BHE 2005).

Noise associated with either NRI construction or installation of AC mitigation would be intermittent during the construction period at any single location. Those in the vicinity of the project would hear the construction noise, but the overall impact would be temporary. Nighttime noise due to construction would not occur, since construction would be limited to daylight hours.

Regular maintenance activities (e.g., line surveys and vegetation maintenance) would involve light- or medium-duty vehicle traffic with relatively low noise levels. More noisy activities (e.g., use of chainsaws) would be infrequent. The anticipated level of noise from maintenance activities would be far lower and of shorter duration than that from construction.

Operation of a transmission line can result in noise impacts from corona, which is the electrical breakdown of air into charged particles caused by the electrical field at the surface of conductors. Corona-generated audible noise from transmission lines is generally characterized as a crackling or hissing noise. The expected levels of noise from a 345-kV transmission line falls within the range of that for a library (30 to 40 dB) and an office (50 to 60 dB) (AMEC 2002). For the NRI, audible noise from corona during wet weather would be about 45 dB(A) directly underneath the line, 42 dB(A) at the edge of the ROW, and 36 dB(A) at 250 ft (76 m) from the centerline. The noise levels at the edge of the ROW would be below the most stringent noise level requirements established by the MDEP State Location Law (Shafer 2005). Modern transmission lines are designed, constructed, and maintained so that during dry conditions, they will operate below the corona inception voltage; that is, the line will generate a minimum of corona-generated noise. During dry weather conditions, noise from the NRI would generally be indistinguishable from background noise [35 dB(A)] at locations beyond the edge of the ROW. The greatest potential for noise-related impacts would be during wet weather near residential dwellings or when recreationists in remote areas would pass directly under the conductors. Even then, the audible noise levels would be minimal and the exposure would be short-term and localized.

Corona effects from transmission lines can also include the production of O_3. No adverse health effects are expected from O_3 produced by the NRI regardless of alternative route (Section 4.1.2).

The primary effect of noise generated would probably be one of annoyance to residents or others nearest the ROW during the construction period. More residents would be exposed to noise from the construction of the MEPCO South Route and fewest for the Modified Consolidated Corridors and Consolidated Corridors Routes on the basis of the number of dwellings within 600 ft (183 m) of the ROWs (Table 4.10-1). However, those seeking more remote recreational opportunities would be affected least along the MEPCO South Route because it has the least remote recreational use. Construction workers would be located closer to the noise sources and would experience longer exposure durations than the public. They would follow standard industry and Occupational Safety and Health Administration (OSHA) procedures for hearing protection.

4.10.2.1.5 Effects on Cardiac Pacemakers. Currents and voltages that are introduced internally to the body represent a possible source of interference to cardiac pacemakers. Both electric and magnetic fields have been found to introduce electromagnetic interference (EMI) that can alter the function of some older (no longer commercially available) cardiac pacemakers. Such pacemaker models could misfunction in an electric field of 2 kV/m or more. The percentage of individuals alive today with older pacemakers is extremely low; only 2.5% of such individuals were at risk in the mid-1980s (WHO 1987). Furthermore, the fraction of those individuals at risk who would be likely to encounter a source of EMI (including the proposed transmission line) during a period when their cardiac function was dependent upon their pacemaker is extremely small (WHO 1987). The occupational exposure guidelines developed by the American Conference of Governmental Industrial Hygienists state that workers with cardiac pacemakers should not be exposed to a 60-Hz magnetic field greater than 1,000 mG (NIEHS 2002a). This magnetic field level is much greater than that associated with high-voltage transmission lines.

Because only minimal differences in EMF would exist among the alternative routes, there would be no significant differences in potential risks to people with pacemakers for the alternative routes. Even when older pacemaker models susceptible to reversion were more prevalent, apparently no accidents resulted from exposure of a pacemaker patient to an AC transmission line. The combination of circumstances that would lead to an accidental event is extremely rare (approaching zero, considering the small number of individuals who still have older models). People driving under a high-voltage transmission line are at an even lower risk from pacemaker problems because the metal of the vehicle would serve as a shield from an external electric field.

4.10.2.1.6 Herbicide Use in ROW Management. Vegetation management practices for the proposed project would primarily consist of a combination of hand cutting and selective herbicide application (TRC 2005b). Mechanical mowing would only be used in unusual circumstances to regain control of vegetation (BHE 2004). Only herbicides registered with the

EPA and the State of Maine would be used to retard the development of tall-growing vegetation that might compromise the integrity and safety of the transmission line. Areas near public water supplies, open waters, wetlands, springs, wells, homes, or roadsides would be managed by manual removal of undesirable vegetation.

As discussed in Section 2.3.6, BHE plans to use herbicides whose active ingredients include fosamine, glyphosate, and imazapyr. The application methods that would be used to maintain the NRI ROW (e.g., backpack sprayers) require the most hands-on use of herbicides and, therefore, carry the greatest risk of exposure to workers. The general public is less likely to receive repeated exposures than those who apply herbicides, since the ROW locations would be mostly remote and the timing of treatments would be widely spaced temporally and spatially. Also, the low volatility of the herbicides that would be used, coupled with selective ground-level application techniques, would limit exposure levels.

Herbicides would be applied to any given area of the proposed route about once every 4 years, thus limiting the opportunity for exposure of the public. Also, basal application methods would limit the potential for movement of herbicides away from the targeted vegetation. Most members of the public who would be present within the ROW would either be on vehicles (ATVs, snowmobiles, or canoes), be present when herbicides are not used (fall and winter), or be wearing clothing that would limit skin exposure (long pants and long-sleeve shirts).

The herbicides being considered by the applicant (Arsenal,® Accord,® and Krenite®) cause little or no adverse health effects when applied according to label directions (BPA 2000; Information Ventures, Inc. 1995; Smith and Oehme 1992). Use of standard mitigation practices would further minimize the risks associated with herbicide use (Section 2.4.5). Utilitywide experience with herbicides has shown that these potentially hazardous materials can be used safely if appropriate precautions are implemented. Herbicides offer a viable alternative or complement to mechanical methods such as mowing, grading, or the use of chain saws, both in terms of cost and reduced worker exposure to injury from equipment (DuPont 2005)

4.10.2.1.7 Radio and Television Interference. Radio interference or static noise is a general term used in reference to any undesirable disturbance of the radio frequency band, which ranges from 3 kHz to 30,000 MHz. The magnitude of corona-generated radio noise decreases with increasing frequency and is very low at frequencies above 10 MHz. Of particular concern are those frequencies at which corona discharge associated with transmission lines can interfere with radio and television reception (i.e., the AM broadcast band [535 to 1,605 kHz] and the lower television broadcast bands [channels 2 to 6 at 54 to 88 MHz]). The degraded reception is referred to as radio interference (RI) or television interference (TVI). Interference is generally noticed on AM broadcast bands when the receiver is located very close to a transmission line (e.g., in a car passing under the line). The FM broadcast range from 88 MHz is unaffected by pulsative-type noise. The RI and TVI related to gap sparking of transmission lines generally is caused by defective or loose fittings of line hardware and can be remedied by routine maintenance of those fittings.

The level of corona-generated frequency noise is quite small in the very high frequency range used for television transmission. Generally, if the AM radio reception near a particular line is acceptable, then TVI would not be a problem. Ghosting is the only TV problem that may result from the proposed line. The audio portion of a TV signal is an FM radio system that is not subject to static types of interference.

The applicant has calculated RI levels at the edge of the ROW.[7] For a frequency of 1 MHz, the calculated RI is 68 dB or less during heavy rain, 60 dB or less during wet conductor conditions, and 43 dB or less during fair weather conditions. However, RI levels decrease rapidly with increasing distance from the line. At 100 ft (30 m) from the edge of the ROW, the estimated RI level drops to 49 dB or less during heavy rain, 40 dB or less during wet conductor conditions, and 23 dB during fair weather conditions. Given a signal-to-noise ratio equivalent of 20 dB for satisfactory radio reception and a 70-dB radio broadcast signal for the primary service area, AM radio reception at the edge of the ROW should be satisfactory, except when conductors are wet or heavy rain is occurring. At distances greater than 100 ft (30 m) from the edge of the ROW, radio reception should be satisfactory during all weather conditions.

The level of TVI is considerably lower than that associated with RI. Thus, the incidence of TVI from the NRI should be of minor consequence. Ghosting can generally be alleviated by repositioning the antenna. TVI would not be expected to be a concern for digital cable or satellite TV systems.

The potential for RI and TVI would be highest for the MEPCO South Route as it would have 20 dwellings within 100 ft (30 m) of the ROW, compared with 6 or less for the other alternative routes. Also, the MEPCO South Route has more highway crossings than the other alternative routes; thus, the potential for RI for vehicles would be higher.

4.10.2.1.8 Physical and Biological Hazards. Construction and maintenance workers for any project are subject to risks of injuries and fatalities from physical hazards. Indirect impacts on workers can include dehydration, heat exhaustion, hypothermia, insect stings, falls, and exposure to poisonous plants (BPA 2000). While such occupational hazards can be minimized when workers adhere to safety standards and use appropriate protective equipment, fatalities and injuries from on-the-job accidents can still occur. Rates of accidents have been tabulated for all types of job categories, and risks can be calculated on the basis of industrywide statistics. Where possible, these statistics have been used to estimate the risk for construction of the NRI, which would have a greater potential risk to workers than would maintenance of the transmission line.

In 2003, 49 total fatalities occurred nationwide for workers employed in the "power and communication line and related structures construction" field of more than 116,000 workers; there were 14 total fatalities for the electric power transmission, control, and distribution field out of about 162,000 workers (U.S. Bureau of Labor Statistics 2004, 2005b). Therefore, the fatality rate for constructing a transmission line can be estimated at 0.004%, while the fatality

7 The RI values were calculated for the Previously Permitted Route evaluated by DOE (1995), but they would be applicable for the NRI alternative routes.

rate for transmission line operation and maintenance can be estimated at 0.009%. No distinctions are made among categories of workers (e.g., supervisors and laborers) because the available fatality and injury statistics by industry are not sufficiently refined to support analysis of worker rates in separate categories.

Incidence rates of nonfatal occupational injuries and illnesses during 2003 were 6.9 per 100 full-time workers for the utility system construction field (which includes water and sewer and oil and gas pipelines as well as electric and communication systems) and 4.9 per 100 full-time workers for the electric power transmission, control, and distribution field (U.S. Bureau of Labor Statistics 2005b).

It is assumed that 100 construction workers would be required for the Modified Consolidated Corridors Route, Consolidated Corridors Route, or Previously Permitted Route, and that 140 construction workers would be required for the MEPCO South Route (Section 4.7.2). It is assumed that, in general, the types of activities required of these employees would be similar to those for workers in the power and communication line and related structures construction sector. On the basis of this assumption and a fatality rate of 0.004%, the number of fatalities from constructing the NRI would be less than 1 (0.4 for the Previously Permitted, Consolidated Corridors, and Modified Consolidated Corridors Routes and 0.6 for the MEPCO South Route).

Potential fatalities per year for maintenance would be even less than for construction. Few field personnel would be required to maintain the NRI. Even if 10 crew members were used for line maintenance, the number of fatalities expected would be much less than 1 (0.09 fatalities). The potential for fatalities would be slightly higher for the MEPCO South Route since it would require more maintenance on the basis of having the highest acreage of ROW compared with the other alternative routes.

The estimated annual number of nonfatal occupational injuries and illnesses for construction of the NRI would be 6.9 for the Modified Consolidated Corridors Route, Consolidated Corridors Route, or Previously Permitted Route, based on 100 construction workers required to construct any of these routes. For the MEPCO South Route, the estimated number of injuries and illnesses would be 9.7, based on 140 workers required for construction. On the basis of 4.9 nonfatal injuries and illnesses per 100 full-time workers for maintenance, the annual number of injuries and illnesses would be expected to be less than 1 in 10 full-time field personnel. The potential for injuries or accidents would be slightly higher for the MEPCO South Route compared with the other alternatives because of the acreage that could require maintenance.

The potential fatality and injury rates would be similar for the installation of AC mitigation for the M&N gas pipeline. However, the primary activity would be the need to excavate an 18-in. (46-cm)-deep trench for the zinc ribbon though an area dominated by grasses and forbs (Section 2.3.5). This would be less hazardous than tree clearing and the construction and installation of a transmission line. Differences among routes would depend on the amount of mitigation required: approximately 68 mi (109 km) each for the Modified Consolidated

Corridors, Consolidated Corridors, and Previously Permitted Routes and 45 mi (72 km) for the MEPCO South Route.

The potential would exist for ATVs and snowmobiles to collide with the NRI support structures or guy wires. However, the fatality risk for ATV or other off-road motor vehicles is 1 in 371,058 (<0.0003%). The potential, however slight, would exist for logging operators to contact energized conductors. The fatality risk for exposure to electric current from transmission lines is 1 in 2,641,663 (<0.00003%) (National Safety Council 2005). The potential for a plane striking the NRI would be negligible. The marker balls used to minimize bald eagle collisions would also make the line more visible to small plane pilots that may use the rivers for navigation. Overall, the potential for a death to the member of the public related to the NRI would be negligible.

4.10.2.2 Rescission of the Presidential Permit

Under the Rescission of the Presidential Permit Alternative, BHE would not build the NRI. Therefore, there would be no health and safety impacts beyond those already occurring.

5 UNAVOIDABLE ADVERSE EFFECTS

The implementation of the proposed project along any of the alternative routes would result in some unavoidable adverse effects identified below by topic. These would be reduced to localized minimal levels through implementation of standard mitigation practices.

5.1 AIR QUALITY

Vehicle and fugitive dust emissions would occur primarily during project construction and, to a lesser extent, ROW maintenance. Vehicle emissions from periodic access to the project site cannot be avoided. During winter construction, fugitive dust would be negligible.

Corona effects from the operation of the transmission line could result in the generation of a small amount of O_3. Effects on ambient air quality would be short term and localized and would not exceed NAAQS.

5.2 LAND FEATURES

Minor modifications to the natural topography, drainage patterns, and slopes would be unavoidable. Construction of the transmission line would compact soils and damage the soil structure during excavation. The burying of soil and loss of soil productivity cannot be avoided by implementation of the proposed project. Increases in soil erosion could occur as a result of construction of the proposed project, temporary access roads, and installation of AC mitigation for the M&N gas pipeline. During the construction phase, localized erosion could increase above natural levels and soil would be deposited downslope. Standard mitigation practices would minimize erosion impacts during construction (Sections 2.4.1 and 2.4.2), and revegetation of construction sites and access roads would mitigate long-term impacts (Section 2.4.3).

Soil density would be affected (soil compaction) at construction areas and along some access roads, while soil structure would be disrupted in all excavation areas, including areas of installation of AC mitigation for the M&N gas pipeline. While mitigation measures would minimize soil erosion, some erosion is inevitable, especially during heavy rainfall events. Erosion impacts would be short term and would cease following revegetation of the exposed soils.

5.3 LAND USE

The transmission line would unavoidably change the nature of land use within the ROW. For example, commercial forestry operations could not occur within the ROW, while agricultural production could not occur within the immediate area of support structures.

5.4 HYDROLOGICAL RESOURCES

While the potential for adverse consequences to hydrologic resources is present, the standard mitigation practices outlined in the erosion and sedimentation control plan prepared for the NRI (BHE 2005) would minimize unavoidable adverse impacts. The mitigation practices are summarized in Sections 2.4.1 through 2.4.3. There would be a minor loss of floodplain area because of the placement of support structures (15 ft^2 [1.4 m^2] per support structure pole). Nevertheless, the support structure poles would not impede floodwater movement or reduce floodwater-storage capacity.

5.5 ECOLOGICAL RESOURCES

Construction and maintenance of the transmission line ROW would cause temporary and permanent changes in plant communities. Vegetation immediately within construction footprints would be destroyed, and trees and other tall vegetation within the ROW would be removed (or topped), as necessary, to provide appropriate conductor clearance. Unavoidable adverse impacts on wildlife would include habitat loss, disturbance and/or displacement, mortality, and obstruction to movement. Increased noise could disrupt wildlife foraging and breeding cycles. Therefore, construction would be scheduled, as feasible, to avoid the reproductive seasons of sensitive wildlife species. The potential would exist for bald eagles and other birds to collide with shield wires or conductors, especially at major stream crossings or large wetland areas. However, bald eagle collisions have not been observed for the existing MEPCO 345-kV transmission line. To reduce the potential for such collisions, ball markers and/or flappers would be placed on the shield wires where the proposed line would cross rivers or streams known or likely to be frequented by bald eagles.

5.6 CULTURAL RESOURCES

Cultural resources could be adversely impacted by construction of the proposed project. Access to previously inaccessible areas could lead to vandalism of both known and undiscovered archaeological sites.

5.7 VISUAL RESOURCES

Because portions of each alternative route could be visible to some local residents, visitors, and people traveling on portions of public and private roads, the proposed project would have an adverse impact on certain viewsheds. This could alter the visual quality for some residents and the recreational experience of some visitors in the vicinity of the proposed project.

5.8 HEALTH AND SAFETY

The construction and, to a lesser extent, operation and maintenance of the proposed project would increase noise levels near the ROW. Noise associated with corona effects would be audible only within the immediate area of the ROW. Noise impacts would be short term and localized and would not cause any significant impacts on human hearing.

The potential, albeit small, would exist for serious injuries or fatalities to workers during construction and maintenance of the NRI. These accidents would be a consequence of unanticipated events in the work environment, typical of all transmission corridor workplaces.

Operation of the NRI would add an additional source of public exposure to EMF. However, this additional EMF exposure would be limited (in terms of both the number of people that would be exposed and the duration of exposure of any individual). Therefore, EMF exposure from the proposed line would contribute only a small amount to the total EMF exposure that individuals receive throughout their lives. Where necessary, AC mitigation would be added to the M&N gas pipeline; thus, the potential for an adverse shock hazard from touching pipeline components would be negligible. The potential would exist for worker or public exposure to herbicides. However, with proper herbicide application, the health risk would be negligible. The potential, however slight, would exist for logging operators to contact energized conductors. The potential for adverse impacts on cardiac pacemakers would be negligible. Operation of the transmission line could cause some localized interference with radio reception (particularly in the AM broadcast band) as vehicles pass under the transmission line.

6 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

This chapter describes the irreversible and irretrievable commitments of resources associated with the implementation of the proposed action or any of the alternatives. A resource commitment is considered *irreversible* when primary or secondary impacts from its use limit future use options. Irreversible commitments apply primarily to nonrenewable resources, such as minerals or cultural resources, and to those resources that are renewable only over long time spans, such as soil productivity or forest health. A resource commitment is considered *irretrievable* when the use or consumption of the resource is neither renewable nor recoverable for use by future generations. Irretrievable commitments apply to the loss of production, harvest, or use of natural resources.

Visual resources would be irretrievable during the duration of the project because the visual quality would be lost. If the project were removed, the area could eventually revert back to its original visual state, and the habitat could revert to its original form and function depending on the effect of other ongoing land use practices (e.g., commercial timber harvests). Each alternative route would be visible from a number of recreation areas or during general recreational use of the area (e.g., by ATV and snowmobile users, canoeists, and campers). These areas represent locations where visitors are likely to be highly sensitive to the landscape.

Placing of the support structures and expansion of the Orrington and Kimball Road Substations would have irreversible impacts on soils and vegetation. Irreversible commitments of resources would include removal of small areas of farmland from potential use for agriculture within the ROW. Some clearing of cropland may be required during construction of the proposed transmission line; however, only the land within the immediate footprint of the support structures would be irreversibly committed. The major loss of soil and productivity would be irreversible where the support structure poles and substation expansions are located.

The direct loss of vegetation due to clearing and construction would be irretrievable but could be reduced by application of mitigation measures. ROW routing through a deer wintering area would be considered irreversible to at least a portion of the deer yard for the life of the project. Special status plant species would be identified and impacts mitigated upon precise siting of the ROW (e.g., altering the placement of support structures) within the chosen alternative route.

Cultural resources are nonrenewable, and disturbance of such resources is an irretrievable impact. Preservation of cultural resources is possible by avoiding the resources. Data recovery of cultural resources that are eligible for listing on the NRHP may be a necessary mitigation measure; however, data recovery is an irreversible use, effectively eliminating options for future preservation or study in situ. No eligible cultural resources are known on any of the alternative routes. Access to previously inaccessible areas could lead to vandalism of both known and undiscovered cultural resources, thereby rendering them irretrievable.

Construction of the transmission line, expansion and modification of the substations, and the addition of AC mitigation to the M&N gas pipeline would require the irretrievable commitment of standard building materials and fuel for construction equipment. The resources irretrievably committed for operation and maintenance of the project would be relatively minor quantities of fuel for maintenance vehicles and equipment, operating supplies, and miscellaneous chemicals. Some materials, such as ceramic insulators and concrete foundations, may be irrevocably committed, while the metals used in conductors, support structures, and other equipment could be recycled. None of the identified construction resources are in short supply, and all should be readily available in or to the local region.

Water resource commitments would be insignificant during construction. Except for water chemically bound in the production of concrete, water needed for construction would eventually be recycled through the atmosphere and surface waters for distribution elsewhere. Recovery of ecosystems by natural processes would occur within a very short time. Construction of facilities (support structures) is an irretrievable commitment of land use, since the transmission line and its support structures would not be removed for the foreseeable future.

7 RELATIONSHIPS BETWEEN SHORT-TERM USES AND LONG-TERM PRODUCTIVITY

This chapter discusses the relationship between the proposed project's short-term use of the environment and the maintenance and enhancement of long-term productivity. The impacts from utilization of resources associated with the proposed project are given in Chapter 4. For this EIS, *short-term* refers primarily to the period of construction, the time when the most extensive environmental impacts are likely to occur.

Although none of the alternative routes require the short-term disturbance or long-term alteration of a major amount of land, the loss of terrestrial and wetland plants, animals, and habitats to accommodate the new facilities and the temporary disturbance of these resources during construction would occur. Land clearing and construction activities resulting in personnel and equipment moving about an area would disperse wildlife and temporarily eliminate habitats. Most of the ROWs for the alternative routes are actively managed and harvested timberlands. Nevertheless, short-term disturbances to previously undisturbed biological habitats (such as wetlands) from the construction of the transmission line could cause long-term reductions in the biological productivity of an area. ATV and maintenance vehicle use of the transmission line ROW could cause long-term negative effects on vegetation. Changes in the types and patterns of recreational usage can be viewed as positive or negative, depending on the subjective values of the interested and affected public.

The proposed project's impacts on previously undisturbed land would affect long-term visual resources and possibly some cultural resources. However, a large portion of each alternative route crosses commercial forest lands, where unaltered viewscapes are limited. Use, productivity, and resource commitment related to archaeological and historic properties would be negligible.

Improved electricity reliability within the NEPOOL service area would be expected to contribute to long-term socioeconomic benefits, including business development and regional population growth.

8 CUMULATIVE IMPACTS

The CEQ regulations implementing the procedural provisions of NEPA define cumulative impacts as “the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or person undertakes such other actions” (40 CFR 1508.7). The regulations further explain that “cumulative effects can result from individually minor but collectively significant actions taking place over a period of time.”

Cumulative impacts can be additive, less than additive, or more than additive (synergistic). This discussion of cumulative impacts describes the impacts from the NRI in the context of other activities within the project area that could also impact environmental resources. In identifying proposals and projects for consideration in estimating cumulative impacts, DOE considered only projects that would be executed within the next 10 years. Projects predicted to occur beyond 10 years were presumed to be too speculative to be considered reasonably foreseeable.

8.1 METHODOLOGY

The potential cumulative impacts were evaluated both for the period of project construction (anticipated to be 12 to 18 months) and for the post-construction (operation and maintenance) period of the project. The affected environment varies for each resource area, depending on the geographic extent of a potential effect. Unless noted otherwise, this would be the same as that used for the impact analyses in Chapter 4.

To address the contributions of the NRI to cumulative impacts, an understanding and knowledge of historical, existing, and reasonably foreseeable future activities are essential. It was assumed that current activities within the project area would continue into the future. These activities include forestry; agriculture; pulp and paper mills; urban, residential, and industrial growth; construction and operation of gas, electric, and communication transmission lines; and outdoor recreation. Suburban-style development is the most common type of development now occurring in Maine (Maine State Planning Office 2001). The NRI, as described under the proposed action and analyzed in this EIS, would be in addition to those activities. During construction of the NRI, AC mitigation would also be installed by Maritimes for its existing gas pipeline in areas where the transmission line would be located near, parallel, or cross the gas pipeline.

In addition to industrial and residential developments, a number of ongoing conservation efforts are being undertaken in the project area. The New England Forestry Foundation, in conjunction with the Downeast Lakes Land Trust, has secured an option to purchase a conservation easement on 312,000 acres (126,262 ha), currently being managed by Wagner Forest Management, that is bounded by the international border to the east and the West Grand Lake region to the west. The NRI would cross the easement lands in several townships. Nothing in the easement's language would preclude the construction of the NRI (Eno 2004). Additional information, including maps, is available at http://www.neforestry.org/projecrts/dlfp.asp.

The reasonably foreseeable future actions within the project area that would affect the environment of the project area would include continued commercial logging and the proposed M&N pipeline expansion project, referred to as the Phase IV Project (TRC 2002). The M&N expansion project would include the installation of 31.3 mi (50.4 km) of a 36-in. (91-cm)-diameter gas pipeline loop in Washington County, Maine (the "Baileyville Loop"). The Baileyville Loop would be installed within the existing M&N gas pipeline ROW from the Baileyville Compressor Station to just before the crossing of Lake Brook, southeast of Fifth Machias Lake in Township T36 MD (TRC 2002). Originally proposed to be constructed in 2003, the project is now projected for 2008.

The following sections summarize the cumulative impacts identified for the resource areas within the locales of the proposed project route alternatives.

8.2 POTENTIAL CUMULATIVE IMPACTS

8.2.1 Alternative Routes

8.2.1.1 Air Quality

Pollutants from a number of sources, including vehicles, power plants and industrial facilities, agricultural and logging operations, mining, dust from unpaved roads, and open burning, have affected urban and regional air quality in the project region. Nonlocal sources of air pollution are transported long distances from population and industrial centers on the East Coast and in the Midwest and southern Canada. These areas generate suspended particulate matter, sulfur oxides, CO, hydrocarbons, heavy metals, and NO_x (LURC 1997). The most common and damaging pollutants from these sources include SO_2, suspended particulate matter (PM_{10} and $PM_{2.5}$), NO_2, ground-level O_3, and CO.

Construction, operation, and maintenance of the NRI would be unlikely to result in air pollutant concentrations that would exceed NAAQS. Multiple construction projects at the same time could contribute to regional pollutant emission loads from construction equipment and worker vehicle exhaust emissions. Localized and temporary incidences of fugitive dust emissions would occur along unpaved roads from vehicle use by NRI workers, logging and gas pipeline industry personnel, and the public. However, dust emissions would not contribute to cumulative impacts on regional air quality because they would be localized and temporary.

Air emissions from vehicles involved in operational and maintenance activities for the NRI would be minimal because of the small number of employees needed along the transmission line at any one time. The small number of employees and associated trips during project operation and maintenance would not have a noticeable effect on cumulative regional air quality.

A characteristic of snowmobiles is that they tend to emit high levels of CO and unburned gases (Stokowski and LaPointe 2000). In the long term, the operation of transmission lines generates very few air emissions; thus, the NRI would not contribute to a cumulative increase in air emissions. No cumulative impacts that would affect the attainment status in the project area under the NAAQS are expected.

8.2.1.2 Land Features

Impacts on soil resources could result from an increased area of disturbance for construction of multiple projects. These cumulative impacts would be similar to the potential impacts described in Section 4.2.2.1, but over a larger area of disturbance. These impacts include an increased potential for erosion and soil compaction from large equipment and from decreased vegetation cover resulting from ATV use and clearing for the ROWs and temporary access roads where necessary. The proposed project would contribute minimally to this impact because standard mitigation practices would be employed (e.g., the use of silt fence and restriction of construction equipment use on steep slopes [Sections 2.4.1 and 2.4.2]). Construction of the proposed project adjacent to the M&N gas pipeline or other ROWs would minimize the new area of soil disturbance because the ROW would not have to be as wide as for a new ROW (i.e., ≤ 155 ft [47 m] wide compared with 170 ft [52 m] wide).

Use of heavy machinery to construct the NRI could cause very localized soil compaction and diminish soil productivity. This would be similar to that caused by other construction projects, logging, and forestry (BPA 2000). However, because the NRI would be a linear project over a large geographic area, its contribution to cumulative impacts within any area would be minimal.

The construction of new temporary access roads, improvements to existing access roads, and installation of support structures could involve cut-and-fill operations. These could place increased demands on supplies of sand, gravel, and crushed rock. However, the amount of fill that could be required would not impact the supply of fill materials within the project area.

The increasing popularity of ATV and snowmobile use in the area of the NRI could increase soil compaction and create mud holes and gullies that alter hydrologic patterns and intensify erosion (Stokowski and LaPointe 2000). However, co-location of the NRI with existing cleared corridors would minimize the potential for new ATV access ways, and therefore minimize new ATV-related impact areas.

Cumulative impacts on geologic resources or seismic characteristics from the NRI are expected to be negligible. The proposed project would include several standard mitigation practices to mitigate impacts from blasting, excavation, or earthmoving activities (Section 2.4.2). Any impacts that might occur would be minimal and largely limited to the project site.

8.2.1.3 Land Use

There may be adverse cumulative effects on land use as a result of past, present, and reasonably foreseeable projects. Potential industrial and residential development would introduce land use changes. BHE's proposed project, combined with other transmission lines, gas pipelines, and industrial and residential growth, could result in the development of land that is currently either undisturbed or used for other activities such as timber production.

If multiple projects are under construction simultaneously, an increased amount of land would be used temporarily for construction lay-down and staging areas. For example, construction of the proposed NRI, installation of AC mitigation for the M&N gas pipeline, and other projects, such as residential construction, would temporarily require land use changes in the project area.

To the extent that changes in land use occur, areas that are currently used for recreation may no longer be available for recreation, or may provide a different recreational experience because of a more developed setting. Increased access from multiple projects, especially transmission lines and gas pipelines that require ongoing maintenance and access, could accelerate the increased recreational use within the project area. Such projects could cause a change in aspects of the recreational experience from more remote wilderness activities to more organized activities such as ATV and snowmobile use.

The new transmission line would contribute to the continuing decline of remote recreational opportunities available within the region, especially along waterways. ROWs increase access to ATV and snowmobile use, which can cause user conflicts with nonmotorized recreational uses. ATVs and snowmobiles may also result in environmental degradation that reduces the pleasure of nonmotorized visitors (Stokowski and LaPointe 2000). In addition, cumulative impacts on land use would consist of a very small reduction in the amount of land available for periodic timber harvesting.

Noise generated by construction activities and traffic would incrementally add to noise generated from logging traffic and operations along Stud Mill Road. However, increases in construction-related noise would be temporary and have no long-term cumulative impacts. Noise generated from corona activity would generally be near ambient sound levels. Corona-generated noise would occasionally be noticeable near the line. In conjunction with the visual intrusion of the line, noise from the transmission line could detract from remote recreational experiences.

Appropriate planning and evaluation to address impacts of all permitted activities of the NRI were required by the applicant at the State and local level to ensure that the proposed project would be compatible with ongoing activities and land uses in the project region. The contribution to cumulative impacts of the NRI would likely be small, since the project would cause no significant permanent loss of other current or future productive use of the region for other activities. However, the NRI would generally be compatible with many other land uses, including agriculture, recreation, and wildlife habitat conservation. The small number of workers required for construction of the NRI and installation of AC mitigation at any given time (e.g., about 120 during the peak construction period [150 for the MEPCO South Route] and only several small crews during operation) would not likely add to cumulative impacts on land use or land disturbance that are occurring or have occurred from ongoing and past activities.

8.2.1.4 Hydrological Resources

Non-point-sources of pollution that threaten water quality within the project area include ATV use, poorly maintained logging roads, other roads, sand and salt facilities, peat harvesting, timber harvesting, faulty septic systems, phosphorus and other nutrients, pesticide drift and runoff, agricultural water withdrawal, beaver activity, acid precipitation, and landfill seepage and runoff (Arter 2003). In 1997, the Erosion and Sedimentation Control Law came into effect in Maine. It was designed to prevent further degradation of Maine's water bodies due to soil erosion by requiring sediment and erosion control measures for all construction projects. A new modification to the law (as of July 1, 2005) regulates all existing chronic erosion problems in watersheds most at risk. On July 1, 2010, the law will apply to all organized areas in the State of Maine, and landowners will be required to fix their chronic erosion problems (e.g., camp roads that wash out every spring, culverts that are washing out around their inlets and outlets, unstabilized ditches and embankments, and washouts downslope from any point of concentrated storm water runoff) (MDEP 2005).

The NRI's contribution to cumulative impacts on water resources is not expected to be significant. The proposed project includes a number of standard mitigation practices to mitigate impacts on both surface water and groundwater quality (TRC 2005a,b). Examples include the use of silt fence and controlling the release of regulated materials (Sections 2.4.1 and 2.4.2). Localized on-site mixing of concrete (if needed where steel-pole support structures would be used for angle or dead-end structures) during construction would require water. Operation and maintenance of the NRI would use very small amounts of water (e.g., to clean insulators) and would not result in discharges to surface waters. Operation of the NRI would not contribute to a cumulative long-term increase in water demand from potential residential and industrial growth.

8.2.1.5 Ecological Resources

The NRI would contribute to ongoing perturbations to ecological resources, such as habitat modification (e.g., reduction, modification, or fragmentation), increased noise, and human intrusion. ATV use, hunting intensity, and other activities that could impact ecological resources would likely increase because of the addition of the NRI ROW, especially in areas where a new, non-co-located ROW would be required.

Nearly all forests within the project area have been affected by past and ongoing human activity. Most of the alternative routes would pass through second- and third-growth mixed forests, which are under heavy harvesting pressure from paper company landowners. Clear-cutting, precommercial thinning, and selective herbicide application on regenerating growth are among the forestry practices followed to give softwoods a competitive advantage over hardwood species. Favoring the development of even-age softwood stands for the logging industry jeopardizes the diversity and natural resistance of forests to infestation (Ota and Restino 2001).

For example, widespread tree mortality has occurred throughout portions of Maine as a result of spruce budworm (*Choristoneura fumiferana*) infestations. The spruce-budworm epidemic of the 1970s and 1980s continues to affect the composition, structure, and distribution of Maine's forested ecosystems. Other invasive exotic pests (e.g., balsam woolly adelgid [*Adelges piceae*], hemlock woolly adelgid [*A. tsugae]*, emerald ash borer [*Agrilus planipennis*], and, possibly, *Phytophthora ramorum* [the causative agent in sudden oak death]) are also expected to pose threats in the future (McWilliams et al. 2005). Occasional severe ice storms can also impact biological resources. For example, an ice storm in 1998 affected more than 16.8 million acres (6.8 million ha) of forest lands in New England, New York, and adjacent Canadian lands (Faccio 2003).

The NRI ROW would be expected to be used by ATVs and snowmobiles that could impact vegetation. These effects can include injury or destruction of vegetation, increased erosion in areas of damaged vegetation or on disturbed soils, and changes in soil characteristics, such as moisture levels or compaction. These changes can alter plant community structure or even eliminate vegetation.

Land temporarily affected by the construction of the Baileyville Loop pipeline expansion project would total about 378 acres (153 ha), and about 85 acres (34 ha) of that would be affected permanently by operations. Typically, a cleared 75-ft (23-m)-wide ROW (the combined Phase II Mainline and Baileyville Loop ROW) would be maintained in upland areas and a 30-ft (9-m)-wide ROW would be maintained in wetlands and riparian zones (TRC 2002).

Areas disturbed by construction projects provide a potential point of entry for invasive species onto the landscape, which could lead to adverse modification of the surrounding ecosystems. The colonization and establishment of an invasive species within the project area would be a significant impact. The potential for the introduction and spread of invasive species would be greatest at clearing and construction locations and would continue during some project maintenance activities (i.e., ROW vegetation management).

The NRI would contribute to forest fragmentation that is ongoing as a result of timber harvesting and rural and urban developments. Additional forest fragmentation would increase recreational user access to deer wintering habitats in the project area. This increased disturbance could decrease use at these wintering habitats and therefore could reduce overwinter conditions of some deer. Because of the limited amount of deer wintering habitat that would be affected by the NRI, the cumulative effect is not likely to be significant. The NRI would contribute to habitats that increase browse available to moose and white-tailed deer. However, creation of additional ROW segments (e.g., where portions of the NRI would not be located within an existing corridor) would add to the areas that could be used by ATVs and snowmobiles. Snowmobile traffic has been shown to influence moose behavior within 1,000 ft (300 m) of a trail and displace moose into less favorable habitats (Colescott and Gillingham 1998). Noise from ATVs and snowmobiles may place undue stress on wildlife such as moose and white-tailed deer (Stokowski and LaPointe 2000). However, such impacts can be temporary (e.g., the animals may move back into the area once the disturbance has ceased). Snow compaction by snowmobiles can affect the survival and activities of small mammals (Stokowski and LaPointe 2000).

Vehicle use (e.g., transportation of construction equipment or components, monitoring, and commutes of workers) would potentially contribute to wildlife mortality from vehicle collisions. However, vehicle use of Stud Mill Road is limited, especially by members of the public, and it would not be expected to change because of the NRI; thus, the number of roadkills would be very low. Also, the NRI would be constructed during daylight hours, when roadkills of wildlife would be less likely to occur. From a wildlife population perspective, roadkills do not constitute a significant impact unless they involve a rare or endangered species.

Herbicide use for forestry applications, which generally incorporate broadcast spraying, could potentially affect wildlife by altering habitat; for example, it could affect the availability and use of browse by large ungulates such as moose (Santillo 1994). Herbicide treatment reduces, but does not eliminate, the use of clear-cuts by moose during the first 2 years after treatment. Also, the use of herbicides to promote conifer regeneration decreases deciduous browse availability, but greater conifer density and height may improve cover for bedding and foraging by moose in winter (Escholz et al. 1996). Broadcast applications of herbicides to clear-cuts in Maine reduced the abundance of both small mammals and birds as a result of reductions in invertebrate populations and reductions in the structural and floral complexity of vegetation (Santillo et al. 1989a,b); the applications also reduced the diversity of small mammal populations (Parker 1989).

Adverse effects on birds, which have the potential to act cumulatively with effects from other projects or activities, include reduced or altered habitat, direct mortality from bird strikes on conductors, and disturbance due to noise and human presence. Other activities in the area of the project have contributed to habitat fragmentation. For example, silvicultural activities have altered (and continue to alter) much of the forest habitat to that dominated by softwoods.

The number of birds killed from collisions with man-made structures in the United States is estimated at 100 million to well over 1 billion annually (Erickson et al. 2001). These estimates include up to 174 million birds killed by power line collisions. The effects of bird collisions on local populations would be a function of the number of individuals killed relative to the size of the total population of the species in the region. The number of birds that could be impacted from collision with the NRI conductors and shield wires would minimally increase losses from other causes of mortality within the ROI (e.g., hunting, predation, vehicle collisions, and collisions with existing transmission lines).

Noise during construction of the NRI would likely result in temporary impacts on wildlife. This would contribute to other noise sources in the area (e.g., forestry operations and vehicles). The cumulative impacts of noise on wildlife populations would be negligible for less sensitive species, or species with relatively large home ranges. Use of the NRI could increase ATV and snowmobile use in the project area. This could increase disturbance and temporary displacement of wildlife. The response of wildlife to disturbance depends on species, physiology and reproductive condition, distance, and intensity and duration of disturbance. These vehicles have the potential to disturb animals within the ROW and in locations where these vehicles leave the ROW to access other areas.

Threats to wetlands throughout Maine include loss and fragmentation from development, agriculture, and silviculture; pollution (sedimentation and toxic chemicals); water level changes; and invasive species (MDEP 2005). Incremental impacts on wetlands have led to severe reductions in their quantity in the United States. Construction of the proposed project would mainly contribute to the cumulative modification, rather than loss, of wetlands in the project area.

All ROW projects (e.g., transmission lines, gas pipelines, and roads) require stream crossings. However, the duration of effects on fish habitat would be short term and infrequent, and impacts on any given stream would be staggered over time. Also, the geographical extent of impacts would be localized. Impacts on streams are largely reversible. Standard mitigation practices would be implemented for any activity that involved a stream crossing; thus, cumulative impacts on fish and their habitats would be minimal. ATV use has been found to widen and rut forest roads and to increase the sediment load to streams, which may threaten fisheries. This potential impact is increased by ROWs that allow ATV access to resource areas that are otherwise less accessible (Stokowski and LaPointe 2000).

8.2.1.6 Cultural Resources

Disturbances from NRI development, combined with other surface-disturbing activities, could uncover or destroy cultural resources. However, the standard mitigation practices addressing cultural resources would limit potential impacts. In addition to project-related disturbance, the increased accessibility created by the ROW created for the project could cause cumulative impacts in the form of increased public visitation, recreational impacts, and vandalism. The cumulative impact on the area landscape from multiple projects would be greater than that from the BHE project alone and could evoke Tribal concerns about the value of the natural landscape within the project area.

8.2.1.7 Socioeconomics

Improved electricity reliability in the NEPOOL region would be expected to contribute to long-term socioeconomic benefits by supporting business development and regional growth. The cumulative result of BHE’s proposed project, combined with industrial and residential growth, could generate more revenue and employment in the three counties during and following construction. However, any cumulative growth could also have the potential to stress community resources such as schools, police, and fire protection.

The NRI could potentially produce adverse cumulative impacts on commercial uses (e.g., forestry and agriculture) and recreation in the immediate area of the NRI. However, the relatively small amount of land required for the NRI, coupled with its mostly being located adjacent to existing ROWs, would result in only a minor impact on other commercial uses. Some commercial activities, particularly agriculture, could continue within most of the ROW. These would minimize conflicts with forestry, agriculture, and recreation.

Traffic impacts would be short term and limited to daylight hours. No long-term cumulative traffic impacts would occur. Multiple simultaneous construction projects could result in a temporary increase in traffic congestion and traffic accidents. No long-term cumulative traffic impacts would occur.

8.2.1.8 Environmental Justice Considerations

The proposed project would not result in any disproportionately high and adverse impacts on minority or low-income populations, as described in Section 4.8. Therefore, the proposed project would not contribute cumulatively to any environmental justice impacts.

8.2.1.9 Visual Resources

Visual resources would be impacted by the NRI. The introduction of construction equipment and staging and construction site areas resulting from multiple projects being under construction simultaneously would result in temporary increases in visual impacts on the project area.

The heights and type of support structures, together with their placement with respect to local topography, are factors that would contribute to visual intrusion on the landscape. The clearing of a new transmission line ROW and subsequent installation of the transmission line components would add to the continuing visual intrusion into the natural landscape from man-made features (e.g., existing electrical and gas transmission ROWs, and logging operations). The level of public acceptance of visual impacts could vary considerably, depending on the location and the activity in which the person was engaged. The presence of the NRI ROW would result in a cumulative impact on visual resources in remote areas.

8.2.1.10 Health and Safety

Noise generated by construction equipment would be variable and depend on the type, size, and condition of equipment used and the equipment operating schedule. Construction equipment could generate noise levels of about 80 to 90 dB(A) at a distance of about 50 ft (15 m). Local residents or recreationists near the project could experience intermittent noise from construction equipment and vehicles during the daytime. Most of the NRI would be located far enough away from people (e.g., homes) that noise levels would not increase above existing background levels. Cumulative noise impacts from simultaneous construction projects would be short term and limited to daylight hours. Noise generated by the Orrington Substation, the transmission line, and maintenance activities during the operational phase would approach typical background levels for rural areas at distances of 2,000 ft (600 m) or less and, therefore, would not be expected to result in cumulative impacts on local residents.

Increased risk to human health and safety could occur during construction and operation (particularly ROW maintenance) of the NRI on the basis of the inherent hazards associated with construction activities and maintenance of ROWs and transmission line components. Cumulative impacts on human health and safety would be negligible considering the potentially low fatality and injury rates expected from construction and operation of the project (Section 4.10.2.1.8).

The proposed transmission line would add an additional source of exposure to EMF. EMF from the transmission line would decrease to levels comparable to those inside a home at distances of about 300 ft (90 m) from the edge of the ROW. However, few people live within several hundred feet of the proposed ROW. Therefore, measurable exposures from the line would mostly be infrequent and of short duration for transient traffic. In comparison with EMF exposures from the home and work environments, the contribution from the proposed transmission line would be minimal to negligible. This is especially true for those that use appliances such as computers and cellular phones for extended periods of time. For example, computer users are exposed to a magnetic field of 0.2 to 6.6 mG (average 1.4 mG) for a period of 1 to 606 minutes per day (average 176 minutes) (Mezei et al. 2001).

No Federal regulations have been established specifying environmental limits on the strengths of EMF from electric transmission lines. The cumulative impacts on human health and safety could be a minimal increase in background EMF exposure to those few residents in the immediate vicinity of adjacent transmission lines. Section 4.10 gives examples of EMF exposures of the existing MEPCO 345-kV transmission line and the NRI operating adjacent to one another. The EMF levels in this situation at a distance where residents would potentially be located are well below 0.8 mG, the average daily exposure to maximum magnetic fields from some common household appliances (NIEHS 2002a). While extensive research has been conducted to determine whether exposure to electric or magnetic fields may cause or promote adverse health effects, NIEHS concluded “The scientific evidence suggesting that EMF exposures pose any health risk is weak” and “The probability that EMF exposure is truly a health hazard is currently small” (NIEHS 2002a). On the basis of the above, no long-term cumulative human health impacts are expected to occur. However, the subject remains controversial.

There are several different categories of common environmental sources that can interfere with cardiac pacemakers. These sources include electrically coupled, magnetic, galvanic, ultrasonics and subsonics, and ionizing radiation (ARRL 2002). Most current research on this topic focuses on higher frequency sources such as cellular phones, citizen band radios, wireless computer links, microwave signals, radio and television transmitters, and paging transmitters (NIEHS 2002a).

Multiple simultaneous construction projects could result in a decrease in worker safety. The addition of the NRI would increase the number of ROWs where selective herbicide use occurs. However, portions of the NRI ROW would replace commercial timber lands that currently receive broadcast application of herbicides.

8.2.2 Rescission of the Presidential Permit

The Rescission of the Presidential Permit Alternative would not contribute to cumulative impacts within the project area.

9 APPLICABLE ENVIRONMENTAL LAWS, REGULATIONS, PERMITS, AND DOE ORDERS

Permits and approvals are required before the proposed transmission line can be constructed. Permits regulate many aspects of facility construction and operations, including the quality of construction, fugitive dust control requirements, and discharges of effluents to the environment. BHE would obtain these permits, as required, from the appropriate Federal, State, and local agencies. Table 9-1 contains a summary of the primary approvals that would be required to implement the proposed action along any one of the alternative routes.

The major Federal laws, regulations, E.O.s, and other compliance actions that potentially apply to the proposed project are identified in Table 9-2. A number of Federal environmental statutes address environmental protection, compliance, or consultation. In addition, certain environmental requirements have been delegated to State authorities for enforcement and implementation.

TABLE 9-1 List of Potentially Required Permits/Approvals

Agency[a]	Permits/Approvals
DOE	Presidential Permit
MDEP	Natural Resources Protection Act Permit, Site Location of Development Permit, 401 Water Quality Certification, and Maine Construction General Permit[b]
MDOT	Location Permit
MHPC	NHPA concurrence in a Programmatic Agreement (and Advisory Council, if necessary, with clearance stipulations)[c]
MPUC	Certificate of Public Convenience and Necessity
NOAA Fisheries	May provide essential fish habitat conservation recommendations
USACE	Clean Water Act Permits, Section 404[b]
USFWS	ESA Section 7 concurrence based on a review of the biological assessment
Local Towns[d]	Building and Shoreland Zone Permits

[a] Abbreviations: DOE = U.S. Department of Energy, ESA = Endangered Species Act, ESH = essential fish habitat, MDEP = Maine Department of Environmental Protection, MDOT = Maine Department of Transportation, MHPC = Maine Historic Preservation Commission, MPUC = Main Public Utilities Commission, NHPA = National Historic Preservation Act, NOAA Fisheries = National Oceanic and Atmospheric Administration, National Marine Fisheries Service, USACE = U.S. Army Corps of Engineers, USFWS = U.S. Fish and Wildlife Service.

[b] The applicant submitted its permit application in May 2005 (BHE 2005).

[c] SHPO clearance obtained.

[d] Local towns include the organized towns and cities (see Tables 2.1-1 and 2.1-2 for those towns and cities traversed by the alternative routes).

TABLE 9-2 Federal Environmental Statutes, Regulations, and Orders[a]

Resource Category	Statute, Regulation, Order	Citation	Administering Agency	Permits, Approvals, Consultations, and Notifications
Air Quality	CAA	42 USC § 7401 et seq.	EPA	Requires sources to meet standards and obtain permits to satisfy NAAQS, SIPs, NSPS, NESHAPs, and NSR. **Applicability:** No major source permit required under NESHAPs or NSR. No NSPS requirements or SIP requirements.
	CAA, NAAQS, SIP	42 USC § 7409 et seq.	EPA	Requires compliance with primary and secondary ambient air quality standards governing sulfur dioxide, nitrogen oxide, carbon monoxide, ozone, lead, and particulate matter and with emission limits/reduction measures as designated in each SIP. **Applicability:** No SIP requirements.
Noise	Noise Control Act	42 USC § 7401 et seq.	EPA	Requires facilities to maintain noise levels that do not jeopardize the health and safety of the public. **Applicability:** Applicable.
Hydrological Resources	CWA	33 USC § 1251 et seq.	MDEP	Requires an EPA- or State-issued permit (NPDES) and compliance with provisions of permits for discharge of effluents to surface waters and additional wetland protection requirements. **Applicability:** No NPDES permit required. Other requirements apply.
	CWA	Section 404	USACE	Requires permit for discharge of dredge or fill material into waters of the United States and water quality certification. **Applicability:** Applicable.

TABLE 9-2 (Cont.)

Resource Category	Statute, Regulation, Order	Citation	Administering Agency	Permits, Approvals, Consultations, and Notifications
Hydrological Resources (Cont.)	E.O. 11988: Floodplain Management E.O. 11990: Protection of Wetlands	42 FR 26951 May 24, 1977 42 FR 26961 May 24, 1977 10 CFR Part 1022 (implementing regulations)	Federal agencies	When there is no practical alternative to development in floodplains and wetlands, Federal agencies are required to prepare a floodplains and wetlands assessment, design mitigation measures, and provide public review. For floodplain involvement, Federal agencies must issue a Floodplain Statement of Findings. **Applicability:** Applicable.
Soil Resources	Farmland Protection Policy Act	7 USC § 4201 et seq.	NRCS	Minimizes any adverse effects to prime and unique farmlands. **Applicability:** Applicable.
Ecological Resources	Bald and Golden Eagle Protection Act	16 USC § 668 et seq.	USFWS	Consultations should be conducted to determine if any protected birds are found to inhabit the area. If so, BHE must obtain a permit prior to moving any nests because of construction or operation of project facilities. **Applicability:** Applicable.
	E.O. 13112: Invasive Species	64 FR 6183 February 8, 1999	Federal agencies	Requires agencies, to the extent practicable and permitted by law, to prevent the introduction of invasive species; to provide for their control; and to minimize the economic, ecological, and human health impacts that invasive species cause. **Applicability:** Applicable.
	Magnuson-Stevens Fishery Conservation and Management Act	50 CFR 600.05–600.930	NOAA Fisheries	Requires Federal agencies to prepare a written EFH assessment describing the effects of that action on EFH. **Applicability:** Applicable.

TABLE 9-2 (Cont.)

Resource Category	Statute, Regulation, Order	Citation	Administering Agency	Permits, Approvals, Consultations, and Notifications
Ecological Resources (Cont.)	MBTA	16 USC § 703 et seq.	USFWS	Requires consultation to determine if there are any impacts on migrating bird populations because of construction or operation of project facilities. If so, BHE would develop mitigation measures to avoid adverse effects. **Applicability:** Applicable.
	ESA/Section 7	16 USC § 1531 et seq.	USFWS	Requires consultation to identify endangered or threatened species and their habitats, assess impacts thereon, obtain necessary biological opinions, and, if necessary, develop mitigation measures to reduce or eliminate adverse effects of construction or operations. **Applicability:** Applicable.
Cultural Resources	NHPA/Sections 106 and 110	16 USC § 470 et seq.	DOE	Requires consultation with the SHPO, land management agencies, and, in certain cases, the Advisory Council on Historic Preservation prior to construction to ensure that no significant historical properties (i.e., National Register-eligible properties, as defined in the NHPA) would be affected. **Applicability:** Applicable.
	Archaeological and Historical Preservation Act	16 USC § 469 et seq.	DOI	Requires DOE to obtain permits for any disturbances of archaeological resources. **Applicability:** Applicable.
	Antiquities Act	16 USC §§ 431–433	DOI	Requires DOE to comply with all applicable sections of the act. **Applicability:** Applicable.
	American Indian Religious Freedom Act	42 USC § 1996	DOI	Requires DOE to consult with local Native American Indian tribes prior to construction to ensure that their religious customs, traditions, and freedoms are preserved. **Applicability:** Applicable.

TABLE 9-2 (Cont.)

Resource Category	Statute, Regulation, Order	Citation	Administering Agency	Permits, Approvals, Consultations, and Notifications
Cultural Resources (Cont.)	E.O. 13007: Protection and Accommodation of Access to "Indian Sacred Sites"	61 FR 26771 May 29, 1996	DOI	Requires DOE to consider the potential impact of its actions on Native American sacred sites, access to sacred sites, or use of sacred sites. **Applicability:** Applicable.
Worker Health and Safety	Occupational Safety and Health Act	5 USC § 5108	OSHA	Requires agencies to comply with all applicable work safety and health legislation (including guidelines of 29 CFR Part 1960) and prepare, or have available, Material Safety Data Sheets. **Applicability:** Applicable.
Visual Resources	Environmental Quality Improvement Act	42 USC §§ 4371–4375	CEQ	Requires each Federal agency conducting or supporting public works activities affecting the environment to implement policies established under existing law that provide for enhancement of environmental quality. **Applicability:** Applicable.
Other	NEPA	42 USC § 4321 et seq. 40 CFR 1500–1508	CEQ	40 CFR Parts 1500–1508 direct all Federal agencies in the implementation of NEPA. DOE NEPA regulations are in 10 CFR Part 1021. **Applicability:** Applicable.
	TSCA	45 USC § 2011	EPA	Requires BHE to comply with inventory reporting requirements and chemical control provisions of TSCA to protect the public from the risks of exposure to chemicals. **Applicability:** Applicable.
	Hazardous Materials Transportation Act	49 USC § 1801 et seq.	DOT	Requires BHE to comply with the requirements governing hazardous materials and waste transportation. **Applicability:** Applicable.

TABLE 9-2 (Cont.)

Resource Category	Statute, Regulation, Order	Citation	Administering Agency	Permits, Approvals, Consultations, and Notifications
Other (Cont.)	Emergency Planning and Community Right-to-Know Act	42 USC § 11001 et seq.	EPA	Requires the development of emergency response plans and reporting requirements for chemical spills and other emergency releases, and imposes right-to-know reporting requirements covering storage and use of chemicals that are reported in toxic chemical release forms. **Applicability:** Applicable.
	Pollution Prevention Act	42 USC §§ 11001−11050	EPA	Establishes a national policy that pollution should be reduced at the source and requires a toxic chemical source reduction and recycling report for an owner or operator of the facility required to file an annual toxic chemical release form under Section 313 of SARA. **Applicability:** Potentially applicable.
	Radio Frequency Device, Kits	47 CFR 15.25	FCC	Provisions of these regulations prohibit operation of any devices producing force fields, which interfere with radio communications, even if (as with transmission lines) such devices are not intentionally designed to produce radio-frequency energy. The FCC requires each line operator to mitigate all complaints about interference on a case-specific basis. The FCC staff usually recommend specific conditions of certification to ensure compliance with FCC requirements. **Applicability:** Applicable.
	E.O. 12088: Federal Compliance with Pollution Control Standards	43 FR 47707 October 17, 1978	OMB	Requires Federal agencies to consult with the EPA and State agencies regarding the best techniques and methods for the prevention, control, and abatement of environmental pollution. **Applicability:** Potentially applicable.

TABLE 9-2 (Cont.)

Resource Category	Statute, Regulation, Order	Citation	Administering Agency	Permits, Approvals, Consultations, and Notifications
Other (Cont.)	E.O. 12898: Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations	50 FR 7629 February 16, 1994	EPA	Requires Federal agencies to identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations. **Applicability:** Applicable.

[a] Abbreviations: BHE = Bangor Hydro-Electric Company, CAA = Clean Air Act, CEQ = Council on Environmental Quality, CFR = *Code of Federal Regulations*, CWA = Clean Water Act, DOE = U.S. Department of Energy, DOI = U.S. Department of Interior, DOT = U.S. Department of Transportation, EFH = essential fish habitat, E.O. = Executive Order, EPA = U.S. Environmental Protection Agency, ESA = Endangered Species Act, FCC = Federal Communications Commission, FR = *Federal Register*, MBTA = Migratory Bird Treaty Act, MDEP = Maine Department of Environmental Protection, NAAQS = National Ambient Air Quality Standards, NEPA = National Environmental Policy Act, NESHAPs = National Emissions Standards for Hazardous Air Pollutants, NHPA = National Historic Preservation Act, NOAA Fisheries = National Oceanic and Atmospheric Administration, National Marine Fisheries Service, NPDES = National Pollutant Discharge Elimination System, NRCS = Natural Resources Conservation Service, NSPS = New Source Performance Standards, NSR = New Source Review, OMB = Office of Management and Budget, OSHA = Occupational Safety and Health Administration, SARA = Superfund Amendments and Reauthorization Act, SHPO = State Historic Preservation Officer, SIP = State Implementation Plan, TSCA = Toxic Substances Control Act, USACE = U.S. Army Corps of Engineers, USC = *United States Code*, USFWS = U.S. Fish and Wildlife Service.

10 CONSULTATIONS

Certain statutes and regulations require DOE to consider consultations with Federal and State agencies and Federally recognized Native American groups regarding the potential for the proposed project to disturb sensitive resources. The consultations are generally required before any land disturbance can begin. Most of these consultations are related to biological, cultural, and Native American resources. Biological resource consultations generally pertain to the potential for activities to disturb sensitive species or habitats. Cultural resource consultations pertain to the potential for destruction of important cultural or archaeological sites. Native American consultations are concerned with identifying Tribal concerns and issues related to the proposed project, including the potential for disturbance of Native American ancestral sites or traditional practices or resources.

DOE, as the lead Federal agency, has initiated consultations with Federal and State agencies as well as Federally recognized Native American groups regarding the potential of the alternatives for the NRI project to disturb sensitive resources. Table 10-1 summarizes the consultation activities conducted by DOE with agencies and Native American groups. Appendix A contains copies of the consultation letters. All agencies and Native American groups will be provided with a copy of the Draft EIS (DEIS). Information in the responses from the agencies and Native American groups was used in Chapters 3 and 4, as appropriate.

TABLE 10-1 Summary of Consultation Letters

Subject	Agency	To/From	Date
Invitation to participate in the NEPA EIS Process	Maine Department of Environmental Protection	To Ms. Dawn R. Gallagher, Commissioner, from Dr. Jerry Pell, DOE	November 30, 2004
	EPA, Office of Environmental Review, Regional Administrator's Office	To Ms. Elizabeth Higgins, Director, from Dr. Jerry Pell, DOE	November 30, 2004
	Bureau of Indian Affairs, Eastern Regional Office	To Mr. Franklin Keel, Regional Director, from Dr. Jerry Pell, DOE	November 30, 2004
	U.S. Army Corps of Engineers, New England District	To Col. Thomas Koning, District Engineer, from Dr. Jerry Pell, DOE	November 30, 2004
	National Marine Fisheries Service, Northeast Regional Office	To Ms. Patricia A. Kurkul, Regional Administrator, from Dr. Jerry Pell, DOE	November 30, 2004
	U.S. Fish and Wildlife Service, Region 5	To Mr. Marvin Moriarty, Regional Director, from Dr. Jerry Pell, DOE	November 30, 2004
Response to DOE's invitation to participate in the NEPA EIS Process	Bureau of Indian Affairs, Eastern Regional Office	To Dr. Jerry Pell, DOE, from Mr. Robert K. Impson, Director	December 7, 2004
	U.S. Fish and Wildlife Service, New England Field Office	To Dr. Jerry Pell, DOE, from Mr. Michael J. Bartlett, Supervisor	January 6, 2005
	National Marine Fisheries Service, Northeast Regional Office	To Dr. Jerry Pell, DOE, from Ms. Patricia A. Kurkul, Regional Administrator	January 7, 2005
Response to BHE request for information regarding the Federally listed species and critical habitats	National Marine Fisheries Service, Northeast Regional Office	To Mr. Gil A. Paquette, TRC Corporation, from Ms. Patricia A. Kurkul, Regional Administrator	January 21, 2005

TABLE 10-1 (Cont.)

Subject	Agency	To/From	Date
Follow-up to DOE's invitation to participate in the NEPA EIS Process	Maine Department of Environmental Protection	To Ms. Dawn R. Gallagher, Commissioner, from Dr. Jerry Pell, DOE	February 8, 2005
	EPA, Office of Environmental Review, Regional Administrator's Office	To Ms. Elizabeth Higgins, Director, from Dr. Jerry Pell, DOE	February 8, 2005
	U.S. Army Corps of Engineers, New England District	To Col. Thomas Koning, District Engineer, from Dr. Jerry Pell, DOE	February 8, 2005
Invitation to participate in the NEPA EIS Process	Houlton Band of Maliseet Indians	To Brenda Commander, Chief, from Dr. Jerry Pell, DOE	February 23, 2005
	Pleasant Point Passamaquoddy Reservation	To Melvin Francis, Governor, from Dr. Jerry Pell, DOE	February 23, 2005
	Passamaquoddy Tribe	To Robert Newell, Governor, from Dr. Jerry Pell, DOE	February 23, 2005
	Aroostook Band of Micmacs	To William W. Phillips, Chief, from Dr. Jerry Pell, DOE	February 23, 2005
	Penobscot Indian Nation	To James Sappier, Chief, from Dr. Jerry Pell, DOE	February 23, 2005
Follow-up to DOE's invitation to participate in the NEPA EIS Process	National Marine Fisheries Service, Northeast Regional Office	To Ms. Patricia A. Kurkul, Regional Administrator, from Dr. Jerry Pell, DOE	February 23, 2005
	Bureau of Indian Affairs, Eastern Regional Office	To Dr. Jim Kardatzke, Branch Chief, from Dr. Jerry Pell, DOE	February 24, 2005

11 REFERENCES

Note to reader: This list of references identifies Web pages and associated URLs where reference data were obtained. It is likely that at the time of publication of this DEIS, some of these Web pages may no longer be available or their URL addresses may have changed. Thus, DOE has maintained hard copies of the information and data obtained from the referenced Web pages.

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13 GLOSSARY

100-Year flood: A flood level that, on average, has a 1% probability of being equaled or exceeded during any given year.

Acre: A unit of land equal to 43,560 ft^2; a square parcel of land approximately 208.5 ft on each side.

Aesthetics: Things that can be appreciated through the five senses (e.g., visual resources).

Affected environment: The existing biological, physical, social, and economic conditions of an area subject to change, both directly and indirectly, as the result of a proposed human action.

Air pollutant: An airborne substance that could, in high enough concentrations, harm living things or cause damage to materials. From a regulatory perspective, an air pollutant is a substance for which emissions or atmospheric concentrations are regulated or for which maximum guideline levels have been established because of potential harmful effects on human health and welfare.

Air quality standards: The level of pollutants prescribed by regulation that may not be exceeded during a specified time in a defined area.

Alevin: A salmon hatched out of its egg, but still attached to the yolk sac.

All-terrain vehicle (ATV): An off-road motor vehicle designed for use on rough, sandy, or marshy ground, as well as roads.

Alternating current (AC): A flow of electrical current that increases to a maximum in one direction, decreases to zero, and then reverses direction and reaches maximum in the other direction. The cycle is repeated continuously. The number of such cycles per second is equal to the frequency, measured in hertz (Hz). U.S. commercial power is 60 Hz.

Alternative routes: Routes that have been identified on the basis of constraint mapping, stakeholder consultation, impact assessment, and other factors.

Ambient: Undisturbed, natural conditions such as temperature; surrounding conditions.

Ambient noise: The background noise in an area or environment. It is a composite of sounds from many sources near and far.

Ampere: The unit of measurement of electric current. It is proportional to the quantity of electrons flowing past a given point on a conductor for one second.

Anadromous species: Fish species, such as salmon, that migrate from saltwater to freshwater to reproduce.

Anthropogenic: Derived or resulting from human activity.

Applicant: Bangor Hydro-Electric Company (BHE), which is applying to amend Presidential Permit PP-89.

Aquifer: A permeable underground formation that yields usable amounts of water to a well or spring. The formation could be sand, gravel, limestone, and/or sandstone.

Archaeological site: Any location where humans have altered the terrain or discarded artifacts during either prehistoric or historic times.

Artifact: An object produced or shaped by human workmanship of archaeological or historical interest.

Attainment area: An area that the U.S. Environmental Protection Agency has designated as being in compliance with one or more of the National Ambient Air Quality Standards for sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone, lead, and particulate matter. Any area may be in attainment for some pollutants but not for others.

Attenuation: The reduction in level of sound.

Bedrock: The more or less solid rock in place either at or beneath the surface of the earth.

Best management practices (BMPs): A practice (or combination of practices) that is determined to provide the most effective, environmentally sound, and economically feasible means of managing an activity and mitigating its impacts.

Biological assessment (BA): A document prepared for the Endangered Species Act Section 7 process to determine whether a proposed activity under the authority of a Federal action agency is likely to adversely affect listed species, proposed species, or designated critical habitat.

Biological resources: Fish, wildlife, plants, biota, and their habitats, which may be land, air, or water.

Biodiversity: The number and variety of different organisms in an ecosystem. It is used to describe species richness, ecosystem complexity, and genetic variation.

Biota: The living organisms in a given region.

Bivalves: A mollusk whose body is enclosed by two hinged shells (e.g., mussels and clams).

Bog: Waterlogged, spongy ground consisting primarily of mosses and containing decaying vegetation that may develop into peat.

Borrow pit: A pit or excavation area used for gathering earth materials (borrow) such as sand or gravel.

Browse: Twigs, shoots, and leaves of woody plants used as food by woodland mammals such as white-tailed deer, moose, and snowshoe hare.

Buffer area: An area of land and/or plants adjacent to a stream or other water body of sufficient width to lessen the entrance of pollutants (e.g., fertilizers, pesticides, and eroded soils) into a water body; provide shade; limit erosion; and promote natural influx of plant nutrients.

Bus: A conductor or an assembly of conductors for collecting electric currents and distributing them to outgoing feeder lines.

Cancer: A term applied to a variety of different diseases characterized by abnormal new growth of cells and the spread of those cells to new locations within the body.

Candidate species: Plants and animals for which the U.S. Department of the Interior U.S. Fish and Wildlife Service or National Oceanic and Atmospheric Administration National Marine Fisheries Service has sufficient information on biological vulnerability and threats to justify proposing to add them to the threatened and endangered species list, but cannot do so immediately because other species have a higher priority for listing.

Canopy: The upper forest layer of leaves consisting of tops of individual trees whose branches sometimes cross each other.

Capable tree: A tree that would grow within the clearance zone of the conductors within the next 3 to 4 years.

Capacity: The load for which a generator, turbine, transformer, transmission circuit, apparatus, station, or system is rated. Capacity is also used synonymously with capability.

Carbon monoxide (CO): A colorless, odorless gas that is toxic if breathed in high concentrations over a period of time. It is formed as the product of the incomplete combustion of hydrocarbons (fuel). Carbon monoxide is one of six criteria air pollutants for which the U.S. Environmental Protection Agency has set National Ambient Air Quality Standards.

Carcinogen: A cancer-causing substance.

Census blocks: Census blocks are defined by the U.S. Bureau of the Census and are the smallest geographic unit for which that agency tabulates data.

Clear-cut: A forest harvesting practice in which all or most of the trees are removed from a site.

Code of Federal Regulations (CFR): All Federal regulations in force are published in codified form in the *Code of Federal Regulations*.

Cogeneration: Production of electrical (or mechanical) energy and thermal energy from the same primary energy source.

Coldwater fisheries: Fish assemblages characterized by trout, char, and/or whitefish. Water temperatures must be low enough to meet the thermal requirements for survival and spawning for natural populations to be maintained. If temperatures are too high, seasonal or annual nonsustaining coldwater fisheries could be maintained by stocking.

Community (biotic): All plants and animals occupying a specific area under relatively similar conditions.

Conductor: Any material capable of carrying an electrical current.

Coniferous forest: A forest dominated by cone-bearing, usually evergreen, trees.

Conservation easement: A legal agreement between a property owner and a qualified conservation organization or agency that restricts the uses that may be made of the property. Most conservation easements limit or prohibit development of the land for commercial, industrial, or residential uses in perpetuity.

Construction lay-down area: Work area required for each transmission line support structure to accommodate structure materials and construction equipment.

Contrast: The effect of differences in the form, line, color, or texture of the landscape features within the area being viewed.

Corona effect: The electrical breakdown of air into charged particles. It is caused by the electric field at the surface of conductors.

Council on Environmental Quality (CEQ): Established by the National Environmental Policy Act. Council on Environmental Quality regulations (40 CFR Parts 1500–1508) describe the process for implementing the National Environmental Policy Act, including preparation of environmental assessments and environmental impact statements, and the timing and extent of public participation.

Criteria air pollutant: An air pollutant that is regulated by the National Ambient Air Quality Standards. The U.S. Environmental Protection Agency must describe the characteristics and potential health and welfare effects that form the basis for setting or revising the standard for each regulated pollutant. Criteria pollutants are sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone, lead, and particulate matter.

Critical habitat: Habitat essential to the conservation of an endangered or threatened species that has been designated as critical by the U.S. Department of the Interior U.S. Fish and Wildlife Service or National Oceanic and Atmospheric Administration National Marine Fisheries Service following the procedures outlined in the Endangered Species Act and its implementing regulations (50 CFR 424). See *Endangered species* and *Threatened species*.

Cropland: Land that currently supports agricultural crops, including silage and feed grains, bare farm fields resulting from cultivation or harvest, and maintained orchards.

Cultural resources: The archaeological sites, historic structures and features, and traditional cultural properties of human occupation or use, including manufactured objects, such as tools or buildings. Cultural resources may also include objects, sites, or geological/geographical locations significant to Native Americans.

Culvert: A pipe or covered channel that directs surface water through a raised embankment or under a roadway from one side to the other.

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

Current: The movement of electricity through a conductor.

Cutting cycle: The period of time between major harvests in a stand of trees. It is usually determined by the type of management being practiced, the condition and type of the forest, and the growing conditions of the soil.

Danger trees: Trees located outside or inside the right-of-way that pose a threat to the operation of the transmission line.

Decibel (dB): A unit for expressing the relative intensity of sounds on a scale from 0 for the average least-perceptible sound to about 130 for the average pain level. For traffic and industrial noise measurements, the A-weighted decibel [dB(A)], a frequency-weighted noise unit, is widely used. The A-weighted decibel scale corresponds approximately to the frequency response of the human ear and thus correlates well with loudness. A 10-dB(A) increase represents a doubling of the noise level, while a 10-dB(A) decrease results in the halving of the noise level.

Deciduous: Trees or shrubs that lose their leaves each year during a cold or dry season.

Demographic: Pertaining to the study of human population characteristics, including size, growth rates, density, distribution, migration, birth rates, and mortality rates.

Diameter at breast height (DBH): The diameter of a standing tree measured at 4.5 ft (1.4 m) above the ground.

Direct current (DC): A steady current that flows only in one direction. The current from batteries is an example of direct current.

Direct effects (direct impacts): As defined by 40 CFR 1508.8, these are effects that are caused by the action and occur at the same time and place as the action.

Disturbance: An event that changes the local environment by removing organisms or opening up an area, thereby facilitating colonization by new, often different, organisms.

Disturbed areas: Areas where natural vegetation and soils have been removed or disrupted.

Diversity: The distribution and abundance of different plant and animal communities and species within an area.

Dormant: In a condition of biological rest or inactivity characterized by a slowing down of growth or development and the suspension of many metabolic processes.

Double-circuit: A transmission line consisting of two systems of conductors (or wires) through which electric current flows.

Drainage: Natural channel through which water flows sometime during the year. Natural and artificial means for effecting discharge of water as by a system of surface and subsurface passages.

Drumlin: An elongated or oval hill of glacial till.

Ecology: The branch of science dealing with the interrelationships of living organisms with one another and with their nonliving environment.

Ecoregion: A geographically distinct area of land that is characterized by a distinctive climate, ecological features, and biotic communities.

Ecosystem: The combination of the biological (biotic) community and the nonliving (abiotic) environment.

Edge or edge habitat: An area where two habitat types meet (e.g., forest and field).

Effects (or impacts): As used in National Environmental Policy Act documentation, the terms effects and impacts are synonymous. Effects can be ecological (such as the effects on natural resources and on the components, structures, and functioning of affected ecosystems), aesthetic, historic, cultural, economic, social, or health; effects can be direct, indirect, or cumulative. Effects include both beneficial and detrimental impacts. Defined at 40 CFR 1508.8.

Electric and magnetic fields (EMF): Electric and magnetic fields are generated when charged particles (e.g., electrons) are accelerated. Charged particles in motion produce magnetic fields. Electric and magnetic fields are typically generated by alternating current in electrical conductors. Also referred to as electromagnetic fields.

Elevation: Height above sea level.

Eligible cultural resource: A cultural resource that has been evaluated and reviewed by an agency and the State Historic Preservation Office and recommended as eligible for inclusion in the *National Register of Historic Places*, based on the criteria of significance. The criteria of significance consider American history, architecture, archaeology, engineering, and culture. The criteria require integrity and association with lives or events, distinctiveness for any of a variety or reasons, or importance because of information the property does or could hold.

Emergent vegetation: Aquatic vegetation that reaches above the surface of the water.

Emergent wetlands: Wetlands, commonly called marshes and wet meadows, that are dominated by grasses, sedges, and other nonwoody plants.

Emission standards: Requirements established by a State, local government, or the U.S. Environmental Protection Agency administrator that limit the quantity, rate, or concentration of emissions of air pollutants on a continuous basis.

Emissions: Pollution discharged into the atmosphere from smoke stacks, other vents, and surface areas of commercial or industrial facilities, residential chimneys, and vehicles.

Endangered species: Plants or animals that are in danger of extinction throughout all or a significant portion of their ranges and that have been listed as endangered by the U.S. Department of the Interior U.S. Fish and Wildlife Service or the National Oceanic and Atmospheric Administration National Marine Fisheries Service following the procedures outlined in the Endangered Species Act and its implementing regulations (50 CFR Part 424). Some States also list species as endangered.

Endemic: Unique to a particular region.

Energy: That which does or is capable of doing work. It is measured in terms of the quantity of work it is capable of doing; electric energy is usually measured in kilowatt-hours.

Environment: The aggregate of physical, biological, economic, and social factors affecting organisms in an area.

Environmental analysis: An analysis of alternative actions and their predictable environmental effects, including physical, biological, economic, and social consequences, and their interactions; short- and long-term effects; and direct, indirect, and cumulative effects.

Environmental impact statement (EIS): The detailed written statement that is required by Section 102(2)(C) of the National Environmental Policy Act for a proposed major Federal action significantly affecting the quality of the human environment. A U.S. Department of Energy environmental impact statement is prepared in accordance with applicable requirements of the Council on Environmental Quality National Environmental Policy Act regulations in 40 CFR Parts 1500–1508 and Department of Energy National Environmental Policy Act regulations in 10 CFR Part 1021. The statement includes, among other information, discussions of the environmental impacts of the proposed action and the range of reasonable alternatives, adverse environmental effects that cannot be avoided should the proposal be implemented, the relationship between short-term uses of the human environment and enhancement of long-term productivity, and any irreversible and irretrievable commitments of resources.

Environmental justice: An identification of potential disproportionately high and adverse impacts on low-income and/or minority populations that may result from proposed Federal actions (Executive Order 12898).

Ephemeral: Lasting a very short time.

Epicenter: The point on the earth's surface directly above the focus of an earthquake.

Epidemiology: The quantitative study of the occurrence of human states and disease states in human populations.

Erosion: The movement of exposed soil caused by the action of rain, snowmelt, or wind.

Esker: A long, narrow ridge or mound of sand, gravel, and boulders deposited by a stream flowing on, within, or beneath a stagnant glacier.

Essential fish habitat (EFH): Those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity. The conservation of essential fish habitat is an important component of building and maintaining sustainable fisheries.

Essential wildlife habitat: Designated areas in the State of Maine that currently or historically provide physical or biological features essential to the conservation of a Federally listed endangered or threatened species, and which could require special management considerations.

Even-aged stand: A stand in which most trees originated around the same time. Even-aged stands result from cutting all trees in a stand within a relatively short period of time, major natural disturbance, or reversion of cleared land to forest.

Extremely low frequency (ELF): Extremely low frequency fields are at the end of the electromagnetic spectrum. They range between 3 to 3,000 Hz.

Fault: A fracture or a zone of fractures within a rock formation along which vertical, horizontal, or transverse slippage has occurred.

Fauna: Animals, especially those of a specific region, considered as a group.

Feeder lines: Power lines that travel out from substations to "feed" smaller distribution lines in a certain geographic area.

Feller buncher: A large logging machine similar to a backhoe with an attachment that cuts trees in place of a shovel. It consists of a standard heavy equipment base with a tree-grabbing device equipped with a saw or other device at the bottom that cuts the tree off at the base and places it on the stack of cut trees.

Fen: A type of wetland that accumulates peat deposits. Fens are less acidic than bogs, deriving most of their water from groundwater rich in calcium and magnesium. See *Bog* and *Peat*.

Field effect: Induced electric currents and voltages as well as related effects that might occur as a result of electric and magnetic fields at ground level.

Field intensity: The strength of an electric field.

Flashover: A sudden surge of voltage causing an arc between conductors.

Fledge: To leave the nest, usually with the ability to fly or run.

Floodplain: The lowlands adjoining inland and coastal waters and relatively flat areas and flood-prone areas of offshore islands. The base floodplain is defined as the 100-year (1%) floodplain. The critical action floodplain is defined as the 500-year (0.2%) floodplain.

Flora: Plants, especially, those of a specific region, considered as a group.

Flyway: A concentrated, predictable flight path of migratory bird species between their breeding ground and their wintering area.

Foliage height diversity (FHD): Habitat complexity, or number of vegetation layers deemed necessary to maintain populations of songbirds.

Forage: Vegetation used for food by wildlife, particularly big game wildlife and domestic livestock.

Forbs: Nonwoody plants that are not grasses or grasslike.

Foreground-middleground: The area visible from a travel route, use area, or other observer position to a distance of 3 to 5 mi (5 to 8 km). The outer boundary of this zone is defined as the point where the texture and form of individual plants are no longer apparent in the landscape, and vegetation is apparent only in pattern or outline.

Forest types: Associations of tree species that have similar ecological requirements. Some common forest types in Maine are spruce-fir, northern hardwoods, pine-oak, and poplar-birch. Often types are simplified into hardwood, softwood, and mixed wood.

Forested wetland: A wetland dominated by trees taller than 20 ft (6 m).

Forest land: Land at least 10% stocked by forest trees of any size, or land that formerly had such a tree cover and is not currently developed for a nonforest use.

Fossil fuel: Natural gas, petroleum, coal, and any form of solid, liquid, or gaseous fuel derived from such material for the purpose of creating useful heat.

Fry: Salmon stage just after the alevin, but before the parr stage in midsummer.

Fugitive dust: The dust released from activities associated with construction, manufacturing, or transportation.

Furbearers: Species that are of primary economic importance for their fur rather than as a food source.

Gauss (G): A unit for expressing the strength of a magnetic field. Magnetic field strengths associated with transmission lines and electrical appliances are generally in the milligauss (mG) range.

Geologic resources: Material of value to humans that is extracted (or is extractable) from solid earth, including minerals, rocks, and metals.

Geology: The science that deals with the study of the materials, processes, environments, and history of the earth, including the rocks and their formation and structure.

Geographic information system (GIS): A system of databases describing, mapping, measuring, and displaying land features.

Geomagnetic fields: Steady (direct current) magnetic fields caused by the earth.

Glacial till: The nonsorted, nonstratified sediment deposited by glacier ice and consisting of clay, sand, gravel, and boulders.

Glacier: A large mass of ice, formed by the compaction of snow, that persists all year and flows slowly over the surface of the ground or down a valley.

Glaciofluvial materials: Materials that exhibit clear evidence of having been deposited by glacial meltwater streams either directly in front of, or in contact with, glacier ice.

Glaciomarine sediments: Sediments of glacial origin laid down in a marine environment in close proximity to glacier ice. They include materials settling from suspsension and from submarine gravity flows, and settled particles released by melting of both floating ice and ice shelves.

Gravel: Rounded or angular fragments of rock up to 3 in. (8 cm) in diameter.

Great pond: A Maine classification for a natural body of water greater than 10 acres (4 ha), or any man-made water body of 30 acres (12 ha) or more.

Grilse: Salmon that have spent 1 year at sea and then return to freshwater.

Ground-level ozone: Ozone concentrations near the earth's surface in the troposphere (below 7 mi [11 km]). It is formed by a chemical reaction between volatile organic pollutants and oxides of nitrogen in the presence of sunlight. Ozone concentrations can reach unhealthy levels when the weather is hot and sunny with little or no wind. Ozone at the ground level can cause adverse effects on lung function and other respiratory effects. It is one of the six criteria pollutants for which the U.S. Environmental Protection Agency has adopted National Ambient Air Quality Standards.

Grounding: Connecting an object that conducts electricity, such as a wire or the metal frame of an appliance, to an object with zero potential to conduct electricity (such as the earth).

Groundwater: Water within the earth that supplies wells and springs.

Guy wire: Wire or cable used to secure and stabilize support structures.

Habitat: The environment in which the life-cycle requirements of a plant or animal are supplied.

Habitat fragmentation: The breaking up of a single large habitat area such that the remaining habitat patches are smaller and farther apart from each other.

Hardwoods: General term for deciduous trees.

Harvest: The cutting, felling, and removal of forest timber or other forest materials.

Herbaceous plants: Nonwoody plants.

Herbicides: Chemicals used to kill undesirable vegetation.

Hertz (Hz): The unit of frequency for the back and forth movements of alternating currents and their resulting magnetic fields corresponding to one cycle per second. In the United States, the electric power frequency is 60 Hz.

Historic properties: Under the National Historic Protection Act, these are properties of national, State, or local significance in American history, architecture, archaeology, engineering, or culture that are worthy of preservation.

Historic site: The site of a significant event, prehistoric or historic activity, or structure or landscape (existing or vanished), where the site itself possesses historical, cultural, or archaeological value apart from the value of any existing structure or landscape.

Historic structure: A standing structure that has historic significance.

Hydrocarbons: Organic compounds occurring in petroleum, natural gas, and coal.

Hydroelectric: Of or relating to production of electricity by water power.

Hydrology: The study of water that covers the occurrence, properties, distribution, circulation, and transport of water, including groundwater, surface water, and rainfall.

Impacts: See *Effects*.

IMPLAN®: An input-output-based economic impact modeling system.

Indigenous species: Species that occur within their historic biogeographical range (i.e., naturally occurring native species).

Indirect effects (indirect impacts): As defined by 40 CFR 1508.8, these are effects that are caused by the action but are later in time or farther removed in distance but which are still reasonably foreseeable.

Infrastructure: The basic facilities, services, and utilities needed for the function of an industrial facility or site.

Interested parties: Those groups or individuals that are interested, for whatever reason, in the project and its progress. Interested parties include, but are not limited to, private individuals, public agencies, organizations, customers, and potential customers.

Intermittent stream: A stream or portion of a stream that flows only in direct response to precipitation or snowmelt. It is dry for part of the year and has a definable channel with evidence of scour or sediment deposition.

Introduced species: Species that are found to occur in areas outside of their natural distributions as a direct result of human intervention. Often synonymously referred to as alien, foreign, exotic, invasive, nonnative, or nonindigenous species.

Irretrievable: Applies to the loss of production, harvest, or use of natural resources. For example, some or all of the timber production from an area is lost irretrievably while it is serving as a right-of-way. The production lost is irretrievable, but the action is not irreversible. If the use changes, it is possible to resume timber production.

Irreversible: Applies primarily to the use of nonrenewable resources, such as minerals or cultural resources, or to those factors that are renewable only over long time spans, such as soil productivity. Irreversible also includes loss of future options.

Kame: A short ridge, hill, or mound of stratified drift deposited by glacial meltwater.

Kelt: A salmon that has spawned and is still in freshwater but is on its way back to the sea.

Kilovolt (kV): The electrical unit of power that equals 1,000 volts.

Kilowatt-hour (kWh): Unit of work or energy equal to that expended by 1 kilowatt (1,000 watts) in 1 hour.

Land use: The way land is developed and used by humans.

Land Use Regulation Commission (LURC): A division of the Maine Department of Conservation that has jurisdiction over land use in unorganized townships.

Landing (or yard): A cleared area within or adjacent to a timber harvest where logs or tree-length materials are processed, piled, stored, and loaded for transport to a sawmill or other facility.

Landform: Any physical, recognizable form on the earth's surface, having a characteristic shape and produced by natural causes.

Landscape: An area composed of interacting ecosystems that are repeated because of geology, land, soils, climate, biota, and human influences throughout the area. Landscapes are generally of a size, shape, and pattern that are determined by interacting ecosystems.

Lead (Pb): A gray-white metal that is listed as a criteria air pollutant. Health effects from exposure to lead include brain and kidney damage and learning disabilities. Sources include leaded gasoline and metal refineries. Lead is one of six criteria air pollutants for which the U.S. Environmental Protection Agency has set National Ambient Air Quality Standards.

Line losses: The general term applied to energy and power lost in the operation of an electric system. Losses occur principally as energy transformations from kilowatt-hours to wasted heat in electrical conductors and apparatus. Specifically, in electricity transmission lines, losses are due to the resistance of the copper or aluminum wires themselves. For transmission lines that have the same characteristics of configuration, voltage, and load, line losses would be a function of line length.

Long-term effects: Effects that would remain permanently or for many years following completion of the project.

Low-income population: A population that is classified by the U.S. Bureau of the Census 2000 as having an aggregated mean income level for a family less than $17,463 (in 1999). This level is adjusted through the poverty index by using a standard of living percentage change where applicable. In identifying low-income populations, a community may be considered either as a group of individuals living in geographic proximity to one another, or as a set of individuals (such as migrant workers or Native Americans), where either type of group experiences common conditions of environmental exposure or effects.

Leukemia: Leukemia is considered a cancer of the blood. It describes any of the various diseases found in bone marrow that results in unrestrained production of white blood cells.

Maine Board of Environmental Protection (MBEP): The Maine Board of Environmental Protection is part of the Maine Department of Environmental Protection. The Board has decision-making authority independent of the Commission of the Main Department of Environmental Protection. The Board is composed of 10 volunteer citizen members, appointed by the Governor of Maine and confirmed by the Maine Legislature, to make decisions on selected permit applications and provide a forum for public participation in the Maine Department of Environmental Protection's decisions.

Maine Department of Environmental Protection (MDEP): The Maine Department of Environmental Protection is responsible for protecting and restoring Maine's natural resources and enforcing the State's environmental laws.

Maine Department of Inland Fisheries and Wildlife (MDIFW): The Maine Department of Inland Fisheries and Wildlife is responsible for establishing and enforcing rules and regulations governing fishing, hunting, and trapping; propagation and stocking of fish; acquisition of wildlife management areas; the registration of snowmobiles, watercraft, and all-terrain vehicles; safety programs for hunters, snowmobilers, and watercraft; and the issuing of licenses (hunting, fishing, trapping, and guiding) and permits.

Main Historic Preservation Commission (MHPC): The agency which functions as the State Historic Preservation Office in Maine. The Maine Historic Preservation Commission is responsible for the identification, evaluation, and protection of Maine's significant cultural resources.

Mainstem: The principal channel of a drainage system into which other smaller streams or rivers flow.

Marsh: A wetland where the dominant vegetation is nonwoody plants, such as grasses, as compared with a swamp where the dominant vegetation is woody plants, such as trees and shrubs. Marshes are also known as emergent wetlands.

Mast: Nuts accumulated on the forest floor and used as food by wildlife.

Material Safety Data Sheets (MSDSs): Material Safety Data Sheets are required by the Occupational Safety and Health Administration and provide details on chemical and physical dangers, safety procedures, and emergency response for chemicals.

Megawatt (MW): The electrical unit of power that equals 1 million watts or 1,000 kilowatts.

Meteorology: The science dealing with the dynamics of the atmosphere and its phenomena, especially relating to weather.

Mineral: Naturally occurring inorganic element or compound.

Migration: The change of location periodically, especially by moving seasonally from one region to another.

Minority population: Individual(s) who are members of the following population groups: American Indian or Alaskan Native; Asian or Pacific Islander; Black, not Hispanic origin, or Hispanic are minorities. The Council of Environmental Quality identifies these groups as minority populations when either (1) the minority population of the affected area exceeds 50%, or (2) the minority population percentage in the affected area is meaningfully greater than the minority population percentage in the general population or appropriate unit of geographical analysis.

Mitigate: To lessen the severity of an impact to a resource.

Mitigation: Includes avoiding the impacts by not taking actions; minimizing the impacts by limiting the degree or magnitude of the action; rectifying the impact through repairing, rehabilitating, or restoring the affected environment; reducing or eliminating the impact over time by preservation and maintenance during the life of the action; and compensating for the impact. Defined at 40 CFR 1508.20.

Mixed forest: Forest stands occupied by a mixture of softwood and hardwood tree species. Neither hardwood nor softwood tree species occupy more than 75% of the tree stocking.

Moraine: A type of glacial landform composed of debris ranging from sand, clay, and rock fragments to immense boulders that have been picked up, moved, and deposited by a glacier.

Mutagenic: Causing mutation, or the abrupt change in the genotype of an organism.

National Ambient Air Quality Standards (NAAQS): Standards defining the highest allowable levels of certain pollutants in the ambient air. Because the U.S. Environmental Protection Agency must establish the criteria for setting these standards, the regulated pollutants are called criteria pollutants. The criteria pollutants are sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone, lead, and particulate matter.

National Oceanic and Atmospheric Administration (NOAA) Fisheries: Part of the U.S. Department of Commerce, National Oceanic and Atmospheric Administration Fisheries Office of Protected Resources is charged with the implementation of the Endangered Species Act of 1973 for marine and anadromous species. National Oceanic and Atmospheric Administration Fisheries is properly referred to as the National Marine Fisheries Service (NMFS).

National Register of Historic Places (NRHP): A list maintained by the Secretary of the Interior of districts, sites, buildings, structures, and objects of prehistoric or historic local, State, or national significance. The list is expanded as authorized by Section 2(b) of the Historic Sites Act of 1935 (16 USC 462) and Section 101(a)(1)(A) of the National Historic Policy Act.

Native American: A person culturally identified with a Tribe that is indigenous to the United States.

Native species: Plants and animals that originated in the area in which they are found, that is, they naturally occur in the area.

Natural community: As defined by the Maine Natural Areas Program, a natural community is an assemblage of interacting plants and animals and their common environment, recurring across the landscape, in which the effects of human intervention are minimal.

Neotropical migrant: Birds that nest in North America and migrate to winter in Central or South America, Mexico, or the Caribbean.

Nitrogen dioxide (NO_2): See *Nitrogen oxides.*

Nitrogen oxides (NO_X): Oxides of nitrogen include various nitrogen compounds, primarily nitrogen dioxide and nitrous oxide. They form when fossil fuels are burned at high temperatures and react with volatile organic compounds to form ozone, the main component of urban smog. They are also precursor pollutants that contribute to the formation of acid precipitation. Nitrogen dioxide is a nitrogen oxide and one of the six criteria air pollutants for which the U.S. Environmental Protection Agency has set National Ambient Air Quality Standards.

Noise: Unwanted or undesirable sound, usually characterized as being so loud as to interfere with, or be inappropriate to, normal activities such as communication, sleep, or study.

Nonattainment area: An area that the U.S. Environmental Protection Agency has designated as not meeting one or more of the National Ambient Air Quality Standards for criteria pollutants. An area may be in attainment for some pollutants but not others.

Nonforest land: Land that has never supported forests, or land formerly forested but now in nonforest use (e.g., cropland, pasture, residential areas, marshes, swamps, highways, and industrial or commercial uses).

Nongame species: Wildlife species that are typically not hunted, either by common practice or by State wildlife laws. Examples include songbirds, eagles, insects, and most reptiles and amphibians.

Non-point-source pollution: Pollution caused by a diffused or indirect source, such as a drainage field or runoff following a rain.

Nutrients: In the forest context, nutrients are mineral elements such as nitrogen, phosphorus, or potassium that are naturally present or may be added to the woodland environment by practices such as fertilizer applications. Nutrients are necessary for the growth and reproduction of organisms. In water, nutrients, chiefly nitrates and phosphates, promote the growth of algae and bacteria.

Occupational Safety and Health Administration (OSHA): Congress created the Occupational Safety and Health Administration under the Occupational Safety and Health Act on December 29, 1970. Its mission is to prevent work-related injuries, illnesses, and death.

Old-growth forest: A wooded area that has no evidence of harvest or alteration by humans. An old-growth forest often has large individual trees, a multilayered crown canopy, and a significant accumulation of large woody material such as snags and fallen logs.

Oriented strand board: A manufactured wood panel made out of small chips of wood scraps and glue to create a strong sheet material that is often used in place of plywood.

Outstanding River Segments: Rivers declared by the Maine Legislature to provide irreplaceable social and economic benefits to people because of their unparalleled natural and recreational values.

Overstory: The level of forest canopy that includes the crowns of dominant, codominant, and intermediate trees.

Ozone (O_3): The triatomic form of oxygen. It is formed in the atmosphere by chemical reactions involving nitrogen oxides and volatile organic compounds. The reactions are energized by sunlight. Ozone is a major constituent of smog and is one of six criteria air pollutants for which the U.S. Environmental Protection Agency has set National Ambient Air Quality Standards.

Palustrine: Pertaining to wet or marshy habitats.

Parr: Young freshwater salmon in stage from dispersal from the redd to migration as a smolt.

Particulate matter: Fine solid or liquid particles, such as dust, smoke, mist, fumes, or smog, found in air or emissions. The size of the particulates is measured in micrometers (μm). One micrometer is 1 millionth of a meter or 0.000039 inch. Particle size is important because the U.S. Environmental Protection Agency has National Ambient Air Quality Standards for particulates. See $PM_{2.5}$ and PM_{10}.

Particulates: Solid or liquid particles, such as dust, smoke, mist, or smog, small enough to become airborne.

Passerines: Perching birds or songbirds.

Peak capacity: The maximum capacity of an electricity system to meet power loads.

Peak demand: The highest demand for power during a stated period of time.

Peat: Organic material that forms in the waterlogged, sterile, acidic conditions of bogs and fens.

Peatland: A type of poorly drained wetland with accumulations of partially decomposed plants and other organic materials.

Permeability: The ability of rock or soil to transmit a fluid.

Perennial stream: A stream that normally maintains water in its channel all year.

Pesticide: Any chemical used to control undesirable insects, vegetation, or animals, or to guard against or treat a forest or crop health problem.

Phase: The time relationship between the oscillations of two alternating currents. For technical reasons, electric power is often transmitted using three wires, each of which has a current that is one-third of a cycle behind the other (three-phase current).

PM_{10}: Airborne particulate matter with a mean aerodynamic diameter less than or equal to 10 μm; regulated under the National Ambient Air Quality Standards.

$PM_{2.5}$: Airborne particulate matter with a mean aerodynamic diameter less than or equal to 2.5 μm; regulated under the National Ambient Air Quality Standards.

Physiography: The physical geography of an area or the description of its physical features.

pH: A measure of acidity or alkalinity. A pH of 7 is neutral, lower values are more acidic, and higher values are more alkaline.

Photochemical oxidants: Secondary gaseous pollutants (e.g., ozone) created in the atmosphere from conversions and reactions of primary gaseous pollutants (such as sulfur oxides and nitrogen oxides).

Physiographic province: A region in which the landforms are similar in geologic structure and differ significantly from the landform patterns in adjacent regions.

Physiography: The physical geography of an area or the description of its physical features.

Point-source pollution: Pollution coming from a very specific source, such as an exhaust stack.

Poletimber tree: A tree that is at least 5.0-in. (12.7-cm) in diameter at breast height, but smaller than sawtimber trees. Softwood poletimber trees range from 5.0 to 8.9 in. (12.7 to 22.6 cm) in diameter at breast height, while hardwood poletimber trees range from 5.0 to 10.9 in. (12.7 to 27.7 cm) in diameter at breast height.

Pollutant: Any waste matter or undesirable material entering the environment that contaminates the air, water, or soil.

Pollution: The addition of an undesirable agent to the environment in excess of the rate at which natural processes can degrade, assimilate, or disperse it.

Polychlorinated biphenyls (PCBs): A hazardous group of manufactured organic compounds made up of carbon, hydrogen, and chlorine. They were used in the manufacture of plastics and as insulating fluids for electrical equipment. Because they are very stable and fat-soluble, they accumulate in ever-higher concentrations as they move up the food chain. Their use was banned in the United States in 1979.

Population: A group of individuals of the same species occupying a defined locality during a given time that exhibit reproductive continuity from generation to generation.

Potable water: Water that can be used for human consumption.

Power frequency: The frequency of the alternating current used for transmission and distribution of electric power. Power frequency is 60 Hz in North American and 50 Hz elsewhere.

Power grid: The power grid encompasses a network of long-distance, high-voltage transmission lines, substations, and distribution lines carrying electricity that is distributed to customers of local utilities.

Prehistoric: Of, relating to, or existing in times antedating written history. Prehistoric cultural resources are those that antedate written records of the human cultures that produced them.

Prime farmland: The U.S. Department of Agriculture defines prime farmland as the land that is best suited to producing food, feed, forage, fiber, and oilseed crops. It has the soil quality, growing season, and moisture supply needed to produce a sustained high yield of crops while using acceptable farming methods. Prime farmlands produce the highest yields and require minimal amounts of energy and economic resources.

Pulp or pulpwood: Wood suitable for use in paper manufacturing.

Raptor: Birds of prey, including various hawks, falcons, eagles, vultures, and owls.

Redd: The depression female salmon make in the gravel on the river or stream bed in which their eggs are laid.

Region of influence (ROI): The area, specific to each resource studied, that will likely be impacted by the proposed project. The largest region of influence (e.g., for socioeconomics) includes Hancock, Penobscot, and Washington Counties.

Reliability: The ability of a transmission system to respond to the loss of a line or other component without the customer, end user, and possibly generators being adversely impacted (i.e., the system continues to provide continuous service when unplanned events such as transmission lines or generators go out of service).

Revenue requirements: The amount of money that must be recovered or generated in order to pay for the interest, depreciation, taxes, insurance, fuel costs, and all other variable expenses associated with the construction, operation, and maintenance of a project.

Richter scale: A logarithmic scale used to express the total amount of energy released by an earthquake. The scale has 10 divisions, from 1 (not felt by humans) to 10 (nearly total destruction).

Riffle: A shallow area of a stream in which water flows rapidly over a rocky or gravelly stream bed.

Right-of-way (ROW): An easement for a certain purpose over the land, such as a strip of land used for a transmission line, roadway, or pipeline.

Riparian: Of or pertaining to the bank or shoreline area of a river, stream, lake, or other water bodies.

Risk: The probability that an event (usually an unwanted event) will occur.

Runoff: The portion of rainfall, melted snow, or irrigation water that flows across the ground surface and may eventually enter water bodies.

Salmonid: A fish belonging to the family *Salmonidae*, which includes salmon and trout.

Sapling tree: A live tree that is 1.0 to 4.9 in. (2.5 to 12.4 cm) in diameter at breast height.

Sawlog: A log of sufficient size and quality to be sawed economically for use in lumber and other products.

Sawtimber tree: Softwood trees that are at least 9.0 in. (22.9 cm) in diameter at breast height or hardwood trees that are at least 11.0 in. (27.9 cm) in diameter at breast height, that contain at least one 12-ft (3.7-m)-long log or two noncontiguous 8.0-ft (2.4-m)-long logs, that meet the minimum sawlog grade specifications. In addition, the tree must have a third or more of its gross board foot volume as merchantable material.

Scoping: An early, open part of the National Environmental Policy Act (NEPA) process for determining the scope of issues to be addressed and for identifying the significant issues related to a proposed action.

Scrub-shrub: Woody vegetation less than about 20 ft (6 m) tall. Species include true shrubs, young trees, and trees or shrubs that are small or stunted because of environmental conditions.

Scrub-shrub wetland: A wetland dominated by scrub-shrub species.

Secondary contact recreation: Recreational activities, such as fishing or boating, that do not generally involve continual direct contact with the water as do such water recreational activities as swimming.

Section 7 of the Endangered Species Act (ESA): The section of the Endangered Species Act that requires all Federal agencies, in consultation with the U.S. Department of the Interior U.S. Fish and Wildlife Service or National Oceanic and Atmospheric Administration National Marine Fisheries Service to ensure that their actions are not likely to jeopardize the continued existence of listed species or result in destruction or adverse modification of critical habitat.

Sedges: Grasslike plants common to most freshwater wetlands.

Sediment: Soil or rock particles that have been transported to stream channels or other bodies of water. Sediment input comes from natural sources, such as soil erosion and rock weathering, as well as from agricultural and construction practices.

Sedimentation: The removal, transport, and deposition of sediment particles by wind or water.

Seismic: Pertaining to any earth vibration, especially an earthquake.

Selective harvest: Often used as a catchall phrase for all types of partial cuttings in forests.

Short-term impacts: Short-term impacts are defined as those effects that would not last longer than the life of the project. Often, short-term impacts last for a few days, months, or years; for example, those that last only during the construction period are considered short-term impacts.

Silt: Sedimentary material consisting of fine mineral particles intermediate in size between sand and clay.

Silt fence: A temporary barrier used to intercept sediment-laden runoff from small areas.

Silviculture: The art and science of growing and tending forest trees.

Skid: To drag logs or tree lengths, either wholly or partially on the ground.

Skid trail or road: An unsurfaced single-lane road used by skidders and other extraction equipment to access forest products for transport from the harvest area to the yard or landing.

Skidder: A generic term for a machine (usually rubber-tired) with a cable winch or grapple used to drag logs out of the forest.

Slash: Unutilized and generally unmarketable accumulation of woody material in the woodland, such as limbs, tops, cull logs, and stumps, remaining after timber harvesting.

Smolt: Juvenile salmon that are migrating or about to migrate to the sea.

Snag: Dead, standing trees, often with the tops broken off. Snags serve as perches and lookouts and provide important food or cover for a wide variety of wildlife species.

Socioeconomics: The social and economic conditions in the study area.

Softwoods: General term for coniferous trees (gymnosperms).

Soil: The unconsolidated material on the surface of the earth that serves as a natural medium for the growth of land plants.

Spawning: In aquatic organisms, the act of producing and fertilizing eggs.

Special status species: Includes Federally and State listed species. These include endangered species, threatened species, and species of special concern.

Species of special concern: A Maine classification for a species whose population has been shown to be suffering a decline that could threaten the species in the area if allowed to continue unchecked, or for a species that occurs in such small numbers or with such a restricted distribution or specialized habitat that it could easily become threatened.

Staging area: Construction headquarters along the route where materials are received, stored, and shipped to the right-of-way.

Stand-size class: A group of forest trees of sufficiently uniform species, composition, age, and condition to be considered a homogeneous unit for management purposes.

State Historic Preservation Officer (SHPO): The official within each State, authorized by the State at the request of the Secretary of the Interior, to act as liaison for purposes of implementing the National Historic Preservation Act.

State Implementation Plan (SIP): A plan developed at the State level and enforceable by the U.S. Environmental Protection Agency, in which the State explains how it will comply with the National Ambient Air Quality Standards.

Streamside management zone: A forested area beside a stream or other water body that is managed to protect the values associated with the water body such as water quality and habitat.

Subsistence: The noncommercial acquisition of naturally occurring renewable resources harvested for traditional and customary uses. Subsistence activities can include hunting, fishing, trapping, and collecting.

Substation: A facility with transformers where voltage on transmission lines changes from one level to another.

Substrate: Defined materials such as boulders, gravel, cobble, etc., that form the bottom surface of a stream or river.

Succession: The natural replacement of one plant or animal community by another over time in the absence of disturbance.

Sulfur dioxide (SO_2): A gas formed from burning fossil fuels. Sulfur dioxide is one of six criteria air pollutants for which the U.S. Environmental Protection Agency has set National Ambient Air Quality Standards.

Surface water: Bodies of water on the surface of the earth that are open to the atmosphere, such as rivers, lakes, reservoirs, ponds, seas, and estuaries.

Swale: An elongated depression in the landscape that is seasonally wet or marshy, is usually heavily vegetated with marsh grasses, and is normally without flowing water.

System reliability: System reliability refers to electrical system reliability; that is, the degree of confidence that the Bangor Hydro-Electric Company and New England Power Pool can place on the certainty of electrical supply. A reliable electric system is one that allows for few involuntary interruptions of services to customers.

Talus: Rock debris at the base of a cliff.

Threatened species: A species Federally listed by the U.S. Department of the Interior U.S. Fish and Wildlife Service or National Oceanic and Atmospheric Administration National Marine Fisheries Service likely to become endangered in the future throughout all or most of its range. Some States also list species as threatened.

Timberland: Forest that is producing, or capable of producing, crops of industrial wood and that is not withdrawn from timber utilization by statute or administrative designation.

Topography: The configuration of the earth's surface, including the shape, elevation, and position of its natural and man-made features.

Toxicity: The ability of a substance to cause damage or death to cells, tissues, or organisms when the substance is inhaled, ingested, or absorbed by the skin.

Traditional cultural properties: Areas of significance to the beliefs, customs, and practices of a community of people that have been passed down through generations.

Transmission line: The structures, insulators, conductors, and other equipment used to transfer electrical power from one point to another.

Turbidity: A measure of the cloudiness or opaqueness of water. Typically, turbidity increases with increasing concentration of suspended material.

Understory: The smaller vegetation (shrubs, seedlings, saplings, and small trees) within a forest stand, occupying the vertical zone between the overstory and the herbaceous plants of the forest floor.

Ungulate: Any four-footed, hoofed, grazing mammal (e.g., deer, moose, cattle, horses).

U.S. Environmental Protection Agency (EPA): The independent Federal agency, established in 1970, that regulates Federal environmental matters and oversees the implementation of Federal environmental laws.

U.S. Fish and Wildlife Service (USFWS): Part of the U.S. Department of the Interior, the U.S. Fish and Wildlife Service shares the responsibility with the National Oceanic and Atmospheric Administration National Marine Fisheries Service for the Endangered Species Act. The U.S. Fish and Wildlife Service uses its existing authorities to conserve threatened and endangered species and ensures that actions do not jeopardize listed species or destroy or adversely modify critical habitat.

Vagrants: Individuals of a species that move by natural means from one geographical region to another outside their usual range, or away from usual migratory routes, without establishing a new population in the region.

Vantage: A position that provides an extensive view and strategic advantage.

Vernal pool: An ephemeral body of water that fills in the spring, holds water for at least 10 days, dries up by fall some or all years, and does not contain fish. Vernal pools are extremely important habitat for a variety of amphibians and reptiles.

Viewshed: The total landscape seen or potentially seen from all or a logical part of a travel route, use area, or water body.

Visual Resource Management (VRM): The planning, design, and implementation of management objectives for maintaining scenic values and visual quality.

Visual resources: The composite of basic terrain, geologic features, hydrological features, vegetative patterns, and land use effects that typify a land unit and influence the visual appeal that the unit may have.

Volatile organic compounds (VOCs): A broad range of organic compounds that produce vapors at relatively low temperatures, such as gasoline and solvents. They contribute significantly to photochemical smog production and certain health problems.

Volt: The unit of voltage or potential difference. It is the electromotive force that, if steadily applied to a circuit having a resistance of 1 ohm, will produce a current of 1 ampere.

Voltage: Potential for an electric charge to do work; source of an electric field.

Warmwater fisheries: Fish assemblages characterized by sunfish and bass (as well as by other species such as carp, most suckers, and bullheads). Warmwater species generally inhabit waters with temperature ranges within which trout and other coldwater species cannot maintain self-sustaining populations.

Water quality guideline: A statement of a measurable value of a water quality parameter recommended to support a given general water use.

Water quality objective: A statement of a measurable value of a water quality parameter that has been established as necessary to support given water use at a specified site.

Water quality standard: A legally enforceable requirement to maintain a specified measurable water quality value.

Watershed: The land area that drains into a given water system.

Watt: The absolute meter-kilogram-second unit of power equal to the work done at the rate of one joule per second or to the power produced by a current of one ampere across a potential difference of one volt.

Wetland: An area that is inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and under normal circumstances does support, a prevalence of vegetation typically adapted for life in saturated soil conditions, including swamps, marshes, bogs, and similar areas.

Wildlife habitat: The native environment of an animal that provides all the elements needed for its life and growth (food, water, cover, and space).

Windthrow (or blowdowns): A tree felled by wind, common among shallow-rooted species and in areas where cutting has reduced stand density.

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