

**NORTHEAST ENERGY DIRECT PROJECT  
DOCKET NO. PF14-22-000**

**DRAFT  
ENVIRONMENTAL REPORT**

**RESOURCE REPORT 10**

**ALTERNATIVES**

**PUBLIC**

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**November 2014**



**RESOURCE REPORT 10 – ALTERNATIVES  
SUMMARY OF FILING INFORMATION**

<b>INFORMATION</b>	<b>FOUND IN</b>
Address the “no action” alternative (§ 380.12 (1)(1)).	Section 10.1
For large Projects, address the effect of energy conservation or energy alternatives to the Project (§ 380.12 (1)(1)).	Section 10.1.1 Section 10.1.2
Identify system alternatives considered during the identification of the Project and provide the rationale for rejecting each alternative (§ 380.12 (1)(1)).	Section 10.2
Identify major and minor route alternatives considered to avoid impact on sensitive environmental areas (e.g., wetlands, parks, or residences) and provide sufficient comparative data to justify the selection of the proposed route (§ 380.12 (1)(2)(ii)).	Section 10.3
Identify alternative sites considered for the location of major new aboveground facilities and provide sufficient comparative data to justify the selection of the proposed site (§ 380.12 (1)(2)(ii)).	Sections 10.4, 10.5, and 10.6



## TABLE OF CONTENTS

<b>10.0</b>	<b>INTRODUCTION.....</b>	<b>10-1</b>
10.1	NO-ACTION ALTERNATIVE .....	10-1
10.1.1	Energy Conservation.....	10-2
10.1.2	Energy Alternatives .....	10-3
10.1.2.1	Wind Power .....	10-4
10.1.2.2	Solar Power.....	10-4
10.1.2.3	Geothermal Power .....	10-5
10.1.2.4	Coal.....	10-5
10.1.2.5	Fuel Oil .....	10-5
10.1.2.6	Nuclear.....	10-6
10.1.2.7	Hydroelectric Power .....	10-6
10.1.2.8	Electric Generation .....	10-6
10.1.2.9	Fuel Cells .....	10-7
10.1.2.10	Other Energy Sources .....	10-7
10.1.2.11	Energy Alternatives Conclusion .....	10-7
10.2	SYSTEM ALTERNATIVES.....	10-7
10.2.1	Existing Systems.....	10-8
10.2.2	Other Systems .....	10-10
10.3	ROUTE ALTERNATIVES .....	10-14
10.3.1	Major Route Alternatives.....	10-15
10.3.1.1	Pennsylvania to Wright Pipeline Segment Alternatives .....	10-15
10.3.1.2	New York Powerline Alternative.....	10-24
10.3.1.3	Existing 200 Line Alternative .....	10-27
10.3.1.4	Massachusetts Route 2 Alternative .....	10-30
10.3.1.5	Mass Turnpike Alternative .....	10-33
10.3.1.6	Massachusetts Powerline Alternative .....	10-36
10.3.1.7	Article 97 Avoidance and Co-location Alternatives .....	10-39
10.3.1.8	New Hampshire Powerline Alternative .....	10-40
10.3.2	Minor Route Alternatives .....	10-43
10.3.2.1	West Nashua Route 13 Lateral Alternative .....	10-43
10.3.2.2	Andover Lateral Alternative – Proposed Lynnfield Lateral .....	10-46



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10.3.3	Minor Route Deviations.....	10-52
10.3.3.1	Landowner Requested Minor Route Deviations.....	10-52
10.3.3.2	Agency Requested Minor Route Deviations.....	10-53
10.4	ALTERNATIVE SITES FOR NEW COMPRESSOR STATIONS.....	10-53
10.5	ALTERNATIVE SITES FOR NEW METER STATIONS.....	10-53
10.6	ALTERNATIVE SITES FOR PIPEYARDS AND CONTRACTOR YARDS .....	10-53
10.7	ALTERNATIVES SUMMARY.....	10-54
10.8	REFERENCES .....	10-55



## LIST OF TABLES

Table 10.3-1 Comparison of The Proposed Route of the Pennsylvania to Wright Pipeline Segment to Constitution Major Route Alternatives for the Project ..... 10-18

Table 10.3-2 Comparison of the Proposed Route of the Wright to Dracut Pipeline Segment to New York Powerline Major Route Alternative for the Project ..... 10-25

Table 10.3-3 Comparison of the Proposed Route of the Wright to Dracut Pipeline Segment to Existing 200 Line Major Route Alternative for the Project ..... 10-28

Table 10.3-4 Comparison of the Proposed Route of the Wright to Dracut Pipeline Segment to Massachusetts Route 2 Major Route Alternative for the Project..... 10-31

Table 10.3-5 Comparison of the Proposed Route of the Wright to Dracut Pipeline Segment to Mass Turnpike Major Route Alternative for the Project..... 10-34

Table 10.3-6 Comparison of the Proposed Route of the Wright to Dracut Pipeline Segment to Massachusetts Powerline Major Route Alternative for the Project ..... 10-37

Table 10.3-7 Comparison of the Proposed Route of the Wright to Dracut Pipeline Segment to New Hampshire Powerline Major Route Alternative for the Project..... 10-41

Table 10.3-8 Comparison of the Proposed West Nashua Lateral to Minor Route Alternative for the Project..... 10-44

Table 10.3-9 Comparison of the Proposed Lynnfield Lateral to Minor Route Alternatives for the Project..... 10-47

Table 10.3-10 Example Landowner Requested Minor Route Deviations for the Project..... 10-52



## **LIST OF ATTACHMENTS**

### **ATTACHMENT 10a – FIGURES**

- Figure 10.2-1 New England and Northeast Natural Gas Pipelines System
- Figure 10.2-2 TGP 300 Line and 200 Line System
- Figure 10.2-3 Algonquin System
- Figure 10.2-4 Iroquois Gas Transmission System
- Figure 10.2-5 Maritimes & Northeast and Portland Natural Gas System
- Figure 10.3-1 Major Route Alternative-Constitution Route 1, 2, 3 Alternatives
- Figure 10.3-2 Major Route Alternative-Interstate 88 Alternative
- Figure 10.3-3 Major Route Alternative-Northeast Exchange (NEEX) Alternative
- Figure 10.3-4 Major Route Alternative-New York Powerline Alternative
- Figure 10.3-5 Major Route Alternative-200 Line Alternative
- Figure 10.3-6 Major Route Alternative-Route 2 Alternative
- Figure 10.3-7 Major Route Alternative-Mass Turnpike Alternative
- Figure 10.3-8 Major Route Alternative-Massachusetts Powerline Alternative
- Figure 10.3-9 Major Route Alternative-Article 97 Avoidance and Co-located Alternatives
- Figure 10.3-10 Major Route Alternative-New Hampshire Powerline Alternative
- Figure 10.3-11 Minor Route Alternative-West Nashua Lateral Alternative
- Figure 10.3-12 Minor Route Alternative-Andover Lateral Alternatives



## **10.0 INTRODUCTION**

Tennessee Gas Pipeline Company, L.L.C. (“Tennessee” or “TGP”) is filing an application seeking the issuance of certificate of public convenience and necessity from the Federal Energy Regulatory Commission (“Commission” or “FERC”) for the construction and operation of the proposed Northeast Energy Direct Project (“NED Project” or “Project”). Tennessee proposes to expand and modify its existing pipeline system in Pennsylvania, New York, Massachusetts, Connecticut, and New Hampshire. Tennessee is requesting issuance of a certificate order for the NED Project in October 2016 and proposes to commence construction activities in January 2017, in anticipation of placing the Project facilities in-service by November 2018 (with the exception of two proposed pipeline looping segments in Connecticut, which would be placed in service by November 2019). Please refer to Resource Report 1 of this Environmental Report (“ER”) for a complete description of the Project components.

Tennessee undertook an extensive needs and alternative routing analysis for the Project. The primary objective in performing this analysis was to develop a project that would accomplish Tennessee’s objective to provide up to 2.2 billion cubic feet per day (“Bcf/day”) of additional natural gas transportation capacity to meet the growing energy needs in the Northeast United States (“U.S.”), particularly in New England, as discussed in more detail in the Purpose and Need section of Resource Report 1 of this filing, while working to avoid or minimize potential adverse environmental impacts to the greatest extent practicable. As discussed below, Tennessee evaluated pipeline routing options based on regional topography, environmental considerations, population density, existing land usage, and construction safety and feasibility considerations. Tennessee also considered route alternatives in conjunction with the Commission’s routing guidelines as set forth in Section 380.15 of the Commission’s regulations, 18 C.F.R. §380.15. Resource Report 10 describes the alternatives that have been considered as of the date of this Resource Report 10 in developing the Project and Attachment 10a includes Project Figures depicting those alternatives analyzed for the Project.

### **10.1 NO-ACTION ALTERNATIVE**

The “no-action” alternative for the Project would avoid the temporary and permanent environmental impacts associated with construction and operation of the currently proposed Project. However, by not constructing the proposed Project, Tennessee would be unable to provide the necessary natural gas transportation service required to meet growing energy needs in the Northeast U.S., specifically New England. The Project, upon completion, will provide up to 2.2 Bcf/day of additional natural gas transportation capacity to meet the growing energy needs of local distribution companies (“LDCs”), gas-fired power generators, industrial plants, and other New England consumers. Tennessee has reached commercial agreement, subject to the customary approvals, for approximately 500,000 dekatherms per day (“Dth/d”) of long-term firm transportation capacity on the Market Path Component of the proposed NED Project<sup>1</sup> with The Berkshire Gas Company, Columbia Gas of Massachusetts, Connecticut Natural Gas Corporation, Liberty Utilities (EnergyNorth Natural Gas) Corporation, National Grid, Southern Connecticut Gas Corporation, City of Westfield Gas and Electric Light Department, and two other LDCs.

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<sup>1</sup> The Supply Path Component encompasses the portion of the proposed NED Project extending from Troy, Pennsylvania to Wright, New York, while the Market Path Component encompasses the portion of the proposed NED Project extending from Wright, New York to Dracut, Massachusetts.



This Project and its in-service date of November 2018 are supported by the Shippers committed to the Project's capacity. As discussed in the Purpose and Need section of Resource Report 1, the new transportation capacity to be created by the Project will help alleviate the natural gas pipeline capacity constraint in New England by increasing capacity in high-demand markets in New England.

Given the constrained pipeline transportation capacity situation in the Northeast U.S., without the proposed Project, other natural gas transmission companies would be required to increase their capacity and construct new facilities to meet the existing and growing demand for the additional natural gas transportation capacity. Such actions would only result in the transference of environmental impacts from one project to another but would not eliminate such impacts in their entirety.

If existing natural gas transmission systems are not enhanced or expanded, energy shortages in times of peak demand may occur, or users may consume different fuels, which would likely include oil and coal. The lack of a new pipeline with access to supply sources into the region will prolong the existing supply constraints in the proposed delivery areas, which will continue to contribute to winter-premium pricing and exacerbate price volatility for all natural gas users in the areas. The lack of adequate natural gas transportation capacity will also increase the difficulty for others, such as the operators of LDC distribution systems and gas-fired electric generating plants, in finding economical gas supplies. This in turn will lead to higher consumer gas and electric rates in a region which is already experiencing the highest rates in the country, and even energy shortages during times of winter peak demand.

Utilization of natural gas for residential and commercial heating, power generation, and industrial use offers the best alternative in terms of supply availability with the lowest environmental impact among available energy sources, particularly with regard to air quality impacts. Existing natural gas delivery systems may be readily expanded to meet increased demand, while minimizing impacts to the environment. The no-action alternative would not provide the potential economic benefits associated with the proposed Project, including increased jobs, secondary spending, and tax revenues during construction, as well as increased property tax revenues to local governments during operations. Further, the no-action alternative would not provide the additional natural gas required by LDCs to support the increased energy demand of consumers in Pennsylvania, New York, Massachusetts, Connecticut, New Hampshire and Rhode Island near the Project and/or consumers that do not currently have access to natural gas. The no-action alternative was not found to be a feasible alternative for the Project because that alternative would not satisfy the purpose and need for the Project and ultimately would result in other, more significant impacts to the environment.

### **10.1.1 Energy Conservation**

Energy conservation measures have and will continue to play an important role in reducing energy demand in the U.S. The Energy Policy Act of 2005 ("EPA 2005") includes guidelines to diversify America's energy supply and reduce dependence on foreign sources of energy, increase residential and commercial energy efficiency and conservation (e.g., EPA Energy Star Program), improve vehicular energy efficiency, and modernize domestic energy infrastructure (U.S. Congress 2005). While the EPA 2005 and state and municipal programs promote increased energy efficiency and conservation by supporting new energy efficient technologies and increasing funds for energy efficiency research, and would most likely minimize energy use, they are not expected to eliminate the increasing demand for energy or natural gas. Additionally, the implementation and success of energy conservation in curtailing energy use is a long-term goal, extending well beyond the timeframe of the proposed Project.



Reducing the need for additional energy usage is the preferred option wherever possible. Conservation of energy reduces the demand for finite the limited and over-utilized fossil fuel reserves. Energy conservation is also advocated by both federal and state authorities. Tennessee presently has programs in place that strongly encourage energy conservation. Even with these programs, there remains an existing need for additional natural gas capacity that would be provided with the construction of this Project.<sup>2</sup> Energy conservation alone is not a viable alternative to the proposed Project. While energy conservation reduces demand for energy sources such as natural gas, and may be a long-term alternative or partial alternative for the Project, implementation of sufficient energy conservation measures to eliminate the need for the proposed Project is not feasible in the short-term.

### **10.1.2 Energy Alternatives**

Use of alternative fuels to supply the needs of the market would potentially result in adverse environmental impacts due to increased air pollutant emissions that would be otherwise minimized through the use of natural gas. In general, alternative energy sources for natural gas consumers include oil, coal, biomass, and nuclear fuels. State and federal air pollution control regulations indirectly promote the use of clean fuels to minimize adverse air quality impacts. These regulations are intended to improve both air quality and the quality of life. Use of these alternative hydrocarbon energy sources would unnecessarily increase adverse air quality impacts, and these increased impacts would conflict with federal and state long-term energy environmental policies aimed toward attaining ambient air quality standards. While renewable alternative energy sources contribute to a diverse energy portfolio for users, they ultimately cannot provide for the immediate energy needs that the Project would support and supply to the Northeast U.S. market. In 2012, the ISO-New England identified likely retirements of older coal- and oil-fired power plants/generators located in New England as of 2020, representing approximately 8.3 MW of capacity, and the need for replacement of these resources to meet the needs of power generators, including natural gas generation.<sup>3</sup> Clean-burning natural gas will continue to be part of a diverse energy portfolio for users in the northeast region and also serves a bridge to renewables by providing a reliable energy supply while these alternative energy sources are further refined and developed.

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<sup>2</sup> See the U.S. Energy Information Administration's Annual Energy Outlook 2014 table data (Natural Gas Transmission and Distribution Model Regions), which projects sectors driving growth in U.S. natural gas consumption. U.S. total natural gas consumption grows from 25.6 trillion cubic feet (Tcf) in 2012 to 31.6 Tcf in 2040 in the AEO2014 Reference case. Natural gas production from the Marcellus Shale area is projected to grow from 1.9 Tcf in 2012 to a peak production volume of approximately 5.0 Tcf per year from 2022 through 2025. Natural gas produced from the Marcellus Shale area is projected to provide up to 39 percent of the natural gas needed to meet demand in markets east of the Mississippi River during that period (up from 16 percent in 2012). Although Marcellus Shale area production is projected to decline after 2024, it will provide enough natural gas to meet at least 31 percent of the region's total demand for natural gas through 2040. See U.S. Energy Information Administration, Annual Energy Outlook 2014, Report #DOE/EIA-0383 (2014), available at <http://www.eia.gov/forecasts/aeo/> (DOE/DOA 2014). Even with energy conservation, additional natural gas pipeline capacity to transport gas in this region is needed.

<sup>3</sup> See ISO-New England, Strategic Transmission Analysis: Generation Retirements Study, dated December 13, 2012, available at [http://www.iso-ne.com/static-assets/documents/committees/comm\\_wkgrps/prtcpnts\\_comm/pac/mtrls/2012/dec132012/retirements\\_redacted.pdf](http://www.iso-ne.com/static-assets/documents/committees/comm_wkgrps/prtcpnts_comm/pac/mtrls/2012/dec132012/retirements_redacted.pdf).



### **10.1.2.1 Wind Power**

Wind power technology has experienced advancements over the last 20 years, including reductions in installation costs, improved turbine performance, and reduced maintenance costs. Although wind projects have no operational emissions, such developments can negatively affect wildlife (particularly birds and bats), visual resources, and other environmental resources. Onshore wind power generation requires large, permanent turbines and supporting facilities, as well as construction of electric transmission lines, to connect wind facilities to transport the wind energy to consumers. These facilities would have an impact on visual resources, because onshore wind turbines are constructed to capture wind high above the natural topography and could be constructed along highly visible ridge lines. Additionally, wind turbines would directly impact resident and migratory birds, bats, and other wildlife from collision mortality, and would indirectly impact wildlife as a result of habitat disturbance and loss. Construction of offshore wind power generation facilities may result in impacts on marine species. In contrast, the permanent right-of-way (“ROW”) of the proposed pipeline area would be restored to pre-construction contours and maintained as herbaceous cover. Potential impacts on wildlife from the proposed Project are expected to be largely short-term and temporary, with the exception of habitat conversion in forested areas and the establishment of some aboveground facilities. Therefore, theoretical onshore wind generation facilities could result in greater impacts upon visual, vegetation, and wildlife resources than the proposed Project.

Wind power currently is not an option for providing the existing or projected power needs in the region where the Project is located. While there has been an increase in wind power capacity in Massachusetts, encouraged by streamlined siting and permitting, overall the capacity is slow to develop. As detailed above, wind power generation presents environmental issues and cannot be precisely scheduled based on demand. In addition, in the Project’s general area, the sites with the highest wind velocities tend to be located along ridgelines in areas of steep slopes (National Renewable Energy Laboratory [“NREL”] 2010) which are challenging to access and generally highly visible. Further, wind power provides electrical output that is considered as an intermittent and non-dispatchable source of generation as it does not generate electricity when the wind is not blowing. Electricity demand also varies during the day in ways that the supply from wind and solar generation may not match, thus requiring the Independent System Operator (“ISO”)-New England to balance the variable renewables by dispatching other wholly-dispatchable non-intermittent units, such as natural gas fired generating units. While renewable resources provide some level of energy supply diversity, they are weather dependent and require hydro or thermal resources to accommodate their variability, and pose both operational and interconnection challenges. Under these circumstances, wind energy would not be able to provide the projected needs for the region as reliably and in the quantity that would be provided by the proposed Project facilities.

### **10.1.2.2 Solar Power**

Photovoltaic solar power systems convert sunlight directly into electricity. These systems generally are not well-suited for use as large-scale generation in the proposed Project area due to relatively low direct insolation, higher capital costs, potential reliability issues, and lower efficiencies. Solar power generation on an industrial scale requires large, permanent facilities with impervious cover and no shading to allow for photovoltaic panels and/or concentrated solar power (“CSP”) to gather energy. These impacts are compared to a narrow permanent ROW that would be restored to pre-construction contours and maintained as herbaceous cover for the proposed Project facilities. In addition, the construction of a solar power generation facility also includes the construction of access roads and electric transmission lines necessary to transport the generated solar energy to consumers, resulting in additional environmental impacts. Further, solar power systems are not only among the highest cost renewable technologies, but



they also provide electrical output that is considered an intermittent and non-dispatchable source of generation as it does not generate electricity when there is insufficient sunlight. Electricity demand also varies during the day in ways that the supply from wind and solar generation may not match, thus requiring the ISO-New England to balance the variable renewables by dispatching other wholly-dispatchable, non-intermittent units, such as natural gas fired generating units. While renewable resources provide some level of energy supply diversity, they are weather dependent and require hydro or thermal resources to accommodate their variability, and pose both operational and interconnection challenges.

For these reasons, renewable resources, such as solar power, even with the efforts to increase solar power capacity in certain states impacted by the Project, are not being developed at a pace fast enough to provide for the projected energy needs in the region where the Project would provide service.

### **10.1.2.3 Geothermal Power**

Large scale geothermal energy is available only at tectonic plate boundaries or at geothermally active hotspots. Due to a lack of these features in the Project area, geothermal energy would not be available for development as an alternative to natural gas.

### **10.1.2.4 Coal**

Coal is used for energy generation and would function as an alternative to natural gas. However, relative to natural gas, the burning of coal results in greater emissions of pollutants such as nitrogen oxides (“NOx”), sulfur dioxide (“SO<sub>2</sub>”), greenhouse gases (“GHG”), and mercury (United States Environmental Protection Agency [“USEPA”] 2005). In 2010, coal comprised 46 percent of total U.S. electric power generation (U.S. Department of Energy/Energy Information Administration [“DOE/EIA”] 2011). Also, certain coal-fired power plants in the northeast region that have served as baseload generators for electric power were identified by the ISO-New England in 2012 as “at-risk” for retirement by 2020, including the Brayton Point Station located in southeast Massachusetts (this plant is coal- and oil-fired), the Mount Tom Station, located in Western Massachusetts, and the Salem Harbor Station, located in Northeast Massachusetts.<sup>4</sup> Due to the greater environmental impacts associated with emissions from coal-burning power generation, it is unlikely that coal would displace the need for natural gas in the target market areas in the foreseeable future. Therefore, coal does not represent a preferred alternative for replacing the natural gas to be supplied by the proposed Project.

### **10.1.2.5 Fuel Oil**

Fuel oil is commonly transported by pipeline which may require construction of other pipeline systems to transport the fuel oil, which would likely have similar impacts as the proposed Project, but in a different location. Additionally, if increased fuel oil demand is met by foreign imports, additional development of bulk storage capacity, and refining facilities would be required. Reliance on fuel oil as an alternative to natural gas would increase the potential for environmental impacts such as oil spills; land development to construct or modify import, storage, and refining facilities; and pollution from air emissions.

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<sup>4</sup> See ISO-New England, Strategic Transmission Analysis: Generation Retirements Study, dated December 13, 2012, available at, [http://www.iso-ne.com/static-assets/documents/committees/comm\\_wkgrps/prtcnpts\\_comm/pac/mtrls/2012/dec132012/retirements\\_redacted.pdf](http://www.iso-ne.com/static-assets/documents/committees/comm_wkgrps/prtcnpts_comm/pac/mtrls/2012/dec132012/retirements_redacted.pdf).



Alternatively, natural gas burns cleaner than other fossil fuels, is relatively inexpensive compared to other fossil fuels, and is domestically produced. While fuel oil is an alternative energy source for meeting future power generation needs in the Project area, fuel oil has no advantage over natural gas, and fuel oil necessitates increased environmental impacts in transportation and at the burner. For these reasons, particularly for facilities designed to use natural gas, fuel oil would not be a preferable alternative to the natural gas to be supplied by the proposed Project.

### **10.1.2.6 Nuclear**

Energy from nuclear power is important nationally and accounted for approximately 9 percent of annual energy consumption nationwide in 2011 (DOE/EIA 2013a). In New York, nuclear power currently accounts for about 14 percent of statewide generating capacity (New York Independent System Operator [“NYISO”] 2012). In New England (Massachusetts, Maine, New Hampshire, Vermont, Rhode Island, and Connecticut), nuclear energy accounted for approximately 12 percent of total energy consumption in 2012 (DOE/EIA 2013a). Although use of nuclear power may avoid GHG emissions that would otherwise occur with burning fossil fuels, the environmental and regulatory challenges concerning safety and security, the disposal and long-term storage of toxic and radioactive materials (*i.e.*, spent fuel), and potential alterations to hydrological/biological systems would need to be addressed before any new nuclear power generation facilities could be constructed. Nuclear power remains problematic given these factors.

The use of nuclear energy is not considered to be an option for meeting the existing and projected demand for energy in the region where the Project is located. The Vermont Yankee nuclear power plant is scheduled to shut down at the end of 2014, further limiting the nuclear power available in the New England region (DOE/EIA 2013b). Due to the lengthy lead time to site a new nuclear facility and controversy with such projects; power generated from such a facility would not be available for development as an alternative to natural gas to be supplied by the proposed Project. The scheduled retirement of the 600 megawatt (“MW”) Vermont Yankee plant in late 2014 will increase the reliance of this region on natural gas fired power generation and lead to higher gas and electricity prices absent the proposed Project.

### **10.1.2.7 Hydroelectric Power**

It is Tennessee’s understanding that hydroelectric generation is fully commercialized, both large impoundment-type and run-of-river type projects in the Northeast U.S. ranging from one MW to hundreds of MWs in capacity. There are a number of proposed hydroelectric import projects from Canada to New England that would require the construction of possibly three transmission lines linking Canadian hydroelectric generating facilities to southern New England load centers. These aboveground transmission line projects require extensive siting approval from northern New England states, such as New Hampshire and Maine. Historically, given the strong opposition to recently proposed electric transmission projects in New England, it is likely that a large hydroelectric import project would face similar siting difficulties. For this reason, use of proposed hydroelectric power projects is precluded from being a viable alternative to the natural gas to be supplied by the proposed Project.

### **10.1.2.8 Electric Generation**

Electrical energy is a second-tier energy source, meaning that electrical energy is generated from first-tier energy sources, such as natural gas, coal, oil, biomass, nuclear, geothermal, hydraulic head, wind, and



solar radiation. For this reason, use of electrical energy is precluded from being a viable alternative to the natural gas to be supplied by the proposed Project.

### **10.1.2.9 Fuel Cells**

Fuel cells are a developing alternative for generating electricity more directly and cleanly from fossil fuels or hydrogen however, fuel cell technology is in the early phases of development. Small-scale fuel cell research and development is active, but reliable fuel cell systems representing an equivalent magnitude to the proposed Project are not expected to be available or cost effective in the near future.

### **10.1.2.10 Other Energy Sources**

Alternative fuel sources available include using Liquefied Natural Gas (“LNG”) and propane/air storage and vaporization. Though both alternatives have the potential to meet the Project objectives, Tennessee determined that these alternatives were not viable due to such factors as siting constraints, increased environmental impacts, and the time required to develop these alternatives. Therefore, supplying adequate volumes of natural gas through the construction of the proposed Project is the preferred alternative.

### **10.1.2.11 Energy Alternatives Conclusion**

As increasing demand for electricity continues to rise, energy efficiency and conservation measures, along with more diversified renewable energy portfolios, can reduce the need to meet the growing demand by fossil-fueled power plants. In recognition of the need to diversify, the states in the Project area have all adopted policies, programs and projects to reduce their state’s dependence on fossil-fuel electric generation. While these measures could impact the overall demand for electricity from fossil fuel generation, the energy conservation and renewable alternative does not meet the needs of the Project, which will provide natural gas transportation service to LDCs to provide additional natural gas supplies to their customers for residential and commercial heating, drying and cooking, and industrial uses. Accordingly, energy conservation and renewable resources would not be an alternative to meet the purpose and needs of the Project.

## **10.2 SYSTEM ALTERNATIVES**

System alternatives are alternatives to the proposed action that would make use of other existing, modified, or proposed natural gas pipeline systems or existing compression to meet the stated purpose and need for a proposed Project. System alternatives involve the transportation of the equivalent amount of incremental natural gas volumes by the expansion of existing pipeline systems or by the construction and operation of other new pipeline systems. A viable system alternative would make it unnecessary to construct all or part of the proposed Project, and would involve the transportation of all or a portion of the additional natural gas volumes by expansion of another existing pipeline system or construction of a new pipeline system. Such modifications or additions would result in environmental impacts; however, the impacts would in all likelihood be similar to, and potentially greater than that associated with construction of the proposed Project.

Although system alternatives that would result in less environmental impacts might be preferable to the proposed Project facilities, only those alternatives that are reasonable, consistent with existing law, and consistent with the underlying purpose and need of the Project are required to be considered for National



Environmental Policy Act (“NEPA”) purposes. Consequently, a viable system alternative must be technically and economically feasible and practicable to satisfy the Project’s purposes, including meeting the necessary contractual commitments made with Project Shippers supporting the development of the Project.

Technical and feasible system alternatives were evaluated in the Project area (Figure 10.2-1) in terms of their ability to meet the Project objectives, which were defined by the incremental level of firm transportation service contracted for the market, as will be described in the certificate application anticipated to be submitted in September 2015 and in Resource Report 1 of this filing. The facilities associated with the Project are necessary to provide the incremental firm transportation capacity to meet the growing energy needs in the Northeast U.S., specifically New England. The Project, upon completion, will provide up to 2.2 Bcf/day of additional natural gas transportation capacity to meet the growing energy needs of LDCs, gas-fired power generators, industrial plants, and other New England consumers. As discussed above, Tennessee has reached commercial agreement, subject to the customary approvals, for approximately 500,000 dekatherms per day Dth/d of long-term firm transportation capacity on the Market Path Component of the proposed NED Project. As discussed in the Purpose and Need section of Resource Report 1, the new transportation capacity to be created by the Project will help alleviate the natural gas pipeline capacity constraint in New England by increasing capacity in high-demand markets in New England. By constructing and placing the Project into service, additional natural gas quantities from prolific supply sources such as the Marcellus Shale formation can be readily delivered to meet the growing demand for natural gas service in the Northeast U.S. market area on both a seasonal and annual basis with detailed consideration given to providing such service economically, safely and with minimal impact to affected landowners and the environment. With its existing system in place, Tennessee is able to facilitate construction, operation, and maintenance of the Project through construction of the Project facilities outlined in Resource Report 1 of this filing.

### **10.2.1 Existing Systems**

Tennessee has no available firm capacity on its existing 300 Line and 200 Line systems (Figure 10.2-2) from the anticipated Project receipt points along the Pennsylvania to Wright, New York Pipeline Segment (the Supply Path Component of the Project). Accordingly, there are no system alternatives available to Tennessee to provide the transportation service for this portion of the Project. Tennessee is however, proposing to utilize its existing system and corridors as much as possible by co-locating with its existing facilities or other utility corridors or looping its existing facilities in its design of the NED Project facilities from Pennsylvania to Wright, New York. Where Tennessee does not have an existing corridor, Tennessee is proposing to co-locate the pipeline with other utility corridors where practicable and feasible, and as legally permitted.

As part of the Supply Path Component of the Project, Tennessee is proposing two separate 36-inch diameter pipeline looping segments that will generally parallel Tennessee’s existing 300 Line (referred to as Loop 317-3 and Loop 319-3 in Pennsylvania) to create additional transportation capacity from the anticipated receipt points to Tennessee’s mainline valve (“MLV”) 320. At that point, the Project as designed will deviate from Tennessee’s existing 300 Line and will extend north to Wright, New York. The new pipeline looping segments are proposed to be located parallel and adjacent to Tennessee’s existing 300 Line corridor in Pennsylvania. For the proposed pipeline that would extend north from the existing 300 Line to Wright, New York, Tennessee was unable to co-locate that segment with an existing utility corridor for the first thirteen miles of that pipeline. However, from that point north to Wright, New York, Tennessee is proposing to co-locate its proposed pipeline with the Constitution Pipeline Project



corridor proposed by the Constitution Pipeline Company, LLC in Docket No. CP13-499-000 (“Constitution”).<sup>5</sup> The certificate application for Constitution is pending before the Commission, so the exact location of that Project’s proposed pipeline facilities and the construction start date for those facilities is not known. Evaluation of this proposed route is ongoing; Tennessee will determine the final location of the segment of the pipeline that is proposed to be co-located with Constitution after the Commission’s decision relative to the Constitution certificate application. Tennessee is proposing to deviate from Constitution’s current proposed route for approximately 39 miles (from milepost [“MP”] 24.25 to 36.24, from MP 50.13 to 63.60, and from MP 123.63 to 134.99) due to Project Shipper needs, areas of steep terrain, and more optimal crossings for two large waterways. Locations where the proposed route for the Project deviates from Constitution’s proposed alignment are identified as alternatives and discussed in Section 10.3 of this Resource Report 10. Tennessee continues to evaluate the portion of the pipeline route at MP 123.63 and may later propose to co-locate the pipeline in this area with the Constitution facilities.

Tennessee has no available firm capacity on its existing 200 Line system from Wright, New York to Dracut, Massachusetts for the Market Supply Component of the Project. When Tennessee evaluated the market need in New England and the facilities that would be required to provide the infrastructure that New England needs to reduce high energy costs and enhance electric reliability, it conducted extensive evaluation of options to either (1) loop the pipeline along its 200 Line pipeline corridor in southern Massachusetts, or (2) construct a new pipeline along a route across northern Massachusetts, utilizing existing transmission corridors where feasible. Tennessee determined that developing a route to parallel the entire length of its existing 200 Line would not be feasible, due to the level of urban congestion, constructability issues, environmental impact, and overall pipeline length. This route is examined as one of the alternative routes and is discussed below. Because the route paralleling Tennessee’s entire existing 200 Line is not feasible, Tennessee is proposing the second option for the Market Path Component of the Project (referred to as Wright to Dracut Pipeline Segment), with a portion of the NED Project from Wright, New York to Dracut, Massachusetts (Wright to Dracut Pipeline Segment, New York Portion) making use of the existing system where practicable and feasible.

The Wright to Dracut Pipeline Segment begins in Wright, New York, and heads east where Tennessee is proposing to co-locate the pipeline along the existing corridor for the 200 Line for approximately 48 miles. Continuing to the east, Tennessee departs from its existing corridor and is proposing to parallel other existing electric transmission corridors for approximately 107 miles (approximately 84 percent) of the route into Dracut, Massachusetts.

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<sup>5</sup> Jointly owned by Williams Partners Operating, LLC; Cabot Pipeline Holdings, LLC; Piedmont Constitution Pipeline Company, LLC; and Capital Energy Ventures Corporation.

Information contained within this Resource Report 10 related to the Constitution Pipeline Project was based on the “*Draft Environmental Impact Statement: Constitution Pipeline and Wright Interconnect Projects*,” FERC EIS No. 0249D, Docket Numbers CP13-499-000, CP13-502-000, and PF12-9-000 (“Constitution DEIS”) (FERC 2014a). Tennessee notes that the Commission, on October 24, 2014, issued the Final Environmental Impact Statement for the Constitution Pipeline Project “*Final Environmental Impact Statement: Constitution Pipeline and Wright Interconnect Projects*,” FERC EIS No. 0249F, Docket Numbers CP13-499-000, CP13-502-000, and PF12-9-000 (“Constitution FEIS”) (FERC 2014b). At the time the Constitution FEIS was issued by the Commission, Tennessee was in the process of finalizing the drafts of Resource Reports 1 and 10 for filing with the Commission on November 5, 2014 and has not had an opportunity to finalize its review of the Constitution FEIS and incorporate any revisions to its proposed route based on that review. Tennessee will determine if any revisions to its proposed route are necessary after its review of the Constitution FEIS and incorporate any such revisions in subsequent filings of the ER.



As part of the Project, Tennessee is also proposing the construction of pipeline laterals and looping segments to accommodate delivery point requests of certain Project Shippers. The existing Haverhill Lateral, North Adams Lateral, the Fitchburg Lateral and the 200-1 system are proposed to be modified as part of the Project to accommodate the additional capacity.

A system analysis of the proposed Haverhill Lateral is ongoing to determine if all or portions of the proposed route could be replaced within the existing ROW by using the lift and lay method (remove the existing 10-inch diameter line and replacing with a 20-inch diameter line within the existing ROW).

### **10.2.2 Other Systems**

In order to provide the necessary natural gas transportation service required to meet the growing energy needs in the Northeast U.S. that the proposed Project would otherwise provide, other pipeline systems in the vicinity of the Project area would need to be expanded and or modified to transport up to 2.2 Bcf/d from Troy, Pennsylvania to Dracut, Massachusetts. To be considered a viable system alternative to the proposed NED Project, expansions or modifications of those pipeline systems would need to serve the same purpose and demand of the Project and create less environmental impacts than anticipated from the proposed Project (Figure 10.2-1).

Tennessee does not have access to proprietary information concerning the flow characteristics of the existing interstate pipeline systems in the Pennsylvania, New York, and New England Project areas. However, based on publicly available information from open season notices and filings submitted to the Commission as well as through access to other publically available sources, Tennessee believes that these existing pipeline systems are at or near capacity. In particular, Tennessee relied on the following sources:

- Portland Natural Gas Transmission System's ("PNGTS") Open Season Notice for Firm Service from December 3, 2013 to January 24, 2014 for its proposed Continent-to-Coast ("C2C") Expansion Project.
- ICF International: Gas-Fired Power Generation in Eastern New York and its Impact on New England's Gas Supplies, submitted to ISO-New England, November 18, 2013.
- Competitive Energy Services: Assessing Natural Gas Supply Options for New England and their Impacts on Natural Gas and Electricity Prices.
- Filings made by Spectra Energy Partners in its Algonquin Incremental Market Project proceeding (Docket No. CP14-96-000), Resource Report 10 Alternatives, dated February 2014.
- Spectra Energy Partners' proposed Atlantic Bridge Project.
- Spectra Energy Partners' proposed Access Northeast Project.
- Filings made by Iroquois Gas Transmission System, L.P. ("Iroquois") in its Market Access Project proceeding (Docket Nos. CP07-457-000 et al.).

For the Supply Path Component of the NED Project (from Troy, Pennsylvania to Wright, New York), a few existing pipelines serve or traverse the region, including Tennessee (discussed above), Transcontinental Gas Pipe Line Company ("Transco"), Columbia Gas Transmission, Millennium Pipeline Company ("Millennium"), and Dominion Transmission ("Dominion"). Tennessee anticipates these systems are near or fully subscribed based on documents filed with the FERC for the two following pending projects; Dominion's "New Market Project" (Docket No. CP14-497-000) and the Constitution Pipeline Project (Docket No. CP13-499-000). These pipeline companies are proposing to expand their existing systems to provide additional transportation capacity to move gas production for shippers in the



Marcellus Shale area to markets north and east. However, based on the public information available about these pending projects, Tennessee would anticipate that significant looping or additional compression would need to be added to those pipeline systems in order to provide equivalent transportation capacity to that proposed to be created by the NED Project, likely resulting in similar, if not greater, environmental impacts than from the proposed Project. Transco has announced its proposed Diamond East Project to provide firm natural gas to markets in the northeast U.S., but that project is proposing to serve different markets in Pennsylvania, New Jersey, and New York than the proposed Project.

With regard to the Constitution Pipeline Project, Tennessee notes that the Commission, on October 24, 2014, issued the Constitution FEIS (FERC 2014b).<sup>6</sup> The Constitution FEIS contains a section in the Alternatives Section discussing Tennessee's NED Project, a portion of which is proposed to generally collocate with the Constitution Pipeline Project from Susquehanna County, Pennsylvania and Wright, New York (as discussed in more detail in the draft of Resource Report 1 in this filing). In the Constitution FEIS, Commission Staff states that it considered the possibility of requiring Constitution and Tennessee to build one larger diameter pipeline to accommodate the objectives of both projects. The Constitution FEIS acknowledges that construction of one larger pipeline rather than two smaller pipelines would generally reduce long-term environmental impacts (assuming that both pipeline projects would cross the same resources), but that a larger pipeline would require a wider construction ROW and additional workspaces at resource crossings. Also, the Constitution FEIS discusses that if a larger pipeline was constructed, the extra capacity would not be immediately utilized, as sufficient takeaway capacity from Wright, New York does not exist currently (e.g. the proposed Wright to Dracut Pipeline Segment of the NED Project). This capacity would not be available to be used until Tennessee files the certificate application for the Project; the Project undergoes NEPA review, is approved, receives all other necessary federal approvals and is then constructed. The Constitution FEIS includes a discussion of the Commission's Certificate Policy Statement, under which the Commission applies a balancing test in reviewing proposals that weighs the environmental impacts of a project against purported benefits, noting that a project providing greater benefits could be approved with larger adverse or significant impacts to the environment. Commission Staff states that were it to recommend that Constitution construct a larger diameter pipeline, that recommendation would directly conflict the Commission's established policy on overbuilding. Also, based on available information, the Constitution Pipeline Project and the NED Project have different project objectives, different shippers, and different market-driven obligations that may not be met by a combined project. Commission Staff also acknowledges in the Constitution FEIS that given the timeframe for the proposed NED Project, recommending the single pipeline alternative would delay Commission review of the Constitution project significantly and would be inconsistent with EAct 2005. See Constitution FEIS, Section 3.3.5, Northeast Energy Direct Single Pipeline Alternative, pp. 3-24 through 3-27, for the complete discussion.

Tennessee has designed the NED Project to meet the expressed needs of the Project Shippers, including requests to provide specific receipt points in Northeast Pennsylvania and specific delivery points to the Project Shippers' existing systems in New England that are already connected to Tennessee's system, as

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<sup>6</sup> At the time the Constitution FEIS was issued, Tennessee was in the process of finalizing the drafts of Resource Reports 1 and 10 for filing with the Commission on November 5, 2014 when the Commission issued the Constitution FEIS and has not had an opportunity to finalize its review of the Constitution FEIS and incorporate any revisions to its proposed route based on that review. Tennessee will determine if any revisions to its proposed route are necessary after its review of the Constitution FEIS and incorporate any such revisions in a Revised Resource Report 10 to be submitted in a subsequent filing of the ER.



well as to new delivery points on Tennessee's system. The NED Project is independent from other proposed pipeline projects in the region and is designed to provide natural gas transportation service to the Project Shippers. The capacity to provide this transportation service must be available by November 2018 in order for the gas supply to be transported to the requested delivery points, which timing may not be able to be accommodated by expansions of pipeline systems that have not yet been proposed by other pipeline companies. Tennessee is not aware that the two pending projects, or other proposed projects in the region, would meet the Project's objectives, including meeting the November 1, 2018 in-service date.

For the Market Path Component of the NED Project (extending from Wright, New York to Dracut, Massachusetts), six interstate pipelines, including Tennessee, serve the New England natural gas supply and delivery infrastructure (Figures 10.2-1 through 10.2-5):

1. Tennessee owns and operates an interstate natural gas transmission system that extends from the states of Texas, Louisiana, and the Gulf of Mexico area, through the states of Texas, Louisiana, Arkansas, Mississippi, Alabama, Tennessee, Kentucky, West Virginia, Ohio, Pennsylvania, New Jersey, New York, Connecticut, Massachusetts, Rhode Island, and New Hampshire.
2. Spectra Energy's Algonquin Gas Transmission Pipeline ("AGT") originates from southern New Jersey, Connecticut and Massachusetts. The AGT System's proposed Atlantic Bridge Project and Access Northeast Project would provide more transportation capacity on the AGT Systems, but, based on the limited public information about this project, would not be capable of providing service to Tennessee's Project Shippers in New York, Massachusetts, northern Connecticut, and New Hampshire, unless AGT were to build an entirely new pipeline system that would essentially duplicate the Tennessee system. Such a project, would involve the construction of hundreds of miles of new pipeline facilities, presumably resulting in significantly greater environmental impacts than the proposed NED Project facilities, which includes pipeline looping and co-location with existing facilities to the extent practicable and feasible.
3. The PNGTS originates from Eastern Canada and provides Canadian supplies to the Boston, Massachusetts region. The PNGTS System's proposed C2C Expansion Project would provide additional transportation capacity on the TransCanada/Trans-Québec and Maritimes and Northeast pipelines, but the PNGTS system is not capable of serving Tennessee's Project Shippers in New York, Massachusetts, northern Connecticut, Rhode Island, New Hampshire, Maine, and Atlantic Canada without building an entirely new pipeline resulting in significantly greater environmental impacts than the proposed Project.
4. The Iroquois project originates from Waddington, New York delivering Canadian supplies to the New York City, New York region. The Iroquois system currently serves southwestern Connecticut and Long Island, New York, but is not capable of serving Tennessee's Project Shippers in New York, Massachusetts, northern Connecticut, New Hampshire, Rhode Island, Maine, and Atlantic Canada, without significant expansions or constructing new pipeline facilities.
5. The Maritimes and Northeast Pipeline originates from the Atlantic Canada provinces and delivers Canadian production and LNG imports from Repsol Canaport LNG in New Brunswick to the Boston, Massachusetts, region. The Canaport Terminal has the option of delivering natural gas to New England from the offshore natural gas production fields of the Sable Offshore Energy Project ("SOEP") and Deep Panuke in Nova Scotia, Canada. However, bringing the Marcellus gas supplies to the Project's markets would necessitate the construction of an entirely new pipeline that would essentially duplicate the Tennessee system from east to west. Such a project



would involve the construction of hundreds of miles of new pipeline facilities, presumably resulting in significantly greater environmental impacts than the proposed NED Project facilities, which includes pipeline looping and co-location with existing facilities to the extent practicable and feasible

6. The Granite State Gas Transmission (“GSGT”) system is located in New Hampshire and does not transport natural gas from supply areas outside New England into New England. Therefore, in order to serve the Project Shippers, the GSGT would be required to construct an entirely new pipeline. Such a project would involve the construction of hundreds of miles of new pipeline facilities, presumably resulting in significantly greater environmental impacts than the proposed NED Project facilities, which includes pipeline looping and co-location with existing facilities to the extent practicable and feasible.

Other pipeline operators in the Project area have marketed transportation service moving natural gas into eastern New York and New England, including AGT, Iroquois, and Millennium, who have each offered projects for shippers to consider through open seasons. Based on publicly available information, AGT’s Incremental Market (“AIM”) Project was successful in attracting binding shipper commitments and is moving forward in the regulatory process. A certificate application for the AIM Project is pending at the Commission in Docket No. CP14-96-000. It is Tennessee’s understanding that other similar projects, such as AGT’s Atlantic Bridge Project (discussed above), Iroquois’ Coast to Coast Project (linked with the PNGTS C2C Expansion Project) and Millennium’s Marcellus to Manhattan Project have not been successful in securing sufficient shipper interest to move forward at the time of filing this Resource Report 10.

While the projects identified above apparently share a common goal with Tennessee’s NED Project of transporting Marcellus Shale gas production to Northeast U.S. markets, including New England, there are significant differences. While Tennessee’s market area does partially overlap with AGT’s and Millennium’s market areas (for example in southeastern New York), there are also many other areas where only one or two of the pipeline systems have existing infrastructure, or where one pipeline can offer a more economical solution for transporting incremental gas supplies. In general, Tennessee’s existing system serves more of western and northern Massachusetts, while AGT serves southeast Massachusetts. While either pipeline company could serve growing markets in Massachusetts, each company is typically better positioned to serve certain geographic areas due to the location of each company’s existing pipeline infrastructure. However, the NED Project uniquely enables service to all areas of Massachusetts given its ability to serve the Tennessee 200 Line System as well as various markets on the AGT system. This Project has the potential to provide high pressure volumes to AGT’s through the Joint Facilities, Maritimes & Northeast Pipeline, AGT’s HubLine Pipeline System, which are needed to replace the rapidly declining imports from Canada. Additionally, via a backhaul, the Project significantly increases the capacity of Tennessee’s 200 Line system and will increase deliverability at an important supply feed to AGT’s system via an existing Tennessee-AGT interconnect at Mendon, Massachusetts.

Tennessee believes that the NED Project is the only proposed pipeline Project that can provide the transformative solution that New England needs to reduce energy costs and enhance electric reliability. The NED Project is designed to provide New England with direct access to low-cost gas supplies in the “scale” necessary to significantly lower energy costs. Further, the NED Project will provide electric generation facilities with access to low-cost gas supplies and enable New England to sustain its electric grid, and reduce air emissions.



### **10.3 ROUTE ALTERNATIVES**

Several alternatives to the proposed NED Project pipeline facilities were evaluated as part of the planning and design process for this Project. Alternatives still under evaluation and consideration along with additional information will be provided to FERC in a revised Resource Report 10 to be submitted in a subsequent filing of the ER. The alternatives analysis for the pipeline routes was based on environmental and land use impacts as well as permanent easement acquisitions, and overall Project costs. A route alternative is a linear segment of pipeline that deviates from the routing of the proposed pipeline facilities for the Project. Tennessee has analyzed (and will continue to analyze) three types of route alternatives.

- a) Major route alternatives significantly deviate in both length and distance from the proposed route of the pipeline facilities (Section 10.3.1).
- b) Minor route alternatives deviate from the proposed route of the pipeline facilities in the same general area as the proposed route (Section 10.3.2).
- c) Minor deviations involve minor adjustments to the proposed route to avoid specific features (*e.g.*, topography, sensitive habitat, and structures) or to address landowner or agency requests (Section 10.3.3).

Tennessee evaluated ten major alternative routes (Figures 10.3-1 to 10.3-10), two minor alternative routes (Figures 10.3-11 and 10.3-12), and over 100 minor deviations. Of these minor deviations, three representative landowner requests are presented in Section 10.3.3. These comparisons of alternatives to the proposed route for the Project pipeline facilities are detailed in Tables 10.3-1 to 10.3-7 (major route alternatives), Tables 10.3-8 and 10.3-9 (minor route alternatives), and Table 10.3-10 (minor deviations-landowner deviations).

Tennessee performed an analysis using desktop data to compare the proposed route for the Project's pipeline facilities against alternative routes. Although environmental survey data is currently being collected for the entire proposed route of the Project's pipeline facilities, this data did not allow for consistent, comparative assessments among the alternatives. Therefore, desktop data was utilized for the alternative analysis to present a more comprehensive, reliable, and consistent data set for alternatives analysis.

The factors considered by Tennessee in its selection of the proposed route for the Project's pipeline facilities rather than the alternative routes and deviations include landowner concerns, minimization of the number of affected landowners, minimization of adverse environmental impacts, ensuring constructability, promoting safety, and meeting Tennessee's goal to minimize the extent of potential disruption to communities during construction. Existing information sources such as field reconnaissance, aerial photography, topographic maps from the U.S. Geological Survey ("USGS"), and National Wetland Inventory ("NWI") maps were used during the route identification and evaluation processes.

When evaluating the routing options for the Project's pipeline facilities, Tennessee attempted to co-locate with its own existing pipeline facilities and ROW, other existing utility ROWs, to the extent practicable, feasible, and consistent with existing law. The use of co-location as a principle design element by Tennessee is necessitated not only by Commission guidelines which stress the corridor concept, but also due to the existing land use characteristics in the areas of the pipeline system. The utility corridor created



by Tennessee's existing pipeline or other utilities or pipelines minimizes further environmental impacts and public disturbance, as well as construction costs. Siting pipeline facilities along existing corridors reduces the establishment of new corridors in previously undisturbed areas, while limiting environmental impacts and the number of affected landowners.

The selection of the major route alternatives discussed in Section 10.3.1 below was dictated by several factors:

- determination of the most cost-effective technical solution (*i.e.*, looping or co-location versus addition of compression);
- development of routing criteria;
- identification of potential routing alternatives;
- collection of data relative to each alternative;
- evaluation of potential environmental and land use impacts; and
- evaluation of routing alternatives against routing criteria.

The main determinants used to select the proposed route for the Project's pipeline facilities rather than the other alternative routes that were evaluated, pertained to minimizing the number of affected landowners, constructability issues, and Tennessee's goal to limit the extent of disruption on the communities to potentially be affected during construction.

### **10.3.1 Major Route Alternatives**

Major route alternatives include those that deviate from the proposed route for the Project's pipeline facilities for a significant distance (often a majority or more of the proposed route's length for a specific pipeline facility), and which provide a substantially different pathway from the supply area to the delivery area. In lieu of the proposed Project facilities that were selected to meet the Project objectives, Tennessee evaluated the alternative of constructing a new pipeline along with ten other alternative alignments as detailed below.

During the early pipeline routing and design stages, Tennessee, in order to evaluate and determine the best viable route, completed a detailed routing analysis of the proposed route of the pipeline facility extending from Wright, New York to Dracut, Massachusetts as compared to three major route alternatives: (1) the co-location with the existing 200 Line; (2) co-location with Route 2; and (3) co-location with the Mass Turnpike ("Mass Pike" also known as Interstate-90). These alternative routes considered are located entirely within the Commonwealth of Massachusetts and the State of Connecticut. The analysis was completed using geographic information system ("GIS") data sets tied to specific data available at the state level. This review and data is summarized in Sections 10.3.1.3 through 10.3.1.5 and Tables 10.3-3 to 10.3-5. The remaining sections and tables provide details for the remaining seven major alternatives (New Hampshire, Massachusetts and New York powerline alternatives, the Article 97 Avoidance and Co-location alternatives, and the Pennsylvania to Wright Pipeline Segment alternatives), which were compiled utilizing publically available, federal and other GIS data set sources.

#### **10.3.1.1 Pennsylvania to Wright Pipeline Segment Alternatives**

Tennessee evaluated a total of five major alternatives along its proposed Pennsylvania to Wright Pipeline Segment. These alternatives consist of three areas in which the proposed route for the Pennsylvania to Wright Pipeline Segment deviates from the proposed route for the Constitution project, one alternative



route along the Interstate 88 (“I-88”) corridor and one alternative previously evaluated as part of Tennessee’s contemplated Northeast Exchange (“NEEX”) project. The information detailed below pertains to the proposed Constitution pipeline route evaluated within the Constitution DEIS (FERC 2014a). As discussed above, the Commission issued the Constitution FEIS on October 24, 2014. Tennessee will determine if any revisions to its proposed route and alternatives discussion are necessary after a thorough review of the Constitution FEIS, and incorporate any such revisions in subsequent filings of the ER.

### **10.3.1.1.1 Constitution Route Alternatives**

The following details three locations along the proposed Pennsylvania to Wright Pipeline Segment where the proposed route deviates from the proposed Constitution alignment<sup>7</sup> for various engineering constraints, which are still under evaluation (Figure 10.3-1).

Tennessee’s Constitution Route 1 Alternative deviates from the proposed Constitution alignment within Pennsylvania at MP 24.25 of the Pennsylvania to Wright Pipeline Segment and returns to the proposed Constitution alignment at MP 36.24. This is an approximate 9.57 mile deviation. The proposed alternative route will provide access to the Project for a potential Project Shipper and would be co-located with an existing powerline easement for approximately 5.70 miles. Tennessee’s proposed route in this location also provides for a more constructible crossing of Starrucca Creek, including the potential to cross the creek with a horizontal direction drill (“HDD”) to minimize impacts to the creek. As of the filing date of this Resource Report 10, Tennessee continues to evaluate this alternative in comparison with the proposed route for the Pennsylvania to Wright Pipeline Segment. Additional information and consideration of this alternative will be provided to in a revised Resource Report 10 to be submitted in a subsequent filing of the ER.

Tennessee’s Constitution Route 2 Alternative route deviates from the proposed Constitution alignment within New York at MP 50.13 of the Pennsylvania to Wright Pipeline Segment and returns to proposed Constitution alignment at MP 63.60. This is an approximate 13 mile deviation. In Susquehanna County, Pennsylvania Tennessee’s proposed route travels in a northeasterly direction and is approximately four miles shorter than the proposed Constitution alignment, resulting in less environmental resources and landowners that would be impacted. In addition the proposed route eliminates areas of steep terrain present along this portion of the proposed Constitution alignment. As of the filing date of this Resource Report 10, Tennessee continues to evaluate this alternative in comparison with the proposed route for the Pennsylvania to Wright Pipeline Segment. Additional information and consideration of this alternative will be provided in a revised Resource Report 10 to be submitted in a subsequent filing of the ER.

Tennessee’s Constitution Route 3 Alternative deviates from the proposed Constitution alignment within New York at MP 123.63 of the Pennsylvania to Wright Pipeline Segment and returns to the proposed route at the Wright Meter Station at MP 134.99. This is an approximate 11.59 mile deviation. Routing considerations in this vicinity includes overall environmental impacts, particularly, especially to the multiple waterbodies in the area. Also known to be an area where hills and karst terrain are prevalent, construction feasibility and safety to personnel and equipment are significant considerations in routing

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<sup>7</sup> As discussed above, the Commission issued the Constitution FEIS on October 24, 2014. Tennessee will determine if any revisions to its proposed route and alternatives discussion are necessary after a thorough review of the Constitution FEIS, and incorporate any such revisions in subsequent filings of the ER.



evaluations. Attempts are made to avoid unnecessary traversing of steep hills while maintaining minimal impacts to land owners and the surrounding environment. As of the filing date of this Resource Report 10, Tennessee continues to evaluate this alternative in comparison with the proposed route for the Pennsylvania to Wright Pipeline. Additional information and consideration of this alternative will be provided in a revised Resource Report 10 to be submitted in a subsequent filing of the ER.

**TABLE 10.3-1**  
**COMPARISON OF THE PROPOSED ROUTE OF THE PENNSYLVANIA TO WRIGHT PIPELINE SEGMENT TO CONSTITUTION**  
**MAJOR ROUTE ALTERNATIVES FOR THE PROJECT**

Factor	Proposed Corresponding Route Segment								
	Pennsylvania to Wright Pipeline Segment			Constitution Alternative Routes			Difference (if applicable) <sup>1</sup>		
	1	2	3	Route 1	Route 2	Route 3	1	2	3
Length of Corresponding Segment (miles)	11.99	13.47	11.37	9.57	17.48	11.59	+2.42	-4.01	-0.22
<b>Type of Right-of-Way (ROW)</b>									
New ROW (miles)	7.51	10.80	3.28	0.00	0.00	8.62	+7.51	+10.80	-5.34
Length Existing Utility ROW (electric/pipeline/road/rail) (miles)	4.48	2.67	8.09	9.57	17.48	2.97	-5.09	-6.90	+5.12
<b>ROW Requirements</b>									
Pipeline Construction Requirements (acres) <sup>2</sup>	145.32	163.28	137.82	116.00	211.88	140.48	+29.32	-48.60	-2.66
Pipeline Operation Requirements (acres) <sup>2</sup>	72.66	81.64	68.91	58.00	105.94	70.24	+14.66	-24.30	-1.33
<b>Wetlands</b>									
Total Wetland Complexes Crossed (number)	6	3	0	3	3	0	+3	0	0
Total Wetland Crossed (linear ft)	1,443.58	404.69	0.00	537.53	739.13	0.00	+906.05	-334.44	0.00

**TABLE 10.3-1**  
**COMPARISON OF THE PROPOSED ROUTE OF THE PENNSYLVANIA TO WRIGHT PIPELINE SEGMENT TO CONSTITUTION**  
**MAJOR ROUTE ALTERNATIVES FOR THE PROJECT**

Factor	Proposed Corresponding Route Segment								
	Pennsylvania to Wright Pipeline Segment			Constitution Alternative Routes			Difference (if applicable) <sup>1</sup>		
	1	2	3	Route 1	Route 2	Route 3	1	2	3
Palustrine Forested Wetland Complexes Crossed (construction/operation acres) (miles)	1.60/0.80 (0.13)	0.66/0.33 (0.05)	0.00/0.00 (0)	0.56/0.28 (0.05)	0.00/0.00 (0.00)	0.00/0.00 (0.00)	+1.04/+0.52 (+0.08)	+0.66/+0.33 (+0.05)	+0.66/+0.33 (+0.05)
Palustrine Scrub-Shrub Wetland Complexes Crossed (construction/operation acres) (miles)	1.26/0.63 (0.10)	0.26/0.13 (0.02)	0.00/0.00 (0)	0.00/0.00 (0.00)	0.87/0.43 (0.07)	0.00/0.00 (0.00)	+1.26/+0.63 (+0.10)-	0.61/-0.03 (-0.05)	0.00
Palustrine Emergent Wetland Impacts (construction/operation acres) (miles)	0.46	0.23/ (0.04)	0.00	0.68/0.34 (0.06)	0.82/0.41 (0.07)	0.00/0.00 (0.00)	-0.22/-0.11 (-0.02)	-0.82/-0.41 (-0.07)	0.00
<b>Waterbodies</b>									
Waterbodies Crossed (number)	12	11	8	8	15	7	+4	-4	+1
Perennial Waterbodies (number)	3	5	8	3	10	7	0	+2	+1
Major River Crossings (number >100 ft)	0	0	0	0	1	0	0	-1	0
Designated natural and scenic rivers (number)	0	0	0	0	0	0	0	0	0

**TABLE 10.3-1**  
**COMPARISON OF THE PROPOSED ROUTE OF THE PENNSYLVANIA TO WRIGHT PIPELINE SEGMENT TO CONSTITUTION**  
**MAJOR ROUTE ALTERNATIVES FOR THE PROJECT**

Factor	Proposed Corresponding Route Segment								
	Pennsylvania to Wright Pipeline Segment			Constitution Alternative Routes			Difference (if applicable) <sup>1</sup>		
	1	2	3	Route 1	Route 2	Route 3	1	2	3
Significant fisheries (number)	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
<b>Federal Listed Endangered or Threatened Species</b>									
Habitat (miles)	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Species (number)	TBD			TBD	TBD	TBD	TBD	TBD	TBD
<b>Cultural Resources</b>									
National Historic Landmarks (number)	0	0	0	0	0	0	0	0	0
National Register of Historic Places (NRHP) Eligible or Potentially Eligible Cultural Resources Sites crossed (number)	0	0	2	0	0	1	0	0	+1
Unlisted/potentially eligible properties	0	0	0	0	0	0	0	0	0
<b>Land Use</b>									
Forested Land Crossed (miles)	8.24	8.24	5.17	8.05	10.48	5.28	+0.19	-2.24	-0.11
Agricultural Land Crossed (miles)	2.89	4.08	5.65	1.13	5.80	5.72	+1.79	-1.72	-0.07
Open (meadow, recreation, historic districts, etc.) (miles)	0.86	1.02	0.47	0.38	1.19	0.46	+0.48/	-0.17	+0.01

**TABLE 10.3-1**  
**COMPARISON OF THE PROPOSED ROUTE OF THE PENNSYLVANIA TO WRIGHT PIPELINE SEGMENT TO CONSTITUTION MAJOR ROUTE ALTERNATIVES FOR THE PROJECT**

Factor	Proposed Corresponding Route Segment								
	Pennsylvania to Wright Pipeline Segment			Constitution Alternative Routes			Difference (if applicable) <sup>1</sup>		
	1	2	3	Route 1	Route 2	Route 3	1	2	3
Residential (miles)	0.00	0.04	0.07	0.00	0.00	0.06	0.00	+0.04	+0.01
Commercial/Industrial (miles)	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	-0.03
<b>Property Owners</b>									
Residences located within 50 ft of the construction work area (number)	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD	TBD
<b>Federal &amp; State Land</b>									
Federal Lands Crossed (number/miles)	0	0	0	0	0	0	0	0	0
State Forest/Parks (number/miles)	(0) 0.00	(1) 0.26	(0) 0.00	(0) 0.00	(1) 0.06	(0) 0.00	(0) 0.00	(0) +0.20	(0) 0.00
Wildlife Management Areas (miles)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>Trails</b>									
National and State Trails (number)	0	1	0	0	1	0	0	0	0
<b>Other Environmental Features</b>									
Landfills, quarries (count w/in 0.50 mile)	14	2	0	18	2	1	-4	0	-1

**TABLE 10.3-1  
COMPARISON OF THE PROPOSED ROUTE OF THE PENNSYLVANIA TO WRIGHT PIPELINE SEGMENT TO CONSTITUTION  
MAJOR ROUTE ALTERNATIVES FOR THE PROJECT**

Factor	Proposed Corresponding Route Segment									
	Pennsylvania to Wright Pipeline Segment			Constitution Alternative Routes			Difference (if applicable) <sup>1</sup>			
	1	2	3	Route 1	Route 2	Route 3	1	2	3	

<sup>1</sup> Details the difference of the proposed route compared to the alternative. + = the proposed route contains an increase from the alternative. - = the proposed route contains a decrease from the alternative.

<sup>2</sup> Construction ROW impacts calculated using a 100-foot-wide corridor. Permanent ROW acreages assumed a 50-foot-wide permanent ROW. These acreages are overestimates as reduced construction ROWs widths in areas of wetlands and waterbodies were not incorporated.

TBD – To be determined



### **10.3.1.1.2 Interstate-88 Alternative**

The I-88 Alternative to the proposed route of the Pennsylvania to Wright Pipeline Segment was discussed in detail in the Commission's Constitution DEIS (FERC 2014a), and in the Commission's Constitution FEIS (FERC 2014b), issued October 24, 2014 (referred to as "Alternative M" in the Constitution FEIS). The section below references the discussion of the I-88 Alternative based on the Constitution DEIS analysis. Tennessee will review the Alternative M discussion in the recently issued Constitution FEIS and update the discussion in this section in a revised Resource Report 10 to be submitted in a subsequent filing of the ER.

In the Constitution DEIS for the proposed Constitution Pipeline Project, the Commission evaluated an alternative within the I-88 ROW (Figure 10.3-2). This alternative evaluated the possibility of co-locating with Constitution's proposed route from Pennsylvania to Wright, New York within or adjacent to the I-88 corridor, thereby reducing the need for disturbance in new areas. I-88 originates near Binghamton, New York, which is located to the north of the Susquehanna County, Pennsylvania supply area, and proceeds approximately 118 miles to the northeast near Schenectady, New York. Constitution's proposed route and I-88 are located in the same general vicinity, both trending northeast-southwest. The I-88 corridor is managed by the New York State Department of Transportation ("NYSDOT"), with funding and oversight provided by the Federal Highway Administration ("FHWA").

As a result of the Commission's review, several potential construction and/or engineering issues were identified regarding this alternative route in the Constitution proceeding:

- blasting near the roadway would be required;
- use of two-tone construction techniques on side slopes would be necessary to install the pipeline;
- disruption of interstate traffic flow during blasting would likely occur;
- delays caused by slow moving, heavy construction equipment operating near the roadway were likely; and
- limited areas where the pipeline could be safely installed relative to the roadway.

The Commission's review of this alternative in their Constitution DEIS included a number of comments from the NYSDOT. Among other things, the Commission noted that the NYSDOT, for safety of both motorists and construction workers, would not allow access to the construction workspace directly from I-88; rather, access would have to be obtained from adjacent private properties. In addition, Constitution would not be allowed access to the permanent ROW from I-88 during operations and placement of the pipeline within the controlled access area managed by the NYSDOT would obstruct pipeline construction as well as inspections and maintenance during pipeline operations (FERC 2014a). The NYSDOT had commented that the proposed pipeline would be required to comply with FHWA policy, (23 CFR 645, Subpart B) which states that "an applicant would be required to show that no feasible alternative routes exist to obtain approval of the I-88 route from NYSDOT and FHWA," of which the proposed Constitution route would be considered a feasible alternative. Further, because the easements along I-88 are federally managed, Constitution would be required to successfully negotiate an easement for any portion of its project located within or crossing these access areas. If the NYSDOT refused to grant an easement or if a mutually agreeable easement could not otherwise be negotiated in these areas and the Commission were to grant a certificate order authorizing the Constitution Pipeline Project, it would essentially be approving a non-buildable project, as federally-managed lands cannot be acquired through the power of eminent domain.



As noted above, the Commission evaluated the I-88 major route alternative in its review of the proposed Constitution route and determined it did not offer major environmental advantages over the proposed Constitution route and therefore, this alternative route was eliminated from further consideration and was rejected in the Commission's DEIS for the Constitution Project. After reviewing this information as part of its evaluation of major route alternatives, including the Commission's findings that the I-88 corridor is not a viable alternative, Tennessee has eliminated this alternative from further evaluation as a possible alternative for the NED Project. As a result, the proposed Pennsylvania to Wright Pipeline Segment of the NED Project has been co-located with the proposed Constitution alignment in this area, as it represents the most environmentally sound route.

Because this alternative has already received an extensive review by the Commission, a comparison table to the proposed route has not been provided in this Resource Report 10.

#### **10.3.1.1.3 Northeast Exchange (NEEX) Alternative**

The NEEX Alternative was originally proposed by Tennessee as a competing pipeline to the proposed Constitution route, extending from Tennessee's existing Station 321 in Pennsylvania and traveling north and east to Wright, New York (Figure 10.3-3). The Commission's analysis of the proposed Constitution route deemed that its proposed alignment is the most viable route in this area. With this analysis and with Constitution's certificate application pending at the Commission, Tennessee does not consider the NEEX route to be a viable alternative for this area and in fact, Constitution adopted a majority of the NEEX route originally developed by Tennessee. As a result, the proposed Pennsylvania to Wright Pipeline Segment has been generally co-located with the preferred Constitution alignment, except as discussed above in Section 10.3.1.1.1.

Because this alternative has already been determined as a non-viable route, a comparison table to the proposed route has not been provided within this Resource Report 10.

#### **10.3.1.2 New York Powerline Alternative**

Tennessee is evaluating the New York Powerline Alternative as an alternative to the proposed route for the Wright to Dracut Pipeline Segment. This alternative routing would co-locate the Wright to Dracut Pipeline Segment with an existing New York powerline corridor (Figure 10.3-4). This alternative would begin at approximately MP 34.13 of the Wright to Dracut Pipeline Segment in New York, travel in a north/northeast direction, eventually turning east/southeast to interconnect with the mainline proposed route at approximately MP 69.91 in Massachusetts.

The advantages of this alternative route include co-location with an existing utility corridor, and the avoidance of the congested populated areas of Pittsfield and Dalton, Massachusetts. However, in Massachusetts, the alternative route would traverse state-owned lands. The co-location of the pipeline with the powerline corridor in these areas, however, would lessen the environmental impacts and avoid habitat fragmentation. This alternative route for the Wright to Dracut Pipeline Segment continues to be evaluated by Tennessee and additional information about the alternative analysis will be provided in a revised Resource Report 10 to be submitted in a subsequent filing of the ER.



**TABLE 10.3-2  
COMPARISON OF THE PROPOSED ROUTE OF THE WRIGHT TO DRACUT PIPELINE  
SEGMENT TO NEW YORK POWERLINE  
MAJOR ROUTE ALTERNATIVE FOR THE PROJECT**

<b>Factor</b>	<b>Proposed Route Wright to Dracut Pipeline Segment</b>	<b>New York Powerline Alternative</b>	<b>Difference (if applicable)<sup>1</sup></b>
Length of Corresponding Segment (miles)	35.77	34.42	+1.35
<b>Type of Right-of-Way (ROW)</b>			
New ROW (miles)	12.46	0.00	+12.46
Length Existing Utility ROW (electric/pipeline/road/rail) (miles)	23.31	34.42	-11.11
<b>ROW Requirements</b>			
Pipeline Construction Requirements (acres) <sup>2</sup>	433.58	417.22	+16.36
Pipeline Operation Requirements (acres) <sup>2</sup>	216.79	208.61	+8.18
<b>Wetlands</b>			
Total Wetland Complexes Crossed (number)	39	37	+2
Total Wetland Crossed (linear ft)	8,528.61	10,542.62	-2,014.01
Palustrine Forested Wetland Complexes Crossed (construction/operation acres) (miles)	15.08/7.54 (1.24)	6.60/3.30 (0.54)	+8.48/+4.27 (+0.70)
Palustrine Scrub-Shrub Wetland Complexes Crossed (construction/operation acres) (miles)	2.04/1.02 (0.17)	6.00/3.00 (0.50)	-3.96/-1.98 (-0.33)
Palustrine Emergent Wetland Impacts (construction/operation acres) (miles)	7.08/3.54 (0.58)	6.98/3.49 (0.58)	+0.10/+0.05 (0.00)
<b>Waterbodies</b>			
Waterbodies Crossed (number)	33	38	-5
Perennial Waterbodies (number)	28	28	0
Major River Crossings (number >100 ft)	1	16	-15
Designated natural and scenic rivers (number)	0	0	0
Significant fisheries (number)	TBD	TBD	TBD



**TABLE 10.3-2  
COMPARISON OF THE PROPOSED ROUTE OF THE WRIGHT TO DRACUT PIPELINE  
SEGMENT TO NEW YORK POWERLINE  
MAJOR ROUTE ALTERNATIVE FOR THE PROJECT**

<b>Factor</b>	<b>Proposed Route Wright to Dracut Pipeline Segment</b>	<b>New York Powerline Alternative</b>	<b>Difference (if applicable)<sup>1</sup></b>
<b>Federal Listed Endangered or Threatened Species</b>			
Habitat (miles)	TBD	TBD	TBD
Species (number)	TBD	TBD	TBD
<b>Cultural Resources</b>			
National Historic Landmarks (number)	0	0	0
National Register of Historic Places (NRHP) Eligible or Potentially Eligible Cultural Resources Sites crossed (number)	3	0	+3
<b>Land Use</b>			
Forested Land Crossed (miles)	21.58	17.64	+3.94
Agricultural Land Crossed (miles)	6.18	6.19	-0.01
Open (meadow, recreation, historic districts, etc.) (miles)	7.83	10.12	-2.29
Residential (miles)	0.18	0.31	-0.13
Commercial/Industrial (miles)	0.00	0.02	-0.02
<b>Property Owners</b>			
Residences located within 50 ft of the construction work area (number)	TBD	TBD	TBD
<b>Federal &amp; State Land</b>			
Federal Lands Crossed (number/miles)	1/1.08	1/0.42	0/+0.66
State Forest/Parks (number/miles)	1/1.24	1/1.61	0/-0.37
Wildlife Management Areas (miles)	0.00	0.00	0.00
<b>Trails</b>			
National Trails (number)	1	1	0



**TABLE 10.3-2  
COMPARISON OF THE PROPOSED ROUTE OF THE WRIGHT TO DRACUT PIPELINE  
SEGMENT TO NEW YORK POWERLINE  
MAJOR ROUTE ALTERNATIVE FOR THE PROJECT**

Factor	Proposed Route Wright to Dracut Pipeline Segment	New York Powerline Alternative	Difference (if applicable) <sup>1</sup>
<b>Other Environmental Features</b>			
Landfills, quarries (count w/in 0.50 mile)	7	4	+3

<sup>1</sup> Details the difference of the proposed route compared to the alternative. + = the proposed route contains an increase from the alternative. - = the proposed route contains a decrease from the alternative.

<sup>2</sup> Construction ROW impacts calculated using a 100-foot-wide corridor. Permanent ROW acreages based on a 50-foot-wide permanent ROW. These acreages are overestimates as reduced construction ROWs widths in areas of wetlands and waterbodies were not incorporated.

TBD – To be determined

### 10.3.1.3 Existing 200 Line Alternative

Co-locating a pipeline with Tennessee’s existing 200 Line was considered as a major alternative to the Wright to Dracut Pipeline Segment proposed as part of the Project. Tennessee evaluated an alternative pipeline route that would be co-located with Tennessee’s existing 200 Line beginning at the New York/Massachusetts border to Dracut, Massachusetts, approximately 151 miles in length (Figure 10.3-5). This alternative would deviate from the proposed route of the Wright to Dracut Pipeline Segment at MP 52.80 and extend southeast, crossing the Connecticut border, and rejoin the proposed route at MP 176.08. Although the existing 200 Line Alternative would be largely co-located, this route is longer and traverses significantly more densely populated areas. The alternative route along the existing pipeline system would also require the reroute of the proposed market delivery laterals through highly populated areas which would significantly increase environmental impacts and potentially lower the number of markets Tennessee could reach. The proposed route for the Wright to Dracut Pipeline Segment results in shorter market deliver laterals that would disturb significantly fewer stakeholders and environmental resources than if Tennessee were to route the pipeline along its existing 200 Line system corridor.

Tennessee did not select this alternative because, when compared to the proposed route for the Wright to Dracut Pipeline Segment, this alternative would have: (1) a much longer overall route length and land requirements for construction ROW; (2) significantly more extensive cultural and environmental impacts; (3) greater number of stream and wetland crossings and (4) greater impacts to residences and developed areas.



**TABLE 10.3-3  
COMPARISON OF THE PROPOSED ROUTE OF THE WRIGHT TO DRACUT PIPELINE  
SEGMENT TO EXISTING 200 LINE MAJOR ROUTE ALTERNATIVE FOR THE PROJECT**

<b>Factor<sup>1</sup></b>	<b>Proposed Route Wright to Dracut Pipeline Segment</b>	<b>200 Line Alternative</b>	<b>Difference (if applicable)<sup>2</sup></b>
Length of Corresponding Segment (miles)	128.20	151.12	-22.92
<b>Type of Right-of-Way (ROW)</b>			
Length New ROW (miles)	91.01	5.94	+85.07
Length Existing Utility ROW (electric/pipeline/road/rail) (miles)	37.19	147.90	-110.71
<b>ROW Requirements</b>			
Pipeline Construction Requirements (acres) <sup>3</sup>	1,553.81	2,215.08	-661.27
Pipeline Operation Requirements (acres) <sup>3</sup>	780.64	586.87	+193.77
<b>Wetlands</b>			
Total Wetland Complexes Crossed (number)	231	646	-415
Palustrine Forested Wetland Complexes Crossed (construction/operation acres)	46.16/30.28	63.80/24.63	-17.64/-5.65
Palustrine Scrub-Shrub Wetland Complexes Crossed (construction/operation acres)	17.99/11.59	42.11/15.18	-24.12/-3.59
Palustrine Emergent Wetland Impacts (construction/operation acres)	20.44/12.94	58.51/19.21	-38.07/-6.27
<b>Waterbodies</b>			
Waterbodies Crossed (number)	118	191	-73
Perennial Waterbodies Crossed (number)	88	102	-14
Intermittent Waterbodies Crossed (number)	29	80	-51
Major River Crossings (number >100 ft)	3	3	0
Designated natural and scenic rivers (number)	1	0	+1
Significant fisheries (number)	TBD	TBD	TBD
Ponds/Lakes (number)	1	9	-8



**TABLE 10.3-3  
COMPARISON OF THE PROPOSED ROUTE OF THE WRIGHT TO DRACUT PIPELINE  
SEGMENT TO EXISTING 200 LINE MAJOR ROUTE ALTERNATIVE FOR THE PROJECT**

<b>Factor<sup>1</sup></b>	<b>Proposed Route Wright to Dracut Pipeline Segment</b>	<b>200 Line Alternative</b>	<b>Difference (if applicable)<sup>2</sup></b>
<b>Federal Listed Endangered or Threatened Species</b>			
Habitat (construction/operation acres)	357.11/176.46	430.03/111.11	-72.92/+65.35
Species (number)	TBD	TBD	TBD
<b>Cultural Resources</b>			
National Historic Landmarks (number)	No Data Available	1	-1
National Register of Historic Places (NRHP) Eligible or Potentially Eligible Cultural Resources Sites crossed (number)	No Data Available	9	-9
<b>Land Use</b>			
Forested Land Crossed (construction/operation) (acres)	1,138.69/581.40	915.71/318.75	+222.98/+262.65
Agricultural Land (construction/operation) (acres)	117.28/57.49	235.17/59.25	-117.89/-1.76
Open (meadow, recreation, historic districts, etc.) (construction/operation) (acres)	262.52/112.19	874.61/153.83	-612.09/-41.61
Residential (construction/operation) (acres)	21.37/9.07	111.16/30.08	-89.79/-21.01
Commercial/Industrial (includes Transportation) (construction/operation) (acres)	5.77/2.76	65.07/19.77	-59.30/-17.01
Other (construction/operation) (acres)	0.39/0.18	6.62/2.01	-6.23/-1.83
<b>Property Owners</b>			
Residences located within 50 ft of the construction work area (number)	144	707	-563
<b>Federal &amp; State Land</b>			
Federal Lands Crossed (construction/operation) (acres)	29.52/14.74	54.16/14.04	-24.64/+0.70
State Forest/Parks (construction/operation) (acres)	106.65/53.64	167.17/42.82	-60.52/+10.82
Wildlife Management Areas (construction/operation) (acres)	52.39/26.12	45.86/11.03	+6.53/+15.09



**TABLE 10.3-3  
COMPARISON OF THE PROPOSED ROUTE OF THE WRIGHT TO DRACUT PIPELINE  
SEGMENT TO EXISTING 200 LINE MAJOR ROUTE ALTERNATIVE FOR THE PROJECT**

Factor <sup>1</sup>	Proposed Route Wright to Dracut Pipeline Segment	200 Line Alternative	Difference (if applicable) <sup>2</sup>
<b>Trails</b>			
National Trails (number)	1	0	+1
<b>Other Environmental Features</b>			
Recreational Areas (ballfields, campgrounds, landfills, quarries, etc.) (construction/operation) (acres)	6.84/3.44	16.05/4.50	-9.21/-1.06

<sup>1</sup> Review of this alternative was completed using Massachusetts and Connecticut state specific GIS data sets.

<sup>2</sup> Details the difference of the proposed route compared to the alternative. += the proposed route contains an increase from the alternative. -= the proposed route contains a decrease from the alternative.

<sup>3</sup> Construction ROW impacts calculated using a 100-foot wide corridor. Permanent ROW acreages based on a 50-foot-wide permanent ROW where not co-located with an existing Tennessee pipeline; where located within 60 feet of a Tennessee pipeline a 30-foot-wide corridor was used. These acreages are overestimates as reduced construction ROWs widths in areas of wetlands and waterbodies were not incorporated.

TBD – To be determined

### 10.3.1.4 Massachusetts Route 2 Alternative

Co-locating with Route 2 is considered a major alternative to the Wright to Dracut Pipeline Segment. Tennessee evaluated an alternative pipeline route that would co-locate the Wright to Dracut Pipeline Segment of NED Project adjacent to existing Route 2 within Massachusetts (Figure 10.3-6). This alternative deviates from the proposed route for the Wright to Dracut Pipeline Segment at MP 52.80 and travels north of the proposed route, before rejoining into the proposed route at MP 177.16.

The proposed route of the Wright to Dracut Pipeline Segment compared to the Route 2 Alternative shows that it is approximately 16 miles shorter in length, which subsequently results in significantly less construction and operation impacts. While the proposed route traverses a greater amount of palustrine forested wetland than the alternative, it has significantly less impact to palustrine scrub-shrub and emergent wetlands and crosses a total of 35 fewer streams than the alternative. As a result of the shorter length the amount of land uses traversed and impacted and residences within the 50 feet of the construction work area, is far fewer than the Route 2 alternative. In addition, constructing and operating a pipeline co-located with roadway presents challenges both during installation of the pipeline and maintenance. Working within or adjacent to a state roadway easement poses potential traffic management and access issues and additional coordination with a state agency.

Tennessee did not select this alternative because, when compared to the proposed route for the Wright to Dracut Pipeline Segment, this alternative has: (1) a much longer overall route length and land requirements for construction ROW, (2) significantly more extensive cultural and environmental impacts; (3) greater number of stream and wetland crossings and (4) impacts a greater number of residences and developed areas.



**TABLE 10.3-4  
COMPARISON OF THE PROPOSED ROUTE OF THE WRIGHT TO DRACUT PIPELINE  
SEGMENT TO MASSACHUSETTS ROUTE 2  
MAJOR ROUTE ALTERNATIVE FOR THE PROJECT**

<b>Factor<sup>1</sup></b>	<b>Proposed Route Wright to Dracut Pipeline Segment</b>	<b>Route 2 Alternative</b>	<b>Difference (if applicable)<sup>2</sup></b>
Length of Corresponding Segment (miles)	128.20	144.53	-16.33
<b>Type of Right-of-Way (ROW)</b>			
Length New ROW (miles)	91.01	51.48	+39.53
Length Existing Utility ROW (electric/pipeline/road/rail) (miles)	37.19	93.05	-55.86
<b>ROW Requirements</b>			
Pipeline Construction Requirements (acres) <sup>3</sup>	1,553.81	1,784.10	-230.29
Pipeline Operation Requirements (acres) <sup>3</sup>	780.64	885.68	-105.04
<b>Wetlands</b>			
Total Wetland Complexes Crossed (number)	231	336	-105
Palustrine Forested Wetland Complexes Crossed (construction/operation) (acres)	46.16/30.28	47.78/30.34	-1.62/+0.06
Palustrine Scrub-Shrub Wetland Complexes Crossed (construction/operation) (acres)	17.99/11.59	43.62/28.90	-25.63/-17.31
Palustrine Emergent Wetland Impacts (construction/operation) (acres)	20.44/12.94	34.81/22.34	-14.37/-9.40
<b>Waterbodies</b>			
Waterbodies Crossed (number)	118	153	-35
Perennial Waterbodies Crossed (number)	88	100	-12
Intermittent Waterbodies Crossed (number)	29	50	-21
Major River Crossings (number >100 ft)	3	5	-2
Designated natural and scenic rivers (number)	1	0	+1
Significant fisheries (number)	TBD	TBD	TBD
Ponds/Lakes (number)	1	3	-2



**TABLE 10.3-4  
COMPARISON OF THE PROPOSED ROUTE OF THE WRIGHT TO DRACUT PIPELINE  
SEGMENT TO MASSACHUSETTS ROUTE 2  
MAJOR ROUTE ALTERNATIVE FOR THE PROJECT**

<b>Factor<sup>1</sup></b>	<b>Proposed Route Wright to Dracut Pipeline Segment</b>	<b>Route 2 Alternative</b>	<b>Difference (if applicable)<sup>2</sup></b>
<b>Federal Listed Endangered or Threatened Species</b>			
Habitat (miles)	357.11/176.46	384.08/185.95	-26.97/-9.49
Species (number)	TBD	TBD	TBD
<b>Cultural Resources</b>			
National Historic Landmarks (number)	No Data Available	No Data Available	0
National Register of Historic Places (NRHP) Eligible or Potentially Eligible Cultural Resources Sites crossed (number)	No Data Available	9	-9
<b>Land Use</b>			
Forested Land Crossed (construction/operation) (acres)	1,138.69/581.40	1,041.45/516.04	+97.00/+65.36
Agricultural Land (construction/operation) (acres)	117.28/57.49	132.09/65.57	-14.81/-8.08
Open (meadow, recreation, historic districts, etc.) (construction/operation) (acres)	262.52/112.19	446.59/223.29	-184.07/-111.10
Residential (construction/operation) (acres)	21.37/9.07	45.46/21.28	-24.09/-12.21
Commercial/Industrial (includes Transportation) (construction/operation) (acres)	5.77/2.76	108.39/44.17	-102.62/-41.41
Other (construction/operation) (acres)	0.39/0.18	0.26/0.00	+0.13/+0.18
<b>Property Owners</b>			
Residences located within 50 ft of the construction work area (number)	144	360	-216
<b>Federal &amp; State Land</b>			
Federal Lands Crossed (construction/operation) (acres)	29.52/14.74	7.82/4.17	+21.70/+10.57
State Forest/Parks (construction/operation) (acres)	106.65/53.64	130.39/65.02	-23.74/-11.38



**TABLE 10.3-4  
COMPARISON OF THE PROPOSED ROUTE OF THE WRIGHT TO DRACUT PIPELINE  
SEGMENT TO MASSACHUSETTS ROUTE 2  
MAJOR ROUTE ALTERNATIVE FOR THE PROJECT**

<b>Factor<sup>1</sup></b>	<b>Proposed Route Wright to Dracut Pipeline Segment</b>	<b>Route 2 Alternative</b>	<b>Difference (if applicable)<sup>2</sup></b>
Wildlife Management Areas (construction/operation) (acres)	52.39/26.12	15.57/7.78	+36.82/+18.34
<b>Trails</b>			
National Trails (number)	1	1	0
<b>Other Environmental Features</b>			
Recreational Areas (ballfields, campgrounds, landfills, quarries, etc.) (construction/operation acres) (acres)	6.84/3.44	9.44/4.48	-2.60/-1.04

<sup>1</sup> Review of this alternative was completed using Massachusetts and Connecticut state specific GIS data sets.

<sup>2</sup> Details the difference of the proposed route compared to the alternative. + = the proposed route contains an increase from the alternative. - = the proposed route contains a decrease from the alternative.

<sup>3</sup> Construction ROW impacts calculated using a 100-foot wide corridor. Permanent ROW acreages based on a 50-foot-wide permanent ROW where not co-located with an existing Tennessee pipeline; where located within 60 feet of a Tennessee pipeline a 30-foot-wide corridor was used. These acreages are overestimates as reduced construction ROWs widths in areas of wetlands and waterbodies were not incorporated.

TBD – To be determined

### 10.3.1.5 Mass Turnpike Alternative

Co-locating with the existing Mass Pike is considered a major alternative to the Wright to Dracut Pipeline Segment of the proposed Project. Tennessee evaluated co-locating the Wright to Dracut Pipeline Segment adjacent to this highway within Massachusetts (Figure 10.3-7). This alternative leaves the proposed route at MP 52.80 and travels south of the Proposed Route within the southern tier of the state and ties back into the proposed route at MP 177.16.

The proposed route of the Wright to Dracut Pipeline Segment compared to the Mass Pike Alternative shows that it is approximately 24 miles shorter in length, which subsequently results in significantly less construction and operation impacts. While the proposed route traverses a greater amount of palustrine forested wetland than the alternative, it has significantly less impact to palustrine scrub-shrub and emergent wetlands and crosses a total of 36 fewer streams than the alternative. As a result of the shorter length the amount of land uses traversed and impacted and residences within the 50 feet of the construction work area for the proposed route are fewer than the Mass Pike alternative. In addition, constructing and operating a pipeline co-located with roadway presents challenges both during installation of the pipeline and maintenance. Working within or adjacent to a state roadway easement poses potential traffic management and access issues and additional coordination with a state agency.

Tennessee did not select this alternative because, when compared to the proposed route for the Wright to Dracut Pipeline Segment, this alternative has: (1) a much longer overall route length and land



requirements for construction ROW, (2) significantly more extensive cultural and environmental impacts; (3) greater number of stream and wetland crossings and (4) impacts a greater number of residences and developed areas.

**TABLE 10.3-5  
COMPARISON OF THE PROPOSED ROUTE OF THE WRIGHT TO DRACUT PIPELINE  
SEGMENT TO MASS TURNPIKE MAJOR ROUTE ALTERNATIVE FOR THE PROJECT**

<b>Factor<sup>1</sup></b>	<b>Proposed Route Wright to Dracut Pipeline Segment</b>	<b>Mass Turnpike Alternative</b>	<b>Difference (if applicable)<sup>2</sup></b>
Length of Corresponding Segment (miles)	128.20	152.02	-23.82
<b>Type of Right-of-Way (ROW)</b>			
Length New ROW (miles)	91.01	10.20	+80.81
Length Existing Utility ROW (electric/pipeline/road/rail) (miles)	37.19	141.82	-104.63
<b>ROW Requirements</b>			
Pipeline Construction Requirements (acres) <sup>3</sup>	1,553.81	1,931.42	-377.61
Pipeline Operation Requirements (acres) <sup>3</sup>	780.64	904.32	-123.68
<b>Wetlands</b>			
Total Wetland Complexes Crossed (number)	231	303	-72
Palustrine Forested Wetland Complexes Crossed (construction/operation) (miles)	46.16/30.28	36.99/23.39	+9.17/+6.89
Palustrine Scrub-Shrub Wetland Complexes Crossed (construction/operation) (miles)	17.99/11.59	24.55/15.92	-6.56/-4.33
Palustrine Emergent Wetland Impacts (construction/operation) (miles)	20.44/12.94	32.43/20.14	-11.99/-7.20
<b>Waterbodies</b>			
Waterbodies Crossed (number)	118	154	-36
Perennial Waterbodies Crossed (number)	88	92	-4
Intermittent Waterbodies Crossed (number)	29	61	-32
Major River Crossings (number >100 ft)	3	5	-2
Designated natural and scenic rivers (number)	1	1	0



**TABLE 10.3-5  
COMPARISON OF THE PROPOSED ROUTE OF THE WRIGHT TO DRACUT PIPELINE  
SEGMENT TO MASS TURNPIKE MAJOR ROUTE ALTERNATIVE FOR THE PROJECT**

<b>Factor<sup>1</sup></b>	<b>Proposed Route Wright to Dracut Pipeline Segment</b>	<b>Mass Turnpike Alternative</b>	<b>Difference (if applicable)<sup>2</sup></b>
Significant fisheries (number)	TBD	TBD	TBD
Ponds/Lakes (number)	1	1	0
<b>Federal Listed Endangered or Threatened Species</b>			
Habitat (miles)	357.11/176.46	192.75/86.45	+164.36/+90.01
Species (number)	TBD	TBD	TBD
<b>Cultural Resources</b>			
National Historic Landmarks (number)	No Data Available	1	-1
National Register of Historic Places (NRHP) Eligible or Potentially Eligible Cultural Resources Sites crossed (number)	No Data Available	8	-8
<b>Land Use</b>			
Forested Land Crossed (construction/operation) (acres)	1,138.69/581.40	1,171.27/612.76	-32.58/-31.36
Agricultural Land (construction/operation) (acres)	117.28/57.49	48.98/18.22	+68.30/+39.27
Open (meadow, recreation, historic districts, etc.) (construction/operation) (acres)	262.52/112.19	308.32/143.16	-45.80/-30.97
Residential (construction/operation)(acres)	21.37/9.07	32.36/12.76	-10.99/-3.69
Commercial/Industrial (includes Transportation) (construction/operation) (acres)	5.77/2.76	269.09/94.92	-263.32/92.16
Other (construction/operation) (acres)	0.39/0.18	1.34/0.00	-0.95/+0.18
<b>Property Owners</b>			
Residences located within 50 ft of the construction work area (number)	144	425	-281
<b>Federal &amp; State Land</b>			
Federal Lands Crossed (construction/operation) (acres)	29.52/14.74	0.00	+29.52/+14.74
State Forest/Parks (construction/operation) (acres)	106.65/53.64	26.93/12.63	+79.72/+41.01



**TABLE 10.3-5  
COMPARISON OF THE PROPOSED ROUTE OF THE WRIGHT TO DRACUT PIPELINE  
SEGMENT TO MASS TURNPIKE MAJOR ROUTE ALTERNATIVE FOR THE PROJECT**

<b>Factor<sup>1</sup></b>	<b>Proposed Route Wright to Dracut Pipeline Segment</b>	<b>Mass Turnpike Alternative</b>	<b>Difference (if applicable)<sup>2</sup></b>
Wildlife Management Areas (construction/operation) (acres)	52.39/26.12	2.93/1.43	+49.46/++24.69
<b>Trails</b>			
National Trails (number)	1	1	0
<b>Other Environmental Features</b>			
Recreational Areas (ballfields, campgrounds, landfills, quarries, etc.) (construction/operation) (acres)	6.84/3.44	3.46/1.43	+3.38/+2.01

<sup>1</sup> Review of this alternative was completed using Massachusetts and Connecticut state specific GIS data sets.

<sup>2</sup> Details the difference of the proposed route compared to the alternative. + = the proposed route contains an increase from the alternative. - = the proposed route contains a decrease from the alternative.

<sup>3</sup> Construction ROW impacts calculated using a 100-foot-wide corridor. Permanent ROW acreages based on a 50-foot-wide permanent ROW where not co-located with an existing Tennessee pipeline; where located within 60 feet of a Tennessee pipeline a 30-foot-wide corridor was used. These acreages are overestimates as reduced construction ROWs widths in areas of wetlands and waterbodies were not incorporated.

TBD – To be determined

### 10.3.1.6 Massachusetts Powerline Alternative

Tennessee has evaluated the Massachusetts Powerline Alternative to the proposed route of the Wright to Dracut Pipeline Segment. This alternative route would be co-located with an existing Massachusetts powerline corridor (Figure 10.3-8). The alternative for the Wright to Dracut Pipeline Segment would begin at approximately MP 91.44, returning to the proposed route at MP 95.23, and then leaving again at MP 102.09 and returning at MP 176.80, where it deviates to the south, and then heads southeast paralleling along an existing powerline easement. Eventually, the co-location of the pipeline along the powerline corridor would take a more northeasterly turn and terminate in Dracut, Massachusetts.

The proposed route of the Wright to Dracut Pipeline Segment compared to the Massachusetts Powerline Alternative shows that it is approximately 11 miles shorter in length, which subsequently results in significantly less construction and operation impacts. The proposed route traverses less palustrine forested, scrub-shrub, and emergent wetlands and crosses a total of 30 fewer streams than the alternative. As a result of the shorter length, the amount of land uses traversed by the proposed route is far fewer than the Mass Pike alternative.

This alternative was not selected by Tennessee as it does not avoid the sensitive land features that the Commonwealth of Massachusetts has requested be avoided (state-owned lands and land with conservation restrictions). This alternative route would also cross numerous areas of congested construction and difficult construction. Furthermore, this alternative would move the Wright to Dracut Pipeline Segment mainline further from the service areas of the Project Shippers, which would necessitate



construction of longer laterals to provide service to the Project Shippers, resulting in additional environmental and landowner impacts.

**TABLE 10.3-6  
COMPARISON OF THE PROPOSED ROUTE OF THE WRIGHT TO DRACUT PIPELINE  
SEGMENT TO MASSACHUSETTS POWERLINE  
MAJOR ROUTE ALTERNATIVE FOR THE PROJECT**

<b>Factor</b>	<b>Proposed Route Wright to Dracut Pipeline Segment</b>	<b>Massachusetts Powerline Alternative</b>	<b>Difference (if applicable)<sup>1</sup></b>
Length of Corresponding Segment (miles)	124.35	136.03	-11.68
<b>Type of Right-of-Way (ROW)</b>			
New ROW (miles)	70.11	21.31	+52.87
Length Existing Utility ROW (electric/pipeline/road/rail) (miles)	54.24	114.72	-64.55
<b>ROW Requirements</b>			
Pipeline Construction Requirements (acres) <sup>2</sup>	1,507.26	1,648.84	-141.58
Pipeline Operation Requirements (acres) <sup>2</sup>	753.63	824.42	-70.79
<b>Wetlands</b>			
Total Wetland Complexes Crossed (number)	155	266	-111
Total Wetland Crossed (linear ft)	36,229.86	60,695.53	-24,465.67
Palustrine Forested Wetland Complexes Crossed (construction/operation acres) (miles)	49.80/24.90 (4.11)	51.78/25.89 (4.27)	-1.98/-0.99 (-0.16)
Palustrine Scrub-Shrub Wetland Complexes Crossed (construction/operation acres) (miles)	13.20/6.60 (1.09)	34.30/17.15 (2.83)	-21.10/-10.55 (-1.74)
Palustrine Emergent Wetland Impacts (construction/operation acres) (miles)	20.18/10.09(1.66)	55.36/27.68 (4.39)	-35.18/-17.59 (-2.73)
<b>Waterbodies</b>			
Waterbodies Crossed (number)	116	129	-13
Perennial Waterbodies (number)	87	87	0
Major River Crossings (number >100 ft)	18	85	-67
Designated natural and scenic rivers (number)	0	0	0



**TABLE 10.3-6  
COMPARISON OF THE PROPOSED ROUTE OF THE WRIGHT TO DRACUT PIPELINE  
SEGMENT TO MASSACHUSETTS POWERLINE  
MAJOR ROUTE ALTERNATIVE FOR THE PROJECT**

<b>Factor</b>	<b>Proposed Route Wright to Dracut Pipeline Segment</b>	<b>Massachusetts Powerline Alternative</b>	<b>Difference (if applicable)<sup>1</sup></b>
Significant fisheries (number)	TBD	TBD	TBD
<b>Federal Listed Endangered or Threatened Species</b>			
Habitat (miles)	TBD	TBD	TBD
Species (number)	TBD	TBD	TBD
<b>Cultural Resources</b>			
National Historic Landmarks (number)	0	0	0
National Register of Historic Places (NRHP) Eligible or Potentially Eligible Cultural Resources Sites crossed (number)	4	12	-8
<b>Land Use</b>			
Forested Land Crossed (miles)	85.07	68.07	+17.00
Agricultural Land Crossed (miles)	9.18	13.78	-4.60
Open (meadow, recreation, historic districts, etc.) (miles)	25.98	43.64	-17.66
Residential (miles)	2.70	6.09	-3.39
Commercial/Industrial (miles)	0.78	3.36	-2.58
<b>Property Owners</b>			
Residences located within 50 ft of the construction work area (number)	TBD	TBD	TBD
<b>Federal &amp; State Land</b>			
Federal Lands Crossed (number/miles)	1/1.08	1/1.08	0/0.00
State Forest/Parks (number/miles)	11/8.14	5/4.56	+6/+3.58
Wildlife Management Areas (miles)	0.00	0.00	0.00
<b>Trails</b>			
National and State Trails (number)	32	21	+11



**TABLE 10.3-6  
COMPARISON OF THE PROPOSED ROUTE OF THE WRIGHT TO DRACUT PIPELINE  
SEGMENT TO MASSACHUSETTS POWERLINE  
MAJOR ROUTE ALTERNATIVE FOR THE PROJECT**

Factor	Proposed Route Wright to Dracut Pipeline Segment	Massachusetts Powerline Alternative	Difference (if applicable) <sup>1</sup>
<b>Other Environmental Features</b>			
Landfills, quarries (count w/in 0.50 mile)	33	22	+11

<sup>1</sup> Details the difference of the proposed route compared to the alternative. + = the proposed route contains an increase from the alternative. - = the proposed route contains a decrease from the alternative.

<sup>2</sup> Construction ROW impacts calculated using a 100-foot-wide corridor. Permanent ROW acreages based on a 50-foot-wide permanent ROW. These acreages are overestimates as reduced construction ROWs widths in areas of wetlands and waterbodies were not incorporated.

TBD – To be determined

### 10.3.1.7 Article 97 Avoidance and Co-location Alternatives

Within the Commonwealth of Massachusetts, the Wright to Dracut Pipeline Segment crosses a significant number of open space Article 97 properties, which are under the ownership and control of the Commonwealth of Massachusetts or its political subdivisions.<sup>8</sup> Tennessee is evaluating two alternatives for the proposed route of the Wright to Dracut Pipeline Segment to determine if it can avoid, minimize or mitigate crossing Article 97 properties. One of the alternative routes would avoid crossing Article 97 properties identified as of the date of filing of this Resource Report 10 (Article 97 Avoidance Route Alternative) and the other alternative route would significantly avoid crossing such properties and would be co-located within or adjacent to existing utility corridors (Article 97 Co-location Route Alternative). Tennessee is continuing to coordinate with the Massachusetts Department of Environmental Protection (“MassDEP”) and the Massachusetts Department of Conservation and Recreation (“MassDCR”) regarding the Project and alternative routing to avoid, minimize or mitigate impacts to Article 97 properties. Tennessee will update the Commission on the steps taken to avoid, minimize or mitigate crossing of Article 97 properties and keep the Commission updated on its discussions with the MassDEP and MassDCR in revised Resource Report 10 to be submitted in a subsequent filing of the ER.

<sup>8</sup> Article 97 references to Article 97 of the Articles of Amendment to the Constitution of the Commonwealth of Massachusetts. This constitutional provision requires that any disposition or change in use of lands held for certain public purposes must first be approved by a two-thirds vote from both houses of the Legislature. In accordance with the Commonwealth of Massachusetts Office of Environmental Affairs policy

“...[A]n Article 97 land disposition is defined as a) any transfer or conveyance of ownership or other interests;

b) any change in physical or legal control; and

c) any change in use, in and to Article 97 land or interests in Article 97 land owned or held by the Commonwealth or its political subdivisions, whether by deed, easement, lease or any other instrument effectuating such transfer, conveyance or change.”



#### **10.3.1.7.1 Article 97 Avoidance Route**

For the Article 97 Avoidance Route Alternative, Tennessee attempted to avoid the identified Article 97 properties known to exist at the time based on the route submitted to FERC by using GIS-based resource modeling to locate a route that would avoid crossing the Article 97 properties. GIS modeling was utilized to formulate and produce a route that would avoid the identified properties. Figure 10.3-9 provides detail on the GIS route modeling. This alternative route would require a major shift from locating the proposed route in rural/forested areas (which areas include the majority of Article 97 state or its political subdivisions-owned lands or lands with conservation easements) to urban areas, which are more congested (Figure 10.3-9). Avoiding the Article 97 properties would also create a route with constructability issues, as the alternative route would be located in highly developed areas. Also, the GIS-modeled Article 97 Avoidance Route Alternative is approximately 9.30 miles longer than the proposed route. Tennessee is continuing to review this alternative and will provide further information after discussions with the Commonwealth of Massachusetts MassDEP and MassDCR and in a revised Resource Report 10 to be submitted in a subsequent filing of the ER.

#### **10.3.1.7.2 Article 97 Co-location Route Alternative**

The Article 97 Co-location Route Alternative within the Commonwealth of Massachusetts significantly avoids identified Article 97 properties and, where feasible, co-locates with existing powerline easements where traversing identified properties. By locating this alternative adjacent to an existing utility corridor, impacts to the environment will be minimized. In western Massachusetts, this alternative route utilizes approximately 6.50 miles of existing powerline easements which cross Article 97 properties. This Article 97 Co-location Route Alternative does not entirely avoid all Article 97 properties and would be approximately 7.40 miles longer as compared to the proposed route. The alternative route would also cross more densely developed urban areas, increasing construction difficulties. Further review of this alternative route will be discussed in a revised Resource Report 10 to be submitted in a subsequent filing of the ER.

#### **10.3.1.8 New Hampshire Powerline Alternative**

Tennessee is evaluating the New Hampshire Powerline Alternative for the Wright to Dracut Pipeline Segment of the Project. This alternative would involve co-locating the pipeline along an existing electric transmission line corridor in southern New Hampshire, parallel and very near the border with Massachusetts (Figure 10.3-10).

This alternative would deviate from the proposed route in Massachusetts at approximately MP 108.64, and travels in a northerly direction into New Hampshire. At that point, the pipeline would be co-located with an existing powerline corridor and travel in an easterly direction, before turning south and then re-entering Massachusetts near Dracut, Massachusetts and rejoining the proposed route at MP 175.34.

Although the New Hampshire powerline alternative route would cross certain Massachusetts state-owned properties, the pipeline would be co-located with an existing corridor through these areas, thus minimizing impacts and avoiding habitat fragmentation. This alternative route for the Wright to Dracut Pipeline Segment continues to be evaluated by Tennessee and additional information will be provided to FERC in a revised Resource Report 10 to be submitted in a subsequent filing of the ER.



**TABLE 10.3-7  
COMPARISON OF THE PROPOSED ROUTE OF THE WRIGHT TO DRACUT PIPELINE  
SEGMENT TO NEW HAMPSHIRE POWERLINE  
MAJOR ROUTE ALTERNATIVE FOR THE PROJECT**

<b>Factor</b>	<b>Proposed Route Wright to Dracut Pipeline Segment</b>	<b>New Hampshire Powerline Alternative</b>	<b>Difference (if applicable)<sup>1</sup></b>
Length of Corresponding Segment (miles)	68.52	80.03	-11.51
<b>Type of Right-of-Way (ROW)</b>			
New ROW (miles)	58.66	7.82	+49.62
Length Existing Utility ROW (electric/pipeline/road/rail) (miles)	9.86	72.21	-61.13
<b>ROW Requirements</b>			
Pipeline Construction Requirements (acres) <sup>2</sup>	830.54	970.06	-139.52
Pipeline Operation Requirements (acres) <sup>2</sup>	415.27	485.03	-69.76
<b>Wetlands</b>			
Total Wetland Complexes Crossed (number)	91	76	+15
Total Wetland Crossed (linear ft)	23,399.11	21,020.46	+2,378.65
Palustrine Forested Wetland Complexes Crossed (construction/operation acres) (miles)	34.54/17.27 (2.85)	20.56/10.28 (1.70)	+13.98/+6.99 (+1.15)
Palustrine Scrub-Shrub Wetland Complexes Crossed (construction/operation acres) (miles)	8.64/4.32 (0.71)	14.86/7.43 (1.23)	-6.22/-3.11 (-0.52)
Palustrine Emergent Wetland Impacts (construction/operation acres) (miles)	10.54/5.27 (0.86)	12.80/6.40 (1.06)	-2.26/-1.13 (0.20)
<b>Waterbodies</b>			
Waterbodies Crossed (number)	65	66	-1
Perennial Waterbodies (number)	56	40	+16
Major River Crossings (number >100 ft)	11	42	-32
Designated natural and scenic rivers (number)	0	0	0
Significant fisheries (number)	TBD	TBD	TBD



**TABLE 10.3-7  
COMPARISON OF THE PROPOSED ROUTE OF THE WRIGHT TO DRACUT PIPELINE  
SEGMENT TO NEW HAMPSHIRE POWERLINE  
MAJOR ROUTE ALTERNATIVE FOR THE PROJECT**

<b>Factor</b>	<b>Proposed Route Wright to Dracut Pipeline Segment</b>	<b>New Hampshire Powerline Alternative</b>	<b>Difference (if applicable)<sup>1</sup></b>
<b>Federal Listed Endangered or Threatened Species</b>			
Habitat (miles)	TBD	TBD	TBD
Species (number)	TBD	TBD	TBD
<b>Cultural Resources</b>			
National Historic Landmarks (number)	0	0	0
National Register of Historic Places (NRHP) Eligible or Potentially Eligible Cultural Resources Sites crossed (number)	3	1	+2
<b>Land Use</b>			
Forested Land Crossed (miles)	50.23	15.44	+34.79
Agricultural Land Crossed (miles)	3.06	4.14	-1.08
Open (meadow, recreation, historic districts, etc.) (miles)	12.19	21.23	-9.04
Residential (miles)	1.99	2.24	-0.25
Commercial/Industrial (miles)	0.79	0.43	+0.36
<b>Property Owners</b>			
Residences located within 50 ft of the construction work area (number)	TBD	TBD	TBD
<b>Federal &amp; State Land</b>			
Federal Lands Crossed (number/miles)	0	0	0
State Forest/Parks (number/miles)	10/6.90	31/6.46	-21/ +0.44
Wildlife Management Areas (miles)	0	1/0.71	-1/-0.71
<b>Trails</b>			
National and State Trails (number)	32	2	+30



**TABLE 10.3-7  
COMPARISON OF THE PROPOSED ROUTE OF THE WRIGHT TO DRACUT PIPELINE  
SEGMENT TO NEW HAMPSHIRE POWERLINE  
MAJOR ROUTE ALTERNATIVE FOR THE PROJECT**

Factor	Proposed Route Wright to Dracut Pipeline Segment	New Hampshire Powerline Alternative	Difference (if applicable) <sup>1</sup>
<b>Other Environmental Features</b>			
Landfills, quarries (count w/in 0.50 mile)	21	1	+20

<sup>1</sup> Details the difference of the proposed route compared to the alternative. + = the proposed route contains an increase from the alternative. - = the proposed route contains a decrease from the alternative.

<sup>2</sup> Construction ROW impacts calculated using a 100-foot-wide corridor. Permanent ROW acreages based on a 50-foot-wide permanent ROW. These acreages are overestimates as reduced construction ROWs widths in areas of wetlands and waterbodies were not incorporated.

TBD – To be determined

### 10.3.2 Minor Route Alternatives

Minor route alternatives deviate from the proposed route less substantially than major route alternatives, are often designed to avoid significant environmental resources or alleviate engineering constraints, and typically remain within the same general area as the proposed route. Two minor route alternatives were considered for two of the proposed laterals in Massachusetts.

#### 10.3.2.1 **West Nashua Route 13 Lateral Alternative**

The West Nashua Route 13 Lateral Alternative was evaluated as an alternative to the West Nashua Lateral proposed as part of the Project (Figure 10.3-11). The majority of this 14.42 mile alternative proposed to be co-located with Route 13 and a powerline corridor near the town of Brookline, New Hampshire. This alternative alignment avoids traversing Beaver Brook Association compared to the proposed route of the lateral. Discussions with the Massachusetts DOT and the New Hampshire DOT have elicited positive responses regarding this alternative route and the alternative route would require approval to co-locate with this state roadway from both agencies.

As of the date of submitting this Resource Report 10, Tennessee continues to evaluate this alternative in comparison with the proposed route for the lateral. Addition information and consideration of this alternative will be provided in a revised Resource Report 10 to be submitted in a subsequent filing of the ER.



**TABLE 10.3-8  
COMPARISON OF THE PROPOSED WEST NASHUA LATERAL TO MINOR ROUTE  
ALTERNATIVE FOR THE PROJECT**

<b>Factor</b>	<b>Proposed West Nashua Lateral</b>	<b>West Nashua Route 13 Lateral Alternative</b>	<b>Difference (if applicable)<sup>1</sup></b>
Length of Corresponding Segment (miles)	11.94	14.42	-2.48
<b>Type of Right-of-Way (ROW)</b>			
New ROW (miles)	11.94	2.08	+9.85
Length Existing Utility ROW (electric/pipeline/road/rail) (miles)	0.00	12.34	-12.34
<b>ROW Requirements</b>			
Pipeline Construction Requirements (acres) <sup>2</sup>	144.72	174.66	-29.94
Pipeline Operation Requirements (acres) <sup>2</sup>	72.36	87.33	-14.97
<b>Wetlands</b>			
Total Wetland Complexes Crossed (number)	11	6	+5
Total Wetland Crossed (linear ft)	2,523.81	1,615.37	+908.44
Palustrine Forested Wetland Complexes Crossed (construction/operation acres) (miles)	4.02/2.01 (0.33)	0.28/0.14 (0.02)	+3.74/+1.87 (+0.31)
Palustrine Scrub-Shrub Wetland Complexes Crossed (construction/operation acres) (miles)	1.64/0.82 (0.14)	2.42/1.21 (0.20)	-0.78/-0.39 (-0.06)
Palustrine Emergent Wetland Impacts (construction/operation acres) (miles)	0.12/0.06 (0.01)	16.00/4.00 (0.08)	-15.88/-3.94 (-0.07)
<b>Waterbodies</b>			
Waterbodies Crossed (number)	3	14	-11
Perennial Waterbodies (number)	2	7	-5
Major River Crossings (number >100 ft)	0	0	0
Designated natural and scenic rivers (number)	0	0	0
Significant fisheries (number)	TBD	TBD	TBD



**TABLE 10.3-8  
COMPARISON OF THE PROPOSED WEST NASHUA LATERAL TO MINOR ROUTE  
ALTERNATIVE FOR THE PROJECT**

<b>Factor</b>	<b>Proposed West Nashua Lateral</b>	<b>West Nashua Route 13 Lateral Alternative</b>	<b>Difference (if applicable)<sup>1</sup></b>
<b>Federal Listed Endangered or Threatened Species</b>			
Habitat (miles)	TBD	TBD	TBD
Species (number)	TBD	TBD	TBD
<b>Cultural Resources</b>			
National Historic Landmarks (number)	0	0	0
National Register of Historic Places (NRHP) Eligible or Potentially Eligible Cultural Resources Sites crossed (number)	0	0	0
<b>Land Use</b>			
Forested Land Crossed (miles)	8.58	4.07	+4.51
Agricultural Land Crossed (miles)	2.21	0.76	+1.45
Open (meadow, recreation, historic districts, etc.) (miles)	0.98	2.17	-1.19
Residential (miles)	0.17	4.30	-4.13
Commercial/Industrial (miles)	0.00	3.08	-3.08
<b>Property Owners</b>			
Residences located within 50 ft of the construction work area (number)	TBD	TBD	TBD
<b>Federal &amp; State Land</b>			
Federal Lands Crossed (number/miles)	0/0.00	0/0.00	0/0.00
State Forest/Parks (number/miles)	6/2.09	4/0.66	+2/+1.43
Wildlife Management Areas (miles)	0/0.00	0/0.00	0/0.00
<b>Trails</b>			
National and State Trails (number)	0	0	0



**TABLE 10.3-8  
COMPARISON OF THE PROPOSED WEST NASHUA LATERAL TO MINOR ROUTE  
ALTERNATIVE FOR THE PROJECT**

Factor	Proposed West Nashua Lateral	West Nashua Route 13 Lateral Alternative	Difference (if applicable) <sup>1</sup>
<b>Other Environmental Features</b>			
Landfills, quarries (count w/in 0.50 mile)	2	0	+2

<sup>1</sup> Details the difference of the proposed route compared to the alternative. + = the proposed route contains an increase from the alternative. - = the proposed route contains a decrease from the alternative.

<sup>2</sup> Construction ROW impacts calculated using a 100-foot-wide corridor. Permanent ROW acreages based on a 50-foot-wide permanent ROW. These acreages are overestimates as reduced construction ROWs widths in areas of wetlands and waterbodies were not incorporated.

TBD – To be determined

### 10.3.2.2 Andover Lateral Alternative – Proposed Lynnfield Lateral

The Andover Lateral Alternative is comprised of three minor route alternatives to the proposed Lynnfield Lateral that are situated to the east and west of the proposed route (Figure 10.3-12).

Alternative Route 1 leaves the proposed Lynnfield Lateral route at MP 1.15 and returns at MP 8.53 situated east of the proposed route traveling primarily west of and adjacent to Interstate 93. This alternative presents several obstacles including a large wetland complex located between Interstate 495 and Lowell Street, limited room between existing buildings, parking lots and the interstate, and limited access for construction and operation of the lateral. Due to these issues this alternative was not selected over the proposed Lynnfield Lateral route.

Alternative Route 2 leaves the proposed Lynnfield Lateral route where it commences at MP 0.00 and returns at MP 10.70, situated west of the proposed route paralleling a high power electric transmission line ROW. This alternative travels through a highly developed area and there is limited room between the powerline easement and commercial and residential buildings to accommodate a new pipeline ROW. Due to these space constraints, the alternative route would require several shifts across the powerline easement in order to route the pipeline in this area. In addition, this alternative contains an approximate 2,000 foot crossing of a large inundated wetland complex that presents construction challenges. Tennessee is still evaluating the northern portion of this alternative.

Alternative Route 3 leaves the proposed Lynnfield Lateral route where it commences at MP 0.00 and returns at MP 10.70, situated west of the proposed alignment traveling through undeveloped areas situated between dense developments before tying into the powerline easement. This alternative also faces spacing restrictions between housing developments and several large wetland crossings including an approximate 1,000 foot crossing of an inundated wetland complex. Alternative Route 3 contains a crossing of Interstate 495 and shares the same constraints as Alternative Route 2, discussed above, where it ties into the powerline easement. Due to these issues, this alternative was not selected over the proposed Lynnfield Lateral Route.

**TABLE 10.3-9  
COMPARISON OF THE PROPOSED LYNNFIELD LATERAL TO MINOR ROUTE ALTERNATIVES FOR THE PROJECT**

Factor	Proposed Lynnfield Lateral	Andover Lateral Alternative Route 1	Andover Lateral Alternative Route 2	Andover Lateral Alternative Route 3	Difference (if applicable) <sup>1</sup>		
					1	2	3
Length of Corresponding Segment (miles)	16.62	15.58	17.33	18.11	+1.04	-0.71	/-1.49
<b>Type of Right-of-Way (ROW)</b>							
New ROW (miles)	9.90	10.37	2.68	1.99	-0.47	+7.22	+7.91
Length Existing Utility ROW (electric/pipeline/road/rail) (miles)	6.72	5.21	14.65	16.12	+1.51	+1.51	-9.40
<b>ROW Requirements</b>							
Pipeline Construction Requirements (acres) <sup>2</sup>	201.44	188.84	210.06	219.52	+12.60	-8.62	-18.08
Pipeline Operation Requirements (acres) <sup>2</sup>	100.72	94.42	105.03	109.76	+6.30	-4.31	-9.04
<b>Wetlands</b>							
Total Wetland Complexes Crossed (number)	50	42	60	59	+8	-10	-9
Total Wetland Crossed (linear ft)	16,138.66	15,929.92	21,734.65	24,607.29	+208.74	-5,595.99/	-8,468.63



**TABLE 10.3-9  
COMPARISON OF THE PROPOSED LYNNFIELD LATERAL TO MINOR ROUTE ALTERNATIVES FOR THE PROJECT**

Factor	Proposed Lynnfield Lateral	Andover Lateral Alternative Route 1	Andover Lateral Alternative Route 2	Andover Lateral Alternative Route 3	Difference (if applicable) <sup>1</sup>		
					1	2	3
Palustrine Forested Wetland Complexes Crossed (construction/operation acres) (miles)	21.78/10.89 (1.80)	21.20/10.60 (1.75)	23.76/11.88 (1.96)	22.68/11.34 (1.89)	+0.58/+0.29 (+0.05)	-1.98/-0.99 (-0.16)	-0.90/-0.45 (-0.09)
Palustrine Scrub-Shrub Wetland Complexes Crossed (construction/operation acres) (miles)	4.34/2.17 (0.36)	2.90/1.45 (0.24)	8.30/4.15 (0.69)	15.94/7.97 (1.32)	+1.44/+0.72 (+0.12)	-3.96/-1.98 (-0.33)	-11.60/-5.80 (-0.96)
Palustrine Emergent Wetland Impacts (construction/operation acres) (miles)	10.90/5.45 (0.90)	12.44/6.22 (1.03)	17.84/8.92 (1.47)	17.64/8.82 (1.46)	-1.21/-0.77 (- 0.13)	-6.94/-3.47 (- 0.57)	-6.74/-3.37 (-0.56)
<b>Waterbodies</b>							
Waterbodies Crossed (number)	20	17	19	19	+3	+1	+1
Perennial Waterbodies (number)	7	6	8	9	+1	-1	-2
Major River Crossings (number >100 ft)	4	3	4	5	+1	0	-1
Designated natural and scenic rivers (number)	0	0	0	0	0	0	0

**TABLE 10.3-9  
COMPARISON OF THE PROPOSED LYNNFIELD LATERAL TO MINOR ROUTE ALTERNATIVES FOR THE PROJECT**

Factor	Proposed Lynnfield Lateral	Andover Lateral Alternative Route 1	Andover Lateral Alternative Route 2	Andover Lateral Alternative Route 3	Difference (if applicable) <sup>1</sup>		
					1	2	3
Significant fisheries (number)	TBD	TBD	TBD	TBD	TBD	TBD	TBD
<b>Federal Listed Endangered or Threatened Species</b>							
Habitat (miles)	TBD	TBD	TBD	TBD	TBD	TBD	TBD
Species (number)	TBD	TBD	TBD	TBD	TBD	TBD	TBD
<b>Cultural Resources</b>							
National Historic Landmarks (number)	0	0	0	0	0	0	0
National Register of Historic Places (NRHP) Eligible or Potentially Eligible Cultural Resources Sites crossed (number)	1	6	2	4	-5	-1	-3
<b>Land Use</b>							
Forested Land Crossed (miles)	2.42	3.25	3.75	3.75	-0.83	-1.33	-1.33
Agricultural Land Crossed (miles)	0.15	0.11	0.47	0.82	+0.04	-0.32	-0.67
Open (meadow, recreation, historic districts, etc.) (miles)	2.13	5.10	8.85	8.05	-2.97	-6.72	-5.92



**TABLE 10.3-9  
COMPARISON OF THE PROPOSED LYNNFIELD LATERAL TO MINOR ROUTE ALTERNATIVES FOR THE PROJECT**

Factor	Proposed Lynnfield Lateral	Andover Lateral Alternative Route 1	Andover Lateral Alternative Route 2	Andover Lateral Alternative Route 3	Difference (if applicable) <sup>1</sup>		
					1	2	3
Residential (miles)	1.43	3.05	2.03	2.83	-1.62	-0.60	-1.40
Commercial/Industrial (miles)	1.56	3.92	2.11	2.52	-2.36	-0.55	-0.96
<b>Property Owners</b>							
Residences located within 50 ft of the construction work area (number)	TBD	TBD	TBD	TBD	TBD	TBD	TBD
<b>Federal &amp; State Land</b>							
Federal Lands Crossed (number/miles)	0/0.00	0/0.00	0/0.00	0/0.00	0/0.00	0/0.00	0/0.00
State Forest/Parks (number/miles)	1/0.01	0/0.00	0/0.00	0/0.00	+1/+0.01	+1/+0.01	+1/+0.01
Wildlife Management Areas (miles)	0.00	0.00	0.00	0.00	0.00	0.00	0.00
<b>Trails</b>							
National and State Trails (number)	0	0	0	0	0	0	0



**TABLE 10.3-9  
COMPARISON OF THE PROPOSED LYNNFIELD LATERAL TO MINOR ROUTE ALTERNATIVES FOR THE PROJECT**

Factor	Proposed Lynnfield Lateral	Andover Lateral Alternative Route 1	Andover Lateral Alternative Route 2	Andover Lateral Alternative Route 3	Difference (if applicable) <sup>1</sup>		
					1	2	3
<b>Other Environmental Features</b>							
Landfills, quarries (count w/in 0.50 mile)	7	8	11	8	-1	-4	-1

<sup>1</sup> Details the difference of the proposed route compared to the alternative. + = the proposed route contains an increase from the alternative. - = the proposed route contains a decrease from the alternative.

<sup>2</sup> Construction ROW impacts calculated using a 100-foot-wide corridor. Permanent ROW acreages based on a 50-foot-wide permanent ROW. These acreages are overestimates as reduced construction ROWs widths in areas of wetlands and waterbodies were not incorporated.

TBD – To be determined



### 10.3.3 Minor Route Deviations

A minor route deviation makes minor adjustments to the proposed route of the pipeline facilities to avoid minor issues such as topographic and man-made features. Because route deviations are considered to resolve localized resource issues (e.g., wetlands, residence, cultural resource sites), they are normally much shorter than major route alternatives or deviations. As proposed, the pipeline route minimizes impacts to the environment and optimizes Project constructability and economics.

#### 10.3.3.1 Landowner Requested Minor Route Deviations

Tennessee has been reviewing, considering, and incorporating landowner requests as the proposed route is further evaluated and refined and will continue to assess requests as they are received. Table 10.3-10 provides an example of the type of requests and deviations being evaluated and incorporated into the proposed route. These deviations address property owner access issues, and requests to avoid coming into close proximity to residences and recreational hunting camps. Numerous similar changes (over 100 changes) have already been incorporated into the proposed alignment as of the date of this draft Resource Report 10. Evaluations of requested deviations will be ongoing and additional deviations reviewed and either approved or denied and will be provided in a revised Resource Report 10 to be submitted in a subsequent filing of the ER.

**TABLE 10.3-10  
EXAMPLE LANDOWNER REQUESTED MINOR ROUTE DEVIATIONS FOR THE PROJECT**

Minor Route Deviation ID	Affected Parcel Numbers	MP From/To	Length (ft)	Status	Reason for Minor Deviation
05-WOR-0029.001-001	TBD	2.1 – 2.4 (North Worcester Lateral)	1,789	To be incorporated	Landowner requested a line change in this area to ensure that one parcel can be kept as a future house lot.
02-MID-0789.00-01	TBD	149.4 – 149.7 (Wright to Dracut Pipeline Segment, Massachusetts Portion)	2,076	To be incorporated	Proposed deviation to avoid a subdivision.
07-ESS-0039.00-01	TBD	1.3-1.7 (Haverhill Lateral)	1,455	To be incorporated	Landowner requests that the proposed route be adjusted to minimize the bisecting of undeveloped land which is intended to be subdivided in the future.

TBD – To be determined



### **10.3.3.2 Agency Requested Minor Route Deviations**

Within Massachusetts, Tennessee is evaluating routes which avoid or minimize traversing Areas of Critical Environmental Concern (“ACECs”) located either within or adjacent to Article 97 properties, which are under the ownership and control of the Commonwealth and its political subdivisions, or which have conservation easements in place. Tennessee is working with Massachusetts agencies to identify and evaluate these alternatives. Tennessee will work with Pennsylvania, New York, Connecticut, and New Hampshire to evaluate other agency-requested alternatives.

## **10.4 ALTERNATIVE SITES FOR NEW COMPRESSOR STATIONS**

Tennessee is still evaluating locations for new compressor stations, as well as the modifications proposed at existing Station 319 in Pennsylvania, including what additional footprint, if any, will be required at that existing compressor station. Tennessee is completing the necessary hydraulic analyses to determine the optimum horsepower and compression to provide the increased volumes of natural gas necessary to meet market demand for the Project. The following factors will be considered when selecting the proposed locations for new compressor stations required for the NED Project:

- Engineering design and construction;
- System design limitations;
- Land/workspace requirements;
- Site elevation;
- Road access;
- Interconnecting pipe;
- Land availability; and
- Environmental Impacts including:
  - Agricultural areas;
  - Federal and state-listed threatened and endangered species;
  - Cultural resource sites listed or eligible for listing on the NRHP;
  - Wetlands and waterbodies;
  - Noise Sensitive Areas (“NSAs”); and
  - Emissions.

Once Tennessee selects the locations for the new compressor stations, it will provide that information to the Commission, as well as a discussion of alternatives for those compressor station locations. This information will be provided in a revised Resource Report 10 to be submitted in a subsequent filing of the ER.

## **10.5 ALTERNATIVE SITES FOR NEW METER STATIONS**

The location of proposed meter stations is under review and pending final selection. A discussion of alternatives for the new meter station locations will be provided in a revised Resource Report 10 to be submitted in a subsequent filing of the ER.

## **10.6 ALTERNATIVE SITES FOR PIPEYARDS AND CONTRACTOR YARDS**

The location of proposed pipeyards and contractor yards is under review and pending final selection. Once Tennessee selects the locations for the pipeyards and contractor yards, it will provide that



information to the Commission, as well as a discussion of alternatives for those locations. This information will be provided in a revised Resource Report 10 to be submitted in a subsequent filing of the ER.

## **10.7 ALTERNATIVES SUMMARY**

After review of all construction, fuel source, system, and the No-Action alternatives, it is evident that the proposed Project is the preferred alternative. If the proposed Project is not constructed to help meet the growing market needs in the Northeast U.S. (i.e., the No-Action Alternative is selected), the Northeast markets may experience energy shortages in times of peak demand or users may revert to the consumption of alternative fuels including oil and coal. Use of alternative fuels to supply the energy needs in the Northeast U.S. is not the best practicable alternative as compared to the use of cleaner-burning natural gas. In addition, although energy conservation is a valuable measure as part of an overall energy plan, energy conservation alone is not a solution to the current energy demand to be served by this Project.

As discussed herein, Tennessee conducted a route alternative analysis to assess various routes for the purpose of avoiding and minimizing impacts to environmental, socioeconomic, cultural/archeological, and other sensitive resources to the extent feasible and practicable, while at the same time ensuring that a constructible Project design could be accomplished. Other potential alternative routes were identified using stakeholder input, environmental survey information, engineering/design criteria, and existing GIS resource mapping. Each alternative has the potential to be viable, though many alternatives were deemed obsolete due to their lack of connectivity with the proposed route and some alternatives were deemed less desirable than others based on environmental and land use impacts, need for agency coordination, and constructability issues.

Tennessee is continuing to review major and minor route alternatives to the proposed Project facilities, and will use field surveys, engineering constructability design assessments, and stakeholder involvement to determine the appropriate routing and location for the Project facilities. The evaluation of alternatives is an on-going process and additional alternative identification, review, analysis, and supporting information will be provided in a revised Resource Report 10 to be submitted in a subsequent filing of the ER.

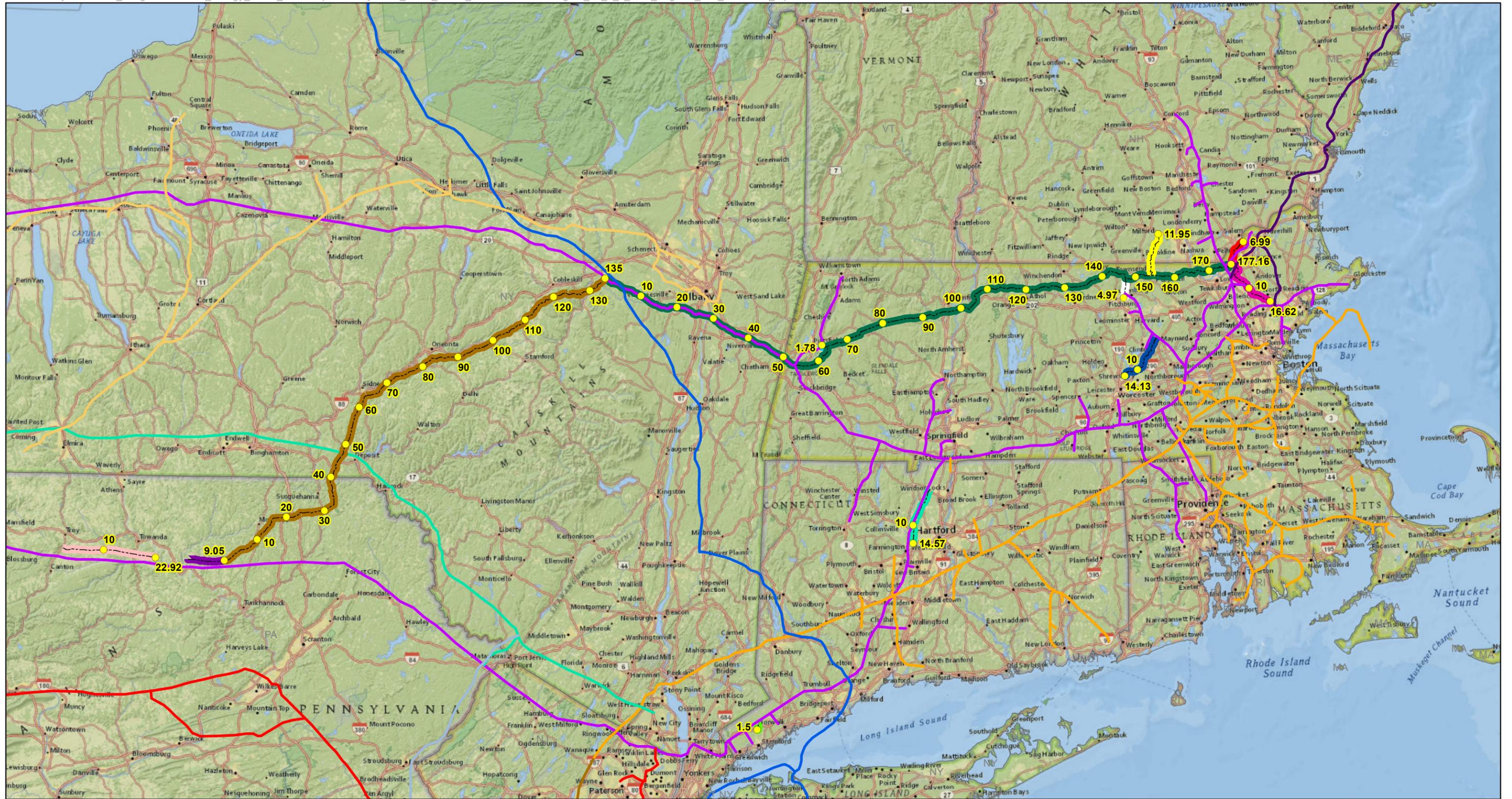


## **10.8 REFERENCES**

- Federal Energy Regulatory Commission (FERC). 2014a. Constitution Pipeline and Wright Interconnect Projects. Draft Environmental Impact Statement. FERC EIS No. 0249D. Docket Numbers CP13-499-000, CP13-502-000, and PF12-9-000. Issued February 2014.
- Federal Energy Regulatory Commission (FERC). 2014b. Constitution Pipeline and Wright Interconnect Projects. Final Environmental Impact Statement. FERC EIS No. 0249F. Docket Numbers CP13-499-000, CP13-502-000, and PF12-9-000. Issued October 2014.
- National Renewable Energy Laboratory (NREL). 2010. New York 80-Meter Wind Map, Last updated September 30, 2013. U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy, operated by the Alliance for Sustainable Energy, LLC. Available URL: [http://www.windpoweringamerica.gov/pdfs/wind\\_maps/ny\\_80m.pdf](http://www.windpoweringamerica.gov/pdfs/wind_maps/ny_80m.pdf). [Accessed September 26, 2014].
- New York Independent System Operator (NYISO). 2012. Power Trends 2012. Available URL: [http://www.nyiso.com/public/webdocs/media\\_room/publications\\_presentations/Power\\_Trends/Power\\_Trends/power\\_trends\\_2012\\_final.pdf](http://www.nyiso.com/public/webdocs/media_room/publications_presentations/Power_Trends/Power_Trends/power_trends_2012_final.pdf). [Accessed October 6, 2014].
- U.S. Congress. 2005. Energy Policy Act of 2005. Available URL: <http://www.gpo.gov/fdsys/pkg/PLAW109publ58/pdf/PLAW-109publ58.pdf>. [Accessed October 6, 2014].
- U.S. Environmental Protection Agency (EPA). 2005. National Emissions Inventory Data & Documentation. Last updated April 30, 2012. Available URL: <http://www.epa.gov/ttn/chief/net/2005inventory.html>. [Accessed September 22, 2014].
- U.S. Department of Energy/Energy Information Administration (DOE/EIA). 2011. U.S. Coal Supply and Demand: 2010 Review. Available URL: <http://www.eia.gov/coal/review/>. [Accessed September 22, 2014].
- U.S. Department of Energy/Energy Information Administration (DOE/EIA). 2013a. Annual Outlook 2013 with Projections to 2040. DOE/EIA-0383(2010). April 2013. Available URLs: <http://www.eia.gov/forecasts/aeo/> and <http://www.eia.gov/oiaf/aeo/tablebrowser/#release=AEO2013&subject=2-AEO2013&table=2-AEO2013&region=1-1&cases=ref2013-d102312a>. [Accessed October 6, 2014].
- U.S. Department of Energy/Energy Information Administration (DOE/EIA). 2013b. Vermont Yankee Nuclear Plant Closure. Available at: <http://www.eia.gov/todayinenergy/detail.cfm?id=12851>. [Accessed September 26, 2014].
- U.S. Department of Energy/Energy Information Administration (DOE/EIA). 2014. Annual Energy Outlook 2014 with Projections to 2040. Energy Information Administration - Report No.: DOE/EIA-0383(2014). April, 2014. Available URL: <http://www.eia.gov/forecasts/aeo/>. [Accessed September 26, 2014].

## **ATTACHMENT 10a**

### **Figures**



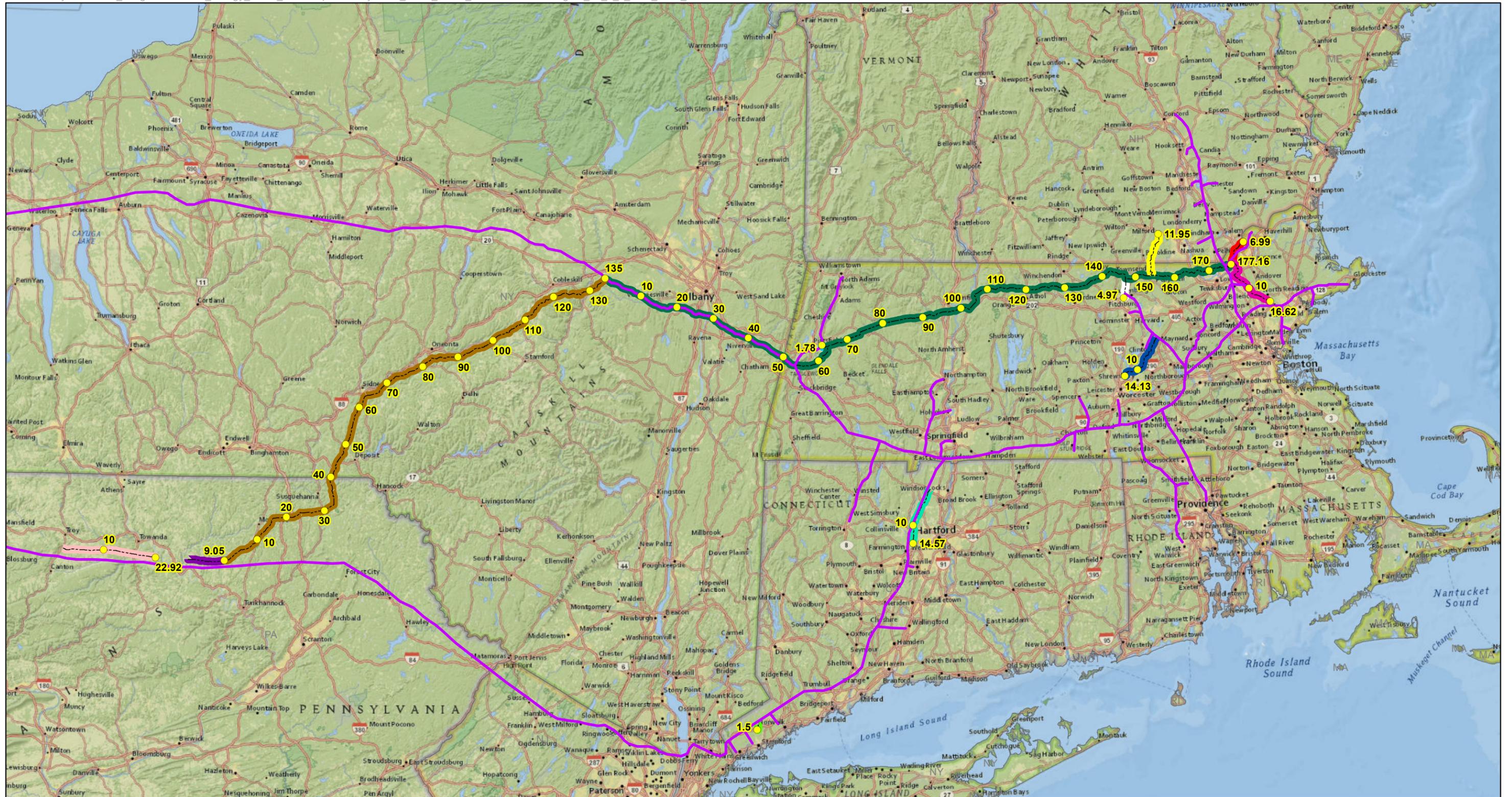
Legend			
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	NED Stamford Loop		NED Fitchburg Lateral Extension
	NED Pittsfield Lateral		Wright to Dracut Pipeline Segment
	NED North Worcester Lateral		NED 300 Line CT Loop
	NED Lynnfield Lateral		Loop 317-3
	Loop 319-3		PA to Wright Pipeline Segment
	Columbia Gas		Dominion
	Iroquois		TGP 300L and 200L
	Mileposts		Texas Eastern
			Transcontinental
			Maritimes & Northeast

Tennessee Gas Pipeline Company, L.L.C.  
 Northeast Energy Direct Project  
 System Alternatives  
 New England and Northeast Natural Gas Pipelines System  
 Figure 10.2-1

0 5 10 20  
 Miles

1 inch = 120,000 feet

Tennessee Gas Pipeline Company, L.L.C.  
 a Kinder Morgan company  
  
 November 2014  
 FIGURE 10.2



**Legend**

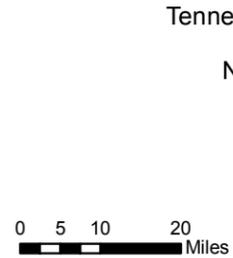
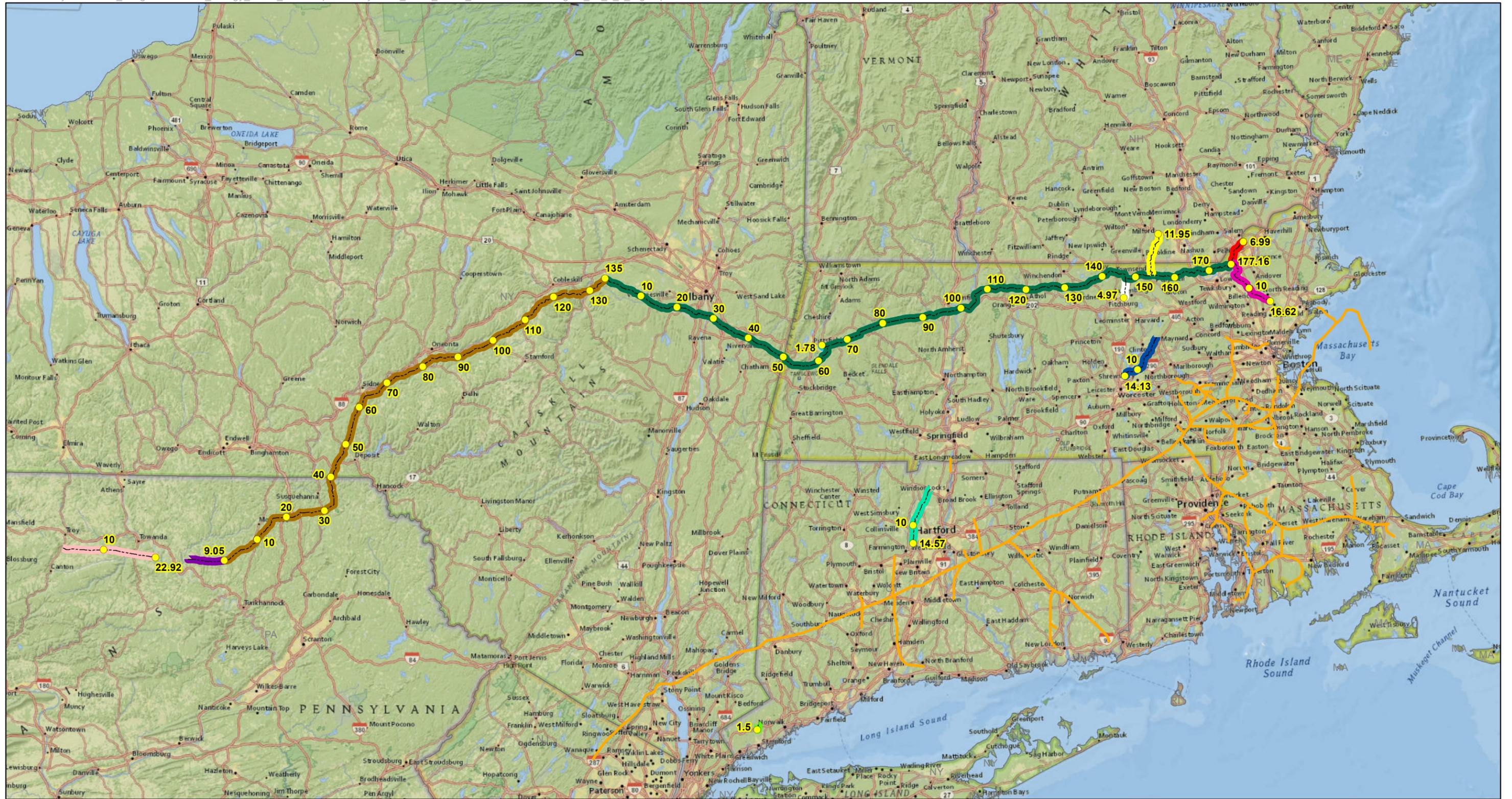
NED West Nashua Lateral	Haverhill Lateral	Loop 317-3
NED Stamford Loop	NED Fitchburg Lateral Extension	Loop 319-3
NED Pittsfield Lateral	Wright to Dracut Pipeline Segment	PA to Wright Pipeline Segment
NED North Worcester Lateral	NED 300 Line CT Loop	TGP 300 Line and 200 Line
NED Lynnfield Lateral	Mileposts	

Tennessee Gas Pipeline Company, L.L.C.  
 Northeast Energy Direct Project  
 System Alternatives  
 TGP 300 Line and 200 Line System  
 Figure 10.2-2

0 5 10 20  
 Miles

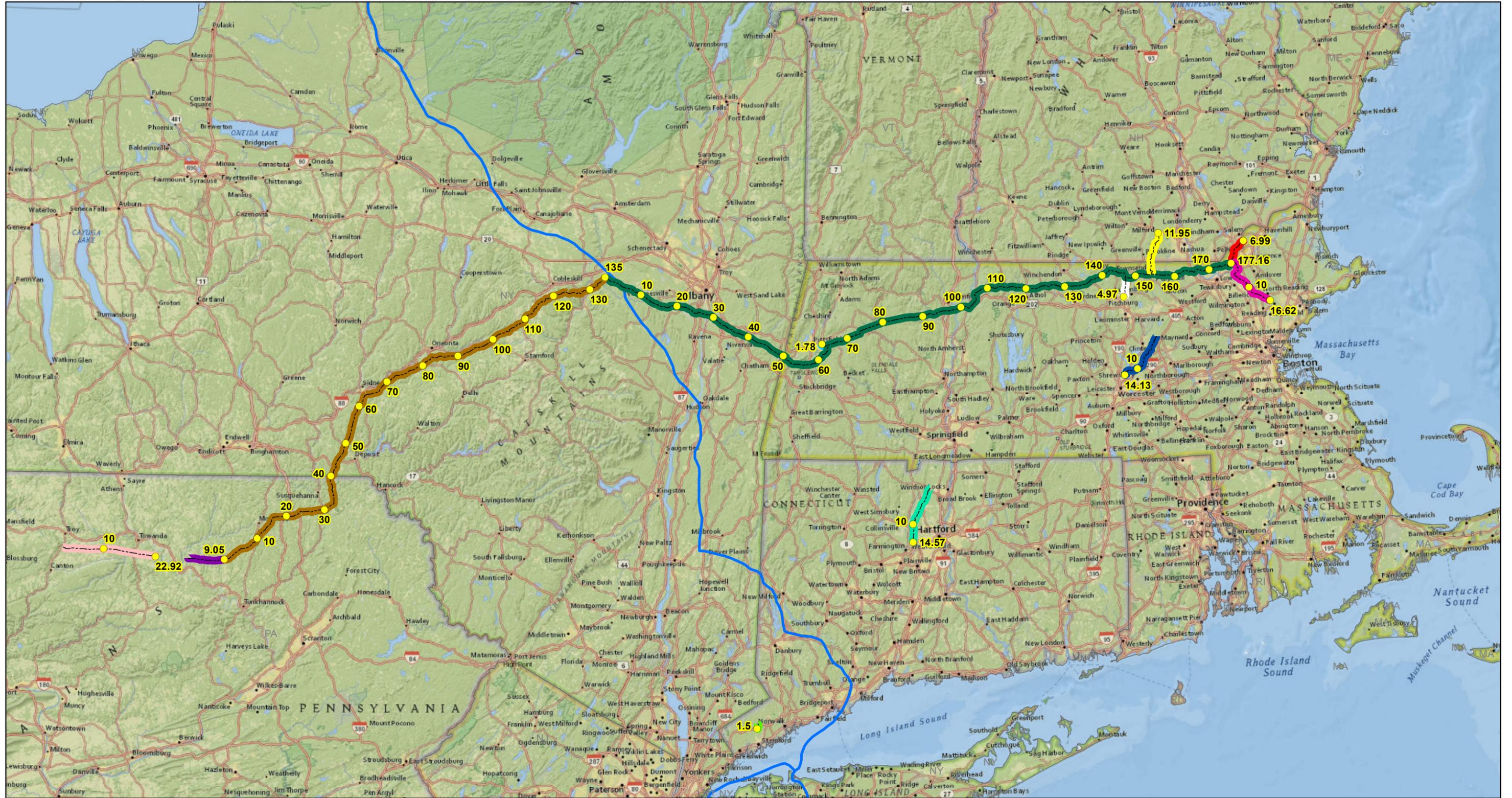
1 inch = 120,000 feet

Tennessee Gas Pipeline Company, L.L.C.  
 a Kinder Morgan company  
  
 November 2014  
 FIGURE 10.2



Tennessee Gas Pipeline Company, L.L.C.  
 Northeast Energy Direct Project  
 System Alternatives  
 Algonquin System  
 Figure 10.2-3

November 2014  
 FIGURE 10.2



- Legend**
- NED West Nashua Lateral
  - NED Stamford Loop
  - NED Pittsfield Lateral
  - NED North Worcester Lateral
  - NED Lynnfield Lateral
  - Haverhill Lateral
  - NED Fitchburg Lateral Extension
  - Wright to Dracut Pipeline Segment
  - NED 300 Line CT Loop
  - Loop 317-3
  - Loop 319-3
  - PA to Wright Pipeline Segment
  - Iroquois
  - Mileposts

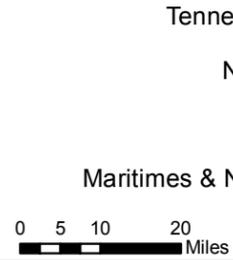
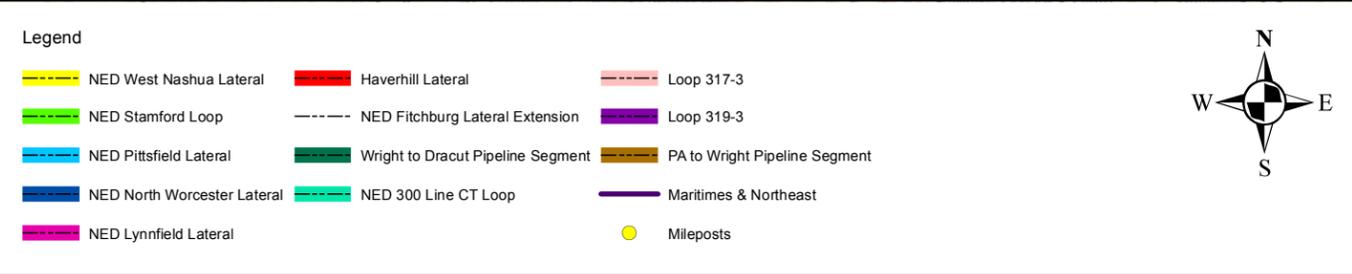
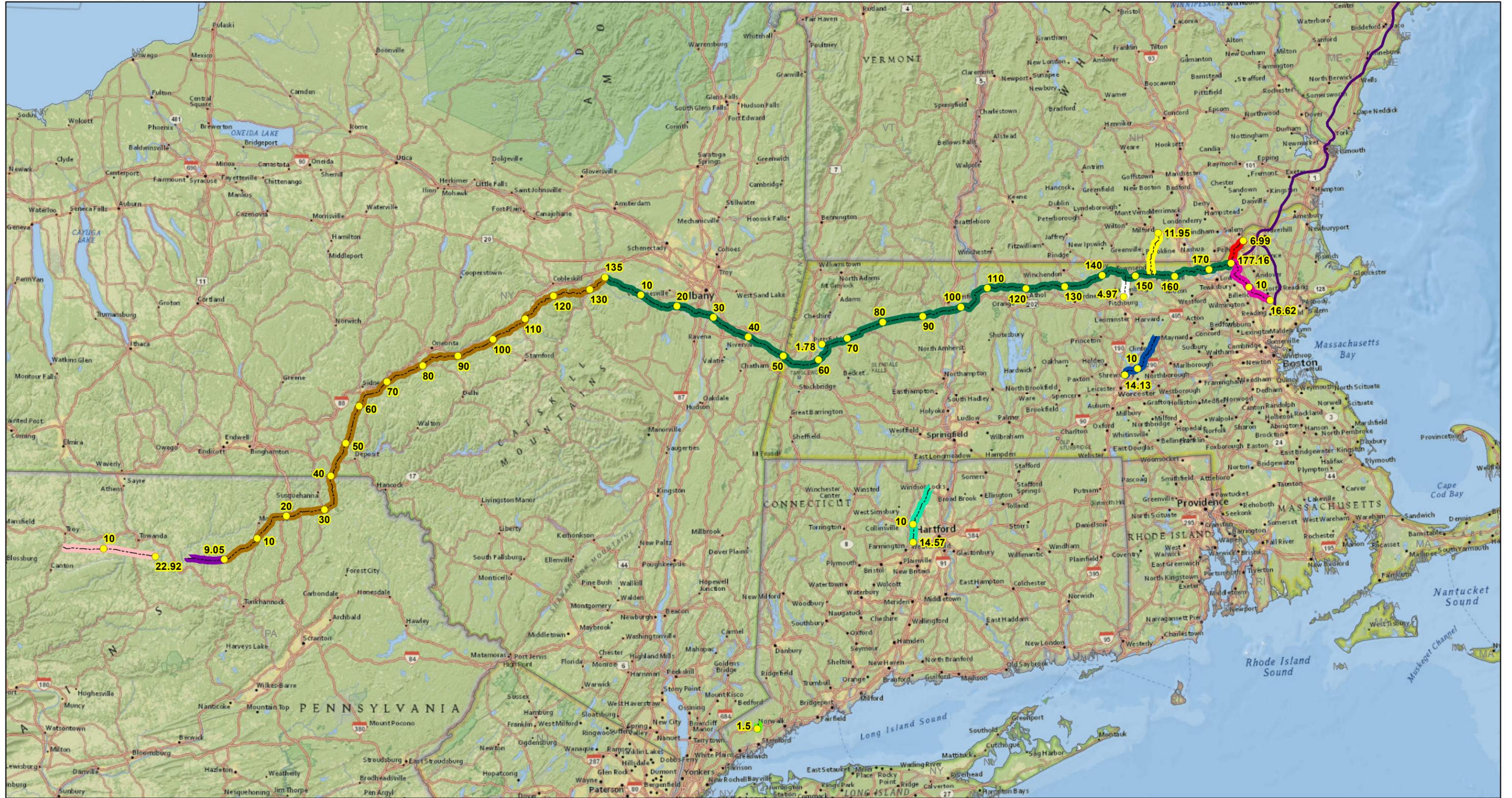


Tennessee Gas Pipeline Company, L.L.C.  
 Northeast Energy Direct Project  
 System Alternatives  
 Iroquois Gas Transmission System  
 Figure 10.2-4

0 5 10 20  
 Miles

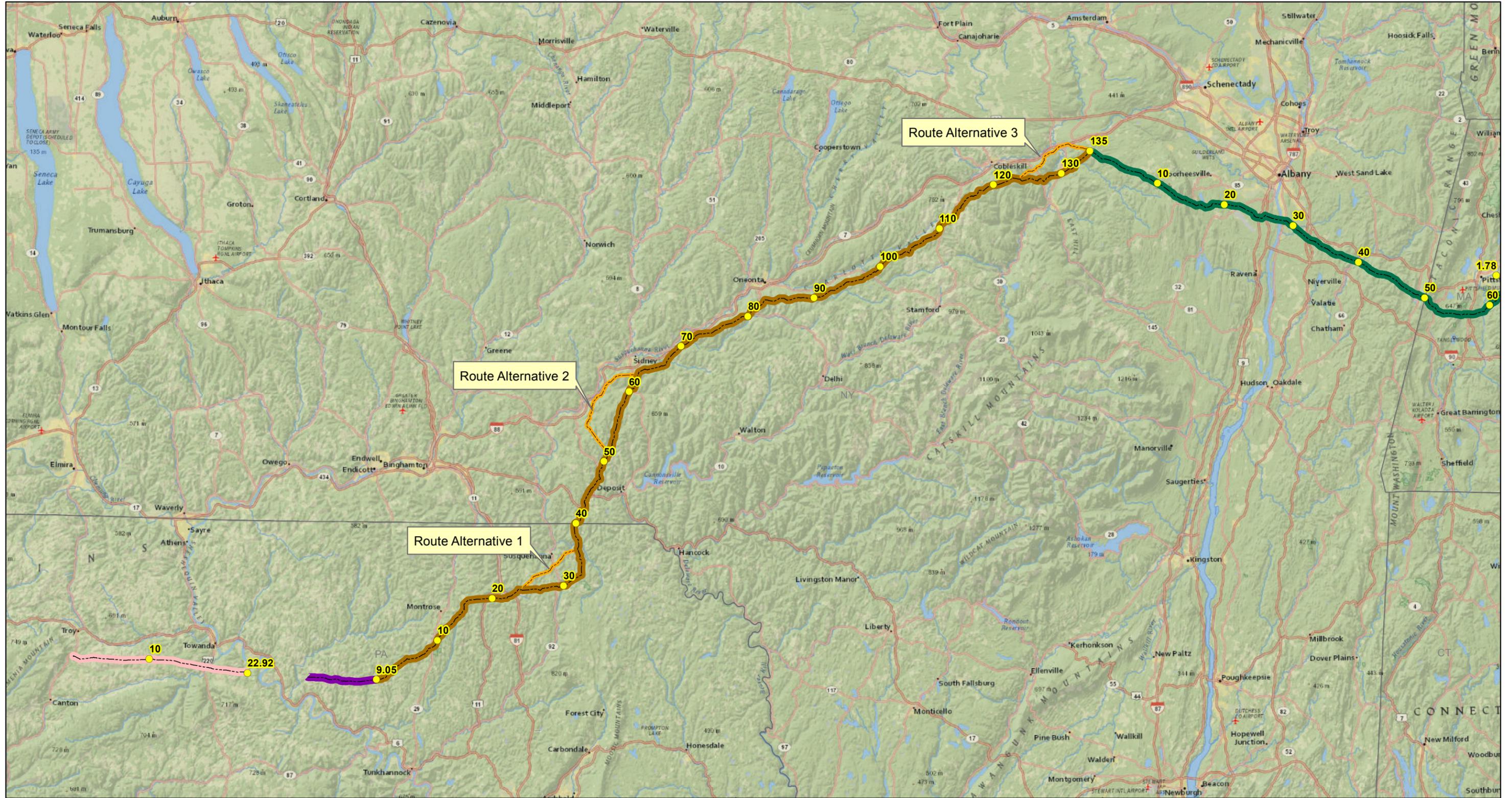
1 inch = 120,000 feet

 Tennessee Gas Pipeline Company, L.L.C.  
 a Kinder Morgan company  
  
 November 2014  
 FIGURE 10.2



Tennessee Gas Pipeline Company, L.L.C.  
 Northeast Energy Direct Project  
 System Alternatives  
 Maritimes & Northeast and Portland Natural Gas System  
 Figure 10.2-5

November 2014  
 FIGURE 10.2



**Legend**

- Loop 317-3
- Loop 319-3
- PA to Wright Pipeline Segment
- Wright to Dracut Pipeline Segment
- Constitution Pipeline Company, LLC Route Alternative
- Mileposts



North arrow pointing North (N), South (S), East (E), and West (W).   
 Scale bar showing 0, 2.5, 5, and 10 Miles.

**Tennessee Gas Pipeline Company, L.L.C.**  
**Northeast Energy Direct Project**  
 Major Route Alternatives

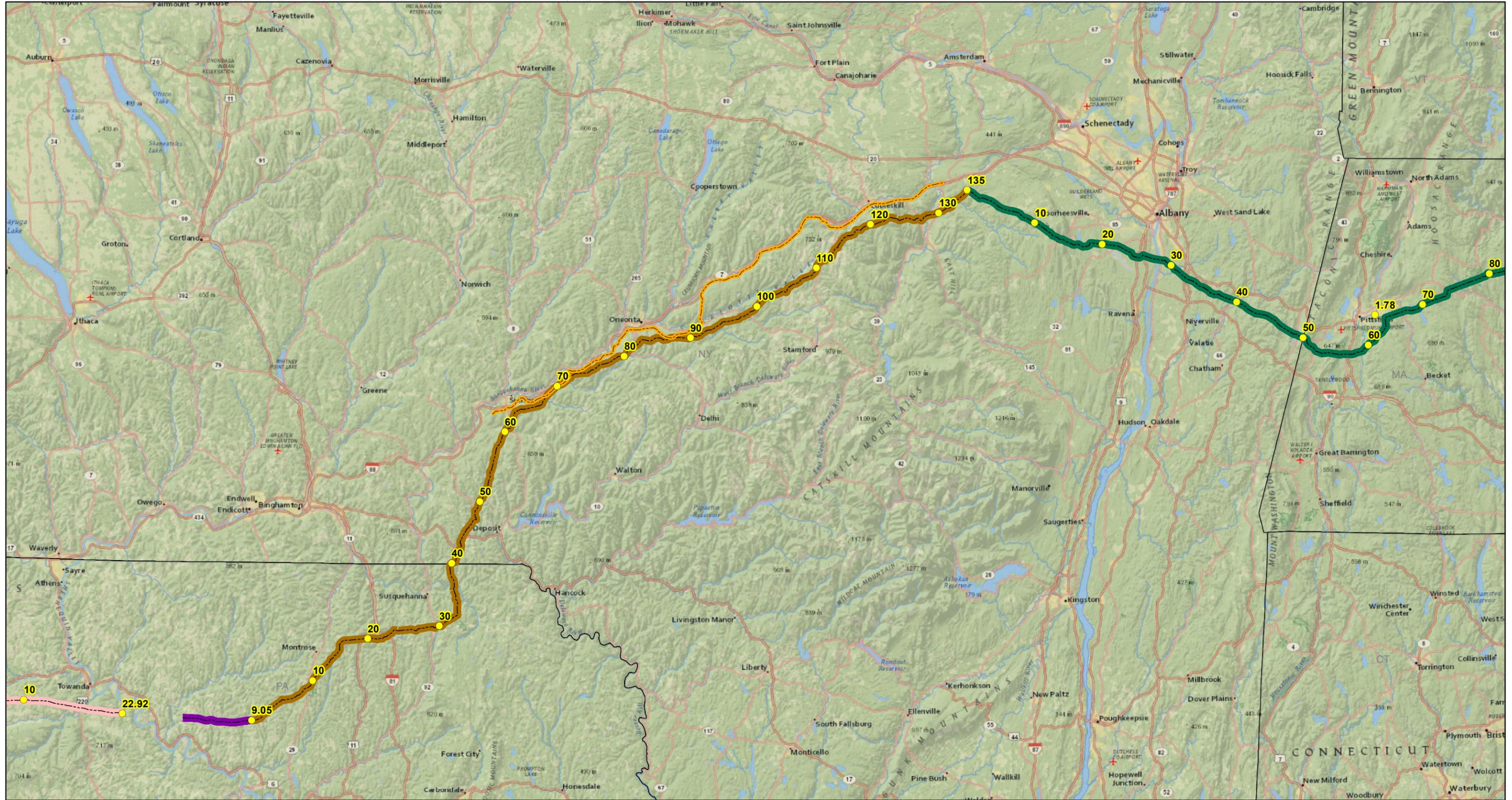
Constitution Pipeline Company, LLC  
 Route 1 Alternative, Route 2 Alternative, Route 3 Alternative  
 Figure 10.3-1

0 2.5 5 10  
 Miles

1 inch = 64,000 feet

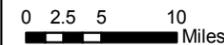
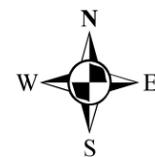


**November 2014**  
 FIGURE 10.3



**Legend**

- Wright to Dracut Pipeline Segment
- Loop 317-3
- Loop 319-3
- PA to Wright Pipeline Segment
- Interstate 88 Alternative
- Mileposts



**Tennessee Gas Pipeline Company, L.L.C.**

**Northeast Energy Direct Project**

Major Route Alternatives

Interstate 88 Alternative  
Figure 10.3-2

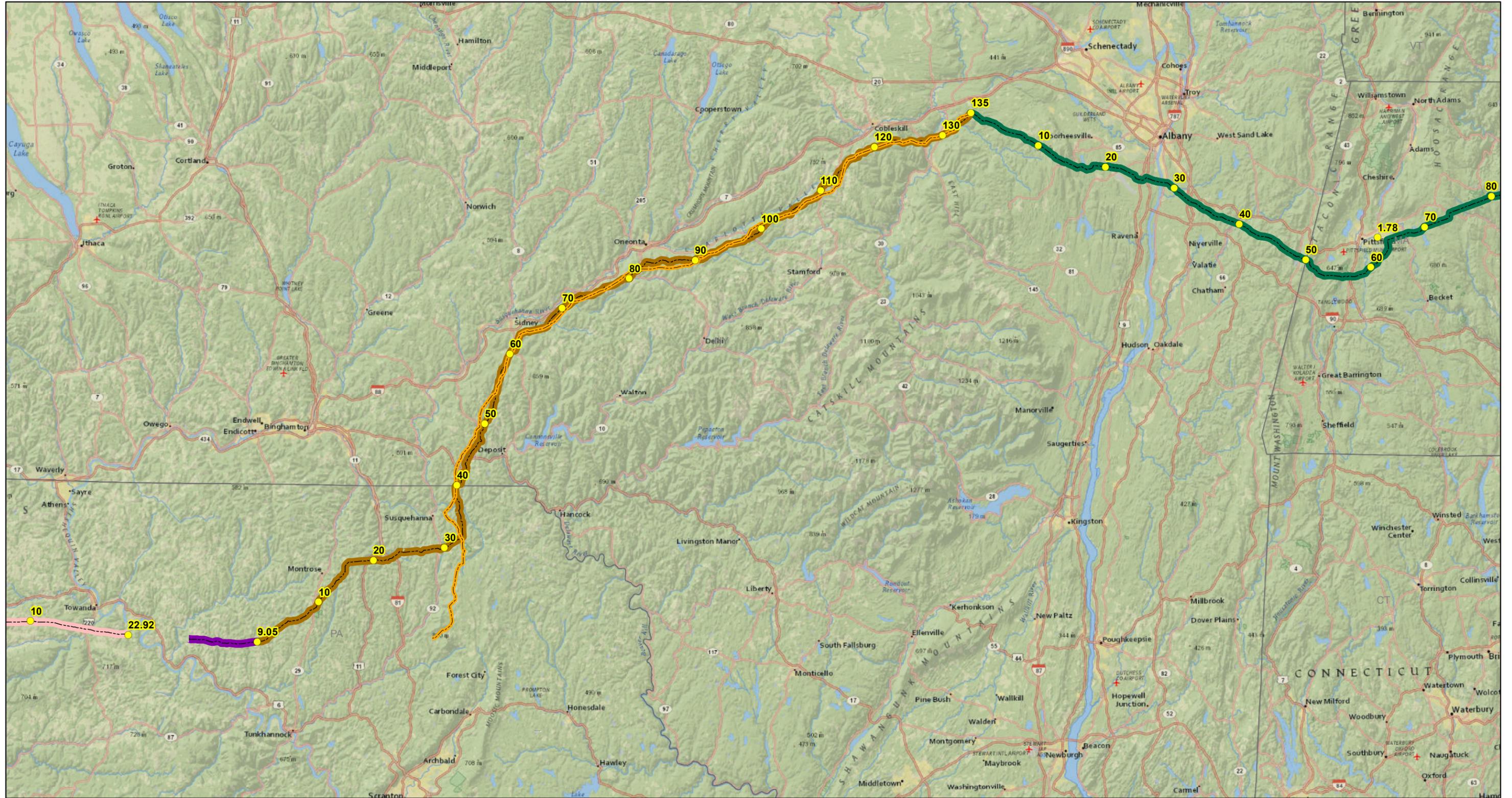
1 inch = 64,000 feet

Tennessee Gas Pipeline Company, L.L.C.  
a Kinder Morgan company

**AECOM**

November 2014

FIGURE 10.3



**Legend**

- - - Loop 317-3
- Loop 319-3
- - - PA to Wright Pipeline Segment
- Wright to Dracut Pipeline Segment
- - - Northeast Exchange (NEEX) Alternative
- Mileposts

Tennessee Gas Pipeline Company, L.L.C.  
 Northeast Energy Direct Project  
 Major Route Alternatives  
 Northeast Exchange (NEEX) Alternative  
 Figure 10.3-3

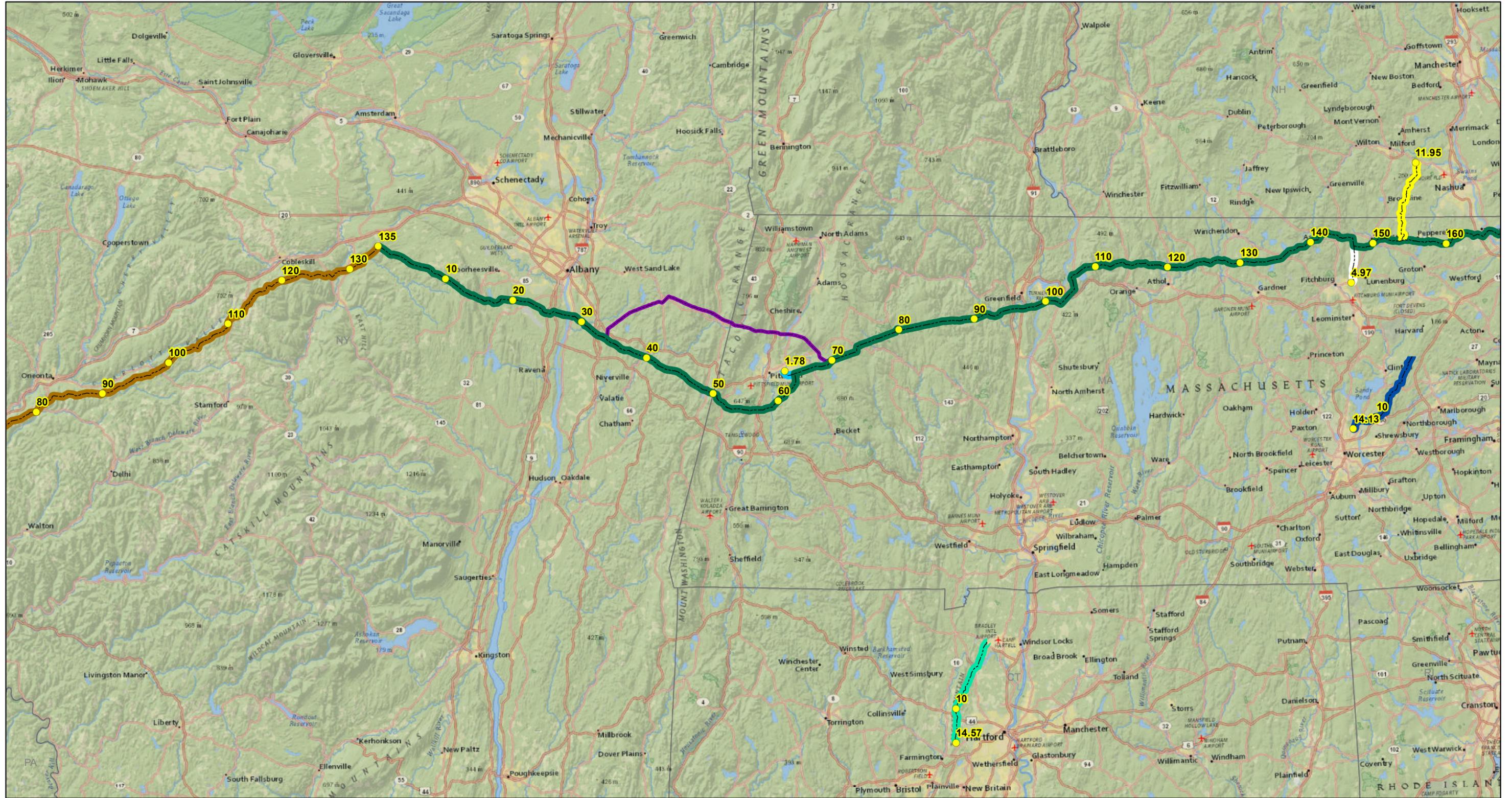
0 2.5 5 10  
Miles

1 inch = 64,000 feet

Tennessee Gas Pipeline Company, L.L.C.  
 a Kinder Morgan company

**November 2014**

FIGURE 10.3



- Legend**
- - - - NED West Nashua Lateral
  - PA to Wright Pipeline Segment
  - - - - NED Pittsfield Lateral
  - NED North Worcester Lateral
  - NED Fitchburg Lateral Extension
  - Wright to Dracut Pipeline Segment
  - - - - NED 300 Line CT Loop
  - New York Powerline Alternative
  - Mileposts



**Tennessee Gas Pipeline Company, L.L.C.**

**Northeast Energy Direct Project**

Major Route Alternatives

NY Powerline Alternative  
Figure 10.3-4

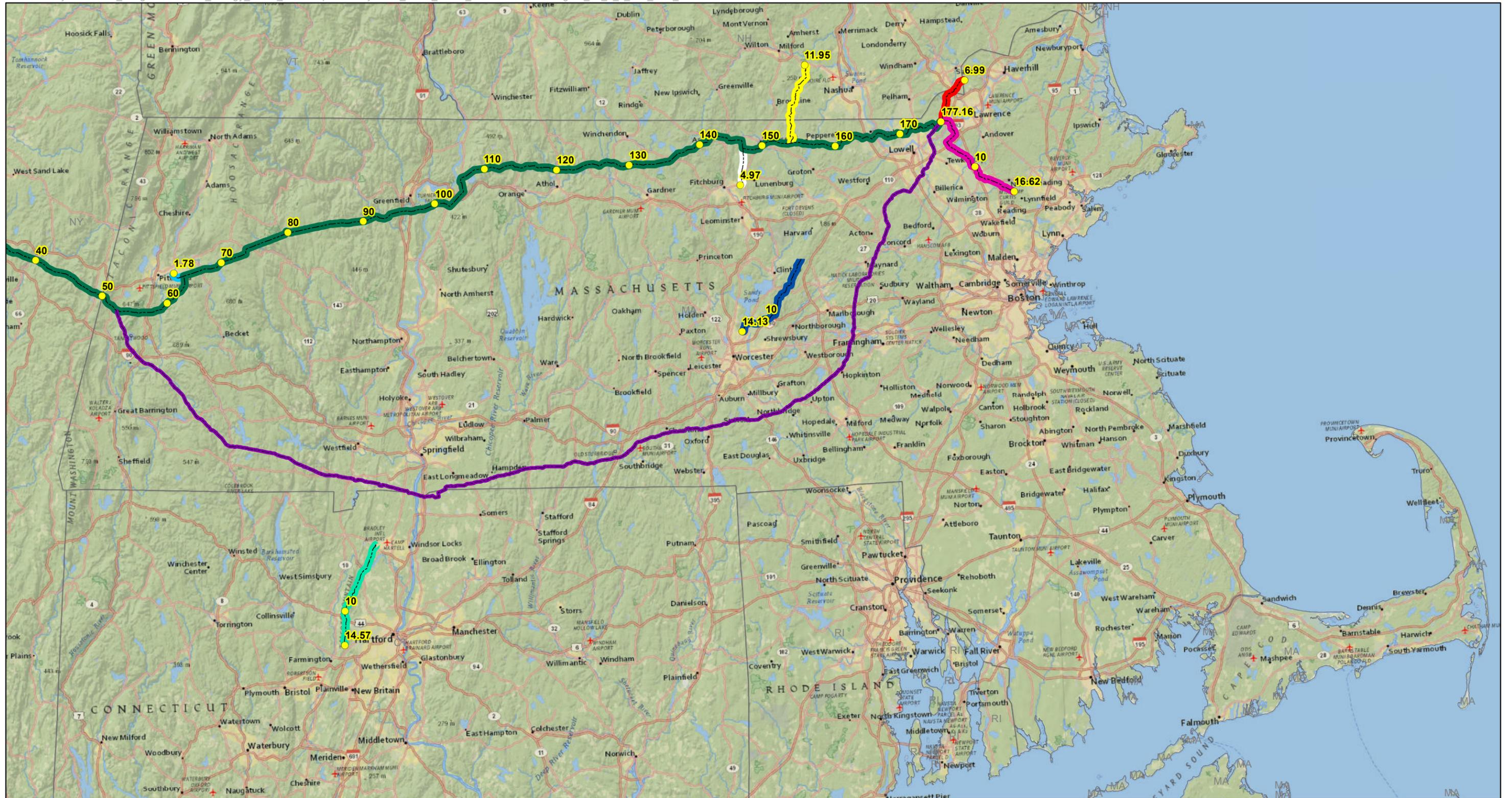
0 2.5 5 10  
Miles

1 inch = 64,000 feet

**AECOM**

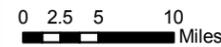
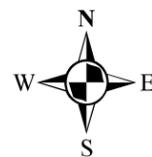
November 2014

FIGURE 10.3



Legend

- NED West Nashua Lateral
- NED Connecticut Lateral
- NED Pittsfield Lateral
- NED Haverhill Lateral
- NED North Worcester Lateral
- NED Fitchburg Lateral Extension
- NED Lynnfield Lateral
- Wright to Dracut Pipeline Segment
- 200 Line Alternative
- Mileposts



Tennessee Gas Pipeline Company, L.L.C.

Northeast Energy Direct Project

Major Route Alternatives

200 Line Alternative  
Figure 10.3-5

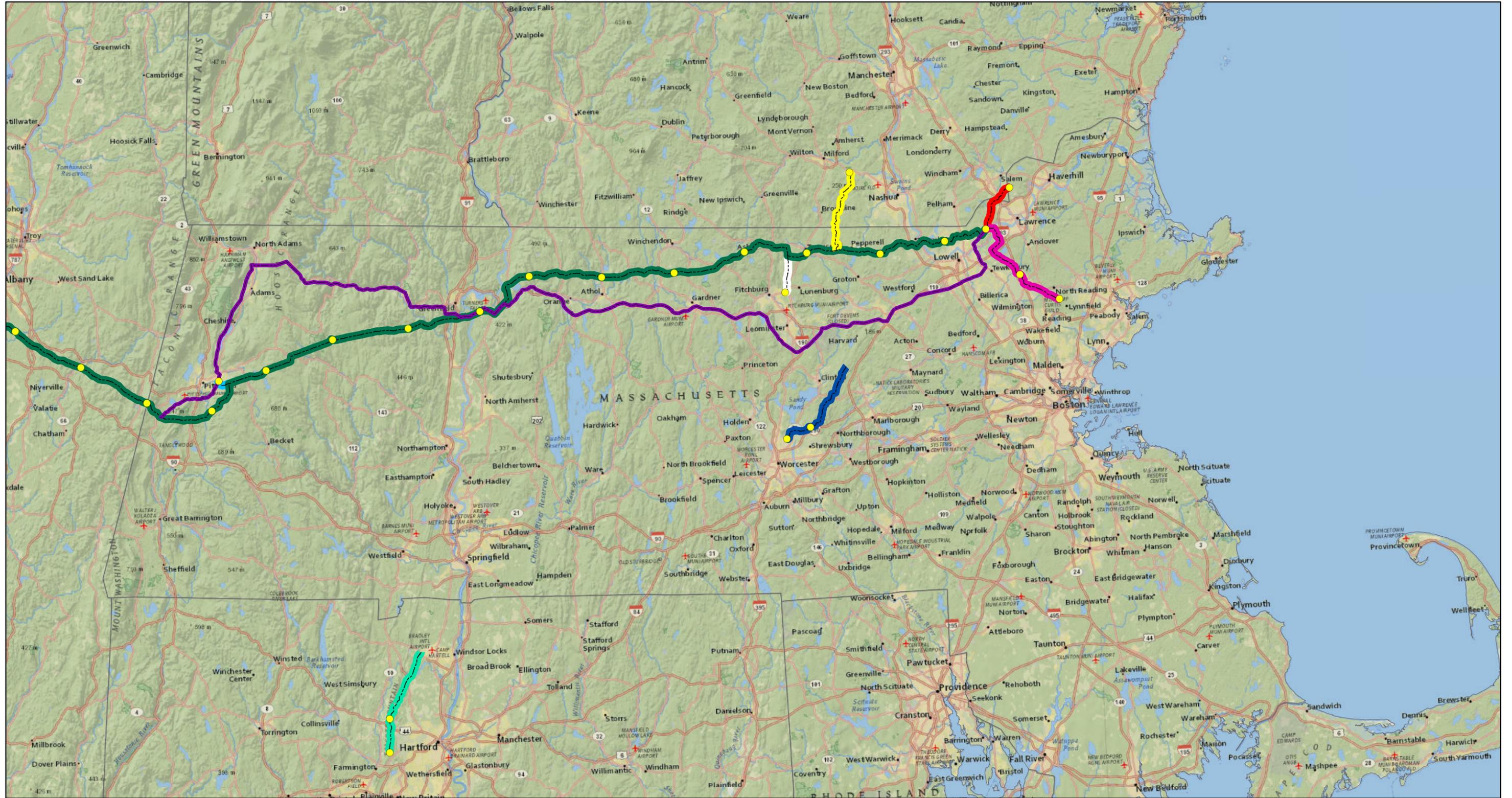
Tennessee Gas Pipeline Company, L.L.C.  
a Kinder Morgan company

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FIGURE 10.3

1 inch = 64,000 feet



- Legend**
- NED West Nashua Lateral
  - NED Stamford Loop
  - NED Pittsfield Lateral
  - NED North Worcester Lateral
  - NED Lynnfield Lateral
  - NED Haverhill Lateral
  - NED Fitchburg Lateral Extension
  - Wright to Dracut Pipeline Segment
  - NED 300 Line CT Loop
  - Route 2 Alternative
  - Mileposts



**Tennessee Gas Pipeline Company, L.L.C.**

**Northeast Energy Direct Project**

Major Route Alternatives

Route 2 Alternative  
Figure 10.3-6

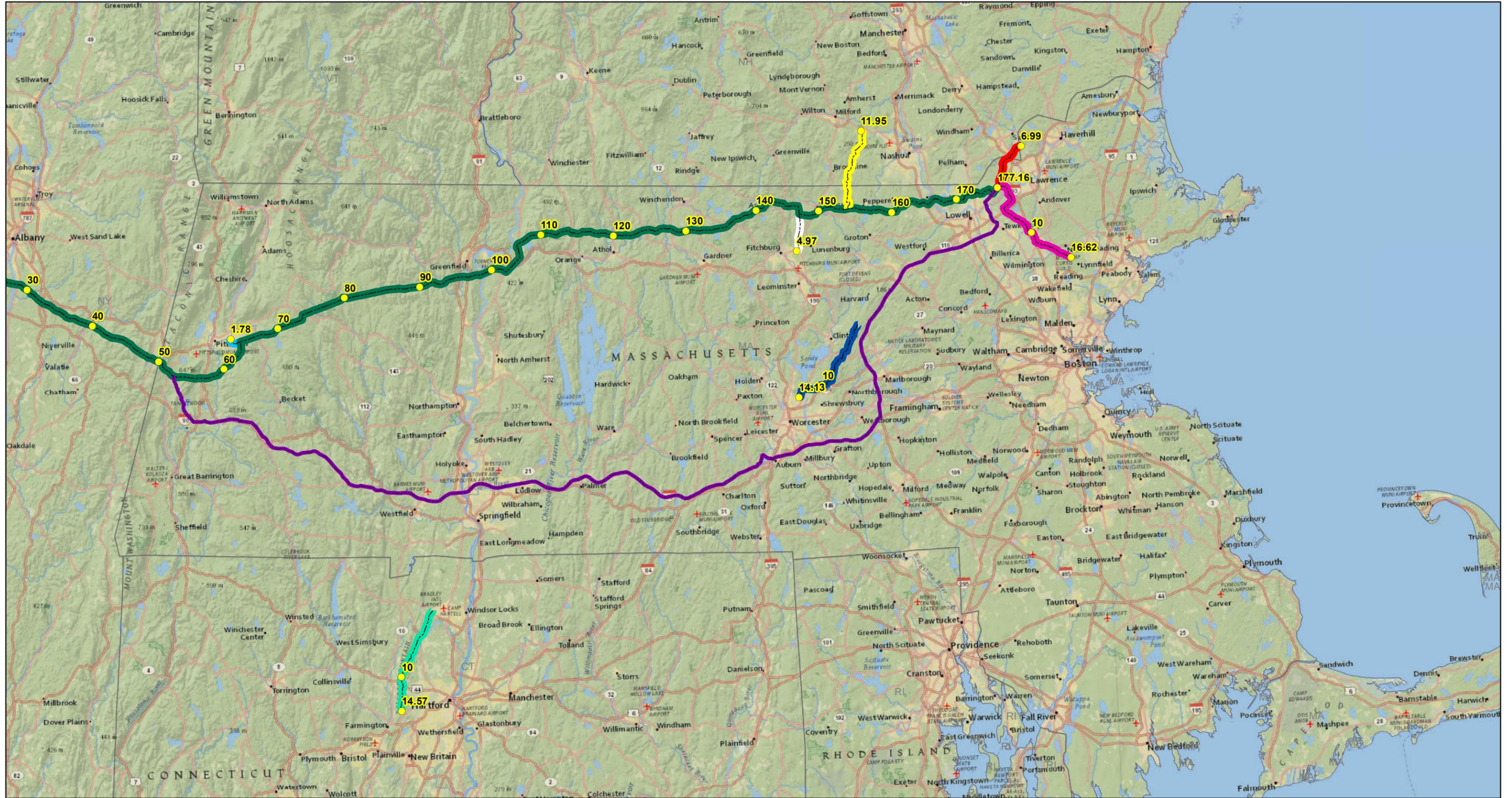
0 2.5 5 10 Miles

1 inch = 64,000 feet

Tennessee Gas Pipeline Company, L.L.C.  
a Kinder Morgan company

November 2014

FIGURE 10.3



- Legend**
- NED West Nashua Lateral
  - NED Stamford Loop
  - NED Pittsfield Lateral
  - NED North Worcester Lateral
  - NED Lynnfield Lateral
  - NED Haverhill Lateral
  - NED Fitchburg Lateral Extension
  - Wright to Dracut Pipeline Segment
  - NED 300 Line CT Loop
  - Mass Turnpike Alternative
  - Mileposts



**Tennessee Gas Pipeline Company, L.L.C.**

**Northeast Energy Direct Project**

Major Route Alternatives

Mass Turnpike Alternative  
Figure 10.3-7

0 2.5 5 10 Miles

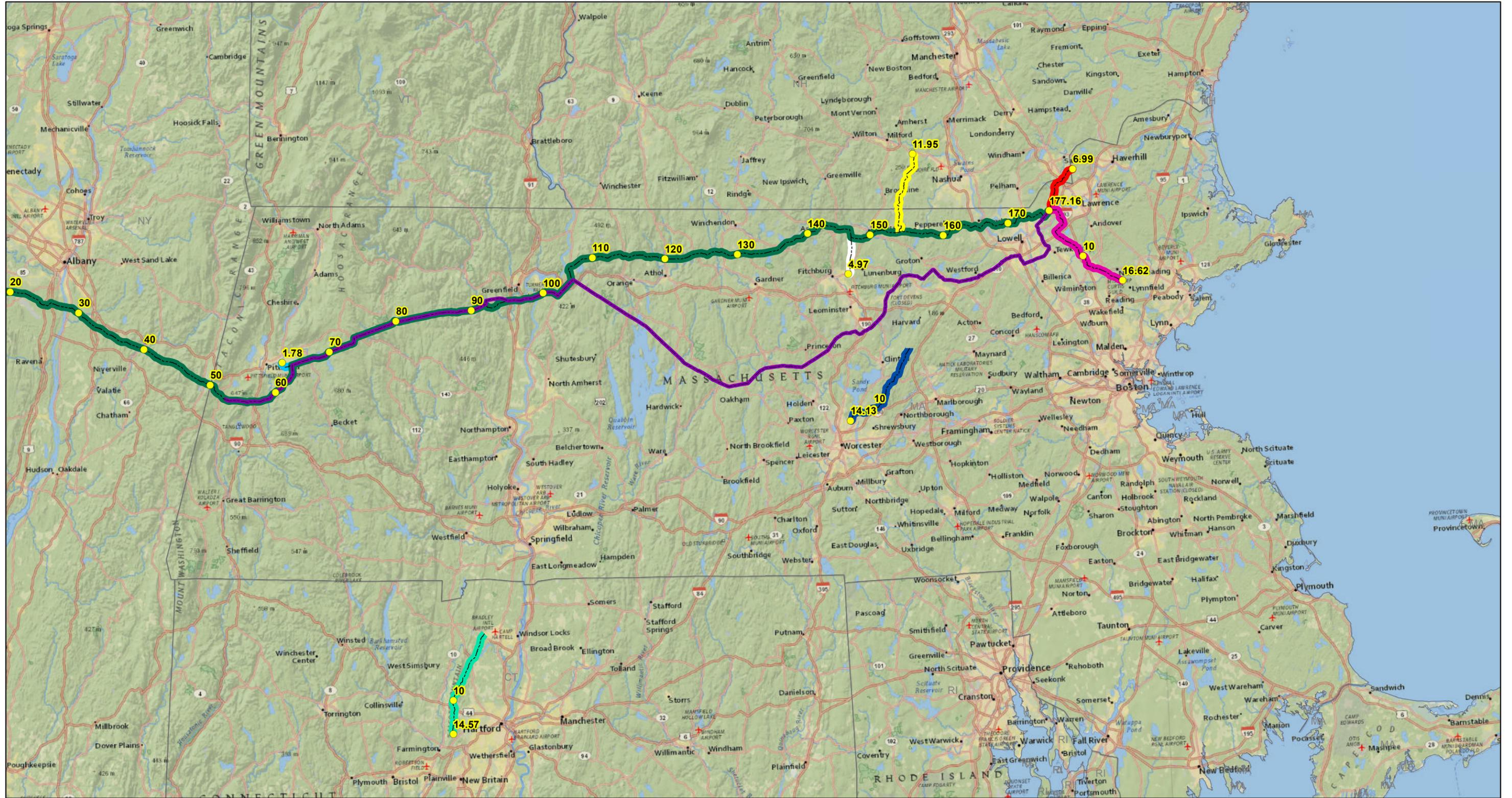
1 inch = 64,000 feet

 Tennessee Gas Pipeline Company, L.L.C.  
a Kinder Morgan company



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FIGURE 10.3



- Legend**
- NED West Nashua Lateral
  - NED Stamford Loop
  - NED Pittsfield Lateral
  - NED North Worcester Lateral
  - NED Lynnfield Lateral
  - NED Haverhill Lateral
  - - - NED Fitchburg Lateral Extension
  - Wright to Dracut Pipeline Segment
  - NED 300 Line CT Loop
  - Massachusetts Powerline Alternative
  - Mileposts



**Tennessee Gas Pipeline Company, L.L.C.**

**Northeast Energy Direct Project**

Major Route Alternatives

Mass Powerline Alternative  
Figure 10.3-8

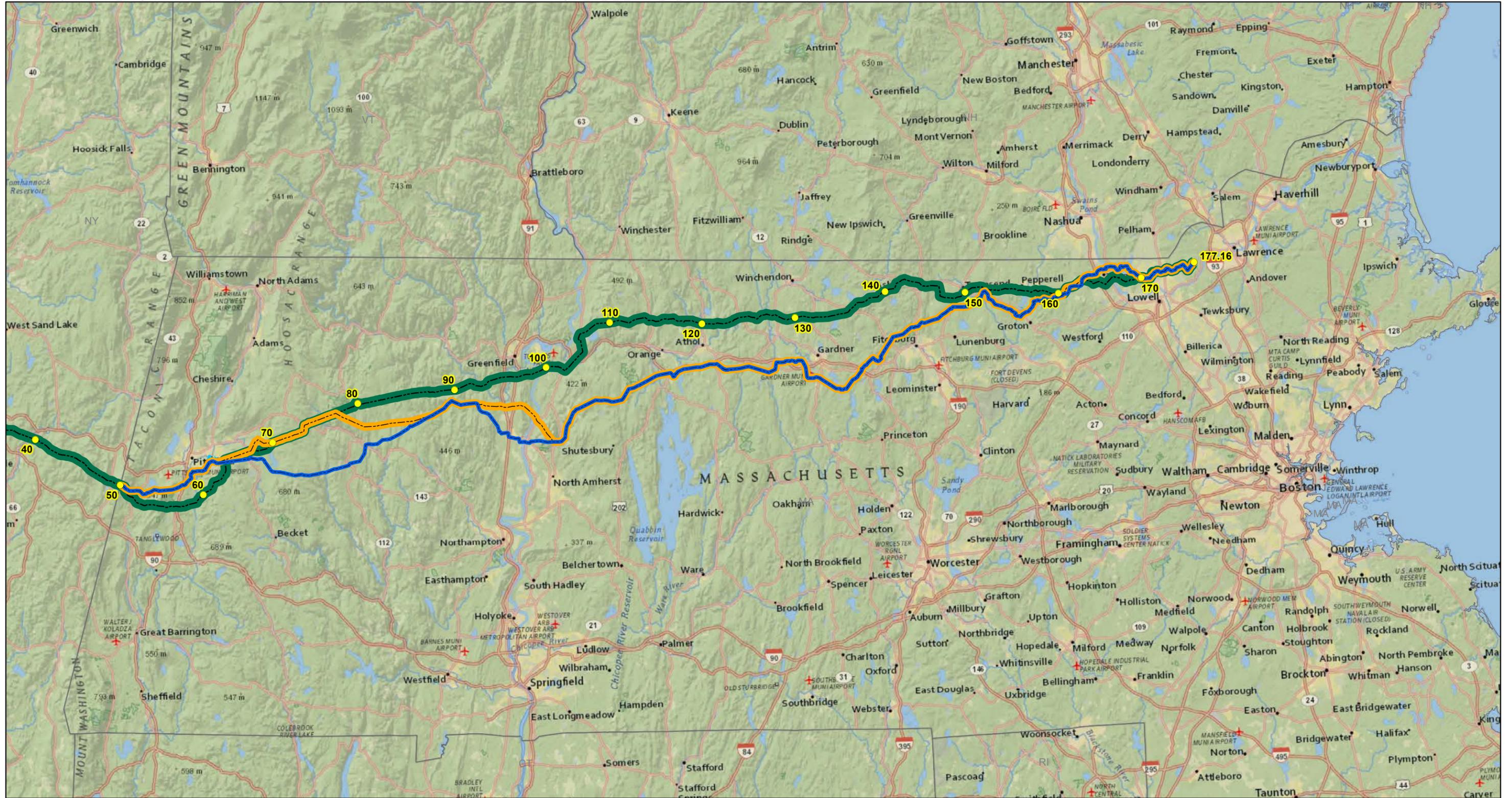
0 2.5 5 10  
Miles

1 inch = 64,000 feet

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FIGURE 10.3



- Legend**
- - - Article 97 Co-located Route
  - Article 97 Avoidance Route
  - - - NED Pittsfield Lateral
  - Wright to Dracut Pipeline Segment
  - Mileposts



**Tennessee Gas Pipeline Company, L.L.C.**  
**Northeast Energy Direct Project**  
 Major Route Alternatives  
 Article 97 Avoidance and Co-located Alternative Routes  
 Figure 10.3-9

0 2.5 5 10  
 Miles

1 inch = 50,000 feet

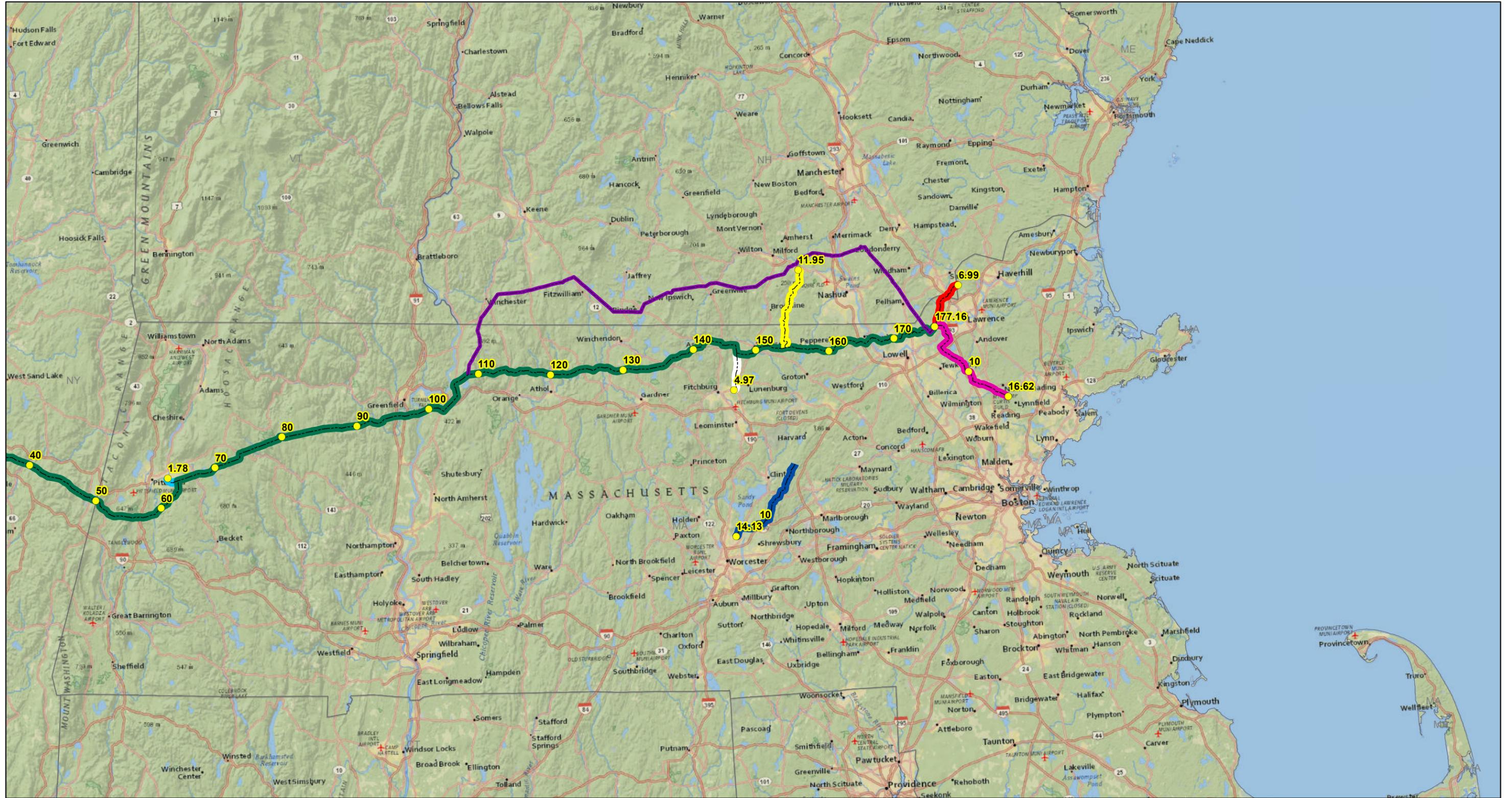
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FIGURE 10.3



**Legend**

NED West Nashua Lateral	NED Haverhill Lateral	New Hampshire Powerline Alternative
NED Pittsfield Lateral	NED Fitchburg Lateral Extension	Mileposts
NED North Worcester Lateral	Wright to Dracut Pipeline Segment	
NED Lynnfield Lateral		

**Tennessee Gas Pipeline Company, L.L.C.**

**Northeast Energy Direct Project**

Major Route Alternatives

NH Powerline Alternative  
Figure 10.3-10

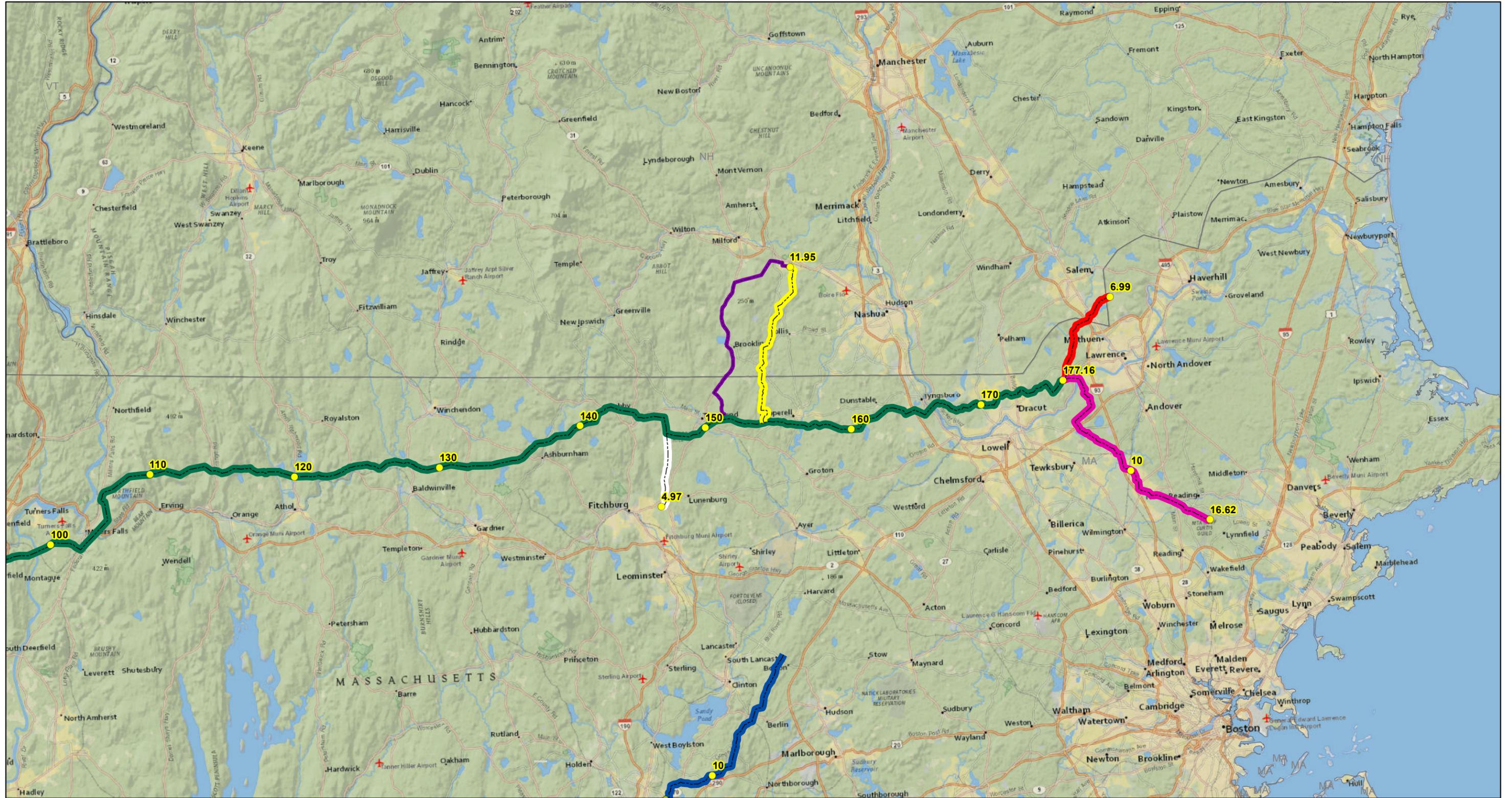
0 2.5 5 10 Miles

1 inch = 64,000 feet

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FIGURE 10.3



Legend

- NED West Nashua Lateral
- NED Haverhill Lateral
- NED North Worcester Lateral
- NED Lynnfield Lateral
- NED Fitchburg Lateral Extension
- Wright to Dracut Pipeline Segment
- West Nashua Lateral Alternative
- Mileposts

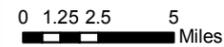


Tennessee Gas Pipeline Company, L.L.C.

Northeast Energy Direct Project

Minor Route Alternatives

West Nashua Lateral Alternative  
Figure 10.3-11



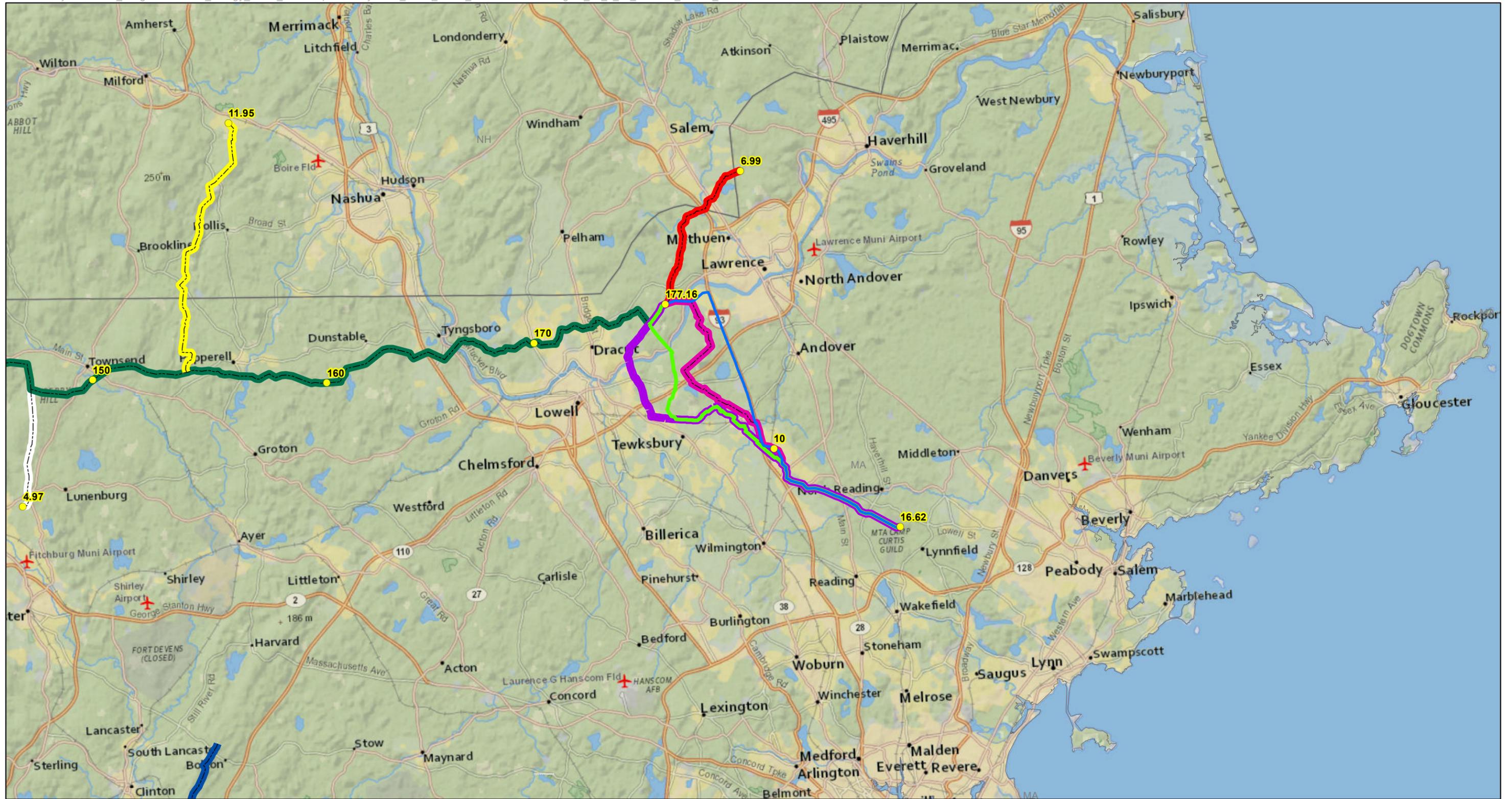
1 inch = 32,000 feet

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FIGURE 10.3



**Legend**

NED West Nashua Lateral	NED Haverhill Lateral	Andover Route 1 Alternative
NED Pittsfield Lateral	NED Fitchburg Lateral Extension	Andover Route 2 Alternative
NED North Worcester Lateral	Wright to Dracut Pipeline Segment	Andover Route 3 Alternative
NED Lynnfield Lateral		Mileposts

**Tennessee Gas Pipeline Company, L.L.C.**

**Northeast Energy Direct Project**

Minor Route Alternatives

Andover Lateral Alternatives  
Figure 10.3-12

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FIGURE 10.3