20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM



November 12, 2014

Kimberly D. Bose, Secretary

Federal Energy Regulatory Commission
888 First Street, N.E.
Room 1A
Washington, D.C. 20426

Re: Tennessee Gas Pipeline Company, L.L.C.
Connecticut Expansion Project, Docket No. CP14-529-000
Supplemental Filing

Dear Ms. Bose:

On July 31, 2014, Tennessee Gas Pipeline Company, L.L.C. ("Tennessee") filed with the Federal Energy Regulatory Commission ("Commission") an application for a certificate of public convenience and necessity for the proposed Connecticut Expansion Project ("Project") in the above-referenced docket.

As noted in Tennessee's Motion for Leave to Answer and Answer filed on September 30, 2014, Tennessee submitted a Draft Environmental Impact Report ("Draft EIR") to the Massachusetts Executive Office of Energy and Environmental Affairs ("EEA"), Environmental Policy Act Office in accordance with the Massachusetts Environmental Policy Act ("MEPA"). The EEA Office's review under MEPA is intended to facilitate environmental planning for proposed projects requiring agency action in Massachusetts. The MEPA process provides an applicant, interested parties, and each state and local permitting agency an opportunity to review and comment on a proposed project and facilitates coordination of all environmental and development review and permitting processes of the Commonwealth of Massachusetts. The state MEPA process is similar to the federal National Environmental Policy Act review process in evaluating project impacts, alternatives, and mitigation.

For this Project, Tennessee submitted an Expanded Environmental Notification Form ("EENF") to the EEA Office on May 13, 2014. On July 11, 2014, the EEA Office issued a Certificate in response to the EENF that required Tennessee to submit both a Draft EIR and a Final Environmental Impact Report ("Final EIR"). The July 11, 2014 Certificate identified the scope and content of the Draft EIR. Tennessee submitted the Draft EIR to the EEA Office on September 29, 2014, and the public comment period for the Draft EIR closed on November 8, 2014.

Tennessee understands that the EEA Office will issue a Certificate on the Draft EIR by November 15, 2014, which will provide the scope and content of the Final EIR. Tennessee anticipates that it will submit the Final EIR by December 31, 2014. The public comment period for the Final EIR will close on February 8, 2015. Tennessee anticipates that the EEA Office will issue a Certificate on the Final EIR by February 15, 2015.

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During the MEPA review process for the portion of the Project in Massachusetts to date, the public and the EEA Office have and will continue to identify measures to minimize and reduce Project impacts to the environment. Tennessee anticipates that it will adopt a number of the identified measures into the Project design, including reducing workspace and incorporating seasonal restrictions. Tennessee will continue to communicate with the EEA Office throughout the review process to minimize impacts to sensitive environmental resources. Once MEPA review process is completed and the Massachusetts Secretary issues a final Certificate, Tennessee will begin the permitting process to obtain all necessary environmental permits in Massachusetts. Upon completion of the MEPA process, Tennessee will update the Commission with any changes to the Project scope that were adopted during the MEPA process and will provide to the Commission updated alignment sheets and resource report tables in this proceeding.

Tennessee is submitting a courtesy copy of the Draft EIR to the Commission in the Project docket. This Draft EIR does not include the Project alignment sheets, as those alignment sheets are the same as the alignment sheets submitted as part of the Project certificate application on July 31, 2014.

In accordance with the Commission's filing requirements, Tennessee is submitting this filing with the Commission's Secretary through the eFiling system. Tennessee is also providing complete copies of this filing to the Office of Energy Projects. Any questions concerning the enclosed filing should be addressed to Ms. Jacquelyne Rocan at (713) 420-4544 or to Mr. Richard Siegel at (713) 420-5535.

Respectfully submitted,

TENNESSEE GAS PIPELINE COMPANY, L.L.C.

By: Jacquelyne M. Rocan
Jacquelyne M. Rocan
Assistant General Counsel

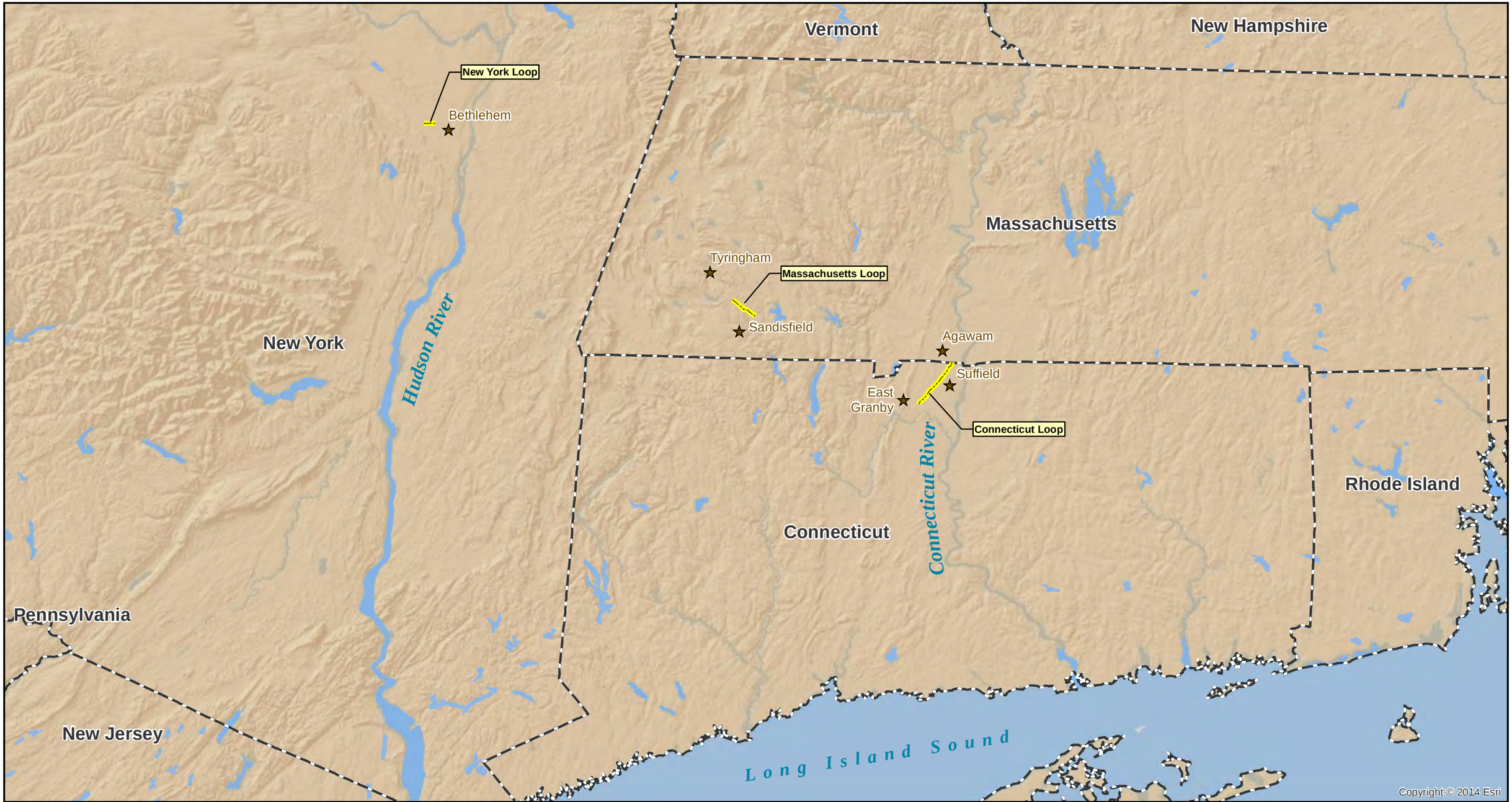
Enclosure

cc: Elaine Baum (Commission Staff)
Official Service List

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

APPENDIX A

USGS Topographical Maps



Map Location



Legend

- Towns
- Proposed Project Centerline
- State Boundaries

Tennessee Gas Pipeline Company, L.L.C.

Connecticut Expansion Project

Project Overview Map

0 40,000 80,000 160,000 Feet

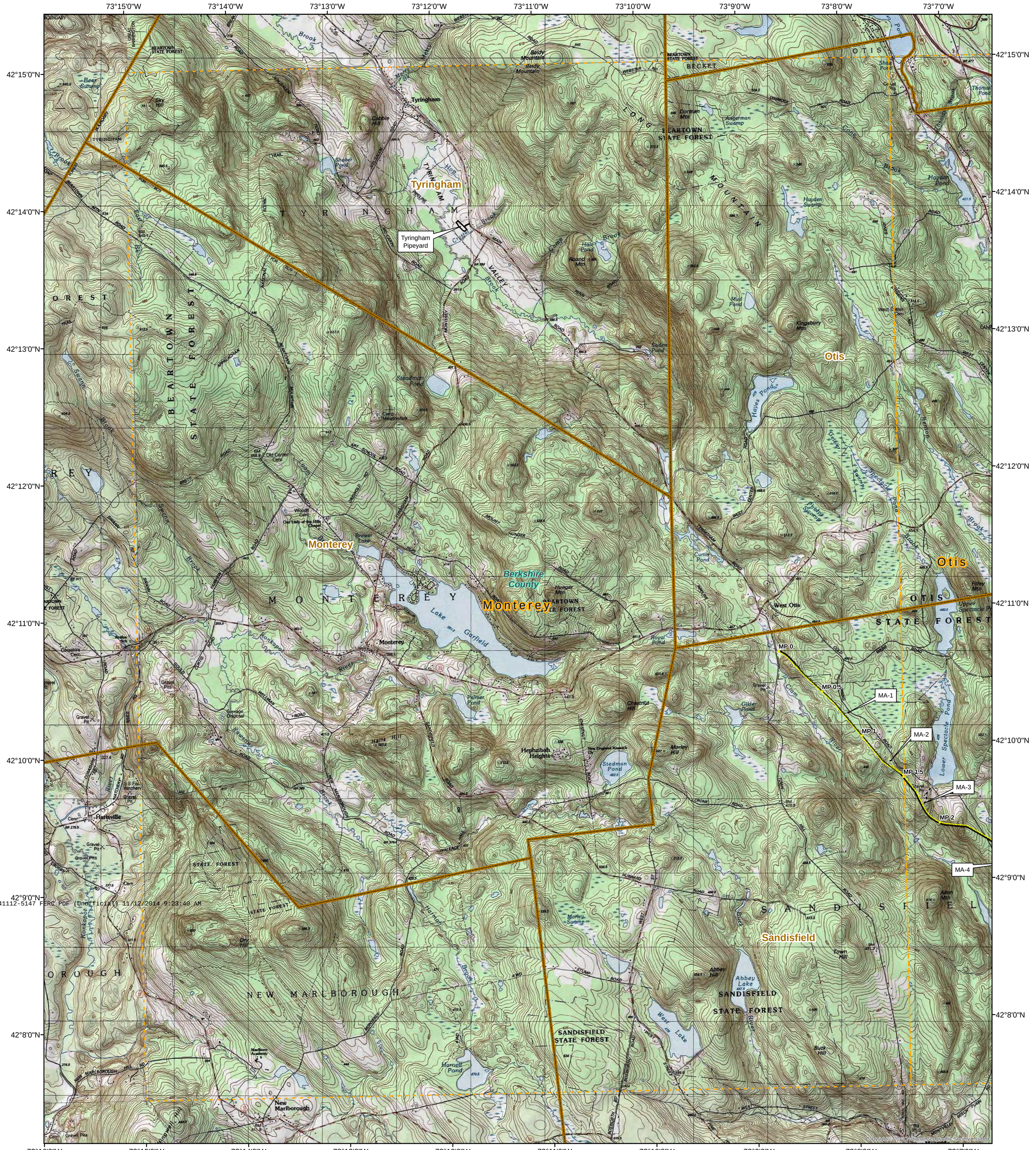
1 inch = 80,000 feet

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

Figure 1.1-1

July 2014

Y:\Projects\Tennessee_Gas\Northeast_Upgrade_Project\MXD\FERC_Resource_Reports\Figure_1_1_1_NEUP_Project_Overview_Map.mxd



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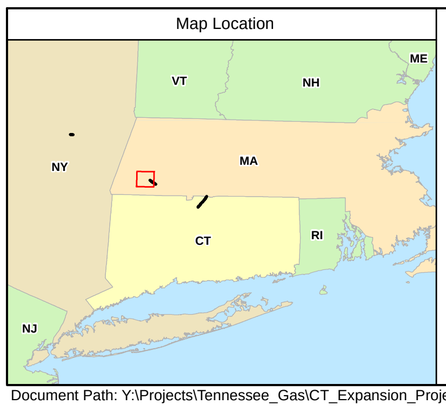
Map Location



Tennessee Gas Pipeline Company, L.L.C.
Connecticut Expansion Project

Mile Post
Existing Compressor Station
Existing Pipe
Centerline Route
Access Roads
MLV Locations
Pipeyards
Towns
County Boundary
USGS Topographic Quads

Scale: 1:24,000

0 1,000 2,000 4,000 6,000 8,000 10,000 12,000 Feet
0 500 1,000 2,000 3,000 4,000 5,000 Meters

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

AECOM

Massachusetts Loop

Figure 1-1

July 2014
Map Projection: NAD 1983 UTM Zone 18N Foot US

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MP 0.5
MA-1
MP 1
MA-2
MP 1.5
MA-3
MP 2
MP 2.5
MA-4
MP 3
MP 3.5
MP 3.81
MA-5
Relocated Pig Receiver and Receiver Valve

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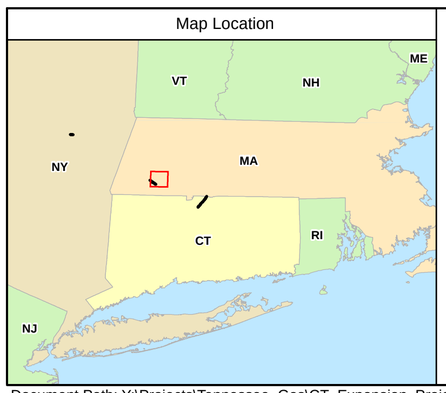
Map Location



Tennessee Gas Pipeline Company, L.L.C.
Connecticut Expansion Project

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Scale: 1:24,000

0 1,000 2,000 4,000 6,000 8,000 10,000 12,000 Feet
0 500 1,000 2,000 3,000 4,000 5,000 Meters

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

AECOM

Massachusetts Loop

Figure 1-2

July 2014
Map Projection: NAD 1983 UTM Zone 18N Foot US

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20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Compressor Station 261

Hickory Street Pipeyard

MP 0

MP 0.5

CT-1

MP 1

CT-2

MP 1.5

CT-3

MP 2

MP 2.5

MP 3

CT-4A

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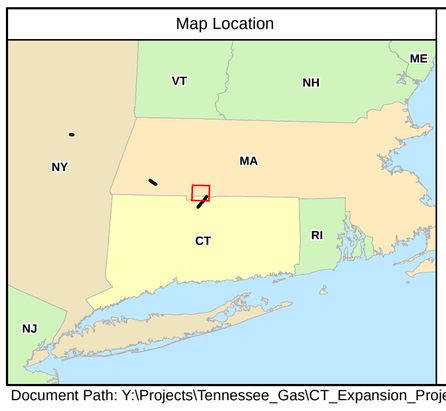
Map Location



Tennessee Gas Pipeline Company, L.L.C.
Connecticut Expansion Project

Mile Post
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Scale: 1:24,000

0 1,000 2,000 4,000 6,000 8,000 10,000 12,000 Feet

0 500 1,000 2,000 3,000 4,000 5,000 Meters

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

AECOM

Connecticut Loop

Figure 1-3

July 2014
Map Projection: NAD 1983 UTM Zone 18N Foot US

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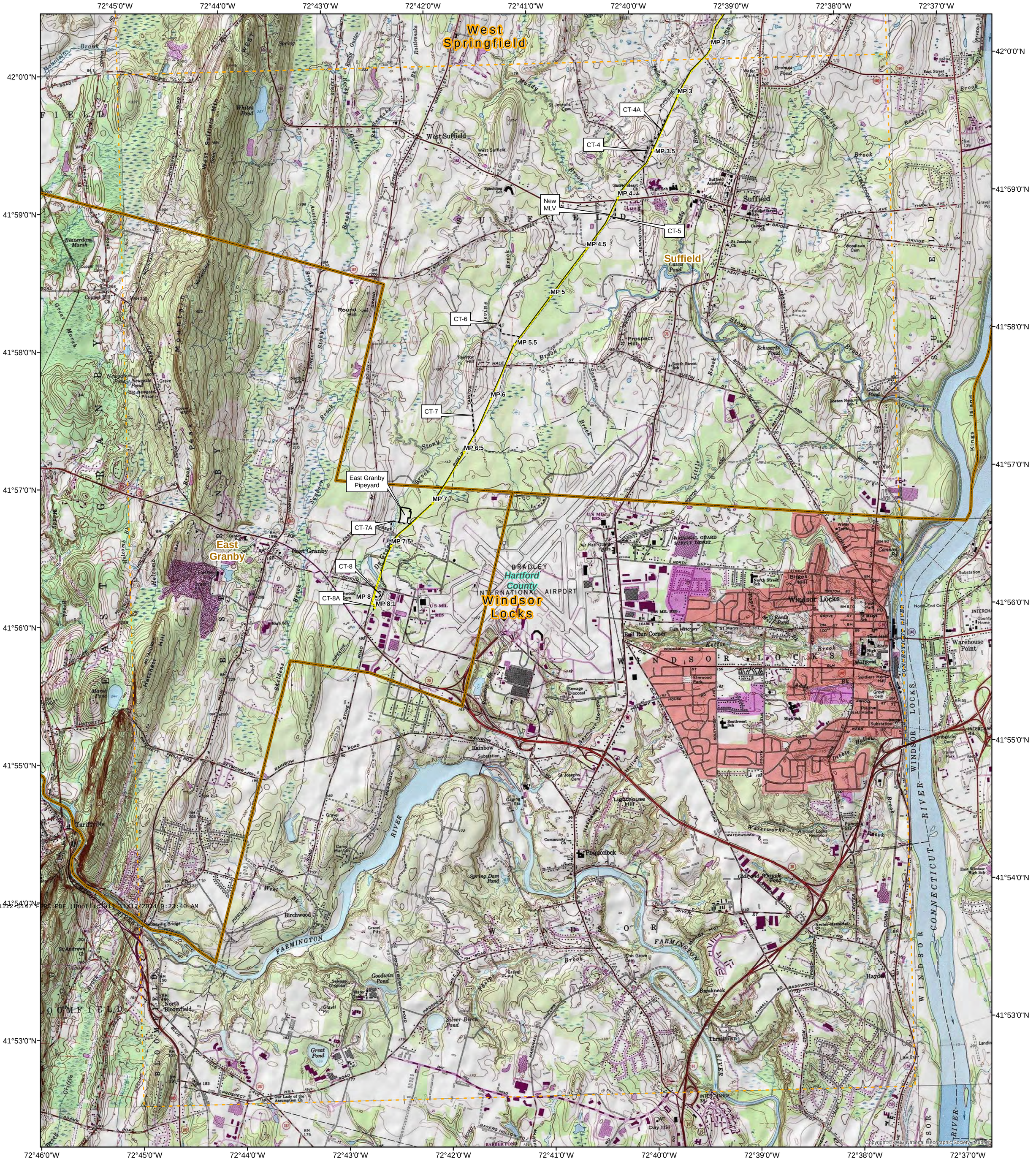

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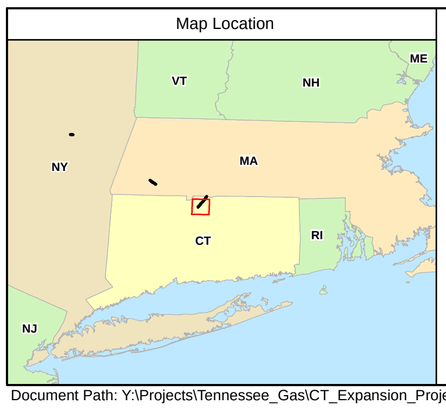
Map Location



Tennessee Gas Pipeline Company, L.L.C.
Connecticut Expansion Project

- Mile Post
- Existing Compressor Station
- Existing Pipe
- Centerline Route
- Access Roads
- MLV Locations
- Pipeyards
- Towns
- County Boundary
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Scale: 1:24,000

0 1,000 2,000 4,000 6,000 8,000 10,000 12,000 Feet

0 500 1,000 2,000 3,000 4,000 5,000 Meters

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

AECOM

Connecticut Loop

Figure 1-4

July 2014
Map Projection: NAD 1983 UTM Zone 18N Foot US

Document Path: Y:\Projects\Tennessee_Gas\CT_Expansion_Project\Maps\New England Corps Permit\CT_and_MA_Full_Quad_GIS_Maps.mxd

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

APPENDIX C

- Agency Consultation Responses
- Agency Response Table

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

APPENDIX C

Agency Response Table

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

AGENCY CORRESPONDENCE AND RESPONSES FOR THE CONNECTICUT EXPANSION PROJECT

Agency	Date Sent	Request	Date Received	Comment[a]
U. S. Fish & Wildlife Service New England Field Office Attn: Mr. Anthony Tur 70 Commercial St., Ste. 300 Concord, NH 03301-5087 (603) 223-2541	9/29/2013	Section 7 Endangered Species / Protected Species Areas	3/21/2014	Provided list of species located within or near the project area, dwarf wedgemussel, New England cottontail, northern long-eared bat
U. S. Fish & Wildlife Service New England Field Office Attn: Mr. Anthony Tur 70 Commercial St., Ste. 300 Concord, NH 03301-5087 (603) 223-2541	5/8/2014	Section 7 Endangered Species / Protected Species Areas – additional access roads and pipeyard areas	6/13/2014	Project is located within the ranges of the New England Cottontail and Northern long-eared bat
Massachusetts Department. of Conservation & Recreation Attn: Ms. Nancy Putnam 251 Causeway Street – Suite 600 Boston, MA 02114 (617) 626-1350	1/21/2014	Natural, recreational, and scenic areas consultation	No Response to Date	No Response to Date
Massachusetts Department. of Conservation & Recreation Attn: Ms. Nancy Putnam 251 Causeway Street – Suite 600 Boston, MA 02114 (617) 626-1350	4/10/2014	Natural, recreational, and scenic areas consultation – additional access roads and pipeyard areas	No Response to Date	No Response to Date
U.S. Environmental Protection Agency, Region 1 Attn.: Ms. Kira Jacobs 5 Post Office Square, Suite 100 Mail Code: OEP06-2 Boston, MA 02109	1/21/2014	Presence of EPA, state and municipal aquifers, aquifer protection districts, state or municipal surface water protection areas and public/private drinking water wells	1/30/2014	Project does not cross or come within 0.25 miles of any aquifers or public drinking water sources. Suggests contacting town officials for information about private drinking water wells
U.S. Environmental Protection Agency, Region 1 Attn.: Ms. Kira Jacobs 5 Post Office Square, Suite 100 Mail Code: OEP06-2 Boston, MA 02109	4/10/2014	Presence of EPA, state and municipal aquifers, aquifer protection districts, state or municipal surface water protection areas and public/private drinking water wells - additional access roads and pipeyard areas	No Response to Date	No Response to Date
Natural Heritage & Endangered Species Program Attn: Mr. Thomas French 100 Hartwell Street, Suite 230 West Boylston, MA 01583 (508) 389-6361	9/10/2013	State threatened and endangered species consultation request – Sandisfield	10/09/2013	No mapped Priority or Estimated Habitat, or state-listed species in the vicinity of the project
Natural Heritage & Endangered Species Program Attn: Mr. Thomas French 100 Hartwell Street, Suite 230 West Boylston, MA 01583 (508) 389-6361	10/15/2013	State threatened and endangered species consultation request – Agawam	11/14/2013	No mapped Priority or Estimated Habitat, or state-listed species in the vicinity of the project

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:45 AM

AGENCY CORRESPONDENCE AND RESPONSES FOR THE CONNECTICUT EXPANSION PROJECT

Agency	Date Sent	Request	Date Received	Comment[a]
Natural Heritage & Endangered Species Program Attn: Mr. Thomas French 100 Hartwell Street, Suite 230 West Boylston, MA 01583 (508) 389-6361	4/8/2014	State threatened and endangered species consultation request – Sandisfield and Tyringham additional access roads and pipeyard	5/28/2014	Provided information on rare species near Tyringham pipeyard and Spectacle Pond. Provided fisheries information
Massachusetts Division of Fisheries and Wildlife Attn: Mr. Andrew Madden District Manager 88 Old Windsor Road Dalton, MA 01226	1/21/2014	Western District Fisheries: Threatened and endangered species, protected species, timing restrictions	No Response to Date	No Response to Date
Massachusetts Division of Fisheries and Wildlife Attn: Mr. Andrew Madden District Manager 88 Old Windsor Road Dalton, MA 01226	4/10/2014	Western District Fisheries: Threatened and endangered species, protected species, timing restrictions – additional access road and pipeyard areas	No Response to Date	No Response to Date
Massachusetts Division of Fisheries and Wildlife Attn: Mr. Ralph Taylor District Manager East Street Belchertown, MA 01007	1/21/2014	Central District Fisheries: Threatened and endangered species, protected species, timing restrictions	No Response to Date	No Response to Date
MA Office of Coastal Zone Management Attn: Bruce Carlisle 251 Causeway Street, Suite 800 Boston, MA 02114	1/21/2014	Request to identify whether the project is within the jurisdiction of the Massachusetts Office of Coastal Zone Management ("CZM") subsequently requiring Federal Consistency Review under the Coastal Zone Management Act	No Response to Date	No Response to Date
MA Office of Coastal Zone Management Attn: Bruce Carlisle 251 Causeway Street, Suite 800 Boston, MA 02114	4/10/2014	Request to identify whether the project is within the jurisdiction of the Massachusetts Office of Coastal Zone Management ("CZM") subsequently requiring Federal Consistency Review under the Coastal Zone Management Act – additional access roads and pipeyard areas	4/25/2014	No effect to coastal zone
U. S. National Park Service Attn: Mr. Dennis Reidenbach U.S. Custom House 200 Chestnut Street, Fifth Floor Philadelphia, PA 19106	1/21/2014	Presence of national parks, wild & scenic rivers, trails and landmarks	3/20/2014	Indicated that there are some properties of interest near the Project, though they would likely not be crossed. USNPS would send GIS shape files of their lands in the Project area
U. S. National Park Service Attn: Mr. Dennis Reidenbach U.S. Custom House 200 Chestnut Street, Fifth Floor Philadelphia, PA 19106	4/10/2014	Presence of national parks, wild & scenic rivers, trails and landmarks – additional access roads and pipeyard areas	4/21/2014 4/22/2014	Provided shape files of USNPS lands

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:45 AM

AGENCY CORRESPONDENCE AND RESPONSES FOR THE CONNECTICUT EXPANSION PROJECT

Agency	Date Sent	Request	Date Received	Comment[a]
Bureau of Waste Site Cleanup Attn: Ms. Eva Tor Massachusetts Department of Environmental Protection 627 Main St Worcester, MA 01608	1/21/2014	Known instances of hazardous materials spills; sites known to be contaminated with hazardous materials and sites with on-going environmental remediation activities	No Response to Date	No Response to Date
Bureau of Waste Site Cleanup Attn: Ms. Eva Tor Massachusetts Department of Environmental Protection 627 Main St Worcester, MA 01608	4/10/2014	Known instances of hazardous materials spills; sites known to be contaminated with hazardous materials and sites with on-going environmental remediation activities-additional access roads and pipeyard	4/16/2014	Provided links to GIS data layers showing locations for known hazardous waste sites
Massachusetts Department of Agricultural Resources Attn. Ms. Barbara Hopson 101 University Drive, Suite C4 Amherst, MA 01002	1/21/2014	Soils information and agricultural resources	No Response to Date	No Response to Date
Massachusetts Department of Agricultural Resources Attn. Ms. Barbara Hopson 101 University Drive, Suite C4 Amherst, MA 01002	4/10/2014	Soils information and agricultural resources - additional access roads and pipeyard	No Response to Date	No Response to Date
Office of the State Geologist Attn: Mr. Stephen B. Mabee Geosciences Department University of Massachusetts 611 North Pleasant Street Amherst, MA 01003-9297	1/21/2014	Presence of potential for paleontological resources, earthquake hazards, the presence of active or currently dormant faults, areas susceptible to landsliding, and volcanism and mineral resources and active/ inactive mined within the project area	2/07/2014	Provided information on geological resources via a short write up and mapping
Office of the State Geologist Attn: Mr. Stephen B. Mabee Geosciences Department University of Massachusetts 611 North Pleasant Street Amherst, MA 01003-9297	4/10/2014	Presence of potential for paleontological resources, earthquake hazards, the presence of active or currently dormant faults, areas susceptible to landsliding, and volcanism and mineral resources and active/ inactive mined within the project area – additional access roads and pipeyard areas	4/25/2014	Provided information on geological resources near pipeyard and access roads via a short write up and mapping
Town of Sandisfield Attn: Mr. Victor Hrychvich Board of Health 66 Sandisfield Road P.O. Box 90 Sandisfield, MA 01255	1/21/2014	Presence of state and municipal aquifers, aquifer protection districts and public/private drinking water wells	No Response to Date	No Response to Date
Town of Sandisfield Attn: Mr. Victor Hrychvich Board of Health 66 Sandisfield Road P.O. Box 9 Sandisfield, MA 01255	4/10/2014	Presence of state and municipal aquifers, aquifer protection districts and public/private drinking water wells – additional access roads and pipeyard areas	4/22/2014	Discussed drinking water wells near the pipeline and access roads. Indicated natural resources near the access road south of Lower Spectacle Pond

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

AGENCY CORRESPONDENCE AND RESPONSES FOR THE CONNECTICUT EXPANSION PROJECT

Agency	Date Sent	Request	Date Received	Comment[a]
Town of Sandisfield Attn: Mr. Gary Bottum Planning Board 66 Sandisfield Road P.O. Box 90 Sandisfield, MA 01255	1/21/2014	Plans for future development in project area consultation request. Presence of state and municipal aquifers, aquifer protection districts and public/private drinking water wells	No Response to Date	No Response to Date
Town of Sandisfield Attn: Mr. Gary Bottum Planning Board 66 Sandisfield Road P.O. Box 90 Sandisfield, MA 01255	4/10/2014	Plans for future development in project area consultation request. Presence of state and municipal aquifers, aquifer protection districts and public/private drinking water wells – additional access roads and pipeyard areas	No Response to Date	No Response to Date
Tyringham Planning Board Attn: Robin Almgren P.O. Box 442 Tyringham, MA 01264	4/10/2014	Request for presence of state and municipal aquifers, aquifer protection districts and public/private drinking water wells - pipeyard location	No Response to Date	No Response to Date
Tyringham Health Department Attn: Peter Curtain P.O. Box 90 Sandisfield, MA 01125	4/10/2014	Request for presence of state and municipal aquifers, aquifer protection districts and public/private drinking water wells - pipeyard location	No Response to Date	No Response to Date
Agawam Planning and Community Development Attn: Ms. Deborah Dachos Town of Agawam 36 Main Street Agawam, MA 01001	1/21/2014	Plans for future development in project area consultation request. Request for presence of state and municipal aquifers, aquifer protection districts and public/private drinking water wells	1/29/2014	Declined to comment on Project
Agawam Health Department Attn: Mr. Randall White Town of Agawam 36 Main Street Agawam, MA 01001	1/21/2014	Presence of state and municipal aquifers, aquifer protection districts and public/private drinking water wells	No Response to Date	No Response to Date
Agawam Water Department Attn: Mr. John Decker Town of Agawam 36 Main Street Agawam, MA 01001	1/21/2014	Presence of state and municipal aquifers, aquifer protection districts and public/private drinking water wells	1/24/2014	No utilities in Project area
DEP Western Region Water Supply Attn: Ms. Catherine Skiba 436 Dwight Street Springfield, MA 01103 (413) 755-2119	1/21/2014	Presence of state and municipal aquifers, aquifer protection districts and public/private drinking water wells.	1/23/2014	Indicated all available information is on MADEP website via GIS layers

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

AGENCY CORRESPONDENCE AND RESPONSES FOR THE CONNECTICUT EXPANSION PROJECT

Agency	Date Sent	Request	Date Received	Comment[a]
DEP Western Region Water Supply Attn: Ms. Catherine Skiba 436 Dwight Street Springfield, MA 01103 (413) 755-2119	4/10/2014	Presence of state and municipal aquifers, aquifer protection districts and public/private drinking water wells – additional access roads and pipeyard areas	4/16/2014	Provided links to GIS data layers showing drinking water resources
National Marine Fisheries Service Northeast Regional Office Attn: Ms. Jennifer Anderson 55 Great Republic Drive Gloucester, MA 01930	1/21/2014	Section 7 Endangered Species / Protected Species Areas	No Response to Date	No Response to Date
National Marine Fisheries Service Northeast Regional Office Attn: Ms. Jennifer Anderson 55 Great Republic Drive Gloucester, MA 01930	4/10/2014	Section 7 Endangered Species / Protected Species Areas – additional access roads and pipeyard areas	No Response to Date	No Response to Date
United States Geological Survey Attn: Mr. Michael Baker Minerals Information 12201 Sunrise Valley Drive Mail Stop 991 Reston, VA 20192	1/21/2014	Mineral resources and geologic hazards	1/23/2014	Federal statute prohibits USGS from commenting on projects for private companies. Indicated there is published USGS data available
United States Geological Survey Attn: Mr. Michael Baker Minerals Information 12201 Sunrise Valley Drive Mail Stop 991 Reston, VA 20192	4/10/2014	Mineral resources and geologic hazards – additional access roads and pipeyard	No Response to Date	No Response to Date
Natural Resources Cons. Service Pittsfield Service Center Attn: Ms. Kate Parsons 78 Center Street, Suite 206 Pittsfield, MA 01201	1/21/2014	Berkshire County soil resources and hazards	No Response to Date	No Response to Date
Natural Resources Cons. Service Pittsfield Service Center Attn: Ms. Kate Parsons 78 Center Street, Suite 206 Pittsfield, MA 01201	4/10/2014	Berkshire County soil resources and hazards– additional access roads and pipeyard areas	4/25/2014	Direction to websites with information on soil hazards, agricultural lands, and seed mixes
Natural Resources Cons. Service Hadley Service Center Attn: Mr. Vince Snyder 195 Russell Street Hadley, MA 01035	1/21/2014	Hampden County soil resources and hazards	2/20/2014	Providing mapping for soils with soils descriptions, conservation restrictions and agricultural fields, priority and core habitat for wildlife, and water resources. Provided NRCS Specification Guide for Critical Area Planting for seed mix guidance

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AGENCY CORRESPONDENCE AND RESPONSES FOR THE CONNECTICUT EXPANSION PROJECT

Agency	Date Sent	Request	Date Received	Comment[a]
Berkshire County Boards of Health Association Attn: Diane Persson 1 Fenn Street, Suite 302 Pittsfield, MA 01201	1/21/2014	Presence of state and municipal aquifers, aquifer protection districts and public/private drinking water wells.	No Response to Date	No Response to Date
Berkshire County Boards of Health Association Attn: Diane Persson 1 Fenn Street, Suite 302 Pittsfield, MA 01201	4/10/2014	Presence of state and municipal aquifers, aquifer protection districts and public/private drinking water wells – additional access roads and pipeyard areas	No Response to Date	No Response to Date
Berkshire Soil and Water Conservation District Attn: Deborah Burke 78 Center Street, Suite 206 Pittsfield, MA 01201	1/21/2014	Soil resources and hazards consultation	No Response to Date	No Response to Date
Berkshire Soil and Water Conservation District Attn: Deborah Burke 78 Center Street, Suite 206 Pittsfield, MA 01201	4/10/2014	Soil resources and hazards consultation - pipeyard and access roads	No Response to Date	No Response to Date
Berkshire County Regional Planning Commission Attn: Mr. Tom Matuszko Assistant Director 1 Fenn Street, Suite 201 Pittsfield, MA 01201	1/21/2014	Plans for future development in project area consultation request. Presence of state and municipal aquifers, aquifer protection districts and public/private drinking water wells	3/5/2014	Indicated no known drinking water resources or developments near the Project. Discussed Otis and Sandisfield State Forest and the likelihood of private wells in the area
Berkshire County Regional Planning Commission Attn: Mr. Tom Matuszko Assistant Director 1 Fenn Street, Suite 201 Pittsfield, MA 01201	4/10/2014	Plans for future development in project area consultation request. Presence of state and municipal aquifers, aquifer protection districts and public/private drinking water wells – additional access road and pipeyard areas	4/22/2014	Provided information about Tyringham pipeyard and access roads. Indicated Lower Spectable Pond and Tyraningham pipeyard are in mapped habitat, access road is near Old Growth Trail, pipeyard and access road possibly near private wells

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

APPENDIX C

Agency Consultation Responses

United States Department of the Interior

FISH AND WILDLIFE SERVICE

New England Field Office
70 Commercial Street, Suite 300
Concord, NH 03301-5087
http://www.fws.gov/newengland

March 21, 2014

Ms. Julia Stearns
AECOM
10 Orms Street, Suite 405
Providence, Rhode Island 02904

Dear Ms. Stearns:

This responds to your correspondence, dated September 29, 2013, requesting information on the presence of federally listed and/or proposed endangered or threatened species in relation to the Tennessee Gas Pipeline Company's proposal to construct and operate the Connecticut Expansion Project. Additional information was received on November 11, 2013. The project involves the installation of approximately 13.3 miles of pipeline looping (installation of new pipeline along existing pipeline within active rights-of-way) in New York, Massachusetts and Connecticut. Pursuant to section 7(a)(2) of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531-1533), federal agencies, including the Federal Energy Regulatory Commission, have a responsibility to consult with the U. S. Fish and Wildlife Service (Service) when projects they fund, authorize, or carry out result in effects to federally listed or proposed species. Our comments are provided in accordance with section 7 of the ESA.

This letter addresses only those portions of the project located in Massachusetts and Connecticut. For review of the New York portions of the project, please send a duplicate request for review package to the Service's New York Field Office at 3817 Luker Road, Cortland, New York 13045.

Endangered Species

Dwarf wedgemussel

The 8.1-mile-long Line 300 loop extending from East Granby, Connecticut north to the Massachusetts border crosses Muddy Brook at a point located approximately 4.75 miles north of the proposed project's southernmost point. The federally endangered dwarf wedgemussel (*Alasmidonta heterodon*) is known to occur at several upstream and downstream locations within close proximity to the project area in Muddy Brook. Accordingly, this species may occur in the project area. Since the proposed project crosses habitat known to support dwarf wedgemussel, further consultation with

this office regarding the project is recommended. Specifically, we request project-specific details regarding construction techniques including erosion and sedimentation control measures, along with your determination as to whether or not the proposed crossing of Muddy Brook may affect the dwarf wedgemussel or its habitat.

Species Undergoing Review

In an effort to improve ESA implementation, the Service developed a multiyear-listing work plan that will enable the agency to systematically review and address the needs of more than 250 species listed on the 2010 Candidate Notice of Review, to determine if they should be added to the Federal Lists of Endangered and Threatened Wildlife and Plants. This work plan was subsequently filed as part of a Multi-District Litigation (MDL) court-approved settlement agreement with the Center for Biological Diversity and WildEarth Guardians, whereby the Service has committed to publish certain ESA listing actions (i.e., petition findings, listing determinations, and critical habitat designations) in fiscal years (FY) 2013 to 2016 (the federal fiscal year ends September 30). The Service recently extended the MDL work plan to include FYs 2017 and 2018 (see the work plan available at: http://www.fws.gov/endangered/improving_ESA/listing_workplan_FY13-18.html [accessed March 2014]).

Although not currently listed, the New England cottontail rabbit (*Sylvilagus transitionalis*) and the northern long-eared bat (*Myotis septentrionalis*) are species that appear on the MDL work plan and may occur in the vicinity of the project. While there is currently no legal obligation to avoid affecting the habitat of these species at the present time, the Service strongly encourages their consideration during project planning. Early consideration of these species in project planning may allow the project to be designed in a manner that avoids adverse effects to these species. This early consideration may help to avert future project delays, since a determination that listing of these species under authority of the ESA is warranted will trigger the need for consultation pursuant to section 7 of the ESA.

New England cottontail

The Service's MDL work plan schedule specifies that we will develop a Proposed Rule to list the New England cottontail or conclude that listing of the New England cottontail is not warranted during FY 2015. We are not aware that any comprehensive surveys or other studies have been conducted for this species within the project area. However, the 3.8-mile-long Line 200 portion of the project located in Berkshire County, Massachusetts is located in an area known to be occupied by the New England cottontail. Vegetation management along utility rights-of-way can have a significant impact on the New England cottontail. Long-term management that converts scrub-shrub corridors into herbaceous vegetative cover eliminates habitat and hinders cottontail dispersal, while short-term management of shrubs results in a temporary impact to habitat. These short-term impacts to shrub communities may be necessary to ensure vegetation succession does not proceed to the point where habitat is no longer suitable for the New England cottontail. Given the conservation status of the New England cottontail and their potential presence in the project area, consideration of the species during project planning is strongly advised.

Northern long-eared bats

The northern long-eared bat is currently proposed for listing under the ESA. The Service's MDL work plan schedule indicates that we will develop a Final Rule to list the northern long-eared bat or conclude that listing of the species is not warranted during FY 2014. During summer months, northern long-eared bats roost singly or in colonies underneath bark, in cavities, or in crevices of both live and dead trees. Males and non-reproductive females may also roost in cooler places, like caves and mines. This bat species appears to be opportunistic in selecting roosts, using various tree species based on suitability to retain bark or provide cavities or crevices. It has also been found in rare instances roosting in structures like barns and sheds.

Lines 200 and 300 are both located within the known range of the northern long-eared bat. Since the northern long-eared bat may be listed prior to the completion of the Connecticut Expansion Project, we recommend time-of-year restrictions to avoid cutting of occupied summer roosting habitat during the period of April 1 to September 30. If this time-of-year restriction cannot be implemented, further consultation to determine impacts of the project to this species is recommended to avoid potential project delays in the event the species becomes listed.

Thank you for your coordination on this project. Please contact Maria Tur of this office at 603-223-2541 with any additional information or for further assistance.

Sincerely yours,

Thomas R. Chapman
Supervisor
New England Field Office

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20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

From: Jacobs, Kira
To: Banach, Eileen
Cc: Heath, Douglas; McClelland, Maureen
Subject: Response to Inquiry about Proposed Connecticut Expansion Project, Tennessee Gas Pipeline Company
Date: Thursday, January 30, 2014 1:38:32 PM

Dear Ms. Banach,

We are in receipt of your FedEx letter dated January 23, 2014 regarding the proposed Connecticut Expansion Project for Tennessee Gas Pipeline Company.

My colleague Doug Heath has provided the following review of the proposed project per your request.

I contacted my counterparts in Massachusetts and Connecticut. I understand that you have been in touch with our colleagues in the Drinking Water Program in CT. However, I have not been able to confirm if you have notified the MassDEP Drinking Water Program as well. If you have not, I would encourage you to do so.

Please let me know if the following response is sufficient.

Thank you,
Kira Jacobs
617-918-1817

From: Heath, Douglas
Sent: Tuesday, January 28, 2014 1:43 PM
Cc: Jacobs, Kira; McClelland, Maureen
Subject: Proposed Connecticut Expansion Project, Tennessee Gas Pipeline Company

Dear Ms. Banach:

We have reviewed your letter of January 21, 2014 with supporting maps describing a proposed construction of 13.3-miles of pipeline looping in New York, Massachusetts and Connecticut by the Tennessee Gas Pipeline Company. Based on the materials provided, and after reviewing our records, the proposed facilities are not anticipated to cross or be within 0.25 miles of US EPA, State or Municipal designated aquifers; State or municipal designated aquifer protection areas; surface waters that provide public drinking water supplies; State or municipal designated surface water protection areas; or any known or proposed public drinking water wells, reservoirs or springs within 300 feet of the proposed alignment in Massachusetts or Connecticut. However, we cannot verify the presence or absence of private drinking water wells in these areas. For that information, we recommend that you contact town officials in Sandisfield, MA and Suffield, CT. In addition, you should consult EPA Region 2 for information about the sensitive environmental areas in Bethlehem, NY, as that city lies outside of Region I. We recommend that you contact Stephen Gould of Region 2 (PH: 212-637-3822). He should be able to assist you.

We understand that an Environmental Report is being prepared as part of the FERC Section 7(C)

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

application and review process for this project. Please forward a copy of the Environmental Report to the attention of Kira Jacobs (Mail Code OEP06-2; PH: 617-918-1817) of our office once it is ready for distribution.

Sincerely,

Douglas Heath, Hydrogeologist
USEPA New England
5 Post Office Square, Suite 100
Mail Code OEP06-3
Boston, MA 02109-3912

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

From:	Banach, Eileen
To:	Banach, Eileen
Subject:	FW: FW: Connecticut Expansion Pipeline Project
Date:	Sunday, April 27, 2014 9:00:45 AM

From: Morrison, Mary [mailto:mary_morrison@nps.gov]
Sent: Monday, April 21, 2014 5:09 PM
To: Banach, Eileen
Subject: Re: FW: Connecticut Expansion Pipeline Project

Hi Eileen,
Sorry it has taken me so long to get back.
I just uploaded the files. Below is a list of what I was able to upload.

Please keep in mind that these files are not updated as of the last three - five years. You will still need to check with the NPS to make sure your project does not cross or impact a NPS unit or program property. Providing maps with the nps properties and the proposed project layers with review materials would be a big help.

I was not able to upload the National Historic Landmark layers.

Here's what you got:

LWCF - Land and Water Conservation Fund Program funded parks
nnl - National Natural Landmarks
civil war battlefields
nhareas - National Heritage Areas
npsnpb - National Park Boundaries
National Historic Trails (there may be duplicate trail information)
Wash Roch - Washington Rochambeau National Historic Trail
wild and scenic - Wild and Scenic Rivers

If you have any questions about the data, please let me know. I hope this is useful for you!

Missy

From: mary_morrison@nps.gov
To: Banach, Eileen
Subject: Notification: Mary Morrison has sent you files
Date: Monday, April 21, 2014 4:58:56 PM

Mary Morrison has sent you 1 file using AECOM's File Transfer System.

Mary Morrison says:

Hi Eileen
Sorry it took so unreasonably long for me to follow through with providing you with NPS layers.

Please be advised that you still need to verify that there are no NPS affiliated properties/park units in your project area by contacting hte NPS. There are new park units and properties added every year and these files are not completely up to date. I was not able to locate the National Historic Landmark program files to share.

This file will be available for download until 4/28/2014

File	Description	Size
CT Expansion Project shared 2014.zip	Zip file NPS layers	5,633KB

Download all files (.zip)

If you are having trouble accessing the links in this email, you can view this message as a web page by copying the following link and pasting it into your browser:

https://sendfiles.aecom.com/message.aspx?msgId=30fb3cbf-db84-4054-a3f2-3d88c208479b&u=eileen.banach%40aecom.com

If you have any questions, please contact your project manager.

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AECOM
10 Orms Street, Suite 405
Providence, RI 02904

401.274.5685 tel
401.521.2730 fax

Telephone Call Summary

By:	Eileen Banach	Date:	January 23, 2014
Talked with:	Michael Baker	Project number:	60306709
From (company):	USGS	Project name:	Connecticut Expansion
Phone number:	703.648.4959	Subject:	Response to consultation

Michael Baker from USGS received consultation letter and called me to respond. Mr. Baker said the USGS is statutorily prohibited from conducting surveys for private companies and is legally barred from commenting on private projects. He referenced statute 43 US Code 41A. Mr. Baker directed me to look at published USGS data to obtain information on the project.



Signature

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From: Steve Mabee
To: Banach, Eileen; Nicholas Venti
Subject: Proposed Tennessee Gas Pipeline Expansion Project
Date: Friday, February 07, 2014 4:25:56 PM
Attachments: AECOM_PipelineExpansionProject.pdf

Eileen-

Sorry for the delay in responding. Attached is a short write up addressing your concerns. If you have any questions, please do not hesitate to contact me.

Steve

--
Stephen B. Mabee, Ph.D., PG
State Geologist
Department of Geosciences
University of Massachusetts
269 Morrill Science Center
611 North Pleasant Street
Amherst, Massachusetts 01003
413-545-4814
http://www.geo.umass.edu/stategeologist

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AGAWAM SECTION

Paleontological resources: possible (see Agawam Bedrock and Surficial Maps)

There are potential paleontological resources here as the bedrock consists of lithified Jurassic Hartford basin (alluvial fan, delta, lake) sediments stratigraphically equivalent to lower Jurassic fossiliferous sections (Turners Falls Sandstone) found in the Deerfield Basin to the north. These bedrock units are generally buried beneath thick glacial/fluvial sediments in this part of the basin. At the proposed site a thin (10-50 foot thick) till layer covers this bedrock. At the tie-in at the northern end of the pipeline, the till is also overlain by a thin layer of glacial lake sediments.

Earthquake hazard: negligible (see Earthquake Map)

Historically, only one small (magnitude 3-5) earthquake has been recorded (since 1928) in the surrounding towns—in Westfield, MA, 2000, magnitude 3-4, 17 km from the proposed pipeline location. The nearest recorded earthquake of magnitude >4 occurred in Moodus/East Haddam, CT in 1791, magnitude 4.4, 60 km from the proposed pipeline location. The nearest recorded earthquake of magnitude >5 occurred north of Cape Ann, MA, 190 km from the proposed pipeline location. (The data table for this earthquake category is unclear regarding event date and specific magnitude). The nearest recorded earthquake of magnitude >6 occurred east of Cape Ann, MA in 1755, 210 km from the proposed pipeline location.

Faults: none within pipeline buffer zone (see Agawam Bedrock Map)

Small nearby inactive faults are described in the hills 7 km to the west along the Agawam-Southwick border where the Holyoke Basalt outcrops. Seventeen kilometers to the east in west Hampden, MA the inactive Mesozoic border fault trace that creates the Pioneer Valley strikes south.

Soil liquefaction susceptibility: moderate-high (see Agawam Surficial Map)

The fine-grained glacial lake sediments at the tie-in at the northern end of the proposed pipeline can liquefy with seismic activity. Especially where thick, these materials pose soil liquefaction hazard to infrastructure built in or on them.

Landsliding, slumping, subsidence susceptibility: low (see Agawam Slope Stability Map)

This area is stable. However the tie-in at the northern end intersects with a tributary to Worthington Brook, a small stream. This stream flows over glacial lake sediments, resistant to erosion, and bank slopes are of low grade.

Flash flooding susceptibility: negligible (see Agawam Flood Hazard Map)

The tie-in at the northern end of the pipeline intersects with a tributary to Worthington Brook, a small stream. FEMA's flood hazard map does not indicate an inundation hazard for this low-gradient headland reach.

Volcanism susceptiblity: none

There are no active or dormant volcanoes in this region. There has been no volcanic activity in this region since the Mesozoic.

Bedrock geology: Strongly cemented fluvial sediments (see Agawam Bedrock Geology Map)

The Lower Jurassic Portland Formation is dominated by alluvial fan-derived arkose and includes beds of siltstone and sandstone (fluvial), and black shale (lacustrine).

Surficial geology: glacial till and lacustrine sequence (see Agawam Surficial Geology Map)

The pipeline runs along the shoreline of a glacial lake. To the west lies an island of thin glacial till. To the east and north lie fine-grained glacial lake sediments. These lake sediments deepen to the north at the pipeline junction.

Minerals: negligible

Accessible glacial till and clay are of little economic value.

Mines: none

SANDISFIELD SECTION

Paleontological resources: negligible (see Sandisfield Bedrock and Surficial Maps)

Neither the Proterozoic metamorphic basement nor the glacial till have potential paleontological resources.

Earthquake hazard: negligible (see Earthquake Map)

Historically, only one small (magnitude 3-5) earthquake has been recorded (since 1928) in the surrounding towns—in Westfield, MA, 2000, magnitude 3-3.9, 23 km from the proposed pipeline location. The nearest recorded earthquake of magnitude >4 occurred in Moodus/East Haddam, CT in 1791, magnitude 4.4, 87 km from the proposed pipeline location. The nearest

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

recorded earthquake of magnitude >5 occurred north of Cape Ann, MA, 220 km from the proposed pipeline location. (The data table for this earthquake category is unclear regarding event date and specific magnitude). The nearest recorded earthquake of magnitude >6 occurred east of Cape Ann, MA in 1755, 240 km from the proposed pipeline location.

Faults: present (see Sandisfield Bedrock Map)

Long-inactive Proterozoic faults criss-cross this part of the state. The proposed pipeline parallels one of these, which enters the buffer north of the pipeline's intersection with Cold Spring-West Otis Road and also at the Sandisfield-Otis border.

Soil liquefaction susceptibility: low-moderate (see Sandisfield Surficial Map)

Localized wetland areas have liquefaction potential, but underlying glacial till does not. Seismic activity is unlikely.

Landsliding, slumping, subsidence susceptibility: low-moderate (see Sandisfield Slope Stability Map)

Although most of this area is stable, some of the proposed pipeline loop area, particularly along the hill south/southeast of Lower Spectacle Pond is moderately unstable.

Flash flooding susceptiblity: negligible (see Sandisfield Flood Hazard Map)

The Clam River and its tributary, Spectacle Pond Brook, which the pipeline crosses, pose negligible flash flooding risk as indicated by FEMA's flood hazard map. Expansion of wetlands northeast of the proposed pipeline may pose greater risk of inundation.

Volcanism susceptiblity: none

There are no active or dormant volcanoes in this region. There has been no volcanic activity in Western Massachusetts since the Mesozoic.

Bedrock geology: Proterozoic basement (see Sandisfield Bedrock Geology Map)

Crystalline Proterozoic basement rocks: Gneiss, schist, granofels, specifically the Washington Gneiss, Tyringham Gneiss, and Granitoid Gneiss

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Surficial geology: thin glacial till (see Sandisfield Surficial Map)

Thin (10-50 feet thick) till deposits characterize surficial geology here. Along the floor of the Clam River valley parallel to the northwestern section of pipeline, till is overlain by sand and gravel. A defunct gravel pit southwest of Lower Spectacle Pond (mapped as till) suggests that a higher resolution (1:24,000) surficial geologic map would reveal additional details. We use the low resolution (1:250,000) map, as high-resolution resources are presently unavailable for this area.

Minerals: sand and gravel

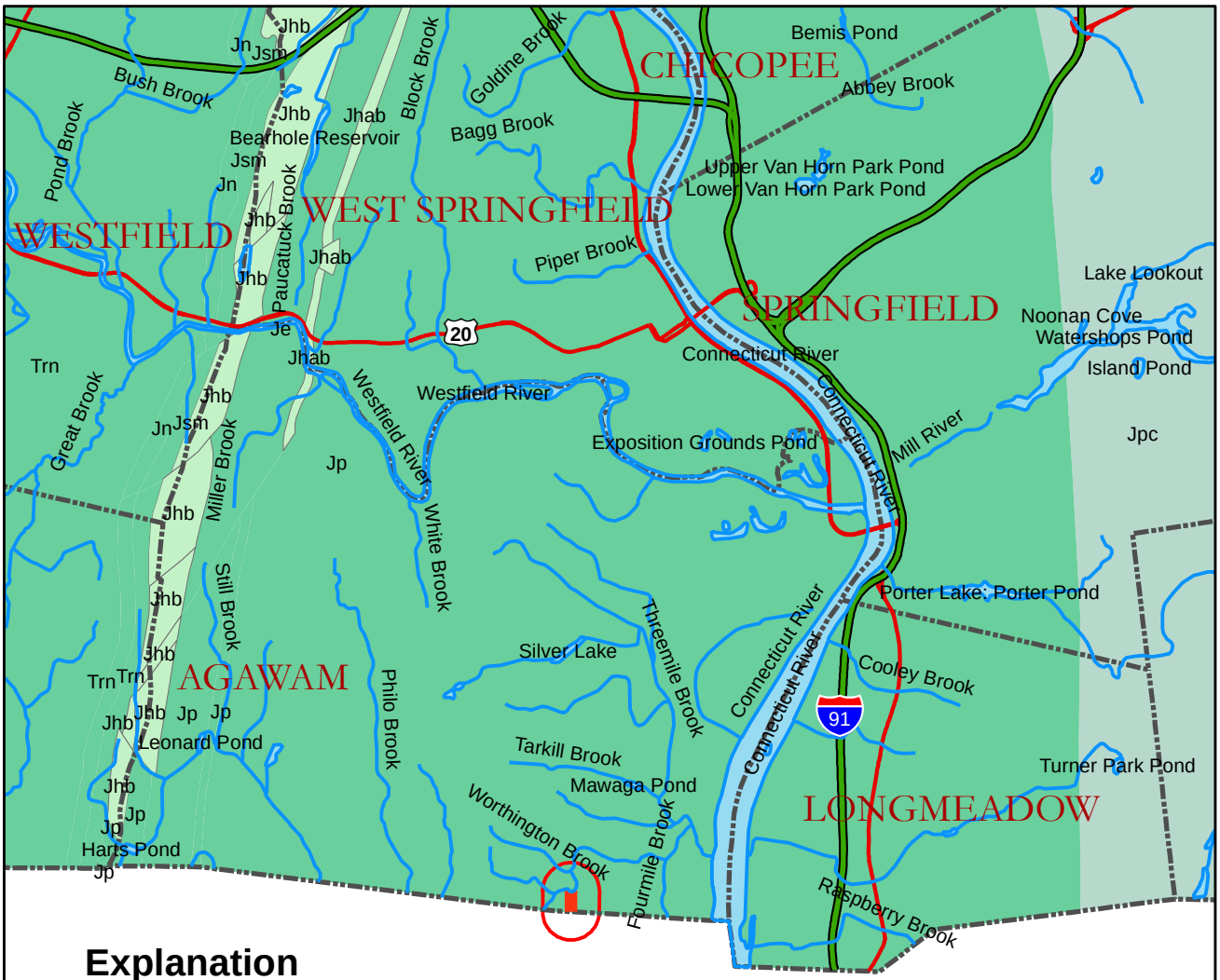
Sand and gravel is found along the floor of Clam River valley, parallel to the northernmost 1.5 km of the proposed pipeline. A disused gravel pit indicates a second potential site of sand and gravel southwest of Lower Spectacle Pond.

Mines: defunct

The topographic map indicates two gravel pits within the buffer, one southwest of Lower Spectacle Pond, and one southwest of the Clam River along the west side of Town Hill Road. Satellite imagery shows that both areas are overgrown.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Bedrock Geology
Agawam section



Explanation

- pipeline
- pipeline_Buffer

MAGEOLOGY-ZEN-SPC83

- Holyoke Basalt (Jurassic)

Jurassic Portland Formation

- arkose
- conglomerate

N

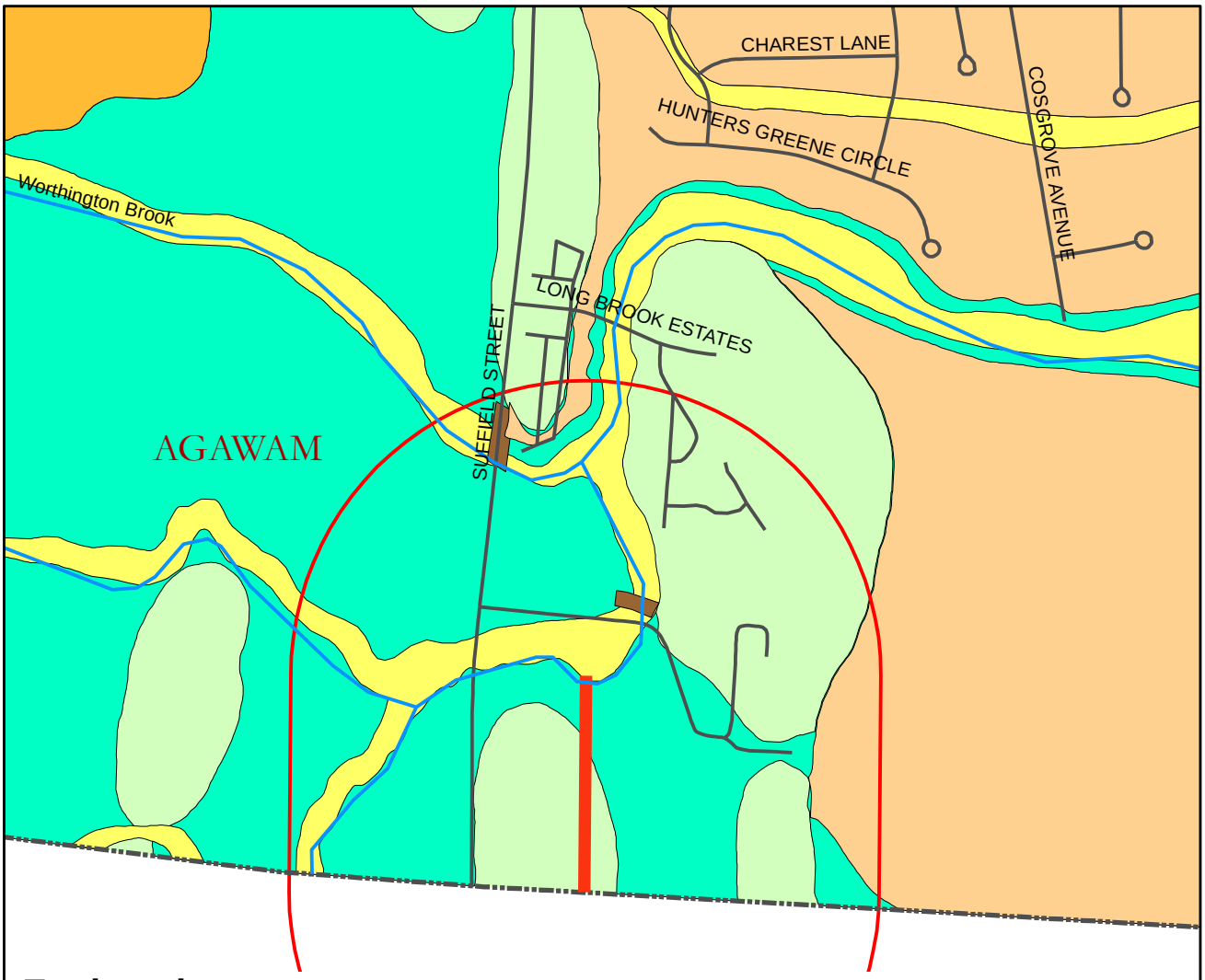
0.4 0.20 0.4 0.8 1.2 1.6

Miles

Data from Zen et al. (1983; 1:250,000)
Map created by Nick Venti, 2/7/2014

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Surficial Geology
Agawam section



Explanation

pipeline

pipeline_Buffer

postglacial

MAP_UNIT

artificial fill

floodplain alluvium

early_postglacial

MAP_UNIT

stream-terrace deposits

stratified_deposits

MAP_UNIT

glacial stratified deposits, coarse

glacial stratified deposits, fine

till_bedrock

MAP_UNIT

thin till

0.04 0 0.04 0.08 0.12 0.16

Miles

N

Data from Stone and DiGiacomo-Cohen, 2006 (USGS, 1:24,000).
Map created by Nick Venti, February 7, 2014

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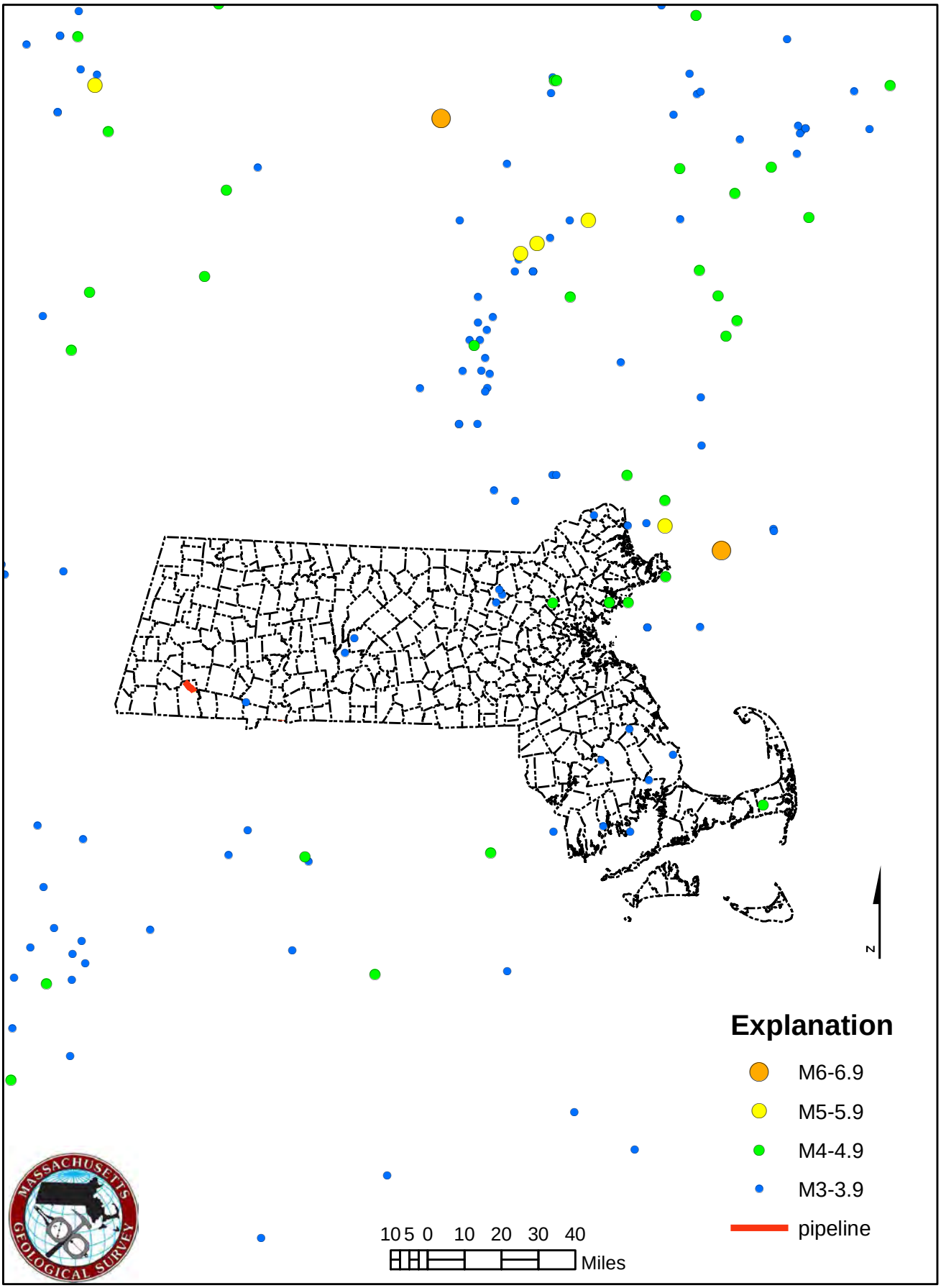
Historical Earthquakes
(Magnitude 3.0-7.0)



Data from Weston Observatory at Boston College.
Map created by Nick Venti, February 4, 2014

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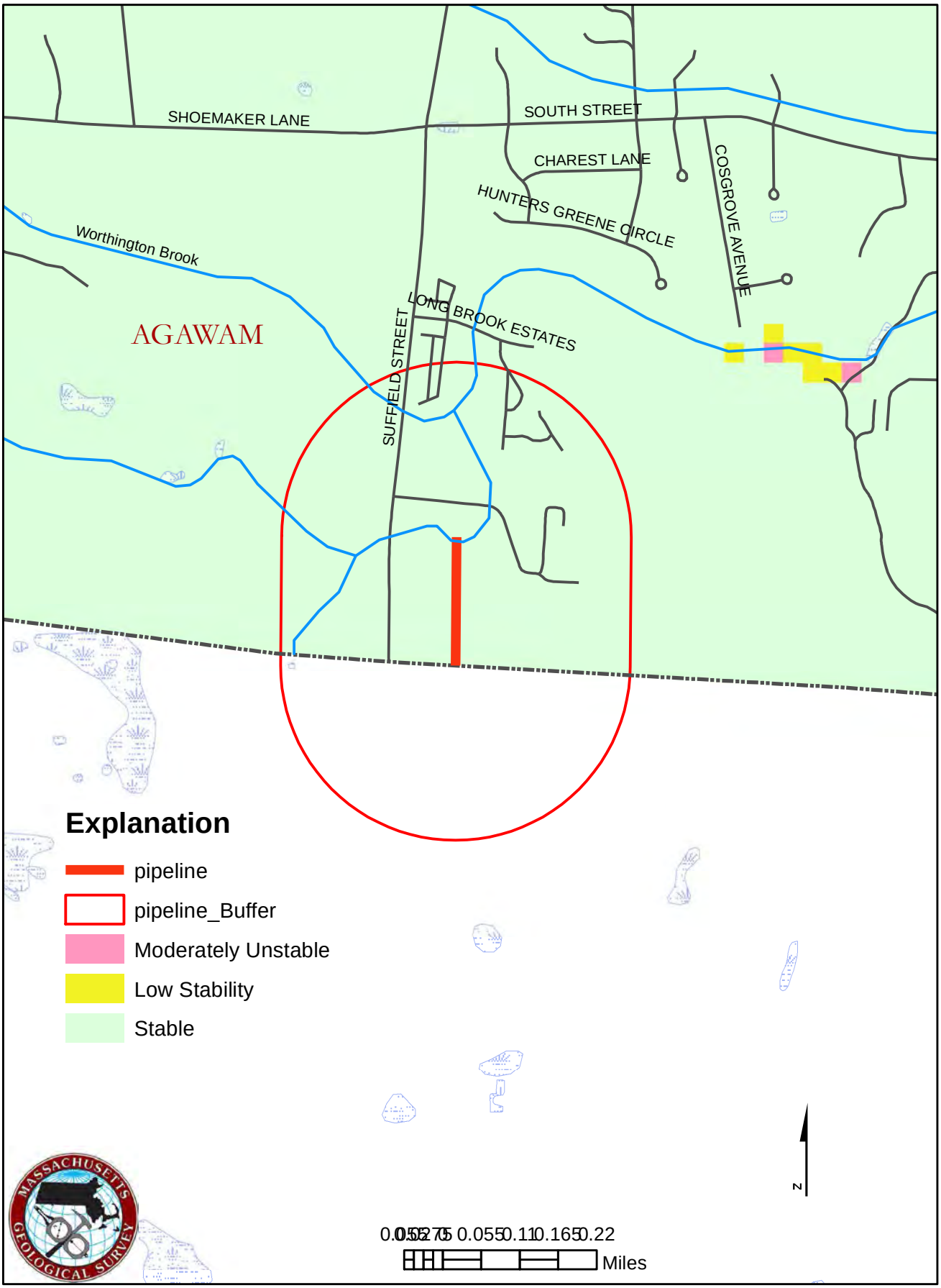
Slope Stability
Agawam section



Data from Mabee and Duncan (2013; 1:125,000)
Map created by Nick Venti, 2/7/2014

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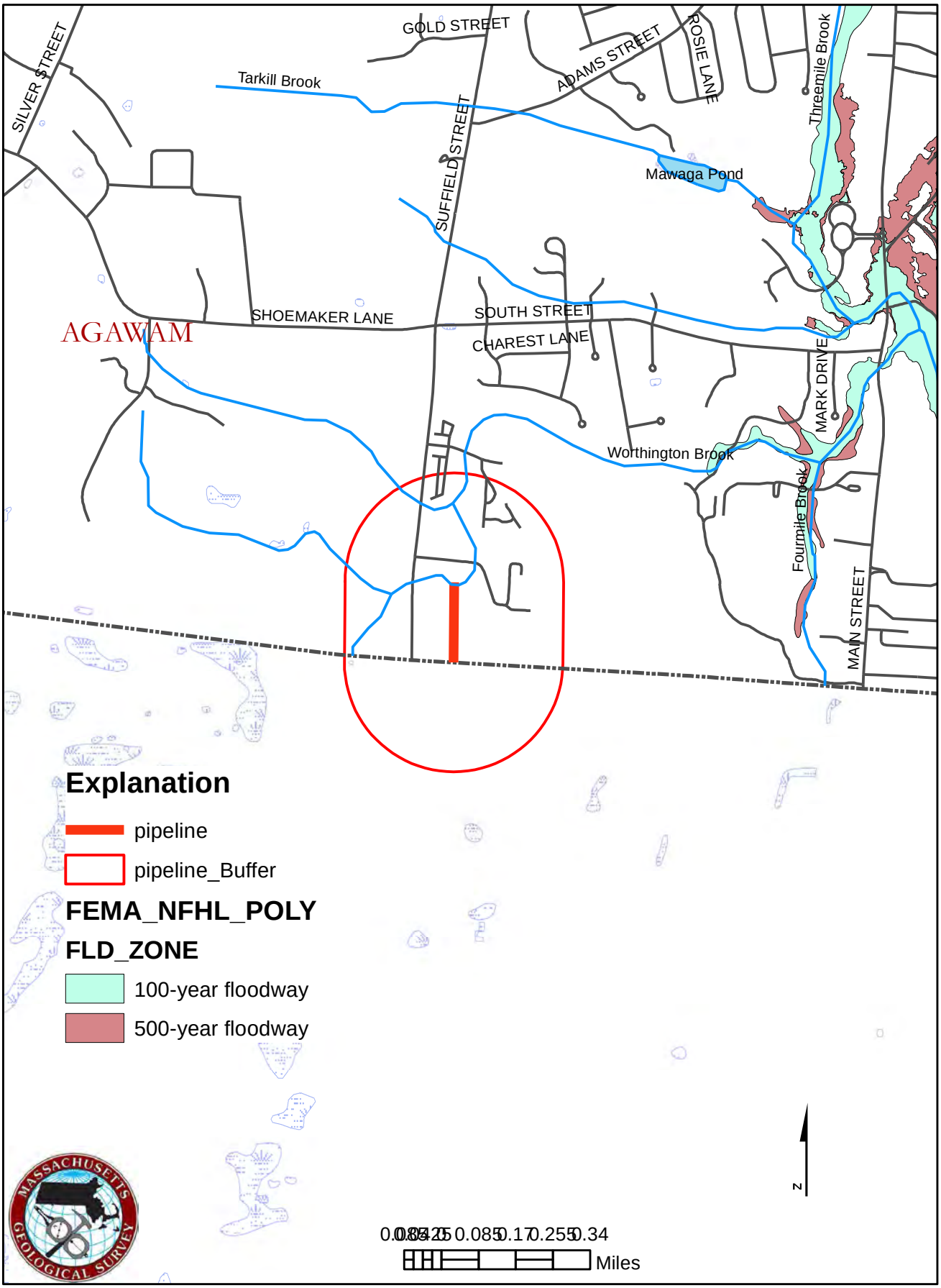
Flood Zones
Agawam section



Data from FEMA (2013; 1:12,000)
Map created by Nick Venti, 2/7/2014

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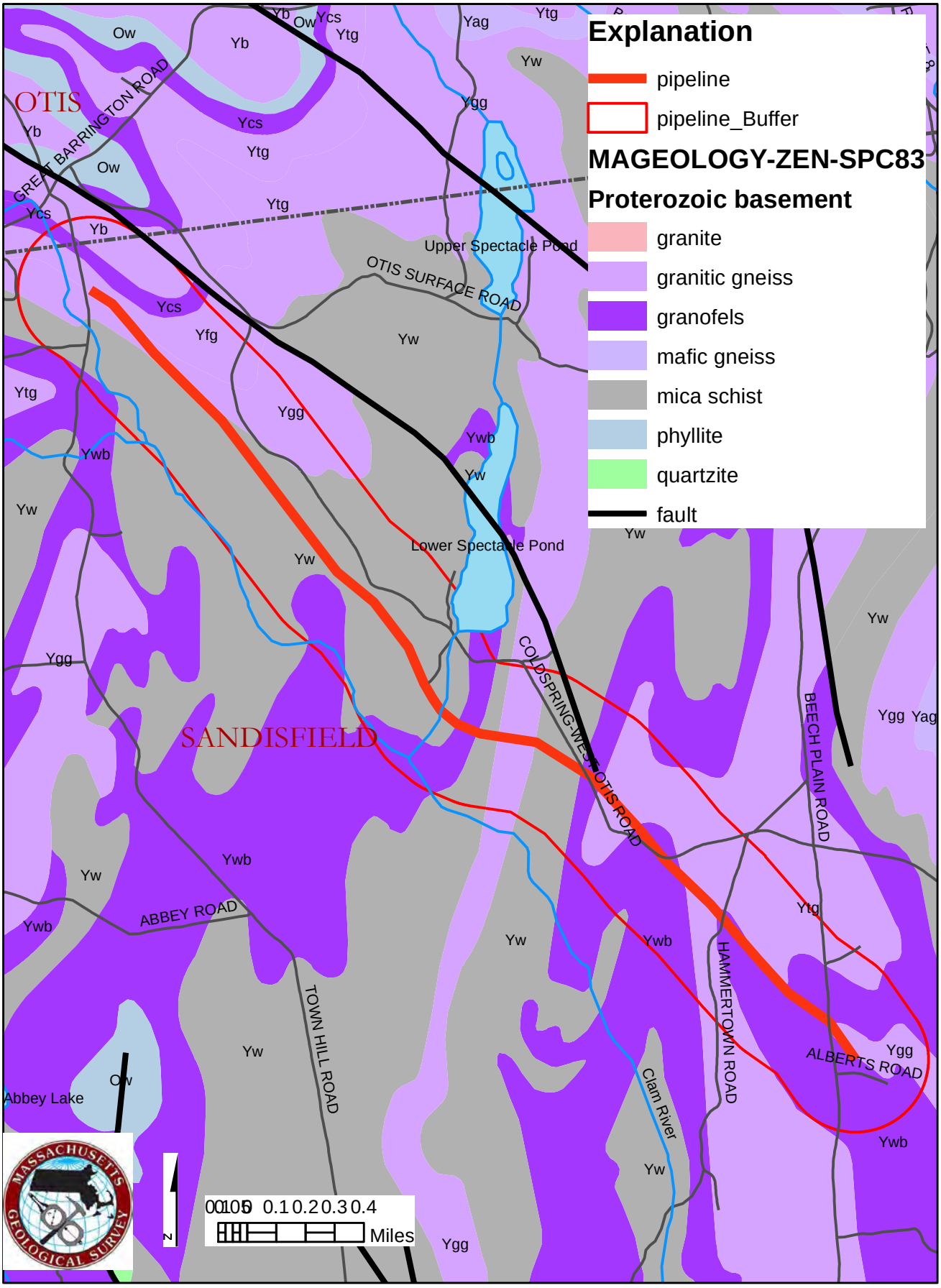
Bedrock Geology
Sandisfield section



Data from Zen et al. (1983; 1:250,000)
Map created by Nick Venti, 2/7/2014

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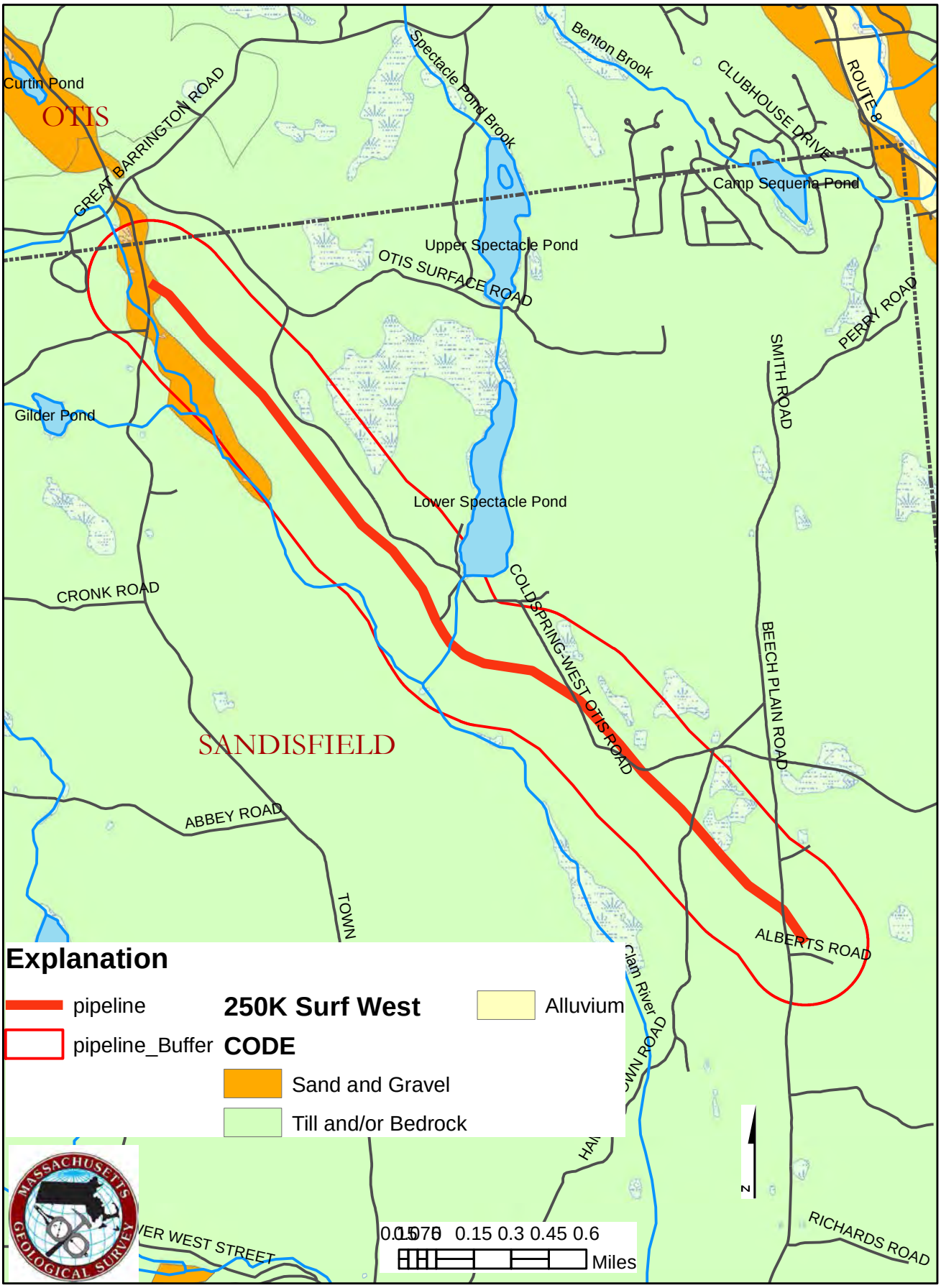
Surficial Geology
Sandisfield section



Data from Stone 1992 (USGS, 1:250,000).
Map created by Nick Venti, February 7, 2014

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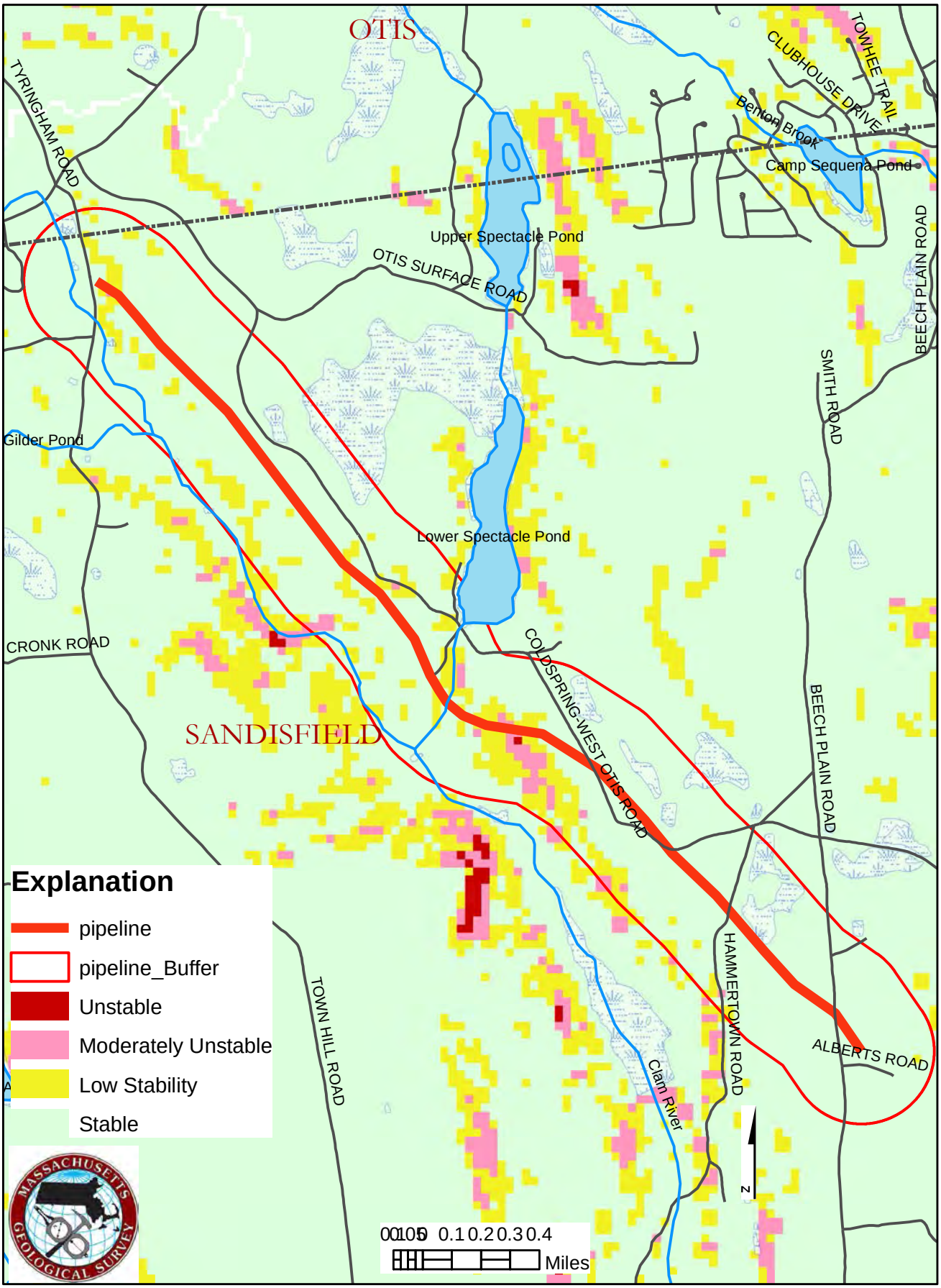
Slope Stability
Sandisfield section



Data from Mabee and Duncan (2013; 1:125,000)
Map created by Nick Venti, 2/7/2014

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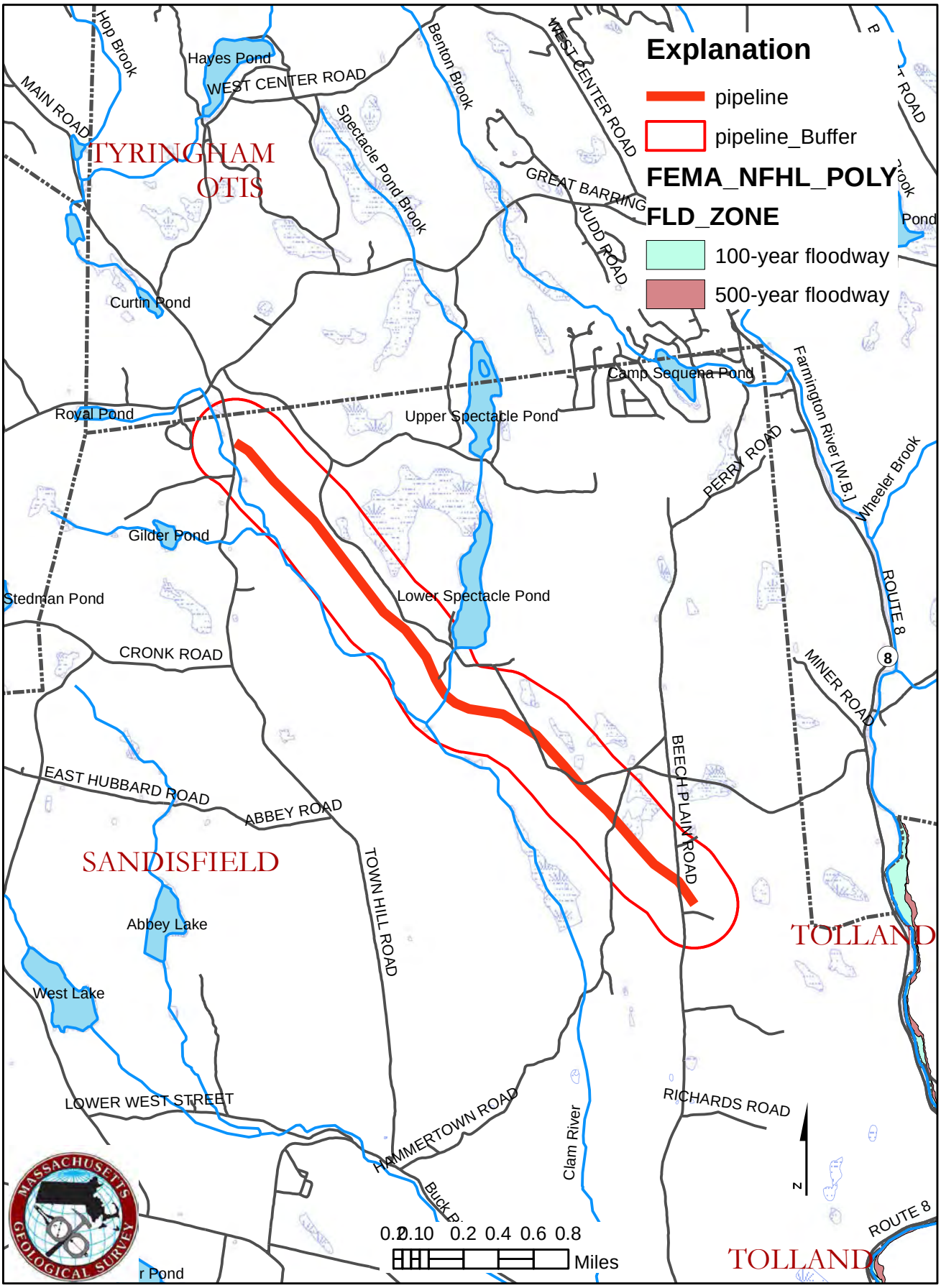
Flood Zones
Sandisfield section



Data from FEMA (2013; 1:12,000)
Map created by Nick Venti, 2/7/2014

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From:	Steve Mabee
To:	Banach, Eileen
Cc:	Nicholas Venti
Subject:	Access Road and Pipe Yard Facilities Review Request
Date:	Wednesday, April 23, 2014 3:51:28 PM
Attachments:	Sandisfield-Tyringham pipeline infrastructure hazards.pdf

---

Eileen-

Attached is the updated report for the above referenced review request. If you have any questions, please do not hesitate to contact Nick Venti at nventi@geo.umass.edu. He should be able to address concerns you may have. Thanks

Sincerely,
Steve Mabee

--
Stephen B. Mabee, Ph.D., PG
State Geologist
Department of Geosciences
University of Massachusetts
269 Morrill Science Center
611 North Pleasant Street
Amherst, Massachusetts 01003
413-545-4814
http://www.geo.umass.edu/stategeologist

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Access Road and Pipe Yard Facilities Review Request for Tennessee Gas Pipeline Company Proposed Connecticut Expansion Project

Prepared for:

AECOM on behalf of
Tennessee Gas Pipeline Company,
a wholly-owned subsidiary of Kinder Morgan

Prepared by:

Nicholas L. Venti
Stephen B. Mabee
Massachusetts Geological Survey
University of Massachusetts
611 North Pleasant Street
Amherst, MA 01003

April 23, 2014

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

SANDISFIELD-TYRINGHAM INFRASTRUCTURE

Paleontological resources: unlikely

The Proterozoic metamorphic basement and glacial till in Sandisfield have no potential paleontological resources. Although fossil-bearing sections of the Stockbridge Formation have been described in Vermont, the marble as exposed in Tyringham is generally considered to have been heated beyond temperatures that would allow fossil preservation. Sand and gravel deposits along Hop Brook have low potential for fossils.

Earthquake hazard: negligible

Historically, only one small (magnitude 3-5) earthquake has been recorded (since 1928) in the surrounding towns—in Westfield, MA, 2000, magnitude 3-3.9, 23 km from the proposed pipeline infrastructure location. The nearest recorded earthquake of magnitude >4 occurred in Moodus/East Haddam, CT in 1791, magnitude 4.4, 87 km from the proposed pipeline infrastructure location. The nearest recorded earthquake of magnitude >5 occurred north of Cape Ann, MA, 220 km from the proposed pipeline infrastructure location. (The data table for this earthquake category is unclear regarding event date and specific magnitude). The nearest recorded earthquake of magnitude >6 occurred east of Cape Ann, MA in 1755, 240 km from the proposed pipeline infrastructure location.

Faults: present

Long-inactive Paleozoic faults criss-cross this part of the state. The pipeyard and access road sites in Tyringham lie very close to one of these (within the buffer). The proposed pipeline infrastructure in Sandisfield parallels another fault, but this feature is not mapped within the 0.25-mi buffer of the proposed infrastructure.

Soil liquefaction susceptibility: low-moderate

Localized wetland areas in Sandisfield have liquefaction potential, but underlying glacial till does not. Seismic activity is unlikely.

Landsliding, slumping, subsidence susceptibility: low-moderate

In Tyringham, the Stockbridge Formation, a marble, does not form a karstic terrain characterized by caves and sinkholes. Instead, drilling reveals pockets supported by wet mud where the marble has dissolved. Sandisfield, underlain by silicate gneiss and schist, is largely stable. However the lower threshold of instability characterizes some of the proposed access road area, particularly the east bank along Spectacle Pond Brook, the drainage from Lower Spectacle Pond to Clam River.

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Flash flooding susceptiblity: negligible

Hop Brook, Clam River, and its tributary, Spectacle Pond Brook, pose negligible flash flooding risk as indicated by FEMA's flood hazard map. Expansion of wetlands in Sandisfield may pose greater risk of inundation.

Volcanism susceptiblity: none

There are no active or dormant volcanoes in this region. There has been no volcanic activity in Western Massachusetts since the Mesozoic (200 Ma).

Bedrock geology: Proterozoic basement

In Sandisfield, bedrock geology is characterized by crystalline silicate Proterozoic basement rocks: gneiss, schist, granofels, specifically the Washington Gneiss, Tyringham Gneiss, and Granitoid Gneiss. The pipeyard and access road in Tyringham are proposed to be built on the Stockbridge Formation, a Paleozoic dolomitized marble.

Surficial geology: thin till, sand and gravel

Thin (10-50 feet thick) till deposits characterize most of the surficial geology in Sandisfield. Sand and gravel overlie the till along Hop Brook in Tyringham Valley and along the floor of the Clam River valley near the northernmost access road site in Sandisfield. A defunct gravel pit southwest of Lower Spectacle Pond (mapped as till) suggests that a higher resolution (1:24,000) surficial geologic map would reveal additional details. We refer to the low resolution (1:250,000) map, as high-resolution resources are presently unavailable for this area.

Minerals: sand and gravel

Sand and gravel is found along the floor of Tyringham Valley, and in Clam River valley, parallel to the northernmost 1.5 km of the proposed pipeline. A disused gravel pit indicates a second potential site of sand and gravel southwest of Lower Spectacle Pond.

Mines: defunct

The topographic map indicates a gravel pit within the buffer of the access road on the west bank of Spectacle Pond Brook. Satellite imagery shows that this area is overgrown, i.e. defunct.

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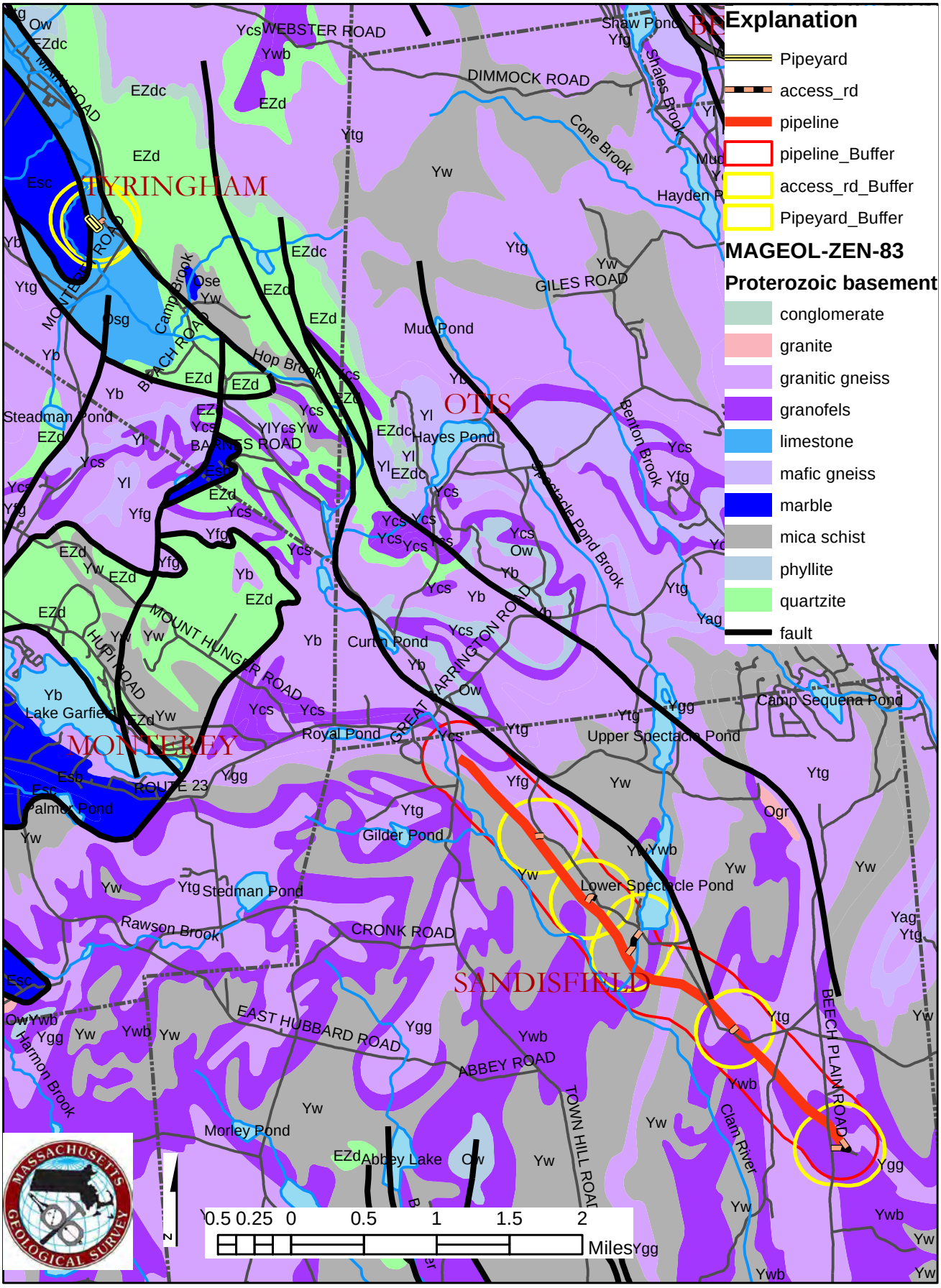
Bedrock Geology
Sandisfield-Tyringham



Data from Zen et al. (1983; 1:250,000)
Map created by Nick Venti, 4/17/2014

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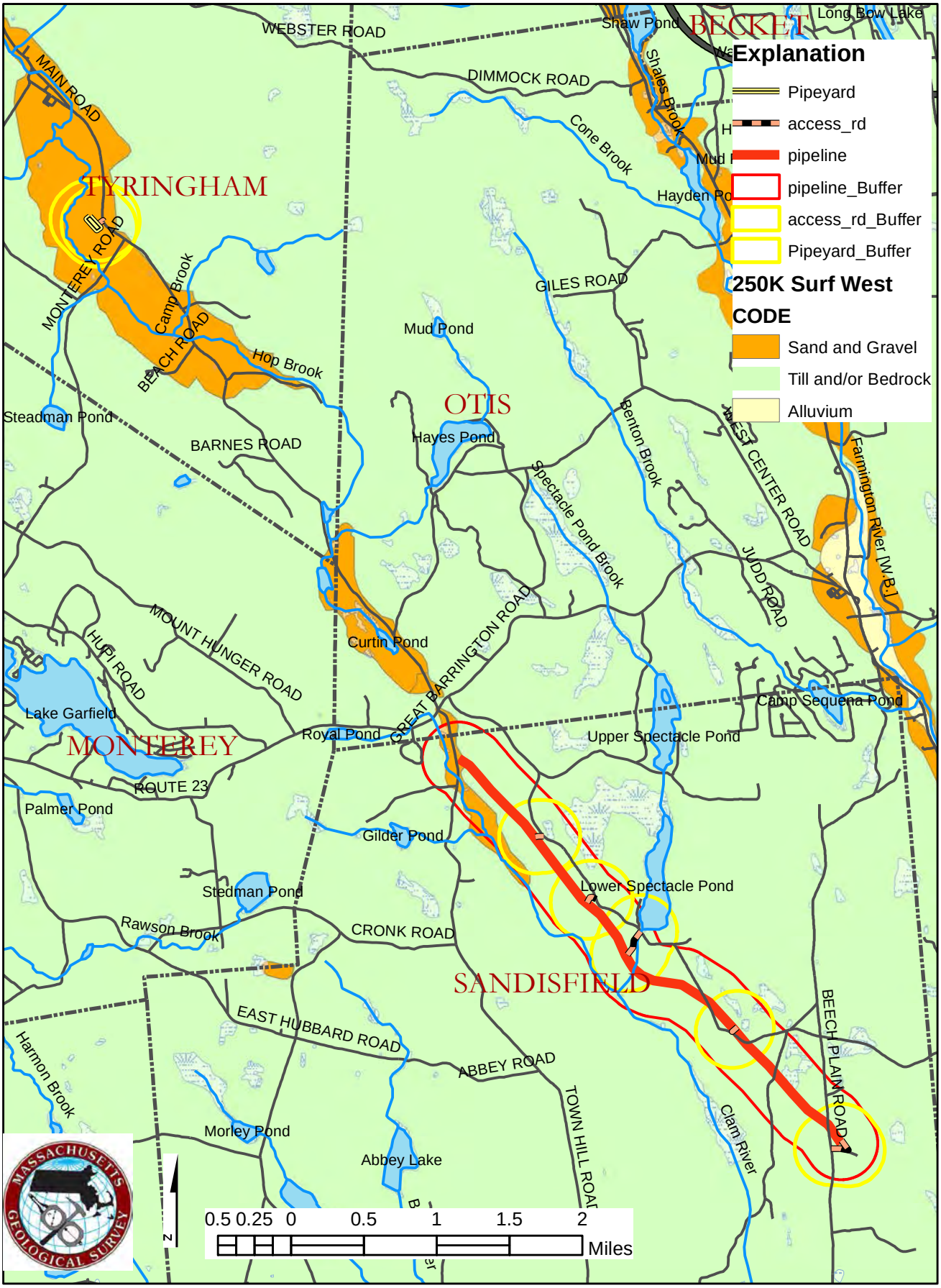
Sandisfield-Tyringham



Data from Stone (1992; USGS 1:250,000)
Map created by Nick Venti, 4/17/2014

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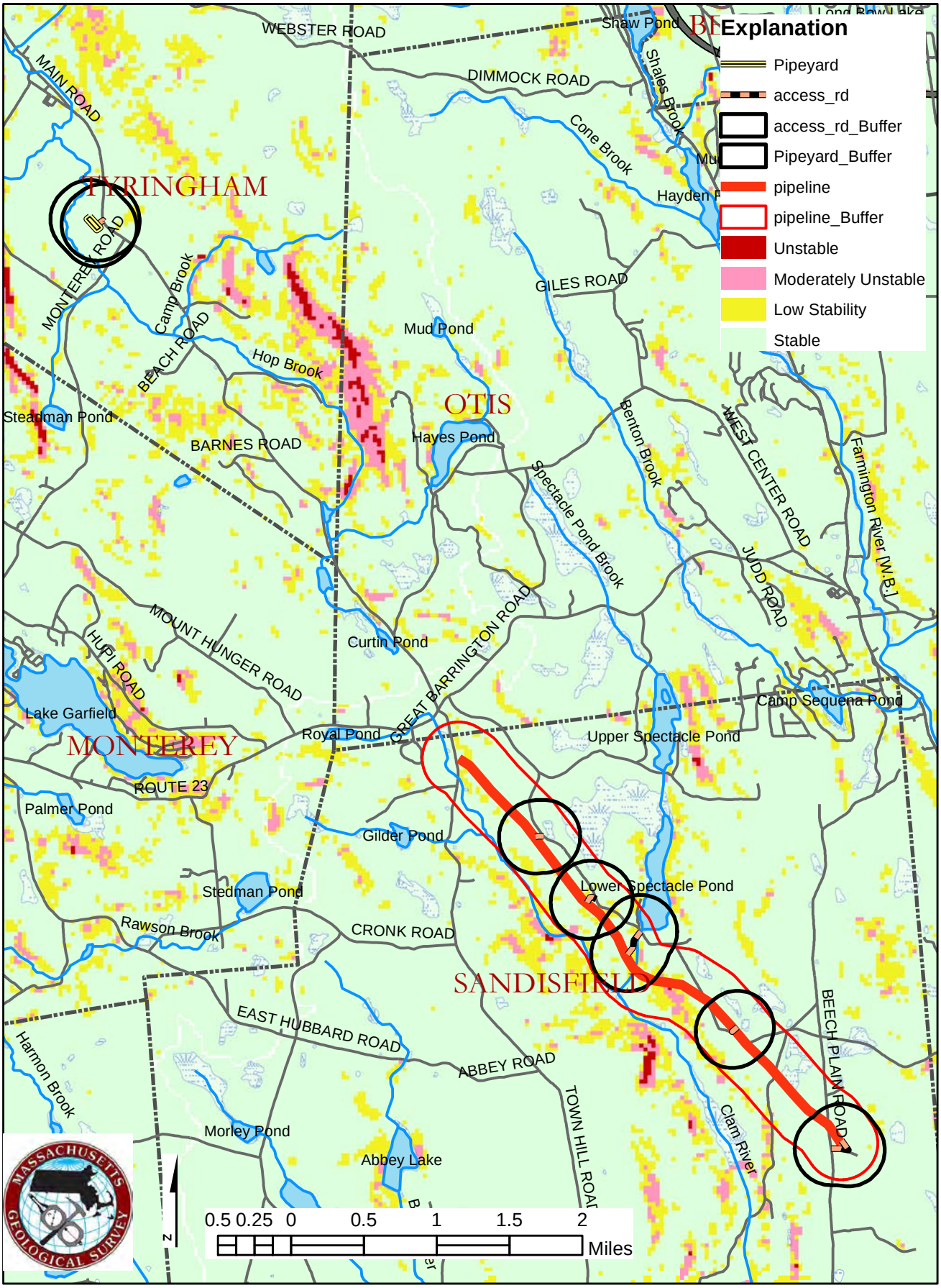
Slope Stability
Sandisfield-Tyringham



Data from Mabee and Duncan (2013; 1:125,000)
Map created by Nick Venti, 4/18/2014

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Commonwealth of Massachusetts

Division of Fisheries & Wildlife

MassWildlife

Wayne F. MacCallum, *Director*

October 09, 2013

Julia Stearns
AECOM Environment
250 Apollo Drive
Westford MA 01824

RE: Project Location: 258-1 Loop; off Cold Spring Road
Town: SANDISFIELD
NHESP Tracking No.: 13-32620

To Whom It May Concern:

Thank you for contacting the Natural Heritage and Endangered Species Program of the MA Division of Fisheries & Wildlife (the "Division") for information regarding state-listed rare species in the vicinity of the above referenced site.

Based on the information provided, the Natural Heritage has determined that at this time the site is not mapped as Priority or Estimated Habitat. The NHESP database does not contain any state-listed species records in the immediate vicinity of this site.

This evaluation is based on the most recent information available in the Natural Heritage database, which is constantly being expanded and updated through ongoing research and inventory. If you have any questions regarding this letter please contact Lauren Glorioso, Endangered Species Review Assistant, at (508) 389-6361.

Sincerely,

Thomas W. French

Thomas W. French, Ph.D.
Assistant Director

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Commonwealth of Massachusetts

Division of Fisheries & Wildlife

MassWildlife

Wayne F. MacCallum, *Director*

November 14, 2013

Julia Stearns
AECOM Environment
250 Apollo Drive
Westford MA 01824

RE: Project Location: off Suffield St, AGAWAM
Town: AGAWAM
NHESP Tracking No.: 13-32712

To Whom It May Concern:

Thank you for contacting the Natural Heritage and Endangered Species Program of the MA Division of Fisheries & Wildlife (the "Division") for information regarding state-listed rare species in the vicinity of the above referenced site.

Based on the information provided, the Natural Heritage has determined that at this time the site is not mapped as Priority or Estimated Habitat. The NHESP database does not contain any state-listed species records in the immediate vicinity of this site.

This evaluation is based on the most recent information available in the Natural Heritage database, which is constantly being expanded and updated through ongoing research and inventory. If you have any questions regarding this letter please contact Lauren Glorioso, Endangered Species Review Assistant, at (508) 389-6361.

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Assistant Director

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United States Department of Agriculture

NRCS

Natural Resources Conservation Service
195 Russell Street, Suite B6
Hadley, MA 01035

413-585-1000 x3
fax 413-586-8648
www.ma.nrcs.usda.gov

February 20, 2014

Eileen Banach
Environmental Scientist
AECOM
10 Orms Street, Suite 405
Providence, RI 02904

Re: Resource Maps

Dear Ms. Banach:

Enclosed are maps of the Sandisfield, MA area of the proposed Connecticut Expansion Project, showing a 0.25 mile buffer on either side of the proposed pipeline project. Massachusetts NRCS does not have resource information for New York or Connecticut. Included are:

1) Soils map and soils descriptions

2) Conservation Restrictions and agricultural fields.

3) Priority Habitat for Wildlife

4) Core Habitat for Wildlife

5) Water Resources

In addition, a USDA NRCS Specification Guide for Critical Area Planting is provided for guidance on recommended seed mixes for restoration activities.

These maps are for planning purposes only. Any required permits must be acquired from the appropriate agencies.

If you have any questions, please contact Vincent Snyder, District Conservationist, at the Hadley Field Office at (413) 585-1000 ext. 3.

Sincerely,

Charlotte Bedet
Nutrient Management Specialist

Encl: 5 maps + Critical Area Planting Specification Guide

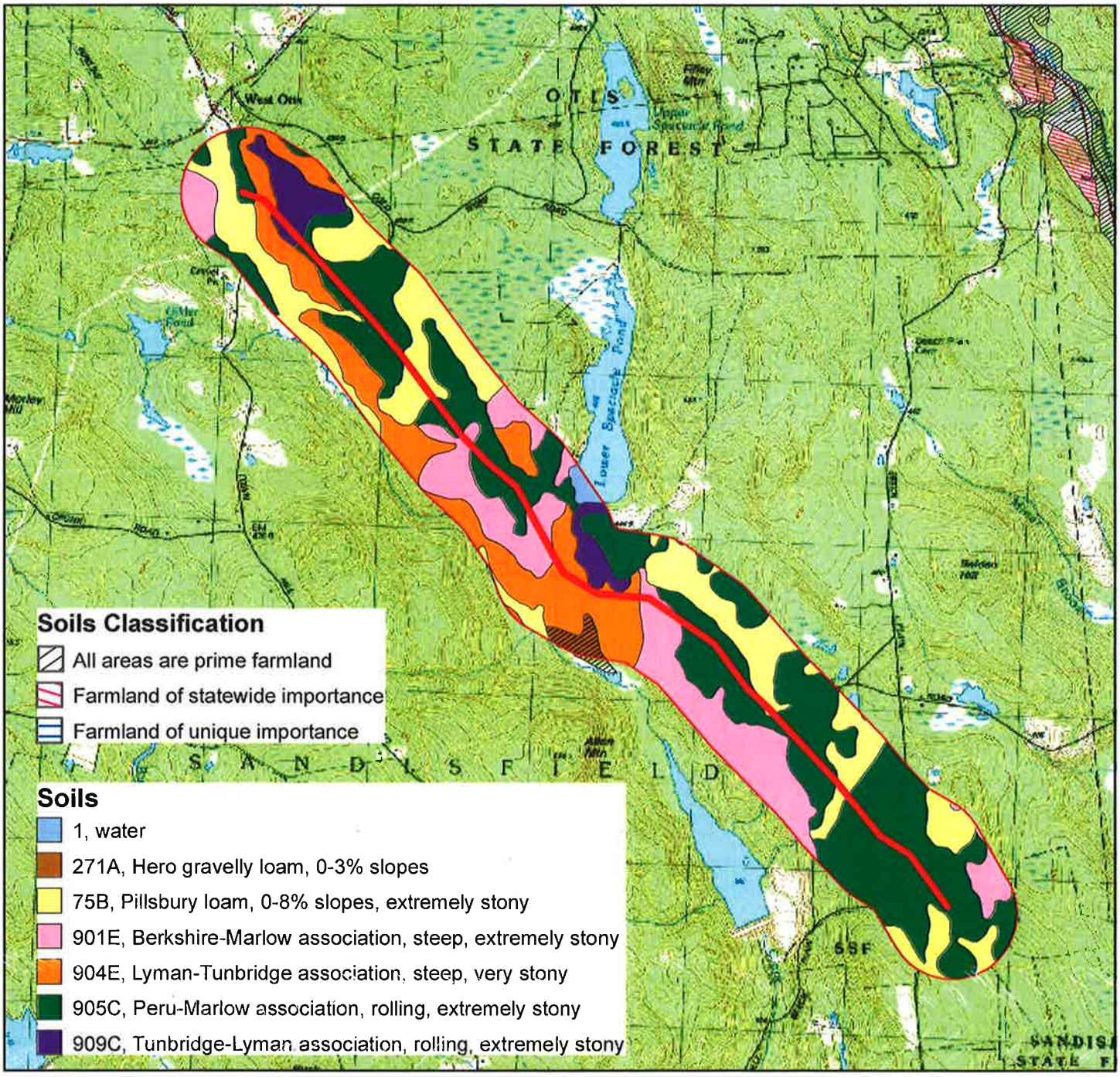
Cc: Vincent Snyder, District Conservationist, Hadley, MA

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Topographic Overview of TGP CT Project

TGP CT Expansion Project
Sandisfield, Berkshire Co.
Proposed pipeline loop: 3.8 miles

Map prepared by Charlotte Bedet
MA Association of Conservation Districts
2/18/2014



Legend

— Proposed Pipeline Loop
⬭ Buffer of 0.25 miles

USGS Topographic Map

0 3,000 6,000 9,000 12,000 Feet

1 inch = 3,000 feet

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Map Unit Description

Berkshire County, Massachusetts

[Minor map unit components are excluded from this report]

Map unit: 1 - Cwater

Component: Cwater (100%)

Generated brief soil descriptions are created for major soil components. The Cwater is a miscellaneous area.

Map unit: 75B - Pillsbury loam, 0 to 8 percent slopes, extremely stony

Component: Pillsbury (60%)

The Pillsbury component makes up 60 percent of the map unit. Slopes are 1 to 8 percent. This component is on depressions. The parent material consists of friable coarse-loamy eolian deposits over dense coarse-loamy lodgment till derived from granite and gneiss. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is poorly drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 9 inches during January, February, March, April, May, November, December. Organic matter content in the surface horizon is about 6 percent. Nonirrigated land capability classification is 7s. This soil meets hydric criteria.

Map unit: 271A - Hero variant gravelly loam, 0 to 3 percent slopes

Component: Hero variant (90%)

The Hero variant component makes up 90 percent of the map unit. Slopes are 0 to 3 percent. This component is on terraces on outwash plains. The parent material consists of loose sandy and gravelly glaciofluvial deposits derived from limestone and/or loose loamy glaciofluvial deposits derived from limestone over soft sandy and silty glaciolacustrine deposits. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is high. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 27 inches during January, February, March, April, November, December. Organic matter content in the surface horizon is about 4 percent. Nonirrigated land capability classification is 2w. This soil does not meet hydric criteria.

Map unit: 901E - Berkshire-Marlow association, 15 to 45 percent slopes, steep, extremely stony

Component: Berkshire (55%)

The Berkshire component makes up 55 percent of the map unit. Slopes are 15 to 45 percent. This component is on hillslopes on uplands. The parent material consists of friable coarse-loamy eolian deposits over friable coarse-loamy basal till derived from granite and gneiss. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.

Component: Marlow (30%)

The Marlow component makes up 30 percent of the map unit. Slopes are 15 to 45 percent. This component is on hills. The parent material consists of friable coarse-loamy eolian deposits over dense coarse-loamy lodgment till derived from granite and gneiss. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 33 inches during March, April. Organic matter content in the surface horizon is about 4 percent. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.

Map unit: 904E - Lyman-Tunbridge association, steep, very stony

Component: Lyman (45%)

The Lyman component makes up 45 percent of the map unit. Slopes are 15 to 45 percent. The parent material consists of shallow, friable loamy basal till derived from mica schist over mica schist. Depth to a root restrictive layer, bedrock (lithic), is 10 to 20 inches. The natural drainage class is somewhat excessively drained. Water movement in the most restrictive layer is high. Available water to a depth

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Map Unit Description

Berkshire County, Massachusetts

Map unit: 904E - Lyman-Tunbridge association, steep, very stony

Component: Lyman (45%)

of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.

Component: Tunbridge (40%)

The Tunbridge component makes up 40 percent of the map unit. Slopes are 15 to 45 percent. The parent material consists of moderately deep, friable coarse-loamy basal till derived from mica schist over mica schist. Depth to a root restrictive layer, bedrock (lithic), is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 5 percent. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.

Map unit: 905C - Peru-Marlow association, rolling, extremely stony

Component: Peru (60%)

The Peru component makes up 60 percent of the map unit. Slopes are 3 to 15 percent. This component is on uplands. The parent material consists of friable coarse-loamy eolian deposits over dense coarse-loamy lodgment till derived from granite and gneiss. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 24 inches during January, February, March, April, May, November, December. Organic matter content in the surface horizon is about 4 percent. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.

Component: Marlow (20%)

The Marlow component makes up 20 percent of the map unit. Slopes are 3 to 15 percent. This component is on uplands. The parent material consists of friable coarse-loamy eolian deposits over denses coarse-loamy lodgment till derived from granite and gneiss. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 33 inches during March, April. Organic matter content in the surface horizon is about 4 percent. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.

Map unit: 909C - Tunbridge-Lyman association, rolling, extremely stony

Component: Tunbridge (50%)

The Tunbridge component makes up 50 percent of the map unit. Slopes are 3 to 15 percent. This component is on hills on uplands, mountains on uplands. The parent material consists of moderately deep, friable coarse-loamy basal till derived from mica schist over mica schist. Depth to a root restrictive layer, bedrock (lithic), is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 5 percent. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.

Component: Lyman (35%)

The Lyman component makes up 35 percent of the map unit. Slopes are 3 to 15 percent. This component is on hills on uplands, mountains on uplands. The parent material consists of shallow, friable loamy basal till derived from mica schist over mica schist. Depth to a root restrictive layer, bedrock (lithic), is 10 to 20 inches. The natural drainage class is somewhat excessively drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.

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Map Unit Description

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions in this report, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

The Map Unit Description (Brief, Generated) report displays a generated description of the major soils that occur in a map unit. Descriptions of non-soil (miscellaneous areas) and minor map unit components are not included. This description is generated from the underlying soil attribute data.

Additional information about the map units described in this report is available in other Soil Data Mart reports, which give properties of the soils and the limitations, capabilities, and potentials for many uses. Also, the narratives that accompany the Soil Data Mart reports define some of the properties included in the map unit descriptions.

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Soils Inventory Report

CHARLOTTE BEDET

Map Unit Symbol	Acres	Percent
1	6.3	0%
271A	11.2	1%
75B	314.2	23%
901E	230.6	17%
904E	207.8	15%
905C	560.7	40%
909C	55.9	4%
Total:	1386.7	100%

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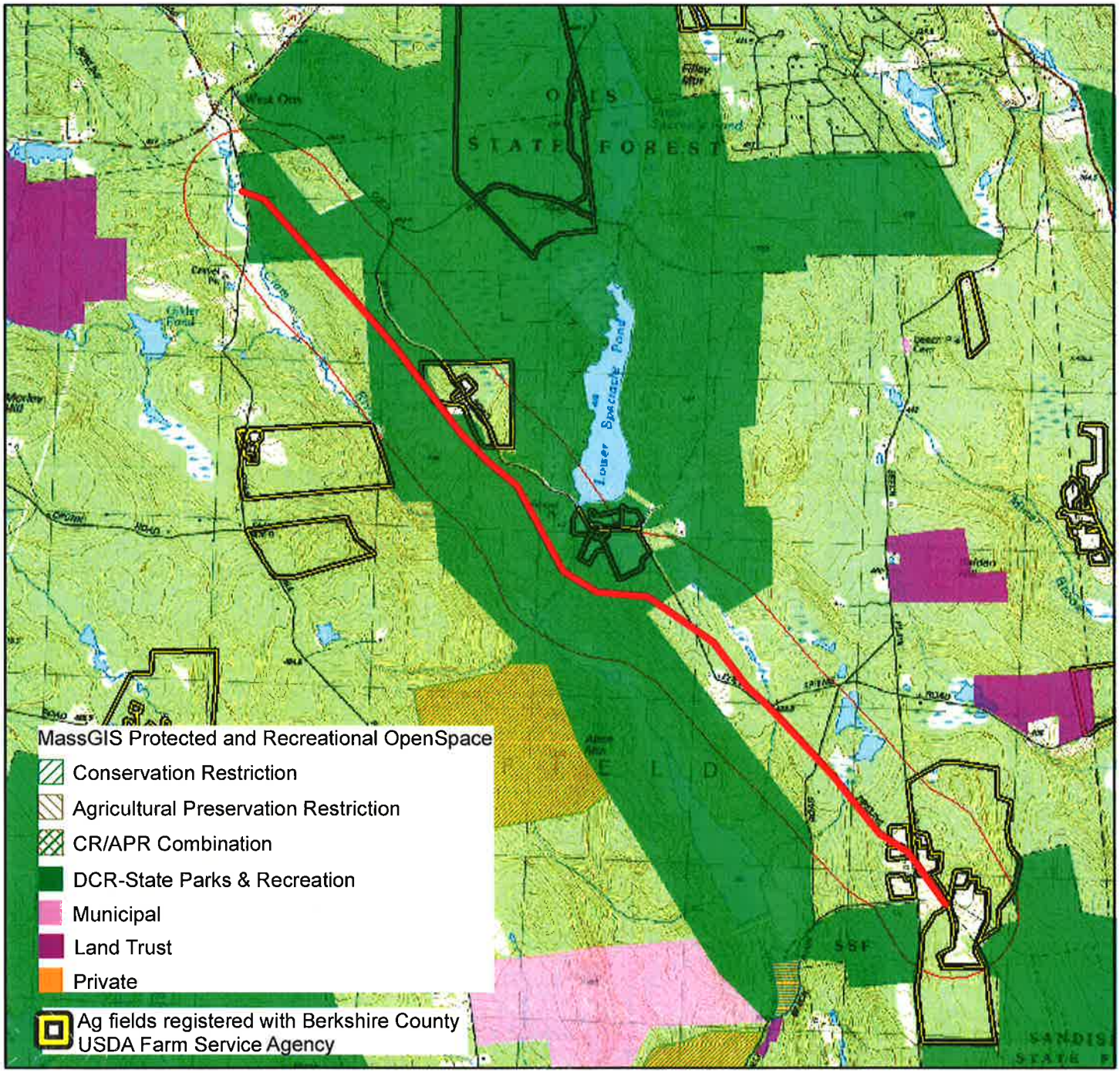
Topographic Overview of TGP CT Project

TGP CT Expansion Project
Sandisfield, Berkshire Co.
Proposed pipeline loop: 3.8 miles

Map prepared by Charlotte Bedet
MA Association of Conservation Districts
2/18/2014



Legend

— Proposed Pipeline Loop

⬭ Buffer of 0.25 miles

USGS Topographic Map

0 3,000 6,000 9,000 12,000 Feet

1 inch = 3,000 feet

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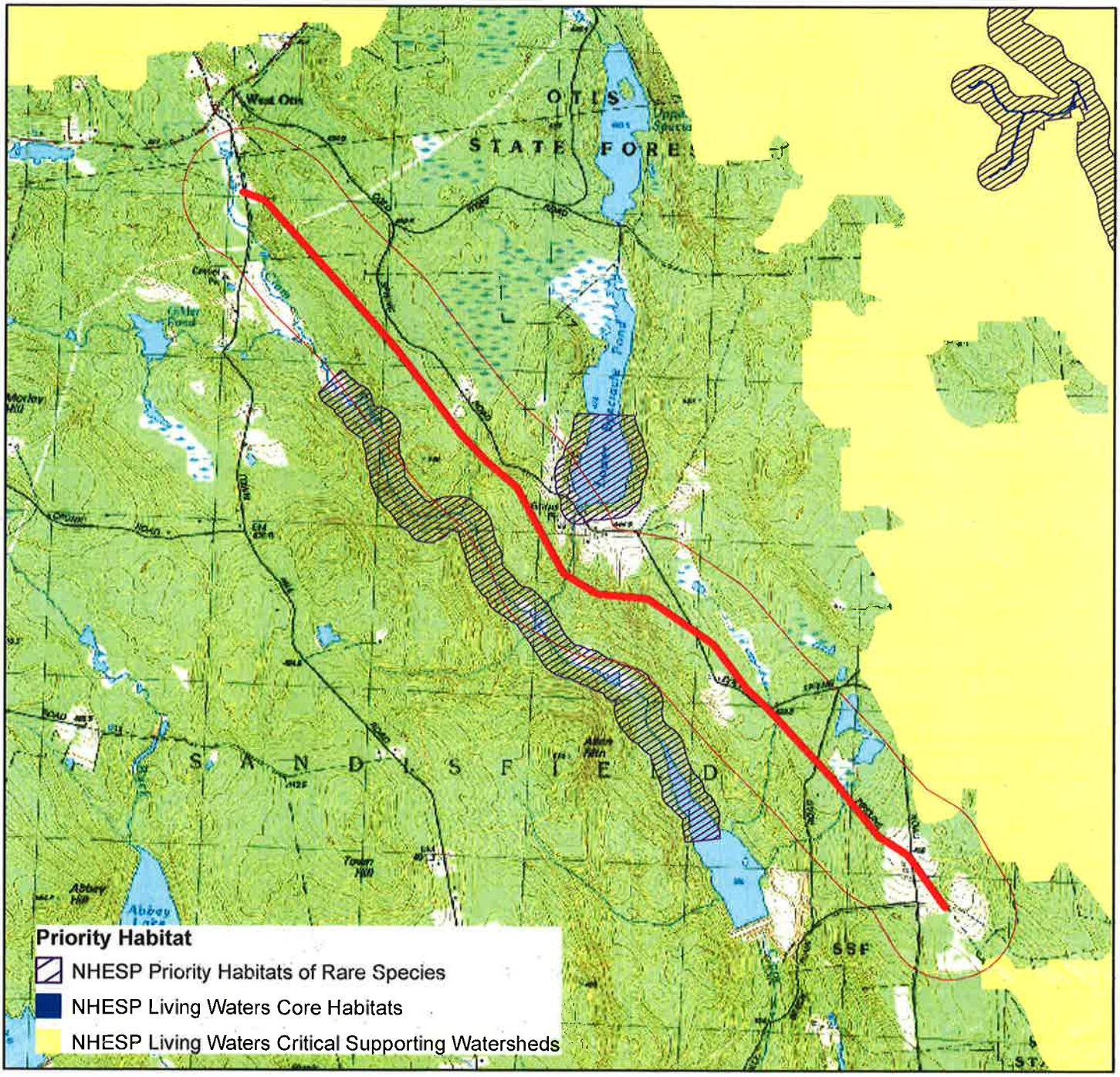

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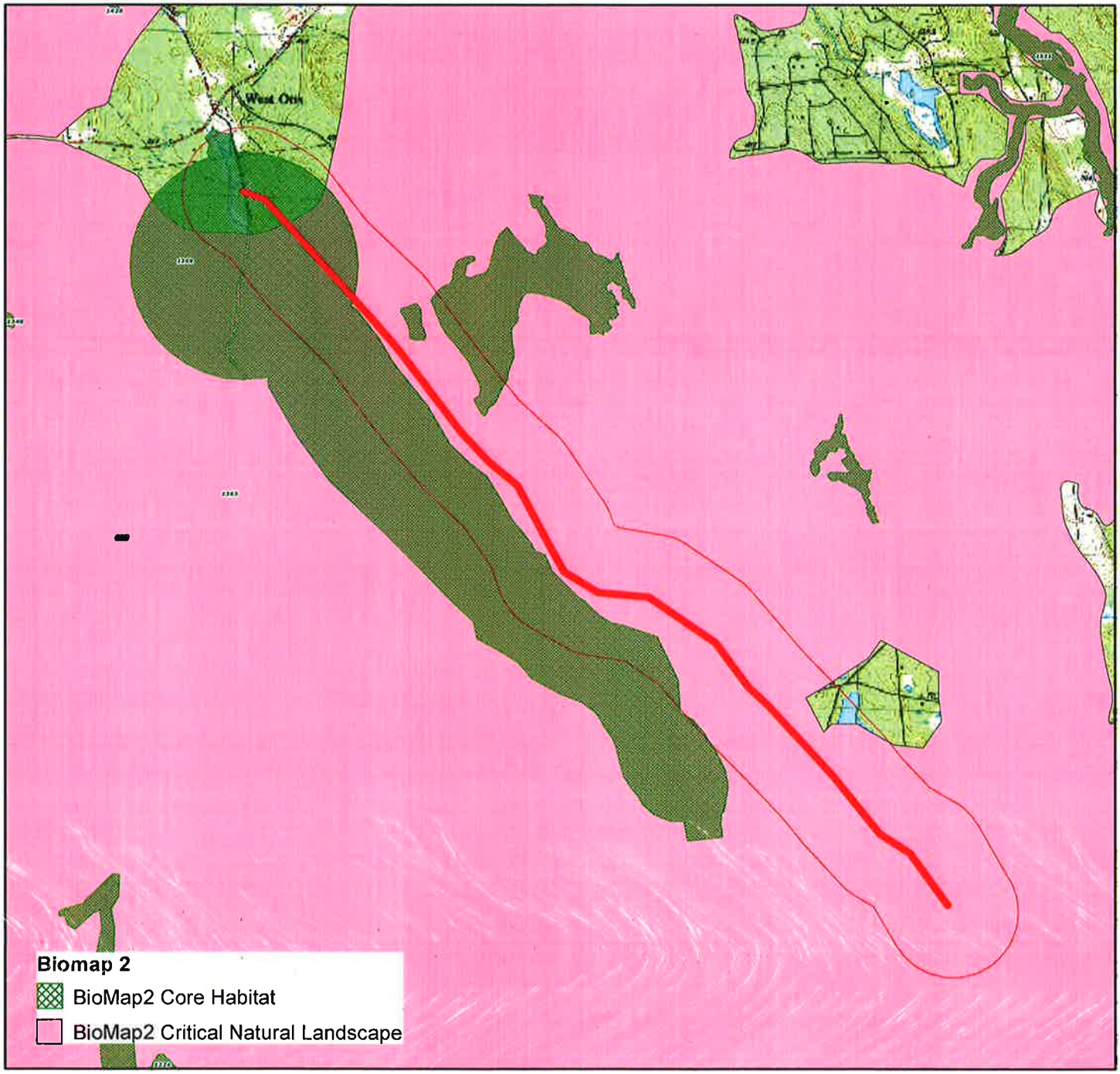

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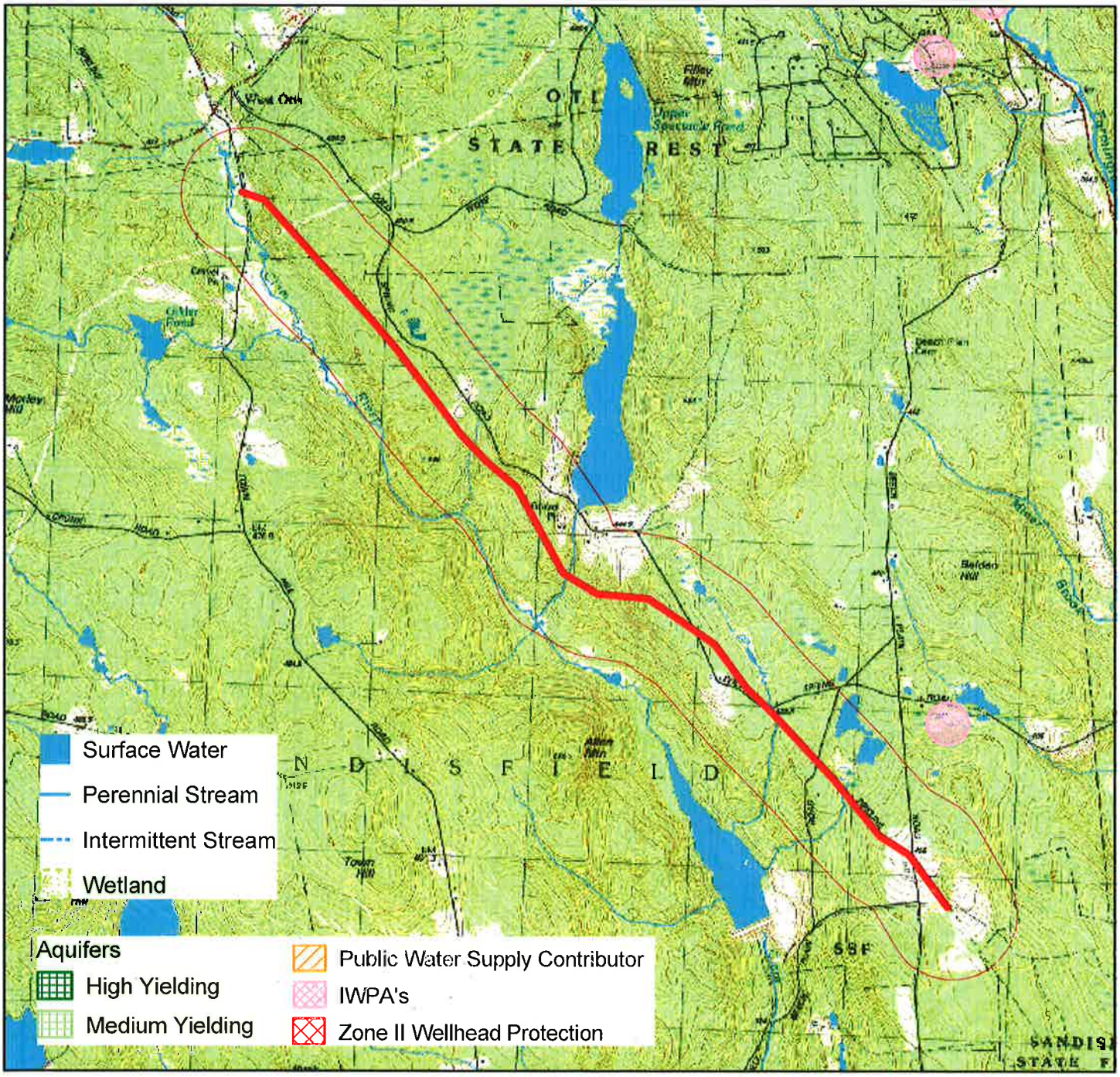

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Proposed Pipeline Loop

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NATURAL RESOURCES CONSERVATION SERVICE
SPECIFICATION GUIDE

CRITICAL AREA PLANTING
(CODE 342)

GENERAL SPECIFICATIONS

Plans and specifications for establishment and maintenance of a critical area planting shall be prepared for each site or management unit according to the USDA, NRCS-MA Conservation Practice Standard, Critical Area Planting (342), Criteria, Considerations, and Operation and Maintenance. They shall be recorded on specification sheets and narrative statements in conservation plans, or other acceptable documentation.

When this practice is used to specify the vegetative component of another practice (e.g., grassed waterway, filter strip, pond, etc.), plans and specifications shall meet the requirements of both standards to achieve the intended purpose of the practice. The completed work shall be checked and documented to verify that the practice was completed according to the drawings and specifications of both standards. Documentation shall be in accordance with the section "Supporting Data and Documentation" in both standards.

GRADING PLAN

The grading plan and practice installation shall be based upon adequate topographic surveys and investigations. The plan shall show the location, slope, cut, fill, and finish elevation of the surfaces to be graded. The plan shall also include auxiliary practices for safe disposal of runoff water, slope stabilization, erosion control, and drainage. Practices such as waterways, ditches, diversions, grade stabilization structures, retaining walls and subsurface drains shall be included where necessary.

SITE PREPARATION

Timber, logs, brush, rocks, stumps and vegetative matter that will interfere with the grading operation or affect the planned stability of fill areas shall be removed and disposed of according to the plan. Topsoil shall be stripped and stockpiled in amounts necessary to complete finish grading of all exposed



areas requiring topsoil. A minimum 4-inch stripping depth shall be used, depending on the particular soil.

Fill material shall be free of brush, rubbish, timber, logs, stumps, and other vegetative matter in amounts that is detrimental to constructing stable fills.

All disturbed areas shall be left with a generally smooth finish and shall be protected from erosion.

Provisions shall be made to safely conduct surface water to storm drains or suitable watercourses and to prevent surface runoff from damaging cut faces and fill slopes.

In areas having a high water table, subsurface drainage shall be provided to intercept seepage that would adversely affect slope stability, building foundations, or create undesirable wetness. Caution should be given to landowners on wetland alteration, referencing Massachusetts Wetland Protection Act Regulations (310 CMR 10.00), Section 404 of the Clean Water Act (33 U.S.C. 1344), and the Wetland Conservation Provisions (Swampbuster) of the U.S. Farm Bill.

Adjoining properties shall be protected from sedimentation associated with excavation and filling operations.

Fill shall not be placed adjacent to the bank of a stream or channel, unless provisions are made to protect the hydraulic, biological, aesthetic and other environmental functions of the stream.

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SOIL AMENDMENTS

Soil tests shall be used to determine the optimum recommendations for both lime and fertilizer. At a minimum, soil samples taken for nutrient and pH analysis shall be from the soil layer that will be used as the surface layer (top 4 to 6 inches) for seeding.

Soil analysis shall be performed by a soil testing laboratory that has been accredited by the North American Proficiency Testing Program, preferably Land Grant University soil testing laboratories from Massachusetts, Connecticut, New York or Vermont.

Lime

Lime shall be applied to achieve a soil pH of between 5.5 and 7.0 depending on the specific requirements of the planting.

Lime materials shall be ground limestone (hydrated or burnt lime may be substituted) that contains at least 50% total oxides (calcium plus magnesium oxide). Pulverized limestone shall be ground to such a fineness that at least 50% will pass through a 100-mesh sieve and at least 98% will pass through a 20-mesh sieve. Pulverized limestone applied at rates greater than 50 pounds per 1,000 square feet (or greater than 1 ton per acre) shall be incorporated into the upper 4 to 6 inches of the soil. Pulverized limestone may also be included in a hydroseeding slurry.

When a soil test is not feasible, lime shall be applied according to the rates specified as follows:

Soil Texture	Limestone Application Rate	
	Tons/Acre	Lbs./1,000 SF
Clay, clay loam, and highly organic soil	3	135
Sandy loam, loam, silt loam	2	90
Loamy sand, sand	1	45

Fertilizer

Fertilizer shall be applied to prepared seedbeds as needed, based on soil test results. Fertilizer applied without a soil test may result in an inefficient quantity of nutrients for plant establishment or could result in over application of nutrients leading to potential water quality problems. If the site conditions involve B-horizon soil and no topsoil, use one of the following recommendations, in lieu of a soil test:

- Cool Season Seed Mix: Apply 10-20-20 analysis fertilizer at a rate of 500 lbs./acre, with 40% of the nitrogen to be in an organic or slow release form. Incorporate into the top 2-3 inches of soil. If legumes are more than 20% of the mix, reduce nitrogen to 30 lbs./acre.
- Warm Season Seed Mix: Apply a 0-10-10 analysis fertilizer at a rate of 600 lbs./acre. Incorporate into the top 2-3 inches of soil. For sterile, droughty sites add a slow release nitrogen after emergence of grass in late spring at the rate of 30 lbs./acre. If the mix includes more than 20% legumes, use 20 lbs./acre of nitrogen. On finer textured soils with high weed pressure, delay application of nitrogen until the second year.

All fertilizer shall be uniform in composition, free-flowing, and suitable for application by approved equipment. Fertilizers shall be delivered to the site fully labeled according to applicable state fertilizer laws, and shall bear the name, trade name, or trademark and warranty of the producer. Slow-release forms of nitrogen shall be used when feasible to provide nitrogen over a longer period of time.

Organic Amendments

Apply manure and compost at a rate based on a nutrient analysis of that material and the soil test results. Organic amendments to sites shall be recommended only after an evaluation of any potential water quality hazards. Organic amendments shall be incorporated to the extent practical into the upper 4 to 6 inches of the soil with a disk, springtooth harrow, or other suitable equipment.

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Topsoil

Topsoil shall be added to a site when needed to improve the soil medium for plant establishment and growth. The use of topsoil shall be limited to slopes that are 2:1 or flatter.

Exposed soils shall be topsoiled if they have one or more of the following limiting factors:

1. Very shallow to bedrock or other restrictive layer (e.g., the subsoil is less than 6 inches deep);
2. Extremely acidic (pH less than 5.0); or,
3. Extremely salty (conductivity greater than 500 parts per million, or 4.0 millisiemens per centimeter).

Topsoil shall also be used when assurance of improved vegetative growth is desired.

Topsoil Quality

Topsoil shall be friable and loamy, free of debris, stones, or other materials larger than 1.5 inches in diameter. It shall be free of any known viable seeds or plant parts of objectionable weeds such as Johnsongrass, Shattercane, Thistle, Multiflora rose, or others as specified.

Topsoil shall contain no toxic substance that may be harmful to plant growth. Soluble salts shall not be excessive (concentration greater than 500 parts per million). A pH range of 5.5 to 7.5 is required. If pH is less than 5.5, lime shall be applied and incorporated with the topsoil to adjust the pH to between 5.5 and 7.0. A pH of 6.5 is ideal. Topsoil hauled in from off-site shall have a minimum organic matter content of 1% by weight, based on soil test results.

Topsoil Application

Before topsoiling, the exposed subsoil shall be tested for pH. Where the subsoil is highly acidic (< 4.0), ground limestone shall be added at the rate of 4 to 8 tons per acre (200 to 400 pounds per 1,000 square feet). Lime shall be distributed uniformly and worked into the subsoil as previously described in the section concerning Soil Amendments.

Immediately before spreading topsoil, the subsoil shall be loosened by disking or scarifying to provide a good bond for the topsoil. Where the slope of the site is flatter than 3:1, loosen the subsoil to a minimum average depth of 2 inches. On steeper slopes (up to 2:1), loosen the subsoil to a depth of 0.5 to 1 inch, or use a bulldozer to track up and down slope to create horizontal check slots that will prevent topsoil from sliding down the slope.

Topsoil shall only be handled when it is dry enough to work (less than field capacity) without damaging soil structure. Topsoil shall not be spread when it is partly frozen or muddy, or on frozen slopes covered with ice or snow.

Topsoil shall be uniformly applied in a 5 to 8 inch layer, and lightly compacted to a minimum thickness of 4 inches. Subsoil with a pH of 4.0 or less, or containing iron sulfide, shall be covered with a minimum depth of 12 inches of topsoil.

Topsoil placed on slopes greater than 5% shall be promptly limed and fertilized (if needed), seeded, mulched, and tracked with suitable equipment.

SEEDBED PREPARATION

Seedbed preparation shall be done when the soil is moist, but not wet. Lime, fertilizer, and other soil amendments shall be evenly applied where needed on the site, as described above. Either dry or wet application methods may be suitable.

Slopes flatter than 3:1

Seedbed preparation shall consist of working the soil to a depth of 3 to 5 inches with a disk or similar equipment. Continue tillage until a reasonably uniform seedbed is prepared.

Slopes 3:1 or steeper

Scarify the soil surface with a bulldozer, heavy chain, hand tools or other equipment that will loosen the soil 0.5 to 1 inch deep. After the soil is loosened, it shall not be worked completely smooth, but left in a somewhat roughened condition. The final surface preparation shall be on the general contour.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

SEEDING

Seed Quality and Treatment

All seed shall be labeled and meet the requirements of the Massachusetts Seed Law. Refer to Table 1 for minimum germination and purity requirements. Seed shall have had a germination test within 12 months prior to the date of sowing. Use of certified seed is preferred. Seed shall be kept cool and dry until planted.

Species with seed lots greater than 50% hard seed shall be dehulled and/or scarified and planted no later than 60 days after scarification.

Grasses that have fluffy seeds shall be planted using specialized seed drills. Alternatively, beards or awns shall be mechanically removed from such seeds to facilitate movement through conventional seeding equipment.

Legume seeds shall be inoculated with the proper, viable Rhizobium bacteria before planting. Inoculant shall be kept as cool as possible until used and shall not be used later than the date indicated on the package. When hydroseeding, use four times the recommended inoculant rate.

Seeding Methods

Apply seed uniformly by hand, cyclone seeder, drill, cultipacker-seeder, or hydroseeder. The preferred method of seeding is by drilling or cultipacker-seeder method, because these methods optimize seed to soil contact. Seeding operations shall be done on the contour, to the extent feasible.

Drill

A grass drill (not a grain drill) or cultipacker-type seeder shall be used to plant grass seed. Grasses shall not be planted more than 1/4 to 1/2-inch deep. If the drill does not have a packer attachment, a packer/roller shall be trailed behind the drill. Where practical, seed shall be applied in two directions perpendicular to each other. Apply one-half the seeding rate in each direction.

Broadcast

Seed may be broadcast by using a cyclone or whirlwind seeder, or by hand. If spread by hand, small or light-seeded species such as redtop or bluestem may be mixed with filler (e.g., sawdust, rice) to achieve an even distribution. Seed shall be applied in two directions, each perpendicular to one another. One–half the seeding rate shall be applied in each direction. Seed shall be incorporated 1/8 to 1/4-inch deep by raking or dragging, cultipacking, or tracking with heavy machinery. Raked areas shall be rolled with a weighted roller to provide good seed to soil contact.

Hydroseeding

This method is best suited for steep, inaccessible areas where use of a drill or other mechanized equipment is not feasible. Hydroseeding shall be done in two separate operations with seed and fertilizer applied in the first pass, and mulch applied in the second pass. Do not use burnt or hydrated lime when hydroseeding. If legume inoculant is used, seeding shall be accomplished within 3 to 4 hours after slurry is mixed, or a fresh supply of inoculant shall be added. If possible after seeding, the area shall be tracked with heavy machinery such as a bulldozer to improve seed to soil contact.

Temporary Seeding

When the period of soil exposure is more than two months but less than twelve months, a temporary seeding (usually an annual grass) shall be used to provide short-term cover on disturbed areas. See Table 2 for recommended plant species and planting rates.

Temporary seedings shall be planted as a nurse crop with a permanent seeding mixture when rapidly growing cover is needed. When seeding toward the end of the listed planting dates for permanent seedings, or when conditions are expected to be less than optimal, select an appropriate nurse crop from Table 2 and plant with the permanent seeding mix. Companion seedings of small-seeded grasses shall not exceed 5% (by weight) of the overall permanent seeding mixture. Companion seedings of small grains such as barley, wheat, oats, or cereal rye shall be sown at one-third the rates listed in Table 2.

Oats are the recommended nurse crop for warm-season grasses. Do not use cereal rye as a nurse crop for warm-season grasses because it will inhibit their germination and growth.

When a temporary or permanent seeding cannot be completed because of weather conditions or time of year, mulch only (no seeding) shall be applied as a temporary cover when soil stabilization is needed. Refer to the Mulching section of this standard for application rates and methods.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Permanent Seeding

Permanent herbaceous vegetation shall be designed to achieve a minimum stand density of 85 percent ground cover within one year.

Grasses and Legumes

Grasses and legumes suitable for critical area planting in Massachusetts are described in Tables 3 and 4.

Seed Mixes

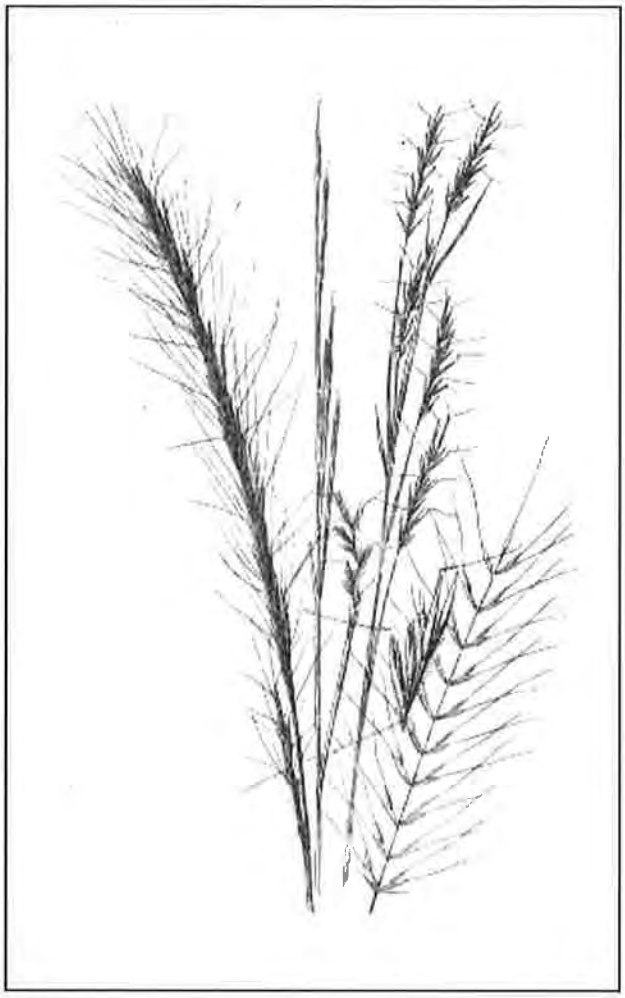
To establish permanent cover, select grass and legume mixes according to the guidelines listed in Tables 5 and 6.

Planting Dates

Use Figure 1 and Table 7 to determine the recommended planting dates for selected mixes.

Supplemental Watering

If soil moisture is deficient, supply new seedings with adequate water (a minimum of 1/4-inch twice a day) until vegetation is well established. This is especially necessary when seedings are made in abnormally dry or hot weather or on droughty soils.



MULCHING

Mulch shall consist of natural and/or artificial non-toxic materials, such as coconut fibers, wood shavings, straw, hay, bark chips, plastic, or fabric of sufficient thickness and durability to achieve the intended effect for the required time period. Tackifiers, emulsions, netting, pinning, or other methods of anchoring mulch shall be sufficiently durable to maintain mulch in place until it is no longer needed.

Mulch shall be used where needed to accomplish one or more of the following purposes:

- Provide temporary erosion control when seeding must be delayed until the proper planting dates, or until plantings become well established;
- Conserve soil moisture to aid seed germination and plant survival;
- Reduce weed growth in planted areas;
- Reduce surface compaction or crusting, and improve water infiltration.

All newly planted areas that are subject to erosion shall be mulched. If dense ground cover is already present after planting (e.g., there is a previously seeded nurse crop sufficient to control soil erosion), then this mulching requirement shall be considered met.

Soil Stabilization Matting

Soil stabilization matting shall have a uniform thickness and distribution of natural or biodegradable synthetic fibers or cords that freely allow penetration by water and plant seedlings. Matting shall resist decay for a minimum of 6 months and a maximum of 12 months. Matting shall not contain any harmful chemicals or other materials that may leach into the soil, or reduce the germination and establishment of seedlings.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Matting products shall be applied on seeded areas and shall be secured to the soil surface according to the manufacturer's instructions. Soil stabilization matting is especially applicable where high water velocities are expected.

Straw or Hay Mulch

Straw or hay shall be applied at the rate of 2 tons per acre (90 pounds per 1,000 square feet) immediately following seeding. Straw and hay shall be unweathered and free of any known viable seeds of objectionable weeds such as Johnsongrass, shattercane, thistle, or others as specified.

Spread mulch uniformly by hand or by mechanical methods so that approximately 85% of the soil surface is covered. This will provide erosion protection and allow adequate light penetration for seedling germination. Straw or hay shall not be chopped or finely broken during application.

On sites where mulch is exposed to displacement by wind and water, it shall be anchored immediately after placement. One of the following methods shall be used, depending on the size of the area, steepness of slope, and costs.

Mulch Netting.

Cover mulch with degradable plastic, jute, or cotton netting. Staple the netting in place using wire staples;

Crimper.

Use a tractor-drawn mulch anchoring coulter (crimper) to cut mulch into the soil surface, so as to anchor part of the mulch and leave part standing upright. Follow the general contours of the site when crimping mulch. Crimping operations are limited to areas accessible by tractor;

Liquid Mulch-Binders.

Use one of the following:

Organic and Vegetable-Based Binders.

Mix with water and apply to mulch to form an insoluble polymer gel binder. Use at rates and under weather conditions as recommended by the manufacturer. These mulch binders shall be physiologically harmless and not impede the germination and growth of desired vegetation;

Synthetic Binders.

Mix with water and apply to mulch to form an insoluble high polymer synthetic binder. Use at rates and under weather conditions as recommended by the manufacturer.

Wood Fiber or Paper Fiber Mulch

Mulch made from wood, paper, or plant fibers shall be applied at the rate of 2,000 pounds per acre, or as recommended by the product manufacturer. Mulch shall not contain any germination or growth inhibiting materials. It may be applied by hydroseeder, but shall not be mixed in the tank with seed. Use shall be limited to flatter slopes and during optimum seeding periods in the spring and fall. Do not use on steep slopes or in concentrated flow areas.

Pelletized Mulch

Dry pellets of compressed and extruded paper and/or wood fiber products shall be applied by hand or mechanical spreader at the rate of 60 to 75 pounds per 1,000 square feet, in accordance with the manufacturer's recommendations. Pelletized mulch may contain co-polymers, tackifiers, fertilizers, and coloring agents. Apply 1/4 to 1/2-inch of water after spreading pelletized mulch to activate and expand the mulch and to provide sufficient soil coverage. This mulch material is especially applicable for small lawns or renovation areas where weed-free mulch is desirable, or straw mulch and tackifiers are not practical.

Bark Mulch

Shredded hardwood bark mulch or bark chips shall be applied to a depth of 2 to 3 inches around plantings of trees, shrubs, groundcovers, and vines. Bark mulch and chips shall be well-aged, and shall be applied to provide at least 85% ground cover of the site. Shredded hardwood bark mulch, rather than bark chips, shall be used on steeper slopes because it is less subject to movement by water.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

SOD

Sod Quality and Treatment

Sod used shall be state certified sod which is at least one year old but not older than 3 years. Commonly available sod types include Kentucky Bluegrass blends, and Tall Fescue/Kentucky Bluegrass mixes.

Sod shall be machine cut to uniform thickness of 3/4-inch, plus or minus 1/4-inch, at the time of cutting. Measurement of thickness shall exclude top growth or thatch.

Standard size sections of sod shall be strong enough to support their own weight and retain their shape when suspended vertically with a firm grasp of the upper 10% of the section.

Individual pieces of sod shall be cut to the supplier's width and length. Maximum allowable deviation from standard widths and lengths shall be no more than 5%.

Sod shall be harvested, delivered, and installed within a period of 36 hours. Sod not transplanted within this period shall be inspected and approved prior to its installation.

Sod shall not be harvested or transplanted when the moisture content (excessively wet or dry) may adversely affect its survival.

Planting Dates

Use Figure 1 and Table 7 to determine the appropriate planting dates for sod.

The optimum planting period is in early fall, followed by the spring planting period. Sod may be planted during the summer if supplemental watering will be provided until the sod is well established. The fall planting season is limited by the amount of time the sod has to develop roots before the ground freezes. Newly sodded areas usually need 4 to 6 weeks before the sod is sufficiently rooted. Similarly, the spring planting season is limited by the high temperatures and drought of summer, unless supplemental water will be provided.

Installation

Prior to sodding, the soil surface shall be cleared of roots, brush, trash, debris, and other objects that would interfere with planting. Based on a soil test, lime and fertilizer shall be evenly applied as needed, and mixed into the top 3 inches of soil. The site shall then be raked smooth in preparation for laying the sod.

During periods of high temperature, the soil shall be lightly watered immediately prior to laying the sod. Sod strips shall be laid lengthwise on the contour, never up and down the slope, starting at the bottom of the slope and working up. On steep slopes, the use of ladders will facilitate the work and prevent damage to the sod.

Sod strips shall be laid in staggered rows, with joints butted tightly together to prevent voids. Sod shall be rolled or tamped immediately following placement to insure solid contact of root mat and soil surface. Sod strips shall not be overlapped.

On slopes greater than 3:1, sod shall be secured to the soil surface with wooden pegs or wire staples.

Where surface water cannot be diverted from flowing over the face of a sodded slope, a capping strip of heavy jute or plastic netting, properly secured, shall be installed along the crown of the slope and edges to provide extra protection against lifting and undercutting of sod. The same technique shall be used to anchor sod in water-carrying channels and other critical areas. Wire staples shall be used to anchor netting in channel work.

Supplemental Watering

Immediately following installation, sod shall be watered until moisture penetrates the soil layer beneath the sod to a depth of 4 inches. Maintain optimum moisture for at least 2 weeks by lightly watering the sod on a regular (usually daily) basis, unless sufficient rainfall has occurred. Do not allow the sod to dry out completely. After the sod begins to take root, reduce the frequency of watering and increase the amount of water applied per watering. This encourages the development of a deep root system and ultimately reduces the amount of water needed.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

GROUNDCOVERS

On sites where grass is difficult to grow or maintain, other perennial groundcovers may be used to control erosion. Groundcovers are low-growing herbaceous plants, vines, and creeping shrubs that spread quickly to form a dense cover. These plants should not be expected to provide erosion control or prevent soil slippage on sites that are inherently unstable due to soil texture, structure, water movement, or excessive slope.

Selection of Plant Species

Low-maintenance groundcovers are available to suit a variety of conditions, especially for small areas around homes and commercial buildings. These plants generally require more care than turf during the initial establishment period, but may require less care after establishment.

Species recommendations may be found by consulting publications in the "References" section of these guidelines. Be cautious of using species that have aggressive growth habits and may spread beyond the planted area, especially if the planting is near a neighboring property or a natural area such as a shoreline or woodland. Species such as English Ivy (Hedera helix) and Periwinkle (Vinca minor) tend to grow rapidly once established, and should not be used except under well-contained conditions.

Planting Dates

Use Figure 1 and Table 7 to determine the appropriate planting dates for the different types of plant materials.

Installation

Soil shall be prepared by incorporating 2 inches of compost or peat moss into the upper 8 inches of soil. If needed based on a soil test, lime and fertilizer shall also be incorporated into the soil. In the absence of a soil test for very small sites (e.g., in home landscaping areas), fertilizer may be added at the rate of 3 pounds of 5-10-10 grade fertilizer (or equivalent) per 100 square feet.

Install the plants at a spacing that is based on their present size, expected rate of growth, and how quickly a complete cover is desired. In general, spacing shall be one plant for every 1 to 4 square feet, using a staggered spacing between rows.

The entire planted slope shall be covered with a mulch that will provide sufficient erosion control during the establishment period. Refer to the "Mulching" section of these guidelines for application rates and methods.

TREES AND SHRUBS

If trees and shrubs will be used on a critical area, the soil surface shall be stabilized with mulch or with a low-growing herbaceous planting to control erosion until the woody plants are large enough to serve that purpose.

When using trees and shrubs for critical area planting, refer to the NRCS-MA Tree/Shrub Establishment Conservation Practice Standard (612), Specification Guidelines and Job Sheet.

Table 8 provides a selected list of native tree and shrub species that may be used for critical areas. Other trees and shrubs that are native, or are introduced and are non-invasive, may also be suitable.

For selection and use of trees and shrubs as part of a soil bioengineering system for upland slopes, refer to Chapter 18 of the Engineering Field Handbook, "Western Massachusetts Streambank Protection Guide", and Streambank and Shoreline Protection (580) Conservation Practice Standard and Specification Guidelines.



20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

OPERATION AND MAINTENANCE

General Requirements for All Plantings

Corrective actions shall be taken as needed to replace destroyed plant material or dislodged mulching material. Reshape the soil surface and replant areas where prolonged slope instability is present. Where vegetative efforts have failed, reassess the need for structural measures to complement vegetative measures.

Invasion of undesirable plants shall be controlled by pulling, mowing, or spraying a selective herbicide. Where wildlife habitat is a concern, do not mow during the primary nesting season (April 15 to July 15). Noxious weeds shall be controlled as required by state law.

Inspect for insects and diseases, and if an incidence threatens stand survival, take corrective action to bring the pest under control.

Grasses and Legumes

During the establishment period, plantings shall be monitored for germination success, water stress, pest problems, and damage by erosion. After one full year from planting, all areas with less than 85% plant cover shall be replanted according to the following recommendations:

1. If the stand provides less than 40% ground cover, reestablish following the original seedbed preparation, lime, fertilizer, and seeding recommendations;

2. If the stand provides 40 to 84% ground cover, overseed and fertilize using one-half the original rate. On small areas, reseeding may be accomplished by broadcasting and lightly raking the seed. For larger areas, use of a grass drill or cultipacker-seeder is preferable.

Spring seedings may require an application of fertilizer between September 1 and October 15, at least every two years, according to soil test recommendations. Mixtures dominated by legumes may only need topdressing once every three years according to soil test recommendations.

If a slow release form of nitrogen (such as ureaform or Osmocote) was used, a follow-up topdressing of nitrogen may not be necessary for several years.

Lime according to soil test recommendations at least once every five years.

Groundcovers

Use a soil test analysis to determine the need for lime and fertilizer. Spread 2 to 3 inches of organic mulch such as shredded hardwood bark or bark chips to reduce evaporation of moisture from the soil and help reduce invasion by weeds.

Use hand tools to remove weeds from between plants. Some perennial weeds, such as thistle and dandelion, are difficult to remove by hand weeding, and may require spot treatment with a nonselective broadleaf herbicide. Care must be taken to avoid herbicide contact with the desired groundcovers or vines, because they are susceptible to being killed or severely damaged by nonselective herbicides. Follow all label directions when using herbicides.

Trees and Shrubs

Competing vegetation shall be controlled until the woody plants are established.

Replanting shall be required when survival is inadequate.

Trees and shrubs shall be protected from fire, insects, disease, and animals until established.

Supplemental watering may be desirable to ensure adequate survival.

Damaging pests shall be monitored and controlled.

Periodic applications of nutrients may be needed to maintain plant vigor.

Refer to the NRCS-MA Tree/Shrub Establishment (612) Conservation Practice Standard and Specification Guidelines.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

SPECIAL PROBLEM SITES – DUNE STABLIZATION

Dune stabilization is used to control surface movement of sand dunes or shifting sand by vegetative or mechanical means. The practice reduces wind erosion, sand movement by storms and tides, and facilitates dune building at ocean, bay frontal and back bay areas. It is applicable along ocean and bay shorelines where blowing sands and storm waters may cause erosion damage, but must be kept at least one hundred feet (horizontal distance) from mean high tide (MHT) water line.

Vegetation

Materials

Sand dunes naturally form on barrier islands, shorelines exposed directly to the ocean, and inland sand deposits (see Figure 2). The source of this wind born sand is the ocean or its bays. These parallel ridges of sand form perpendicular to prevailing winds and grow toward its source of sand. Periodic storm events and human activity continually alter their development and original configuration. Once developed, the sand dunes provide protection from moderate storms and tides.

The existence and maintenance of vegetation on dunes provides a network of root and foliage that holds unconsolidated sand in place. American beachgrass is the dominant naturally occurring vegetation of the frontal dunes of Massachusetts. When beachgrass is established with structural resources and other dune species, a well-anchored storm barrier is established.

The foliage of most sand dune species filters sand from the wind. The reduction of wind velocity near the dune's surface by vegetation allows sand to be deposited. The root-mass of these plant species are typically deep and extensive, anchoring the dunes to their foundation.

When establishing dune vegetation, plant certified cultivars that have been tested on similar sites when possible. Plant materials recommended for sand dune stabilization in Massachusetts are listed below.

Plant Materials for Dune Stabilization

Cultivars:*

- 'Cape' **American Beachgrass** (*Ammophila breviligulata*)
- 'Avalon' **Saltmeadow Cordgrass** (*Spartina patens*)
- 'Wildwood' **Bayberry** (*Myrica pensylvanica*)
- 'Ocean View' **Beach Plum** (*Prunus maritima*)
- 'Sandy' **Rugosa Rose** (*Rosa rugosa*)

Non-Cultivars:

- **Switchgrass** (*Panicum virgatum*)
- **Seashore Little Bluestem** (*Schizachyrium scoparium* var. *litoris*)
- **Seaside Goldenrod** (*Solidago sempervirens*)
- **Eastern Red Cedar** (*Juniperus virginiana*)

*All cultivars listed above were released by the USDA, NRCS, Cape May Plant Material Center, Swainton, NJ.

American Beachgrass is successionally classified as a pioneering type species; it is the hardiest species capable of surviving the harsh environmental conditions of the frontal dunes. For initially stabilizing a dune system, this species is the most reliable and commercially available option. Once established it rapidly spreads by a rhizomatous root system, developing a soil-binding network of inter-woven roots.

Saltmeadow Cordgrass, although typically associated with tidal salt marshes, naturally occurs in the secondary and back dune areas. Predominantly inhabiting inter-dune troughs and low blow-out areas. It is dominant in these micro-sites since most other sand dune species can not tolerate wet to saturated soil conditions. The trailing rhizomes of saltmeadow cordgrass are slender, but form dense mats near the surface. It is vegetatively established on normal sites using freshly harvested stems (culms) or containerized plants on severe locations.

Switchgrass & Bluestem

Switchgrass is a medium to tall height native perennial grass that grows in nontidal and fresh tidal marshes. It is tolerant of drought, flooding, salt, sun and wet soil. It's soil stabilization function is attributed to its rhizomotous root system. Its stiff stems resist lodging and will recover to an upright position after storms. A typical seeding rate is 10 PLS lbs./acre.

Little Bluestem is a medium tall native bunch grass that is almost always incorporated into mixes used to produce low maintenance, long-living stands. It

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

grow well in full sun, adapts to a wide variety of soil types and is drought tolerant. Little Bluestem should be seeded at a rate of 12 PLS lbs./acre alone and at 4 PLS lbs./acre in mixes. Seeding vigor is weak, therefore, control of competition is necessary. For best results, soil pH should be between 5.5 and 6.5.

Shrubs and Trees—Medium sized shrubs and small trees naturally dominate the back dune zone of barrier islands. The shrubs begin to co-inhabit the mid-secondary dunes. Once, extensive stands of bayberry, beach plum, pitch pine and other woody species covered these islands where houses now stand. The shrub species that are well adapted to the dune ecosystem are capable of either layering or root suckering. The trees and shrubs of the sand dunes have deep tap root systems for supplying adequate moisture and nutrients. Each species utilized for back dune stabilization has its own unique attributes. Beach plum has a colorful bloom in spring that yields a tasty succulent cherry like fruit. Bayberry roots have nodules which enable it to fix atmospheric nitrogen similar to legumes; it also produces aromatic fruit and leaves. The thorny stems of Rugosa Rose are useful in directing pedestrian traffic along established access trails. This rose species also blooms from late spring to early fall, then gives rise to a bright red fruit. The pines and junipers that are adapted to sand dunes provide the visual appeal of evergreens in the back dunes. The major function of tree and shrub vegetation on sand dunes is permanent solid structural stabilization. All trees and shrubs of the sand dunes produce viable seed, but intentional establishment occurs using bare-rooted or potted seedlings.

Establishment

Table 9: Establishment of Dune Vegetation specifies planting dates, units, methods, size, depth, spacing and other notes for planting cultivars.

Dune Crossing Areas

Where foot or vehicular traffic is expected over dunes, it is recommended that a curvilinear path be constructed to direct traffic. These paths can be constructed with boards or be comprised of a gravel base. The crossings should be bordered by sand fence to funnel the traffic to and from the beach.

Fertilizer

Date	May through July; No sooner than 30 days after planting.
Rate	< 50 lbs. of nitrogen (N) per acre; < 25 lbs. of phosphorus (P) per acre, and 25 lbs. potassium (K) per acre.
Frequency	Apply N for the first two years after planting, then as needed to maintain stem density and plant health. Single or split applications are acceptable if not applied before May 1 or after July 30. Split applications must be at least 30 days apart. It is only necessary to apply (P) and (K) in alternate years.
Recommended Formulations	10-10-10, 20-10-10, 15-10-10, etc. are acceptable as long as the maximum rates per nutrient are not exceeded. Time-release fertilizers that will provide the target amounts of the primary nutrients per acre are encouraged.
Notes	Fertilize dune grass planting by mechanical or broadcast application, except where woody species are planted. Only apply fertilizer within the drip line of shrubs and trees. Where woody plants are established, fertilizer may be broadcast applied. [*Not following this procedure will result in excessive herbaceous growth, which will out-compete newly established trees and shrubs.*]

Replanting

Uniform, unbroken dune lines are essential to the protection provided by a dune system. When uncontrollable events (i.e. storms, construction, etc.) damage dunes, replanting may be necessary to maintain a properly functioning system.

If such damage occurs between October and April, replant within a month. If the damage is experienced from May to September, utilize the outlined sand fencing or excavation procedures listed below, then plant during the recommended establishment period

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Sand Fencing

Sand fencing provides a quick and effective way to build temporary sand dunes. Utilizing lines of fencing and wooden posts, orientated parallel to the beach, approximately 140 feet (horizontal distance) from the mean high tide (MHT) water line.

A source of sand is necessary for this technique to be effective, but it is not limited by time of establishment.

Materials

Fencing:

- Standard 4 foot slatted wood snow fencing; wood must be decay free.
- Polyvinyl fencing material with 50% porosity may be used as an alternative.
- Four wire-ties (>12 gauge) must be used to secure fencing to each post.

Posts

- Wooden posts must be > 6½ feet long, with a minimum diameter of 3 inches; typical length ranges from 7 to 8 feet.
- The posts should be made from black locust, eastern red cedar, Atlantic white cedar, or other species of similar durability and strength.
- Space posts 10 feet apart, and set them > 3 feet deep.

Technique

Position – Orientation of fence line is parallel to the water line of the beach, at least 140 feet from mean high tide (MHT).

Height – With adequate sand sources, dune elevations can be increased annually by at least four foot increments. The maximum dune height that is attainable will range from 12 to 15 feet, but is greatly influenced by the prevailing wind velocities and sand grain size.

Installation – Weave fencing in front of and behind alternating posts to attain maximum strength.

Number of Rows – When the distance to the MHT water line is 100 feet or more, 2 parallel rows spaced 30 to 40 feet apart are ideal (see Figure 3).

Single rows with 30 foot perpendicular spurs, spaced 40 feet apart are also acceptable if there is less than 100 feet from the MHT and a protective dune is desired. A zigzag pattern also may be considered. Where there is less than ___ feet from the MHT it may not be feasible to build dunes.

Replacement – sand will typically fill fencing to ¾ of its total height, at a maximum. Upon reaching maximum fence capacity, additional lines of fence can be added until maximum planned dune height is reached. Replace damaged fencing and posts within one month of storm damage to maintain a contiguous dune line.

Comments

This method is more expensive per lineal foot than building dunes with vegetation alone, but less expensive than using earth-moving machinery to construct dunes.

Dune height can be increased quickly, but it is limited by the fence height and the ability to add continually more lines of fencing.

Planting parallel rows of vegetation on either side of fence is usually more effective than either vegetation or fencing techniques alone. When complementing fencing with vegetation, do not plant closer than ten feet and no further than 15 feet from the fence lines. Vegetative strips should be about 20 feet wide (see Figure 4).

Mechanical Excavation

Temporary excavated sand dunes may be created quickly, with the use of various earth-moving machines. Since time is required for settling and cohesion to occur, such dunes are often short lived and only provide minimal protection to the resources behind them.

This method is often useful in the repair of storm damaged sand dunes during the fall and winter months. Any blow-out areas can be quickly filled.

Front-end loaders of all sizes can be used. Various grading machines are also useful. Pumped sand from off shore dredging can be shaped and positioned with machinery.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

SUPPORTING DATA AND DOCUMENTATION

The following is a list of the minimum data and documentation to be recorded in the case file:

1. Completed copy of Job Sheet MA-108, "Critical Area Planting Specifications" (see Exhibit 1), or other approved job specifications and management plans. The following items shall be addressed, as appropriate:
   a. Method of site preparation and type of seedbed preparation;
   b. Conservation Practice Code to be seeded, or type of problem site;
   c. Species and rates to be seeded/planted;
   d. Seeding/planting dates;
   e. Rate and type of soil amendments to be applied;
   f. Rate and type of mulch and anchoring methods.
2. Field location and extent of planting in acres, and assistance notes. Also note the location of the planting on the conservation plan map.

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20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Figure 1. USDA Plant Hardiness Zones for Massachusetts

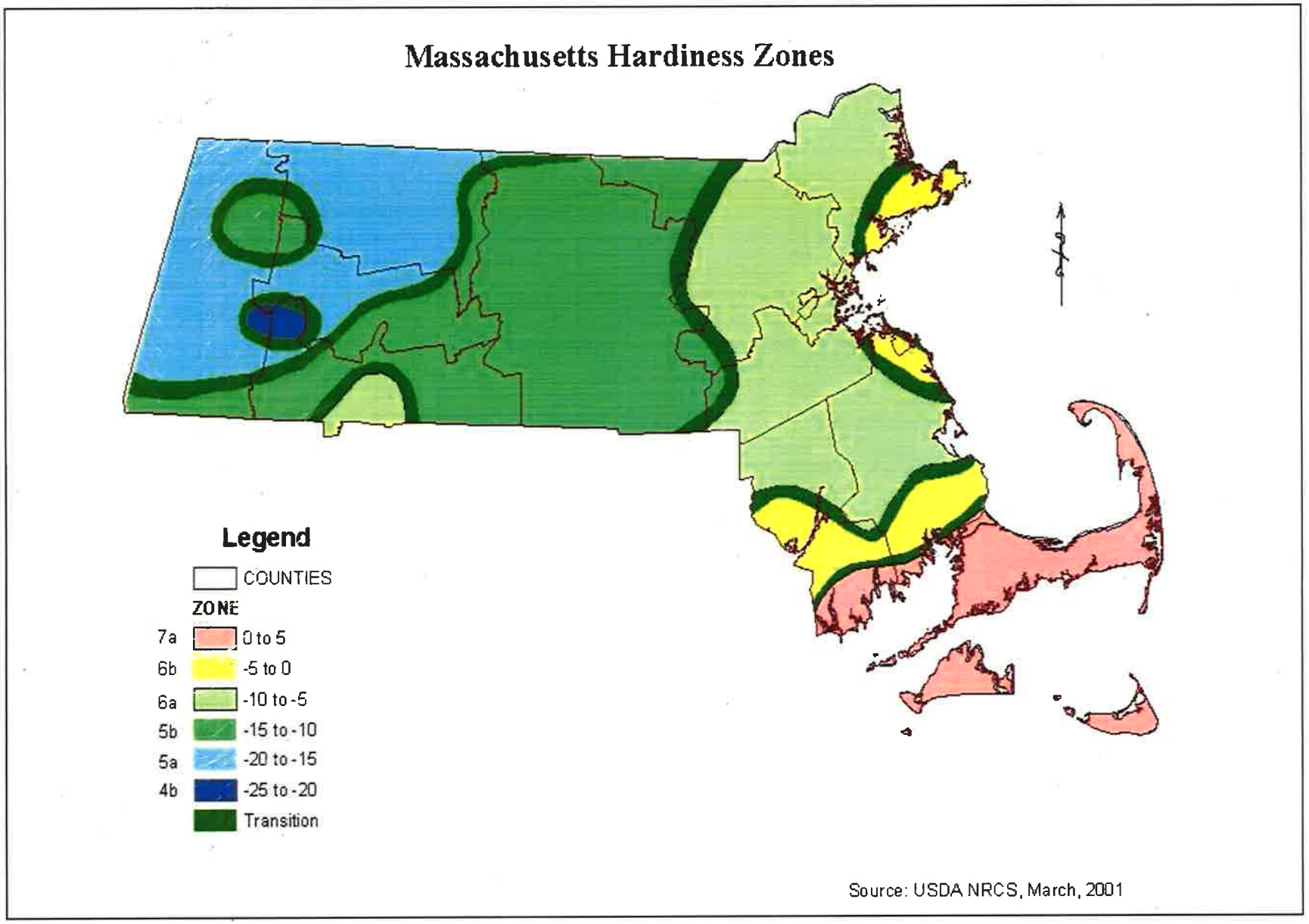

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FIGURE 2: Typical Barrier Island Cross Section

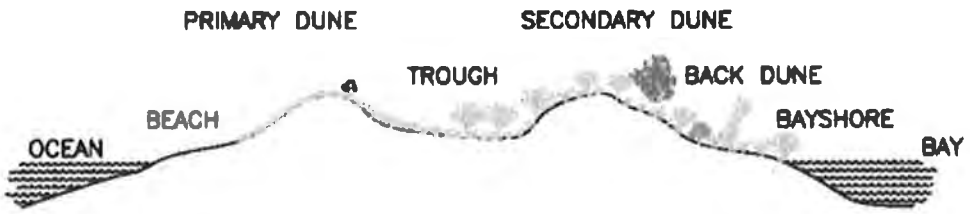
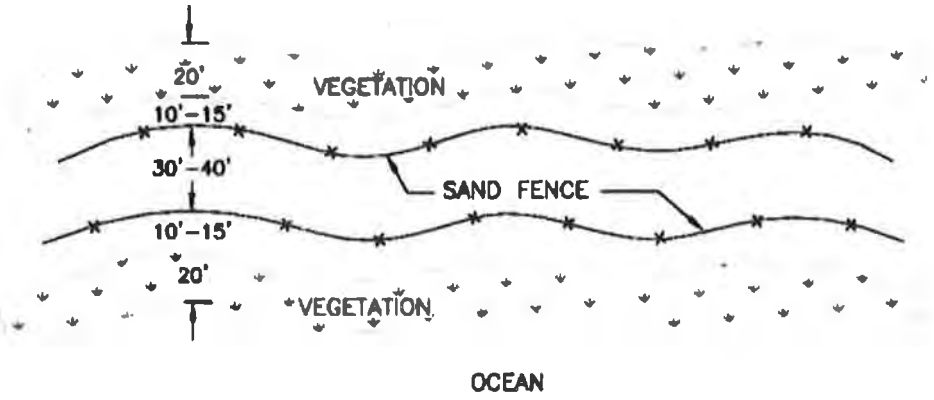


FIGURE 3: Combination Of Sand Fence And Vegetation For Dune Building



Not to Scale

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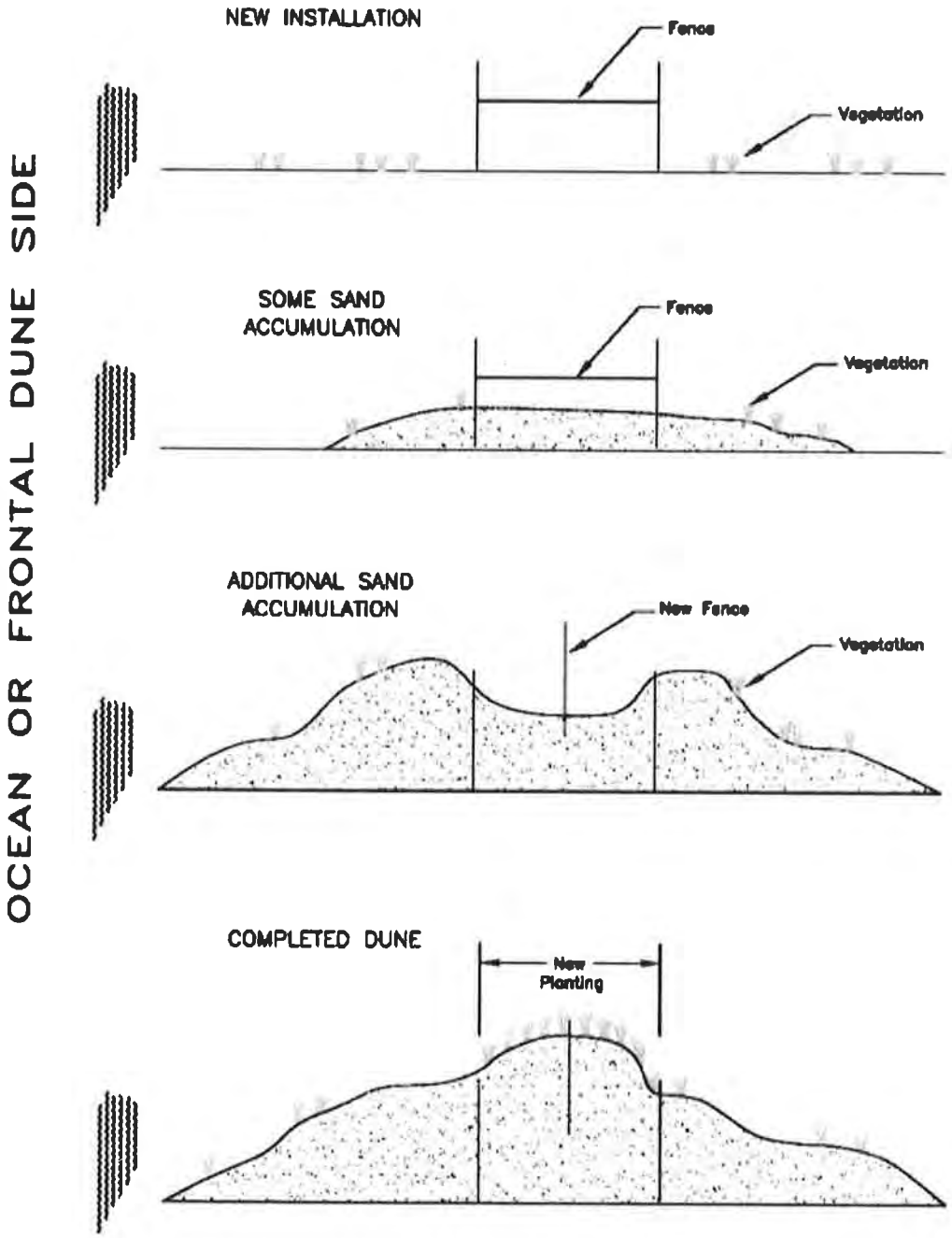
FIGURE 4: Typical Cross Section Produced By A Combination Of Sand Fence And Vegetation



20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

TABLE 1: Quality of Seed [1]					
Species	**Minimum Seed Purity (%)**	**Minimum Seed Germination (%)**	**Species**	**Minimum Seed Purity (%)**	**Minimum Seed Germination (%)**
COOL-SEASON GRASSES			***WARM-SEASON GRASSES***		
Alkali saltgrass	85	80	Bluestem, Big	60	60
Barley	98	85	Little Bluestem, Broomsedge	55	60
Bentgrass, Creeping	95	85	Deertongue	95	75
Bluegrass, Canada	90	80	Indiangrass	60	60
Bluegrass, Kentucky	97	80	Lovegrass, Purple	--	--
Bluejoint, Canada	85	70	Millet, Foxtail	98	80
Bromegrass, Fringed	85	70	Switchgrass	95	75
Bromegrass, Smooth	95	85	***LEGUMES/FORBS***		
Cordgrass, Freshwater	85	70	Beach pea	--	--
Dropseed, Poverty	--	--	Bushclover	80	50
Fescue, Creeping Red, Hard, Chewings, Sheep	97	85	Clover, Alsike	99	85
Meadowgrass, Fowl	90	70	Flatpea	98	75
Oats	98	85	Groundnut	--	--
Orchardgrass	90	80	Pea, Partridge	98	70
Redtop	92	80	Tick trefoil	90	70
Rye, Cereal	98	85	Wild Indigo	--	--
Ryegrass, Annual or Perennial	97	85			
Wheat	98	85			
Wild Rye, Canada, VA, Riparian	85	70			
Wood Reedgrass	--	--			

[1] All seed shall comply with the Massachusetts, Connecticut, or Rhode Island State Seed Law.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

TABLE 2: Temporary Seeding for Site Stabilization						
Plant Species	**Seeding Rate** [1]		**Seeding Depth** *(inches)* [2]	**Recommended Seeding Dates by Plant Hardiness Zone** [3]		
	lbs/ac	*lbs./ 1,000 sf*		**4b & 5a**	**5b**	**6a, 6b, & 7a**
Cool-Season Grasses						
Annual Ryegrass *Lolium perenne* ssp. *multiflorum*	40	1.0	0.5	Apr 1 to May 31 Aug 1 to Sept. 1	Mar 15 to May 31 Aug 1 to Sept. 15	Mar 1 to May 31 Aug 15 to Sept 30
Oats *Avena sativa*	86	2.0	1.0	Apr 1 to July 1 Aug 1 to Sep 30	Mar 15 to Jun 15 Aug 1 to Oct 15	Mar 1 to Jun 1 Aug 15 to Sept 30
Cereal Rye *Secale cereale*	112	2.8	1.0	Aug 15 to Sept 15	Aug 15 to Sept 30	Aug 15 to Oct 30
Warm-Season Grass						
Foxtail Millet *Setaria italica*	30	0.7	0.5	Jun 1 to Jul 31	May 1 to Jul 31	May 1 to Aug 15

TABLE 2 NOTES:

1. Seeding rates for the warm-season grasses are in pounds of Pure Live Seed (PLS). Actual planting rates shall be adjusted to reflect percent seed germination and purity, as tested. No adjustments are necessary for the cool-season grasses.

   Seeding rates listed above are for temporary seedings, when planted alone. When planted as a nurse crop with permanent seed mixes, use 1/3 the seeding rate listed above for barley, oats, wheat, and cereal rye. For smaller-seeded grasses (annual ryegrass, pearl millet, foxtail millet), do not exceed more than 5% (by weight) of the overall permanent seeding mix.

   Oats are the recommended nurse crop for warm-season grasses. Do not use cereal rye with warm-season grasses; it has been shown to have allelopathic properties that inhibit the germination and growth of warm-season grasses.

2. For sandy soils, plant seeds at twice the depth listed above.

3. The planting dates listed are averages for each Zone, and may require adjustment to reflect local conditions, especially near the boundaries of the zone.

* Winter rye planting dates differ depending on fall and spring cover

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

TABLE 3: Characteristics of Grasses & Legumes for Erosion Control

Common Name	Scientific Name	Native	Season	Environmental Tolerance*	Plant Type*
Beachgrass, American	*Ammophila breviligulata*	Yes	Cool	S,D	M,G
Bentgrass,Creeping	*Agrostis stolonifera var. palustris*	Yes	Cool	F,W	M,P,G,R
Bluegrass, Canada	*Poa compressa*	No	Cool	D,S,s,W	S,P,G,R
Bluegrass, Kentucky	*Poa pratensis*	No	Cool	S	S,P,G,R
Bluestem, Big	*Andropogon gerardii*	Yes	Warm	D,S	L,P,G,B
Bluestem, Little	*Schizachryrium scoparium*	Yes	Warm	D,S	M,P,G,B
Bromegrass, Smooth	*Bromus inermis*	No	Cool	D,F,S,w	M,P,G,R
Bromegrass, Fringed	*Bromus, ciliatus*	Yes	Cool	S,s,w	M,P,G,R
Broomsedge	*Andropogon virginicus*	Yes	Warm	D,S	M,P,G,B
Bushclover, Hairy	*Lespedeza hirta*	Yes	Warm	S	L.P
Bushclover, Round Head	*Lespedza capitata*	Yes	Warm	D,S	L,P
Cordgrass, Freshwater	*Spatina pectinata*	Yes	Cool	F,Na,S,W	M,P,G
Cordgrass, Saltmeadow	*Spartina patens*	Yes	Warm	F,Na,S,W	S,P,G
Cordgrass, Smooth	*Spartina alterniflora*	Yes	Warm	F,Na,S,W	L,P,G
Cut Grass, Rice	*Leersia oryzoides*	Yes	Cool	F,S,W	M,P,G
Deertongue Grass	*Dicanthelium clandestinum*	Yes	Warm	D,S,W	S,P,G,R
Dropseed, Poverty	*Sporobolus vaginiflorus*	Yes	Warm	D,S	S,A,G,B
Fescue, Red	*Festuca rubra*	Yes	Cool	F,S,w	M,P,G,R
Flatpea	*Lathyrus sylvestris*	No	Cool	D,S,W	P,HV
Groundnut	*Apios americana*	Yes	Cool	F,S,s	P,HV
Indiangrass, Yellow	*Sorghastrum nutans*	Yes	Warm	D,F,S	L,P,G,B
Lovegrass, Tumble	*Eragrostis spectabilis*	Yes	Warm	D,S	S,P,G,B
Manna Grass, Canada	*Glyceria canadensis*	Yes	Cool	W	M,G
Manna Grass, Fowl	*Glyceria striata*	Yes	Cool	W	M,G
Meadow Grass, Fowl	*Poa palustris*	Yes	Cool	S,W	M,P,G
Pea, Beach	*Lathyrus japonicus*	Yes	Cool	D,S,Na	P,HV,R
Red Top	*Agrostis alba*	No	Cool	D,S,W,F	M,P,G,R
Reed Grass, Blue Joint	*Calamagrostis canadensis*	Yes	Cool	F,S,W	L,P,G
Ryegrass, Perennial	*Lolium perenne*	No	Cool	W	M,P,G,B
Rye, Canada Wild	*Elymus canadensis*	Yes	Cool	D,S,s,Na	L,P,G,R
Rye, Riverbank Wild	*Elymus riparius*	Yes	Cool	F,s,w	M,P,G,R
Rye, Virginia Wild	*Elymus virginicus*	Yes	Cool	F,S,s	M,P,G,R
Switchgrass	*Panicum virgatum*	Yes	Warm	D,F,Na,S,W	L,P,G,R
Trefoil, Showy-Tick	*Desmodium canadense*	Yes	Cool	D,S	L,P
Wood Reed, Stout	*Cinna arundinacea*	Yes	Cool	s,W	L,P,G

Table 3 Legend

Environmental Tolerance		Plant Type	
D	Drought	L	Large (> 4 ft.)
F	Flood	M	Medium (< 4 ft.)
Na	Salt	S	Small (< 2 ft.)
S	Full Sun	HV	Herbaceous Vine
s	Shade	A	Annual
W	Wet Soil	P	Perennial

Plant Type	
G	Grass
R	Rhizomotous
B	Bunch

Prepared by USDA-NRCS - Amherst, Masschusetts.
Native Plant List from Massachusetts NHESP, B.Sori and P.Somers.
Environmental Tolerance and Plant Type adapted from Landscape Restoration Handbook, Lewis Publishers.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

TABLE 4. Characteristics, Uses and Establishment of Grasses and Legumes for Critical Area Planting In Massachusetts		
Plant Name	**Plant Characteristics**	**Uses and Establishment Notes**
American Beachgrass *(Ammophila breviligulata)*	• **Native** to Massachusetts, (in fact, the 'Cape' variety available from nurseries, is the native strain) • Extensively rhizomatous in sandy soils and readily grows up through new deposition layers (dunes) • 3 ft. mature height • Adapted to coastal dunes • **Cool Season**	• Tolerant of droughty sands, full sun • Intolerant of foot and vehicular traffic • Established by planting dormant stems (culms) , 2-3 per planting unit on 12"-18" centers • Useful as initial vegetative cover on dunes and other sandy sites, to be later inter-planted with native woody shrubs •
Bentgrass, Creeping/Marsh *(Agrostis stolonifera Var. palustris)*	• **Native** to Massachusetts • Rhizomotous perennial • Sod forming, • FACW • Adapted to wet meadows, shores and coastal marshes • **Cool Season**	• Tolerant of wet soils and flooding • Seed in mixes at 1lb./acre rate • (4.5 million seeds/pound) • Suitable for waterways and ditch or pond banks • 4,540,000 seeds/lb.
Bluegrass, Canada *(Poa compressa)*	• Introduced to Massachusetts • Rhizomotous perennial • Open, sod forming • 2 ft. mature height, • FACU • **Cool Season**	• Useful on dry, low fertility soils • Tolerant of drought, full sun, shade and wet soil • Slow starter • Use in mixes only • 2,500,000 seeds/lb.
Bluegrass, Kentucky *(Poa pratensis)*	• Introduced to Massachusetts • Rhizomotous perennial • Turf forming • 3' mature height, • FACU • **Cool season**	• Grows best on well-drained fertile soil with pH 5.5-7.0 • Avoid acid soils • Useful in lawn-type mixes • Tolerant of moist or dry sites • 2,156,000 seeds/lb.
Bluestem, Big *(Andropogon gerardii)* Bluestem, Little *(Schizachryrium scoparium)*	• Both **Native** to Massachusetts • Perennial bunchgrasses, with dense root systems • Big (7 ft. height), • Little (3 ft. height) • Big (FAC); • Little (FACU) • Adapted to hot, dry, sunny sites in sandy, loamy or silt soils • Both **Warm season**	• Tolerates medium to low fertility soil with pH 5.0-7.5 • Seed at 2 to 4 lbs. per acre in a mix and 5 to 10 lbs. per acre when seeded alone • Useful for stabilizing sand and gravel pits, road sides and mine spoil • Slow to germinate the first year • Seed in early spring with a native grass drill. Roll or cultipack • BB - 165,000 seeds/lb. • LB - 240,000 seeds/lb.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

TABLE 4, cont. Characteristics of Grasses and Legumes

Plant Name	Plant Characteristics	Uses and Establishment Notes
Bromegrass, Smooth *(Bromus inermis)*	• Introduced to Massachusetts • Rhizomotous perennial • Forms coarse dense sod • Adapted to diverse types of soils, but not wet soils • 3 – 4 ft. mature height, • **Cool Season**	• Tolerant of heat, drought and periodic flooding • Prefers fertile soils with pH 5.5-8.0 • Suited for waterways,channels, pond banks where soils do not remain wet. • 140,000 seeds/lb.
Bromegrass, Fringed *(Bromus ciliatus)*	• **Native** to Massachusetts • Rhizomotous perennial • 1 – 5 ft. mature height, • FACW • **Cool Season**	• Tolerant of full sun or partial shade • Good species for moist soils • Suitable for waterways and pond banks •
Broom-Sedge *(Andropogon virginicus)*	• **Native** to Massachusetts • Perennial bunchgrass • 2 – 5 ft. mature height, • FACU • **Warm Season**	• Adapted to dry, open sites with a variety of soil types • Suited for general erosion control where an eastern prairie appearance is desired • 800,000 seeds/lb.
Bushclover, Hairy *(Lespedeza hirta)*	• **Native** to Massachusetts • Erect perennial • **Warm Season**	• Open, sandy, sterile sites • Mix with native, warm season grasses. • 113,636 seeds/lb.
Bushclover, Round Head *(Lespedeza capitata)*	• **Native** to Massachusetts • Erect perennial • **Warm Season**	• Roadsides, sandy, dry sites • Mixes with native, warm season grasses • 154,000 seeds/lb.
Cordgrass, Freshwater *(Spartina pectinata)*	• **Native** to Massachusetts • OBL • 2 – 7 ft. mature height • Adapted to upland edge of salt marshes in relatively dry soil • **Warm Season,** July – Sept.	• Tolerant of saltwater flooding • Suited to wet soil in eastern prairie • Suitable for streambank or wetland stabilization • 197,000 seeds/lb.
Cordgrass, Saltmeadow *(Spartina patens)*	• **Native** to Massachusetts • Small perennial grass • Less than 2 ½ ft. • Thin stems bend easily and form big cowlicks in the marsh • **Warm Season,** late June – Oct.	• Tolerant of daily saltwater flooding, wet soils, and full sun; • Grows on **high marsh** sites
Cordgrass, Smooth *(Spartina alterniflora)*	• **Native** to Massachusetts • Tall perennial grass • Up to 8 ft. • Spreads by rhizomes and builds strong underground network • **Warm Season**	• Tolerant of constant saltwater flooding, wet soils, and full sun; • Grows on **low marsh** sites, along outer edge of salt marsh, and along the edge of creeks and ditches; • On protected beaches and mud flats, acts as colonizer, initiating marsh formation. • Dense stands trap silt and cause elevation of soil to rise. • 175,000 seeds/lb.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

TABLE 4, cont. Characteristics of Grasses and Legumes		
Plant Name	**Plant Characteristics**	**Uses and Establishment Notes**
Cut Grass, Rice *(Leersia oryzoides)*	• **Native** to Massachusetts • OBL • 2 - 5 ft. mature height • **Cool Season**	• Tolerant of saturated soils, full sun and flooding • Suited for waterways, pond/ditch/ stream banks stabilization
Deertongue Grass *(Dicanthelium clandestinum)*	• **Native** to Massachusetts • Perennial, spreads slowly by seed and rhizomes • Up to 3 ft. mature height • FAC+ • Adaptation: dry to moist sites with full sun to partial shade • **Warm Season**	• Best grass for acid soil sites • Tolerant of low fertility sites • Use for cover of erodible sandy areas such as road/ditch banks and sand and gravel borrow areas. • Seed in mixes at rate of 5-10 lbs./ac. • Seed with other native warm season species or with perennial ryegrass • 400,000 seeds/lb.
Dropseed, Poverty *(Sporobolus vaginiflorus)*	• **Native** to Massachusetts • Annual bunchgrass • 1 – 2 ft. mature height • UPL • Shallow root system • **Warm Season**	• Tolerant of dry sites with full sun and low fertility • Suitable as a native nurse crop for warm season mixes • Adapted to dry roadside sites
Fescue, Red Creeping Red Fescue *(Festuca rubra var rubra)* Chewings Red Fescue *(Festuca rubra commutata)*	• *Festuca rubra* is a species native to Massachusetts • Short perennial with round, wiry basal leaves • Creeping Red Fescue tends to grow in tufts on low fertility sites, but spreads by rhizomes in more fertile soils. • Chewings is a true bunch type • FACU • **Cool Season**	• Valuable for its shade tolerance • Suited for close growing cover in mixes; seed at rate of 10-40 lbs.per acre depending on use • Adapted to variety of soil types; tolerant of dry and very moist sites • Suited for low maintenance areas, general purpose turf or in mixes for wood roads, landings, roadbanks… • Adapted to full or partial shade • 615,000 seeds/lb.
Flatpea (Lathyrus *sylvestris*)	• Introduced to Massachusetts • Deep-rooted perennial • Long, climbing, vine-like stems • Established stand resist encroachment by other plants	• Adapted to a variety of sites from dry to moist. • Slow to germinate • Seed alone (with perennial ryegrass) for utility rights-of-way • 8,000 seeds/lb.
Groundnut *(Apios americana)*	• **Native** to Massachusetts • Climbing vine, from rhizome • 3-10 ft. in length	• Moist soils • Use in mixes for pond and streambanks
Indiangrass *(Sorghastrum nutans)*	• **Native** to Massachusetts • Perennial, Bunchgrass • 3 – 5 ft. mature height • **Warm Season**	• Grows best in fertile loam • Light and fluffy seed. Use native grass drill designed for chaffy seed. • Seed at 2-4 lbs./acre in mix or 5-10 lbs./acre alone • 175,000 seeds/lb.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

TABLE 4, cont. Characteristics of Grasses and Legumes

Plant Name	Plant Characteristics	Uses and Establishment Notes
Lovegrass, Tumble *(Eragrostis spectabilis)*	• **Native** to Massachusetts • Perennial, bunchgrass. • 12 – 18 inches in height • UPL • **Warm Season**	• Suited to Dry sites with Full Sun • Purplish-pink appearance in flower (late summer) • Low maintenance • 1,500,00 seeds/lb.
Manna Grass, Canada *(Glyceria canadensis)*	• **Native** to Massachusetts • Perennial • 2 – 3 ft. height • OBL • **Cool Season**	• Suited to very wet sites • Good for initial wetland cover
Manna Grass, Fowl *(Glyceria striata)*	• **Native** to Massachusetts • Perennial • 2 – 3 ft. height • OBL • **Cool Season**	• Suited to very wet sites • Low maintenance • 1,000,000 seeds/lb.
Pea, Beach *(Lathyrus japonicus)*	• **Native** to Coastal Mass. • Perennial with rhizomes	• Adapted to beach/dune sites • Seeded in moist, inter-dune areas
Red Top *(Agrostis alba)*	• Introduced to Massachusetts • Spreading, perennial grass • FACW • **Cool Season**	• Suited to full sun, wet or dry sites • Seed at 1 lb/ac. or less in mixes • Suited to pH 4.0-7.5 • Suited in mixes for waterways, road banks, diversions or critical areas • 4,900,000 seeds/lb.
Reed Grass, Blue Joint (Calamagrostis canadensis)	• **Native** to Massachusetts • Perennial • 4-5' height • Spreads by rhizomes • FACW+ • **Cool Season**,	• Adapted to wet sites with full sun • Tolerates flooded conditions • Suited for waterways, ditches, pond/stream banks • 4,000,000 seeds/lb.
Rush, Path (Juncus tenuis)	• **Native** to Massachusetts • perennial • 12" height • FAC-	• Adapted to full or partial sun • Tolerant of flooding , wet soils and compacted soils • Suited for cover of access road surfaces • 45,000,000 seeds/lb.
Switchgrass (Panicum virgatum)	• **Native** to Massachusetts • **Warm Season**, Bunchgrass • 3 -5' height, FAC • Provides excellent nesting and fall and winter wildlife cover • Expect 1-2 years for establishment	• Adapted to a wide range of sites: • Dry, Moist, Wet, Full Sun or Partial Sun • Tolerant of salt • Seed at 5 - 10 lbs. PLS per acre in mix or 15 lbs. PLS per acre alone • Suited to pH of 4.5-7.5 • 389,000 seeds/lb.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

TABLE 4, cont. Characteristics of Grasses and Legumes		
Plant Name	**Plant Characteristics**	**Uses and Establishment Notes**
Ryegrass, Perennial (Lolium perenne)	• Introduced to Massachusetts • Fast Growing • Short lived perennial • 2 ft. mature height • FACU • **Cool Season**	• Best in moist soils and has fair drought tolerance • Seed in mixes at rate of 10 lbs./acre • 230,000 seeds/lb.
Trefoil, Showy-Tick (Desmodium canadense)	• **Native** to Massachusetts • Taproot • 2 – 5 ft. height	• Adapted to moist - dry open sites and all soil textures
Wild Rye, Canada (Elymus candensis)	• **Native** to Massachusetts • Perennial bunchgrass • 2 ½ - 6 ft. height • Good wildlife food and cover • FACU+ • **Cool Season**	• Suited to dry-moist sites with full sun or partial shade • Seed in mixes at 5 lbs./acre • 121,000 seeds/lb.
Wild Rye, Riverbank (Elymus riparius)	• **Native** to Massachusetts • Perennial bunchgrass • 3 - 5 ft. height • FACW • **Cool Season**	• Suited to moist to wet sites with partial shade • Tolerates flooding • 96,000 seeds/lb.
Wild Rye, Virginia (Elymus virginicus)	• **Native** to Massachusetts • Perennial bunchgrass • 4 – 5 ft. height • Good wildlife food and cover • FACW- • **Cool Season**	• Suited to wet sites but can tolerate drought. Can tolerate shade. • Good initial grass for seeding newly established wetlands • 73,000 seeds/lb.
Wood Reed, Stout (Cinna arundinacea)	• **Native** to Massachusetts • Perennial • 5 ft. height • FACW • **Cool Season**	• Adapted to interior woodland and woodland borders • Tolerant of shade • 2,100,000 seeds/lb.

TABLE 4 NOTES:

Wetland Plant Indicator Categories:

Abreviation	Indicator Category	Description	Probability of Occurance
OBL	Obligate Wetland	Occur almost always under natural conditions in wetlands	> 99%
FACW	Facultative Wetland	Usually occur in wetlands, but occasionally found in nonwetlands	67% - 99%
FAC	Facultative	Equally likely to occur in wetlands or nonwetlands.	34% - 66%
FACU	Facultative Upland	Usually occur in nonwetlands, but occasionally found in wetlands	1% - 33%
UPL	Obligate Upland	Occur in wetlands in another region, but occur almost always under natural conditions in nonwetlands here.	> 99%

(A positive (+) or negative (-) sign is used to indicate more or less regional frequency of occurrence in wetlands.)

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

TABLE 5: Recommended Permanent Seeding Mixtures by Purpose													
Purpose of the Planting	**Massachusetts Seeding Mix No.**												
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
Berms, Low Embankments (not on Ponds)	u	u	4	4	4	u			u	4	u		
Bottom of Drainage Ditches, Swales, Detention Basins				u	u		u	4	u		4		
Dikes and Dams				4	4	4			u	u			
Dune Stabilization												4	
Field Borders, Filter Strips, Contour Buffer Strips	u	u	u	u	4	u	u	u	u		u		
Grassed Waterways, Diversions, Terrace, Spillways				4	4		u	u	u		u		
Mine Spoil, Dredged Material, and Spoil Banks	u	u	4	u	u	u			u		u		
Pond and Channel Banks, Streambanks				4	u		4	u	u		u		
Sand and Gravel Pits, Sanitary Landfills	4	4	4	u	u	u			u	u			
Steep Slopes, Roadsides	4	4	4	u	u	4				4	u		
Tidal Shores													4
Utility Rights-of-Way			u	u	u	4	u		u	u			

TABLE 5 NOTES:

4 Recommended best mix for this purpose.

u Alternative mix, depending on site conditions.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

TABLE 6: Permanent Herbaceous Seeding Mixtures

Mix	Recommended Cultivars	Seeding Rate [1] lbs./ac.	Seeding Rate [1] lbs./ 1000 sq .ft.	Soil Drainage Class [2]	Max. Height (feet)	Maint. Level [3]	Remarks
WARM-SEASON/COOL-SEASON GRASS MIXES							
1. Switchgrass *Panicum virgatum*	Blackwell, Carthage, Cave-in-Rock, or Shelter	10	0.23				**Good sand stabilizing mixture using all native species.** If little bluestem is used, mix needs to be seeded with a specialized native grass drill.
Little (seacoast) bluestem *Schizachyrium scoparium (var. littoralis)*	Aldous, Blaze, or coastal ecotype	3	0.07				
Canada Wildrye *Elymus canadensis*	Common	5	0.11				Canada wildrye is a quick establishing, short-lived companion grass.
OPTIONAL:				E - MW	3-4	C - D	
Purple lovegrass *Eragrostis spectablis*	Common	2	0.05				Purple lovegrass seed may be difficult to obtain commercially.
PLUS TWO OF THE FOLLOWING LEGUMES:							
Partridge Pea *Chamaecrista fasciculata*	Common	4	0.09				Partridge pea is a reseeding annual with good wildlife value. All the legumes are adapted to coastal conditions. Beach pea seed may be difficult to obtain.
Beach pea *Lathyrus japonicus*	Common	2	0.05				
Wild Indigo *Baptisia tinctoria*	Common	2	0.05				
2. Big Bluestem *Andropogon gerardii*	Niagara	3	0.07				**Eastern prairie mixture using all species native to Massachusetts.** The indiangrass and bluestems have fluffy seeds. Plant with a specialized native seed drill. On highly erodible sites, include a temporary (annual) grass at 1/3 the rate specified in the table, for quick cover. All the legumes are perennials except partridge pea, which is a reseeding annual. All are adapted to droughty soils. Tick trefoil is also adapted to finer textured soils.
Indiangrass *Sorghastrum nutans*	Rumsey	3	0.07				
Little Bluestem *Schizachyrium scoparium*	Aldous or Blaze	4	0.09				
Switchgrass Panicum virgatum	Blackwell, Carthage, Cave-in-Rock, or Shelter	5	0.11				
PLUS ONE OR MORE LEGUMES:				E - MW	5 - 8	C - D	
Partridge Pea *Chamaecrista fasciculata*	Common	4	0.09				
Bushclover *Lespedeza capitata/hirta*	Common	2	0.05				
Wild Indigo *Baptisia tinctoria*	Common	2	0.05				
Showy Tick-Trefoil *Desmodium canadense*	Common	1	0.02				

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

TABLE 6, cont. Permanent Herbaceous Seeding Mixtures

Mix	Recommended Cultivars	Seeding Rate [1/]		Soil Drainage Class [2/]	Max. Height (feet)	Maint. Level [3/]	Remarks
		lbs./ac.	*lbs./ 1000 sq .ft.*				
3. SELECT THREE GRASSES:							**Dredge disposal mix. Excellent for excessively droughty and low pH (4.0) soils**
Deertongue *Dicanthelium clandestinum*	Tioga	10	0.23				
Broomsedge *Andropogon virginicus*	Common	3	0.07				If broomsedge is used, a specializd seed drill is needed for fluffy seed.
Redtop *Agrostis gigantea*	Streaker, Fireball	1	0.02	E - MW	2-4	C - D	
PLUS: Sheep Fescue *Festuca ovina* **OR**	Azay, Covar	15	0.34				Sheep fescue, Canada wild rye, and Redtop are cool-season companion grasses that will provide immediate cover for erosion protection.
Canada Wild Rye *Elymus canadensis*	Common	5	0.11				
PLUS: Flatpea *Lathyrus sylvestris* **And/Or**	Lathco	10	0.23				Flatpea is tolerant of low pH (4.0)
Partridge pea *Chamaecrista fasciculata*	Common	4	0.09				Partridge pea is tolerant to pH 5.0
4. Deertongue *Dicanthelium clandestinum* **OR**	Tioga	10	0.23				**Grassed waterway/Streambank mix**
Switchgrass *Panicum virgatum*	Blackwell, Carthage, Shelter, Cave-in-Rock	10	0.23				(Good mix for variable soil moisture conditions.)
And: Creeping Red Fescue *Festuca rubra* var. *rubra*	Ensylva, Longfellow, Pennlawn	20	0.46				Use switchgrass in grassed waterways.
Select One of the Following:				W - P	2 - 3	C - D	Creeping red fescue provides a quick, low growing cover.
Virginia Wild Rye *Elymus virginicus*	Common	5	0.11				Use Virginia or Riparian wild rye on moist, shady sites; Canada wild rye on droughty sites.
Riparian Wild Rye *Elymus riparus*	Common	5	0.11				
Canada Wild Rye *Elymus canadensis*	Common	5	0.11				
COOL-SEASON GRASS MIXES							
5. Creeping Red Fescue *Festuca rubra* var. *rubra*	Ensylva, Longfellow, Pennlawn	15	0.34				**Traditional grassed waterway mix.**
Perennial Ryegrass *Lolium perenne* **OR**	Blazer II, Pennfine	10	0.23				Use redtop on acid soils (<5.5)
Redtop *Agrostis gigantea*	Streaker, Fireball	1	0.02	W-P	2-3	C-D	
And: Alsike clover *Trifolium hybridum*	Common	2	0.05				Alsike clover is adapted to wet soils.

TABLE 6, cont. Permanent Herbaceous Seeding Mixtures							
Mix	**Recommended Cultivars**	**Seeding Rate [1]**		**Soil Drainage Class [2]**	**Max. Height (feet)**	**Maint. Level [3]**	**Remarks**
		lbs./ac.	*lbs./ 1000 sq .ft.*				
6. Orchardgrass Dactylis glomerata **OR**	Any forage variety	10	0.23	MW-SWP	1-2	C-D	**Good mix for utility rights of way.** Use orchardgrass if wildlife forage is desired. Use redtop for wetter and lower pH soils. Flatpea suppresses woody vegetation
Hard Fescue *Festuca trachyphylla*	Biljart, Scaldis, Spartan, Tornament	20	0.46				
And:							
Perennial Ryegrass *Lolium perenne* **OR**	Blazer (II), Pennfine	10	0.23				
Redtop *Agrostis gigantea*	Streaker, Fireball	1	0.02				
Plus: Flatpea *Lathyrus sylvestris*	Lathco	15	0.34				
7. Virginia/Riparian Wild Rye *Elymus virginicus/riparius*	Common	5	0.11	SWP-P	2-3	D	**Riparian area mix** Good native species mix for shady, moist conditions (forested floodplain) Wood reedgrass, Fringed bromegrass and Groundnut seed may be difficult to obtain.
Bottlebrush grass *Elymus hystrix*	Common	2	0.05				
(Optional):							
Wood reedgrass *Cinna arundinacea*	Common	1	0.02				
Fringed bromegrass *Bromus ciliatus*	Common	1	0.02				
Groundnut *Apios americana*	Common						
8. Canada bluejoint *Calamagrostis canadensis*	Common	2	0.05	SWP-P	3-4	D	**All native grass mix for waterways, ditches, and pond banks.** Seed may be difficult to obtain.
Fowl Meadowgrass *Poa palustris*	Common	2	0.05				
Creeping bentgrass *Agrostis stolonifera*	Common	1	0.02				
9. Canada wildrye *Elymus canadensis* **OR**	Common	3	0.07	W - SP	2 - 3	C - D	**Successional mix.** Use to provide quick, non-aggressive cover that allows indigenous vegetation to volunteer. Use Canada wildrye and redtop in droughty soils. Use partridge pea on dry sites and tick trefoil on moist sites.
Virginia wildrye *Elymus virginicus*	Common	3	0.07				
Perennial ryegrass **Or**	Common	5	0.11				
Redtop *Agrostis gigantea*	Streaker, Fireball	1	0.02				
Plus: (optional)							
Partridge pea *Chamaecrista fasciculata* **OR**	Common	2	0.05				
Tick trefoil *Desmodium canadense*	Common	1	0.02				

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

TABLE 6, cont. Permanent Herbaceous Seeding Mixtures

Mix	Recommended Cultivars	Seeding Rate [1] lbs./ac.	Seeding Rate [1] lbs./ 1000 sq .ft.	Soil Drainage Class [2]	Max. Height (feet)	Maint. Level [3]	Remarks
10. Chewings Fescue *Festuca rubra* ssp.*commutata*	NE turf-types [4]	15	0.34	E - MW	2 - 3	C - D	**Erosion Control/Wildflower mix** Attractive mix of fine fescues and wildflowers for low maintenance conditions. Once well-established, the grasses may tend to outcompete the wildflowers. Hydroseeding is not recommended for this mix if wildflowers are used. (They have very small seeds.)
Hard Fescue *Festuca trachyphylla*	NE turf-types [4]	15	0.34				
Sheep Fescue *Festuca ovina*	NE turf-types [4]	15	0.34				
PLUS WILDFLOWER MIX:							
Black-eyed Susan *Rudbeckia hirta*	Common	2	0.05				
Lance-leaved Coreopsis *Coreopsis lanceolata*	Common	2	0.05				
Purple Coneflower *Echinacea purpurea*	Common	2	0.05				
Partridge Pea *Chamaecrista fasciculata*	Common	5	0.11				
11. Alkali Saltgrass *Puccinellia distans*	Fults or Salty	20	0.46	W - P	2 - 3	B - D	**Saline (salt) adapted mix** Alkaligrass will persist only under saline conditions. Use the 'Dawson' variety of creeping red fescue in saline conditions. Add bentgrass for wet, saline conditions.
Creeping Red Fescue *Festuca rubra* var. *rubra*	Dawson, Ensylva, Longfellow, Pennlawn,	15	0.34				
Perennial ryegrass Lolium perenne	Pennfine	5	0.11				
OPTIONAL ADDITION							
Creeping Bentgrass *Agrostis stolonifera*	Seaside, Southshore	2	0.05				
12. American Beachgrass (*Ammophila breviligulata)*	'Cape'	18" centers	18" centers	E - MW	3	D	**Dune stabilization** Vegetative planting with dormant culms, 3-5 culms per planting.
13. Smooth Cordgrass *(Spartina alterniflora)* Saltmeadow Cordgrass *(Spartina patens)*	'Avalon'	12-18" centers	12-18" centers		1 - 8	D	**Tidal Shores** Vegetative planting with transplants.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

TABLE 6 NOTES:

Seeding rates for the warm-season grasses are in pounds of Pure Live Seed (PLS). Actual planting rates shall be adjusted to reflect percent seed germination and purity, as tested. No adjustments are necessary for the cool-season grasses, legumes, or wildflowers. All legume seeds shall be inoculated before planting with the appropriate *Rhizobium* bacteria.

1. **Soil Drainage Class** (see county soil survey):

   E - Excessively Drained
   W - Well Drained
   MW - Moderately Well Drained
   SP - Somewhat Poorly Drained
   P - Poorly Drained

2. **Maintenance Level**:

   A - Intensive mowing (every 2 - 4 days), fertilization, lime, insect and weed control, and watering (examples: high maintenance fields).

   B - Frequent mowing (every 4 - 7 days), occasional fertilization, lime, pest control, and watering (examples: residential, school, and commercial lawns).

   C - Periodic mowing (every 7 - 14 days), occasional fertilization and lime (examples: residential lawns, parks).

   D - Infrequent or no mowing, fertilization, or lime after the first year of establishment (examples: wildlife areas, roadsides, steep banks, dunes and tidal shores)

4. **Recommended Cultivars**. See University of Massachusetts, Connecticut, or Rhode Island's Cooperative Extension Service Turfgrass Fact Sheets.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

TABLE 7: Recommended Planting Dates for Permanent Cover [1/]				
Type of Plant Material		**Plant Hardiness Zones**		
		4b & 5a	**5b**	**6a, 6b, & 7a**
Grasses & Legumes	Cool-Season Seed Mixes	Apr. 1 to May 31 Aug 1 to Sep 10	Apr.1 to May 15 Aug 1 to Oct 15	Mar. 15 to May 15 Aug 15 to Oct 31
	Warm-Season/ Cool-Season Seed Mixes	Apr. 1 to May 15 (Jun 1 to Jun 15)*	Apr. 1 to May 31 (May 1 to Jun 15)*	Mar.15 to Jun.15 (May 1 to May 31)* Nov 1 to Dec. 31♦
	Cool-Season Sod	Apr. 1 to May 31 (Jun 1 to Aug 15)* Aug. 15 to Oct 1	Apr.1 to May 15 (May 1 to Sep 1)* Sept.1 to Oct 15	Mar. 15 to May 15 (May 1 to Sep 15)* Sept 15 to Oct.30
Forbs	Seeds	Apr.1 to May 31 Aug.15 to Sept.15	Apr. 1 to May 15 Sept.1 to Oct.15	Mar.15 to May 15 Sept.15 to Oct.30
	Bare-Root Seedlings	Apr 1 to May 31 Jun 1 to Jun 30*	Mar 15 to May 30 May 15 to Jun 30*	Feb 15 to May 30 May 1 to Jun 30*
	Containerized Stock	Same as bare-root except: Sept.1 to Oct.15*	Same as bare-root except: Sept.15 to Nov.1*	Same as bare-root except: Sept.15 to Nov.1*

TABLE 7 NOTES:

1. The planting dates listed are averages for each zone. These dates may require adjustment to reflect local conditions, especially near the boundaries of the zones. When seeding toward the end of the listed planting dates, or when conditions are expected to be less than optimal, select an appropriate nurse crop from Table 1 and plant with the permanent seeding mix. (See Table 1, Note 1 for more information.)
2. ♦Additional planting dates for the Cape and Islands, dependent on annual rainfall and temperature trends. Recommend adding a nurse crop, as noted above, if planting during this period.
3. *Additional planting dates during which supplemental watering may be needed to ensure plant establishment.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

TABLE 8: Species for Tree and Shrub Plantings

Trees For Dry-Open Sites

Scientific Name	Common Name	Mature Height
Betula populifolia	Gray Birch	30'
Juniperis virginiana	Eastern Red Ceder	10-75'
Pinus resinosa	Red Pine	70'
Pinus rigida	Pitch Pine	50'
Pinus strobus	White Pine	80'
Quercus rubra	Red Oak	70'
Quercus coccinea	Scarlet Oak	70'
Quercus velutina	Black Oak	70'

Shrubs For Dry-Open Sites

Scientific Name	Common Name	Mature Height
Amelanchier canadensis	Shadbush	15'
Ceanothus americanus	New Jersey Tea	4'
Comptonia peregrina	Sweetfern	4'
Cornus racemosa	Gray Dogwood	6-10'
Gaylussacia baccata	Black Huckleberry	1'
Hypericum prolificum	Shrubby St. Johnswort	4'
Juniperus communis	Pasture Juniper	2'
Myrica pensylvanica	Bayberry	6'
Prunus maritima	Beachplum	6'
Rhus aromatica	Fragrant Sumac	3'
Rhus copallina	Shining Sumac	4-10'
Rhus glabra	Smooth Suma	9-15'
Rosa carolina	Pasture Rose	3'
Rosa virginiana	Virginia Rose	3'
Spirea tomentosa	Steeplebush	3-4'
Viburnum dentatum/recognitum	Arrowood	5-8'
Viburnum lentago	Nannyberry	15'

Shrubs For Dry-Shady Sites

Scientific Name	Common Name	Mature Height
Hamamelis virginiana	Witch Hazel	15'
Kalmia latifolia	Mountain Laurel	3-8'
Rhododendron nudiflorum	Pinxterbloom Azalea	4-6'
Vaccinium angustifolium	Lowbush Blueberry	2'
Viburnum dentatum	Arrowood	5-8'

Trees For Moist Sites

Scientific Name	Common Name	Mature Height
Acer rubrum	Red Maple	60'
Betula nigra	River Birch	
Chamaecyparis thyoides	Atlantic White Ceder	
Fraxinus pennsylvanica	Green Ash	60'
Picea mariana	Black Spruce	40'
Picea glauca	White Spruce	
Picea rubens	Red Spruce	70'

Trees For Moist Sites, cont.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Scientific Name	Common Name	Mature Height
Populus deltoides	Eastern Cottonwood	80-100'
Populus tremuloides	Quaking Aspen	30-60'
Salix nigra	Black Willow	40'
Tilia americana	Basswood	60-80'

Shrubs For Moist-Open Sites

Scientific Name	Common Name	Mature Height
Amelanchier canadensis	Shadbush	15'
Aronia arbutifolia/melanocarpa	Chokeberry	8-12'
Clethra alnifolia	Sweet Pepper Bush	3-10'
Cornus amomum	Silky Dogwood	15'
Cornus sericea	Red Osier Dogwood	7-10'
Cornus racemosa	Gray Dogwood	6-10'
Corylus americana	American Hazelnut	10'
Corylus cornuta	Beaked Hazelnut	10'
Ilex glabra	Inkberry	2-6'
Ilex verticillata	Winterberry	10'
Kalmia angustifolia	Sheep laurel	3'
Leucothoe fontanesiana	Drooping Leucothoe	3-7'
Lindera benzoin	Spicebush	10'
Sambucus canadensis	Elderberry	6'
Spirea latifolia	Meadowsweet	5'
Salix discolor	Pussy Willow	10'
Rhododenron maximum	Rosebay	12-15'
Rhododendron viscosum	Swamp Azalea	8'
Rubus odoratus	Pink Flowering Raspberry	5'
Viburnum cassinoides	Wild Raisin	6'
Vaccinium corymbosum	Highbush Blueberry	10'
Viburnum dentatum	Arrowood	5-8'
Viburnum trilobum	Highbush Cranberry	7'

Shrubs For Moist-Shady Sites

Scientific Name	Common Name	Mature Height
Corylius americana	Americn Hazelnut	6'
Cornus amomum	Silky Dogwood	15'
Hamamelis virginiana	Witch-hazel	15'
Kalmia latifolia	Mountain laurel	3-8'
Leucothoe fontanesiana	Drooping leucothoe	6'
Leucothoe racemosa	Swamp doghobble	8'
Lindera benzoin	Spicebush	10'
Lonicera villosa	Mt. Fly Honeysuckle	4'
Rhododendron arborescens	Sweet Azalea	9'
Rhododendron carolinianum	Carolina Rhododenron	6'
Rhododendron maximum	Rosebay Rhododendron	12-15'
Rubus odoratus	Pink Flowering Raspberry	5'
Vaccinium corymbosum	Highbush Blueberry	6-8'
Viburnum acerifolium	Maple-leaved Viburnum	6-8'
Viburnum dentatum	Arrowwood	5-8'
Viburnum trilobum	Highbush Cranberry	6-10'

Trees For Wet Sites

Scientific Name	Common Name	Mature Height
Acer negundo	Box Elder	60'

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Acer Rubrum	Red Maple	60'
Acer saccharinum	Silver Maple	70'
Chamaecyperis thyoides	Atlantic White Ceder	
Fraxinus pennsylvanica	Green Ash	40'
Fraxinus nigra	Black Ash	45'
Nyssa sylvatica	Black Tupelo	40-60'
Platanus occidentalis	Sycamore	100'
Thuja occidentalis	White Ceder	60'
Larix laricina	American Larch	80'
Quercus palustris	Swamp White oak	50-70'

Shrubs For Wet Sites

Scientific Name	Common Name	Mature Height
Alnus rugoas/serulata	Speckeld/Smooth Alder	10-15'
Cephalanthus occidentalis	Buttonbush	7'
Clethra alnifolia	Sweet Pepperbush	3-10'
Cornus amomum	Silky Dogwood	7'
Decodon verticillatus	Water Willow	3-5'
Ilex glabra	Inkberry	2-6'
Ilex verticillata	Winterberry	10'
Kalmia angustifolia	Sheep Laurel	3'
Lindera benzoin	Spicebush	10'
Lyonia ligustrina	Maleberry	2'
Salix discolor	Pussy Wllow	10'
Sambucus canadensis	Elderberry	6'

Trees For Sand Dunes

Scientific Name	Common Name	Mature Height
Juniperus virginiana	Eastern Red Cedar	

Shrubs For Sand Dunes

Scientific Name	Common Name	Mature Height
Myrica pensylvanica	'Wildwood' Bayberry	
Prunus maritima	'Ocean View' Beach Plum	
Rosa rugosa	'Sandy' Rugosa Rose	

Table 8. Establishment Note:
Wetland restoration/creation and establishment of riparian buffers call for planting stock adapted to moist or wet sites that also may be subject to flooding. The species listed above all occur naturally in the identified site moisture conditions, however attention needs to be given to the origin and source of the seedling stock to be planted. Origin is the geographic location where the seed or plants were first collected. Source is the supplier of the plants. Seedlings are oftentimes shipped long distances from production nurseries to wholesale nurseries from one region of the country to another. In situations like this, the species may not perform well in the habitats they will be introduced to and the plantings may fail. It is best to assure the origin and source of the material is adapted to the habitat of the planting site.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

TABLE 9: Establishment of Dune Vegetation							
Cultivar	**Planting Dates**	**Planting Unit**	**Method**	**Size**	**Depth**	**Spacing**	**Notes**
American Beachgrass	October 15 to April 1; non-frozen soil condition	Minimum two stems (culms) per hole	Hand placed, vegetable or tree planter	16 to 18 inch stems; > ¼ inch diameter	Approx. 8" deep (≥7" ≤9")	Severe sites = 12"X12" Normal sites = 18"X18" Stable sites = 24"X24"	Plant > 100 feet of horizontal distance from the mean high tide (MHT) water line. Plant a minimum of 10 parallel rows; stagger rows to maximize protection. Firm soil around plants to eliminate air pockets. If using dredged fill, allow salts to leach out before planting and allow rains to compact sands.
Saltmeadow Cordgrass	May 1 to June 15	3 to 5 live stems placed bare-root or container stock	Hand placed, or vegetable planter	> 12 inches	2 inches below the nursery grown depth	18 to 36 inches depending on the severity of the planting site	Utilize this species in low elevation sites of sand dunes that are frequently inundated.
Shrubs & Trees	March 15 to April 15, unless soil is frozen	1/1 or 2/1 or greater bare-root seedlings or container transplants	Hand placed, or tree planter	> 12 inches tall	2 inches below the nursery grown depth	4 to 6 feet apart; stagger rows for maximum protection	To ensure establishment (first 2 years) all competing vegetation must be removed from within 2 feet of each plant. It is important not to fertilize the surrounding vegetation which will potentially out-compete the tree or shrub.

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AECOM
10 Orms Street, Suite 405
Providence, RI 02904

401.274.5685 tel
401.521.2730 fax

Telephone Call Summary

By:	Eileen Banach	Date:	April 25, 2014
Talked with:	Al Averal	Project number:	60306709
From (company):	NRCS Pittsfield	Project name:	Connecticut Expansion
Phone number:	413.253.4382	Subject:	Response to consultation

Mr. Averal responded to the initial project consultation as well as additional pipe yard and access road consultation. He directed me to the MassGIS open space and land use layer to determine land in agricultural use and land with agricultural restrictions, and to the NRCS web soil survey to determine soil hazards. For direction on soils with erosion potential and seed mixes, he directed me to NRCS EFOTGs (technical guides).



Signature

Z:\Kinder_Morgan\60306709 CT Expansion\500-Deliverables\FERC\Consultations\Responses\MA NRCS Pittsfield 2014-04-25 (phone from) response to information request_direction to websites with soils data.docx

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AECOM
10 Orms Street, Suite 405
Providence, RI 02904

401.274.5685 tel
401.521.2730 fax

Telephone Call Summary

By:	Eileen Banach	Date:	January 23, 2014
Talked with:	Catherine Skiba	Project number:	60306709
From (company):	MA DEP	Project name:	Connecticut Expansion
Phone number:	413.755.2119	Subject:	Response to consultation

Ms. Skiba received consultation letter and called to direct me to the MA DEP website to obtain project information. She said all the information we are looking for is available via GIS data layers on their website.



Signature

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AECOM
10 Orms Street, Suite 405
Providence, RI 02904

401.274.5685 tel
401.521.2730 fax

Telephone Call Summary

By:	Eileen Banach	Date:	April 2, 2014
Talked with:	Catherine Skiba	Project number:	60306709
From (company):	MA DEP	Project name:	Connecticut Expansion
Phone number:	413.755.2119	Subject:	Response to consultation

Ms. Skiba responded to an email requesting information on aquifers and groundwater data. She indicated there was no data on bedrock aquifers, and if the MassGIS datalayer doesn't show stratified drift aquifers then there is no additional data. She said that mapping was done by USGS near river valleys to identify high yield aquifers so she is not surprised there is limited data in Sandisfield.

Ms Skiba said there are no groundwater quality mapping or standards she is aware of, but she would ask Wetland and Watersheds programs to verify. She said the only regulations she knows of requires that contaminant levels after spills must meet drinking water standards, unless the spill occurs in an area with municipal water supply.



Signature

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MassDEP
Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection
Western Regional Office • 436 Dwight Street, Springfield MA 01103 • 413-784-1100

DEVAL L. PATRICK
Governor

RICHARD K. SULLIVAN JR.
Secretary

DAVID W. CASH
Commissioner

April 16, 2014

Ms. Eileen Banach
AECOM
10 Oms Street, Suite 405
Providence, RI 02904

Re: **Sandisfield/Tyringham**
Public Records

Dear Ms. Banach:

This letter is sent in response to your Massachusetts Public Records Act request received by the Massachusetts Department of Environmental Protection (MassDEP), Springfield Regional Office on April 14, 2014. The request is regarding sensitive environmental areas near the Tennessee Gas Pipeline Company proposed Connecticut Expansion Project work areas in Sandisfield and Tyringham. Specific information you requested is as follows:

- Known instances of nay hazardous materials spills
- Sites known to be contaminated with hazardous materials
- Sites with on-going environmental remediation activities

All of MassDEP's Bureau of Waste Site Cleanup information is available on-line both in visual mapping and all documents. You can review State mapped confirmed release sites of hazardous waste or oil through the MassGIS Oliver web site. The link to the MassGIS Oliver website can be found at the following: http://maps.massgis.state.ma.us/map_ol/oliver.php. You may also request MassGIS data layers directly from MassGIS for AECOM's in-house GIS use at the following MassGIS webpage: http://www.mass.gov/anf/research-and-tech/it-serv-and-support/application-serv/office-of-geographic-information-massgis/.

Through MassGIS Oliver, you can view the layer that shows all Tier Classified sites under the Massachusetts Contingency Plan, MGL 21E by turning on the "*DEP Tier Classified 21E Sites*" layer. If there are any sites within your area of interest, a Release Tracking Number (RTN) will show up next to the map symbol. Please refer to the following MassDEP web site to view all documents associated with that site: http://public.dep.state.ma.us/SearchableSites2/Search.aspx. Alternatively, you may query street names and addresses directly in the Searchable data base as referenced. To view sites with an Activities and Use Limitation on the MassGIS Oliver site, turn on the layer "*Regulated Areas*".

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A quick reviewed the MassGIS Oliver map in the areas identified showed RTN 1-014946 southwest of Lower Spectacle Pond. MassDEP advises you to conduct your own detailed review of the MassGIS mapping and the MassDEP Searchable database as referenced above to ensure you have identified all sites. Please feel free to contact me for additional instruction for reviewing information online or with any other questions.

With respect to AECOM requesting information from MassDEP, please direct all inquiries to the Records Keeper for the specific Regional Office from which you are requesting documents or information or request to conduct a file review. For the Western Regional Office please direct your inquiries to me rather than to individual programs or to Kellie Niemiec for fil review. I will coordinate a Public Rcords response from the Springfield Regional Office and Kellie can assist with a file review request. If you have any questions related to this response, please feel free to contact me at your convenience at catherine.skiba@state.ma.us or 413-755-2119.

Respectfully,

Catherine V. Skiba, P.G.
Service Center Manager
Western Regional Office

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MassDEP
Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection
Western Regional Office • 436 Dwight Street, Springfield MA 01103 • 413-784-1100

DEVAL L. PATRICK
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Secretary

DAVID W. CASH
Commissioner

April 16, 2014

Ms. Eileen Banach
AECOM
10 Oms Street, Suite 405
Providence, RI 02904

Re: **Sandisfield/Tyringham**
Public Records

Dear Ms. Banach:

This letter is sent in response to your Massachusetts Public Records Act request received by the Massachusetts Department of Environmental Protection (MassDEP), Springfield Regional Office on April 14, 2014. The request is regarding sensitive environmental areas near the Tennessee Gas Pipeline Company proposed Connecticut Expansion Project work areas in Sandisfield and Tyringham. Specific information you requested is as follows:

- U.S. EPA, State or municipal designated aquifers
- State-designated aquifer protection areas
- Surface water that provide public drinking water supplies
- State designated surface water protection areas
- Any known existing or proposed public or private drinking water wells or springs within 30 feet of the proposed alignment.

MassDEP does not have records for EPA or municipal designated aquifers. To view State mapped potentially productive aquifers (these are USGS designated sand and gravel aquifers but not bedrock aquifers), aquifer protection areas (Zone 2 and IWPA) which are designated for specific public groundwater supplies, surface water protection areas (Zone A, B and C) which are designated for public surface water supplies you can review MassGIS Oliver. MassGIS Oliver site is at the following: http://maps.massgis.state.ma.us/map_ol/oliver.php. You may also request MassGIS data layers directly from MassGIS for AECOM's in-house GIS use at the following MassGIS webpage: http://www.mass.gov/anf/research-and-tech/it-serv-and-support/application-serv/office-of-geographic-information-massgis/.

In addition, although MassDEP does not regulate private water supplies, MassDEP has taken over regulatory control of the well drillers program and has attempted to catalogue existing

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

wells in Massachusetts. All of the currently available information can be queried at the following website: http://public.dep.state.ma.us/searchwell/. Additional information regarding the well drillers program is available at the following website: http://www.mass.gov/eea/agencies/massdep/water/drinking/well-driller-program-searchwell.html.

With respect to AECOM requesting information from MassDEP, please direct all inquiries to the Records Keeper for the specific Regional Office from which you are requesting documents or information. For the Western Regional Office please direct your inquiries to me rather than to individual programs at MassDEP. I will coordinate any response from the Springfield Regional Office. If you have any questions related to his response, please feel free to contact me at your convenience at catherine.skiba@state.ma.us or 413-755-2119 if you have any questions.

Respectfully,



Catherine V. Skiba, P.G.
Service Center Manager
Western Regional Office

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AECOM
10 Orms Street, Suite 405
Providence, RI 02904

401.274.5685 tel
401.521.2730 fax

Telephone Call Summary

By:	Eileen Banach	Date:	February 24, 2014
Talked with:	Victor Hrychvich	Project number:	60306709
From (company):	Sandisfield Health Department	Project name:	Connecticut Expansion
Phone number:		Subject:	Response to consultation

Mr. Hrychvich called in response to the January 2014 consultation letter. He indicated that the residences near the pipeline have private wells, and that all the water resources in the area drain into Clam river which then goes into the Farmington River. The Farmington River flows into a reservoir used as drinking water for Hartford, CT. Mr. Hrychvich asked for more detailed mapping of the project area and said that he would mark resources in the project area on the maps. He also suggested calling the Massachusetts Board of Health. Mr. Hrychvich said he is a landowner affected by the property and not in favor of it being built.



Signature

C:\Users\banache\Desktop\CT Expansion\Phone logs\Sandisfield board of health_Hrychvich_02242014.docx

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AECOM
10 Orms Street, Suite 405
Providence, RI 02904

401.274.5685 tel
401.521.2730 fax

Telephone Call Summary

By:	Eileen Banach	Date:	April 22, 2014
Talked with:	Victor Hrychvich	Project number:	60306709
From (company):	Sandisfield Health Department	Project name:	Connecticut Expansion
Phone number:		Subject:	Response to consultation

Mr. Hrychvich called with information regarding private drinking wells near the Project. He indicated that there are wells close to the project on properties off of South Beech Plain Road, Cold Spring Road, and Hammertown Road. The Hammertown Road property is a building lot with a well but no building.

Mr. Hrychvich also received the second consultation letter concerning access roads in Sandisfield. He said the access road south of Spectacle Pond goes through state land and is near a protected area of old growth hemlocks. I explained that Tennessee is in consultation with MA DCR concerning state lands.

Mr. Hrychvich will provide mapping with well locations marked on them to Bob Winter, Tennessee's land agent.

Eileen Banach

Signature

Z:\Kinder_Morgan\60306709 CT Expansion\500-Deliverables\FERC\Consultations\Responses\Sandisfield board of health 2014-04-22 (phone from) discussed private drinking water wells and natural resources near the Project in Sandisfield.docx

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Town of Agawam

36 Main Street Agawam, Massachusetts 01001-1837

Tel. 413-786-0400 Fax 413-786-9927

January 29, 2014

Eileen Banach
Environmental Scientist
AECOM
10 Orms Street, Suite 405
Providence, RI

Dear Ms. Banach:

I am in receipt of your letter dated January 21, 2014 concerning Tennessee Gas Pipeline Company's planned pipeline looping project. After speaking with our Law Department, the research that you have asked of this Department is excessive and appears to be the responsibility of either your company and/or your consultant. Much of the requested information would not be available in the Planning Department.

We would be happy to meet with you to discuss where you might obtain the information you seek.

Sincerely,

Deborah S. Dachos, Director
Office of Planning and Community Development

cc: Law Department

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AECOM
10 Orms Street, Suite 405
Providence, RI 02904

401.274.5685 tel
401.521.2730 fax

Telephone Call Summary

By:	Eileen Banach	Date:	January 24, 2014
Talked with:	John Decker	Project number:	60306709
From (company):	Agawam water department	Project name:	Connecticut Expansion
Phone number:	413.821.0627	Subject:	Response to consultation

Mr. Decker left a voicemail indicating that there are no utilities in the project area in Agawam as the alignment only in Agawam for a very short run.



Signature

C:\Users\banache\Desktop\CT Expansion\Phone logs\Agawam water dept_Decker_01242014.docx

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From: Banach, Eileen
To: Banach, Eileen
Subject: FW: EENF, TGP Connecticut Expansion, NHESP 13-32620, EEA No. 15205
Date: Wednesday, July 30, 2014 10:58:00 AM
Attachments: Sandisfield_13_32620_EENF_FishComment.pdf

From: Glorioso, Lauren (FWE) [mailto:lauren.glorioso@state.ma.us]
Sent: Monday, June 30, 2014 1:39 PM
To: Strysky, Alexander (ENV)
Cc: pkerr@agawam.ma.us; planning@agawam.ma.us; bbard@agawam.ma.us; sandisfieldtownclerk@verizon.net; MPuntin; almgrenk@berkshire.net; townhall@vcn.net; Stinson, Mark (DEP); Gardella, Mark
Subject: RE: EENF, TGP Connecticut Expansion, NHESP 13-32620, EEA No. 15205

All,

My apologies, but please disregard my previous email and attachment . Please see the current attachment which includes information on the warmwater and coldwater fisheries resources in the vicinity of this project. If you have questions or require a hard copy, please contact our office.

Sincerely,

Lauren Glorioso
Endangered Species Review Assistant
PLEASE NOTE NEW FIELD HEADQUARTERS ADDRESS
Natural Heritage & Endangered Species Program | Division of Fisheries & Wildlife | 100 Hartwell Street, Suite 230 | West Boylston, MA 01583 | ph: 508-389-6361 | fax: 508-389-7890 | lauren.glorioso@state.ma.us | **www.mass.gov/nhesp**

NHESP Website is now a part of Mass.gov - Please update your bookmarks with our new URL!

From: Glorioso, Lauren (FWE)
Sent: Monday, June 30, 2014 1:19 PM
To: Strysky, Alexander (EEA)
Cc: 'pkerr@agawam.ma.us'; 'planning@agawam.ma.us'; 'bbard@agawam.ma.us'; 'sandisfieldtownclerk@verizon.net'; 'MPuntin'; 'almgrenk@berkshire.net'; 'townhall@vcn.net'; Stinson, Mark (DEP); 'mark.gardella@aecom.com'
Subject: EENF, TGP Connecticut Expansion, NHESP 13-32620, EEA No. 15205

Good Afternoon,

Please see the attached letter regarding the Expanded Environmental Notification Form for the TGP Connecticut Expansion Project. If you have questions or require a hard copy, please contact our office.

Sincerely,

Lauren Glorioso
Endangered Species Review Assistant
PLEASE NOTE NEW FIELD HEADQUARTERS ADDRESS

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Natural Heritage & Endangered Species Program | Division of Fisheries & Wildlife | 100 Hartwell Street, Suite 230 | West Boylston, MA 01583 | ph: 508-389-6361 | fax: 508-389-7890 |
lauren.glorioso@state.ma.us | **www.mass.gov/nhesp**

NHESP Website is now a part of Mass.gov - Please update your bookmarks with our new URL!

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Commonwealth of Massachusetts

Division of Fisheries & Wildlife

MassWildlife

Wayne F. MacCallum, *Director*

June 30, 2014

Secretary Maeve Vallely Bartlett
Executive Office of Environmental Affairs
Attention: MEPA Office, Alex Strysky, EEA No. 15205
100 Cambridge St.
Boston, Massachusetts 02114

Project Name:	Connecticut Expansion Project
Proponent:	Tennessee Gas Pipeline Company, LLC
Location:	Agawam, Sandisfield, Tyringham
Document Reviewed:	Expanded Environmental Notification Form (EENF)
Project Description:	3.8 miles of new pipeline
NHESP Tracking No.	13-32620

Dear Secretary Bartlett:

The Natural Heritage & Endangered Species Program (NHESP) of the Massachusetts Division of Fisheries & Wildlife (Division) has reviewed the Expanded Environmental Notification Form (EENF) for the Connecticut Expansion Project and would like to offer the following comments.

There are two potential areas associated with this project located within *Priority Habitat* and *Estimated Habitat* as indicated in the 13th Edition of the *MA Natural Heritage Atlas* and therefore the project requires review through a direct filing with NHESP for compliance with the Massachusetts Endangered Species Act (MESA 321 CMR 10.00) and its implementing regulations (MESA, 321 CMR 10.00). Review of the NHESP database indicates that the proposed pipeline corridor is located within mapped habitat for the Umber Shadowdragon (*Neurocordulia obsoleta)*, a dragonfly listed as "Special Concern" pursuant to the MESA. The proposed pipeyard in Tyringham is mapped for Sedge Wren (*Cistothorus platensis*) and American Bittern (*Botaurus lentiginosus*); both birds are listed as "Endangered" pursuant to the MESA. Additionally, portions of this pipeyard area are mapped for the Wood Turtle (*Glyptemys insculpta*), a species listed as "Special Concern" pursuant to the MESA. Based on the preliminary information included in the EENF, it appears that the proposed activities (including the proposed hydrostatic pressure testing) could be conditioned to avoid a prohibited "take" of state-listed species. However, more detailed information on the limit of work, especially associated with the pipeyard, should be included in the MESA filing for review. The Division anticipates being able to resolve any outstanding state-listed species issues through the MESA review process.

The Division will not render a final decision until the MEPA review process and associated public and agency comment period is completed, and until all required MESA filing materials are submitted by the proponent to the Division. As our MESA review is ongoing, no alteration to the soil, surface, or vegetation and no work associated with the proposed project shall occur on the property until the Division has made a final determination. If you have any questions or need additional information, please contact Eve Schlüter, Ph.D., Senior Endangered Species Review Biologist, at (508) 389-6346 or eve.schluter@state.ma.us.

Division of Fisheries and Wildlife
Temporary Correspondence: 100 Hartwell Street, Suite 230, West Boylston, MA 01583
Permanent: Field Headquarters, North Drive, Westborough, MA 01581 (508) 389-6300 Fax (508) 389-7890
An Agency of the Department of Fish and Game

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FISHERIES COMMENTS

The Clam River itself is a coldwater fisheries resource. Fisheries surveys have yielded: Blacknose Dace (*Rhinichthys atratulus*), native Brook Trout (*Salvelinus fontinalis*), Brown Bullhead (*Ameiurus nebulosus*), reproducing Brown Trout (*Salmo trutta*), Common Shiner (*Notropis cornutus*), Creek Chub (*Semotilus atromaculatus*), Cutlips Minnow (*Exoglossum maxillingua*), Longnose Dace (*Rhinicthys cataractae*), Pumpkinseed (*Lepomis gibbosus*), Slimy Sculpin (*Cottus cognatus*), Smallmouth Bass (*Micropterus dolomieu*), Tessellated Darter (*Etheostoma olmstedi*), White Sucker (*Catastomus commersoni*) and Yellow Perch (*Perca flavescens*). Additionally, the river is annually stocked in the spring with Brook Trout, Brown Trout, Rainbow Trout (*Oncorhynchus mykiss*) and/or Tiger Trout (*Salmo trutta x Salvelinus fontinalis*). Coldwater fisheries resources are highly susceptible to changes in water quality and/or quantity such as siltation and run-off, water level fluctuations, loss of riparian habitat, stream fragmentation and alterations of the temperature regime. Therefore, the project must not in any way diminish the ability of the river to support coldwater fish species.

The Fisheries Section currently does not have fisheries survey information for the unnamed tributaries to the Clam River. However, surveys conducted by the Division have shown the importance of coldwater tributaries in helping maintain the coldwater status of their receiving waters. Until fisheries surveys are conducted, these unnamed tributaries should be treated as coldwater.

Fisheries surveys of Spectacle Pond Brook have yielded: Bluegill (*Lepomis macrochirus*), Brown Bullhead (*Ameiurus nebulosus*) and Largemouth Bass (*Micropterus salmoides*).

Lower Spectacle Pond contains a warmwater fishery. Fisheries surveys have yielded: Bluegill (*Lepomis macrochirus*), Brown Bullhead (*Ameiurus nebulosus*), Chain Pickerel (*Esox niger*), Golden Shiner (*Notemigonus crysoleucas*), Largemouth Bass (*Micropterus salmoides*), Pumpkinseed (*Lepomis gibbosus*) and Yellow Perch (*Perca flavescens*).

If you have any questions regarding fisheries information, please contact Rich Hartley, Fisheries Biologist, at (508) 389-6330 or richard.hartley@state.ma.us.

Sincerely,

Thomas W. French

Thomas W. French, Ph.D.
Assistant Director

cc: Mark Gardella, AECOM
Agawam Board of Selectmen
Agawam Conservation Commission
Agawam Planning Department
Sandisfield Board of Selectmen
Sandisfield Conservation Commission
Sandisfield Planning Department
Tyringham Board of Selectmen
Tyringham Conservation Commission
Tyringham Planning Department
DEP Western Regional Office, MEPA Coordinator

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From:	Banach, Eileen
To:	Banach, Eileen
Subject:	FW: TGP CT Expansion Project, NHESP Tracking No. 13-32620
Date:	Wednesday, July 30, 2014 11:18:00 AM
Attachments:	MESA_Cvr_Ltr_CT_Exp_Pre_Filing_Consult_7_8_11.pdf

From: OSullivan, Tim
Sent: Tuesday, July 08, 2014 2:07 PM
To: eve.schluter@state.ma.us
Cc: Gardella, Mark
Subject: TGP CT Expansion Project, NHESP Tracking No. 13-32620

Eve,

In response to your request for additional Project related information in advance of our scheduled pre-filing consultation meeting on July 15th, please find the attached letter and supporting materials. Should you have any questions pertaining to any of the information within it, please contact me at any time at the number below.

We look forward to discussing the details of the proposed Project with you and thank you for your continued attention to the Project.

Tim

Timothy P. O'Sullivan MS, PWS
Project Manager
Wetland and Wildlife Biologist
tim.osullivan@aecom.com

Cell Phone 978-621-6756

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Rocky Hill, CT 06067
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AECOM
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Rocky Hill, CT 06067-3913

860 263 5800 tel
860 263 5777 fax

July 8, 2014

Ms. Everose Schlüter, PhD
Senior Endangered Species Review Biologist
Natural Heritage & Endangered Species Program
MA Division of Fisheries and Wildlife
100 Hartwell Street, Suite 230
West Boylston, MA 01583

Subject: **MESA Pre-Filing Consultation Meeting Materials**
Tennessee Gas Pipeline Company, L.L.C.
Connecticut Expansion Project
Agawam, Sandisfield and Tyringham, MA

Dear Ms. Schlüter,

As you know, the Tennessee Gas Pipeline Company, L.L.C. ("Tennessee") is in the process of designing and permitting the Connecticut Expansion Project (the "Project"). Two components of the Project are located in Priority Habitat ("PH") and Estimated Habitat "EH". Projects occurring within PH and EH are typically subject to the jurisdiction of the Massachusetts Endangered Species Act ("MESA"). Accordingly, Tennessee has requested a pre-filing consultation meeting to provide your office with a general overview of the Project, permitting, anticipated impacts to PH and EH and proposed mitigation measures. In advance of the July 15th meeting, enclosed please find Project materials which should facilitate a productive meeting.

Project Overview

Tennessee has operated pipelines in Massachusetts as part of its interstate pipeline network for more than 60 years and is now proposing the Connecticut Expansion Project to expand that pipeline network to serve an existing demand for natural gas in the service area. This Project will involve construction of pipelines and related facilities in three states – New York, Connecticut and Massachusetts. In Massachusetts, the Project consists of approximately 3.8 miles of new 36-inch outside diameter ("OD") pipeline, co-located within or adjacent to Tennessee's existing "200 Line" right-of-way ("ROW") in Sandisfield, Massachusetts, and 0.11 miles of 24-inch OD pipeline co-located within or adjacent to Tennessee's "300 Line" ROW in Agawam, Massachusetts. In addition, Tennessee is proposing to utilize a pipe yard in Tyringham, MA, at which it will store equipment and material in support of construction.

Tennessee is currently compiling information to file its application for a Certificate of Public Convenience and Necessity (the "Certificate") from the Federal Energy Regulatory Commission ("FERC") for the Project. Upon completion, the Project will increase delivery capability to New York,

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Connecticut and southern Massachusetts by approximately 72.1 million dekatherms per day by looping the existing pipeline.

The Project is needed to meet the current demand for increased natural gas in the region and is not related to or contingent upon other potential projects or expansions by Tennessee in Massachusetts. Tennessee has evaluated alternative routes to serve the increased demand for the area served by the existing pipeline network, and is proposing the route that minimizes impacts to the environment and has made every effort to utilize the existing ROW.

General Regulatory Overview

In addition to the Massachusetts Environmental Policy Act ("MEPA"), MESA and other state environmental protection regulatory programs, the Project is ultimately subject to the jurisdiction of FERC which also requires a comprehensive environmental review process under the National Environmental Policy Act ("NEPA"). As part of its FERC application, Tennessee will be submitting an Environmental Report ("ER") that provides detailed information regarding existing conditions, potential project-related impacts and proposed impact avoidance and minimization measures for a number of environmental resources including land use, wetlands, threatened and endangered species, soils, geology and vegetation. After reviewing the ER, FERC will prepare an Environmental Assessment that will include proposed conditions to ensure the continued protection of the resources present within the Project alignment.

The Project is also subject to the jurisdiction of the United States Army Corps of Engineers ("USACE"), a 401 Water Quality Certification from Massachusetts Department of Environmental Protection ("MA DEP") and the Wetlands Protection Act, administered jointly by MADEP and the Agawam, Tyringham and Sandisfield Conservation Commissions. Each of these agencies will be reviewing the Project relative to compliance with applicable standards and regulations for work within wetlands and waterways.

A portion of the proposed work will occur on lands controlled by the MA Department of Conservation and Recreation ("DCR"). Therefore, Tennessee will be seeking Article 97 legislation for work on state lands. Tennessee is actively working with the DCR to minimize impacts on state lands and ensure appropriate mitigation. In addition, the FERC environmental review process will ensure that the interests of the DCR are represented and protected.

Tennessee is currently in the process of preparing the various permit applications and will continue to coordinate with each agency relative to its review process.

Massachusetts Endangered Species Act

According to the MA NHESP, two components of the Project are located in PH and EH. The proposed pipe yard in Tyringham is located in PH 1454 and EH 8 (Figure 1, Appendix A) and the proposed water withdrawal site in Sandisfield (Lower Spectacle Pond, Figure 2, Appendix A) is located in PH 702 and EH 602. Accordingly, Project activities occurring within these areas are subject to the jurisdiction of MESA. A discussion of the proposed activities, a summary of anticipated impacts and proposed mitigation measures for each site is included below. Due to the relatively minor impacts associated with the proposed activities and the proposed timing of mitigation measures, Tennessee believes it can avoid a "Take" under MESA. In addition, the June 30, 2014 letter from the MA NHESP to the MA Executive Office of Environmental Affairs (Appendix B) indicated the proposed actions at the two subject sites could be conditioned to avoid a prohibited

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"Take" of state-listed species. The letter also requested additional information, which is provided below.

Tyringham Pipe Yard

According to the MA NHESP, the proposed pipe yard site may provide habitat for three state-listed species. Table One presents this information.

Table One. State-listed Species Potentially associated with the Tyringham Pipe Yard

Common Name	Scientific Name	State Status
Sedge Wren	*Cistothorus platensis*	Endangered
American Bittern	*Botaurus lentiginosus*	Endangered
Wood Turtle[1]	*Glyptemys insculpta*	Species of Special Concern

1 Only a portion of the proposed pipe yard is mapped as habitat for this species.

Sedge Wren

The sedge wren is small and secretive. It prefers to breed in short grass and sedge marshes, with the nest often constructed in rushes, sedges or grasses within one to two feet of muddy ground or shallow water. This species has been documented as breeding in highly transitory habitats and tends to utilize differing patches of habitat on a nearly annual basis. Sedge wrens eat a variety of invertebrates. Therefore, if present in the area, it is possible that this species could potentially utilize the area proposed for the pipe yard for foraging. Existing conditions in the active, upland, hayfield are unlikely to provide suitable nest sites for this species.

American Bittern

The American bittern breeds and stalks its prey in freshwater marshes with tall vegetation, where it is very difficult to locate. This species would not typically utilize an upland hay field for nesting or foraging. Hop Brook is located to the north, west and south of the proposed pipe yard. This low gradient, perennial stream is associated with extensive wet meadow, marsh and scrub/shrub wetland habitats. These latter areas would serve as the primary habitat for any American bitterns that may occur in the area. Therefore, Tennessee does not anticipate negatively impacting this species or its habitat.

Wood Turtle

The wood turtle prefers low gradient streams with sandy bottoms and associated riparian habitats. This species spends a considerable amount of time on land in mixed deciduous forests, floodplains, hay fields, and wetlands of various types, where it forages for food and nests. Nesting typically takes place in areas with sandy/gravelly soils with some aspect of southern exposure. Based upon the existing conditions observed at the proposed pipe yard and the presence of Hop Brook and associated riparian areas nearby, it is possible that wood turtles could, at times, utilize the area for foraging. However, no nesting activity would be expected to occur there because the soils are not suitable and the hay field is heavily vegetated.

Tennessee plans to use 1.94 acres of active hay field as a pipe yard to store equipment and materials in support of construction. The entire pipe yard is within uplands and no wetland areas will be impacted by the use of the pipe yard. Additionally, no woody vegetation will need to be cleared to accommodate the pipe yard. A photograph of the proposed pipe yard is included in Appendix C.

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In later winter or very early spring 2015, Tennessee anticipates placing construction mats over a portion of the 1.94 acre proposed pipe yard and associated access road, while simultaneously installing a perimeter of properly dug in silt fencing. Details of the mats which may be used are included herein as Appendix D. A final decision on the exact matting has not been made at this time. Mat placement would take place prior to sedge wrens returning to the area for the pending breeding season and prior to wood turtles emerging from Hop Brook after over-wintering. The construction mats and silt fencing would remain in place for approximately one year and would be removed some time during the late winter or early spring of 2016. The hay field would then presumably be put back into regular production for the 2016 growing season. Using this approach, both the sedge wren and the wood turtle would be excluded from using the area for one season.

Given that the proposed pipe yard area is on the edge of the PH mapping, is small (< 2 acres) and there is an abundance of hay fields in the immediate area, it is AECOM's opinion that the local populations of sedge wren and wood turtle would not be negatively affected by being temporarily excluded from the area for one season. There is an abundance of more suitable habitat for both species associated with Hop Brook in Tyringham Valley. In our opinion, Tennessee would therefore avoid a "Take" of these species under MESA. As previously stated, it is anticipated that the land owner would resume the regular harvest of hay from the field after the construction mats and silt fencing are removed.

Lower Spectacle Pond Water Withdrawal Location, Sandisfield

According to the MA NHESP, Lower Spectacle Pond provides habitat for the umber shadowdragon (*Neurocordulia obsoleta*). This species is listed as a species of special concern pursuant to MESA. Umber shadowdragons prefer sparsely vegetated lakes and sections of rivers of various sizes. This species does well in man-made habitats such as sections of impounded rivers and reservoirs. The species has a flight period from mid-May through mid-August.

In compliance with United States Department of Transportation specifications, Tennessee will conduct hydrostatic testing on all segments of the pipeline prior to placing it in service. Tennessee anticipates using water from Lower Spectacle Pond for hydrostatic pressure testing and plans on accessing the pond from an existing boat ramp off of Cold Spring Road. A photograph of the proposed withdrawal area is included in Appendix C. Tennessee is proposing to install a pump at the end of the ramp in a secondary containment structure to avoid the potential for a fuel and/or oil spill. A spill kit containing materials designed to contain a release would be kept on site for the duration of the withdrawal process. A suction hose would be attached to the pump with a dissipation device (screen) attached to the end, to avoid the entrainment of fish and other wildlife. The intake and screen will be suspended in the water column and elevated off the bottom by attaching floats, to avoid the withdrawal of mud and sediment from the bottom. The process of installing the elevated/suspended intake hose and screen will be done from a small boat and/or on foot. Therefore, the process is anticipated to avoid disturbing insect larvae, including any odonate larvae which may be present, by avoiding impacts to the bottom substrate. Timing of the withdrawal (fall) would avoid the flight period of the umber shadowdragon, further reducing any chance of negative impacts to this listed species.

Lower Spectacle Pond has a surface area of approximately 70 acres. The proposed withdrawal volume for hydrostatic test water is approximately 1,025,00 gallons or 3 acre-feet. To complete the withdrawal in the proposed 8 hour timeframe, the withdrawal rate would need to be approximately 2,000 gallons per minute. The overall effect on Lower Spectacle Pond from the proposed withdrawal would be a reduction in depth of approximately 0.04 feet over the entire pond and is not anticipated to have a discernible impact on local wildlife or human users.

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Upon completion of the hydrostatic tests, the test water will be discharged to an upland area through a dewatering structure consisting of an energy dissipation device and water filtration structure. The discharge rate of the test water will be regulated using valves and energy dissipation devices to reduce the potential for erosion. This clean test water (no chemical additives are used during testing) will only be discharged into areas where adequate vegetation is present, adjacent to the construction ROW. All discharge activities will be monitored through the duration of the activity to ensure proper function of the structures utilized and to prevent erosion and sedimentation from occurring as a result of dewatering activities. Hydrostatic test water discharge is anticipated to occur over an 8 hour period, similar to the fill rate. Tennessee anticipates that test water will infiltrate into the ground and move as sheet flow across well vegetated areas before reaching surface waters downstream. Tennessee does not anticipate that this limited quantity of water would impact downstream areas and will monitor and slow the discharge rate, if necessary, to prevent any downstream impacts from the discharge. Environmental impacts from withdrawal and discharge of test water will be minimized by utilizing the measures outlined in FERC's Plan & Procedures and Tennessee's Construction BMP's as well as by complying with all applicable permit requirements.

Should you have any questions regarding any of the materials submitted herein, please contact Tim O'Sullivan, at 978-621-6756 or via email at tim.osullivan@aecom.com. Tennessee appreciates your advanced consideration of these materials and we look forward to speaking with you on July 15, 2014 at the pre-filing consultation meeting.

Sincerely,



Timothy O'Sullivan MS, PWS
Wetland and Wildlife Biologist
tim.osullivan@aecom.com

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Appendix A

Site Loci

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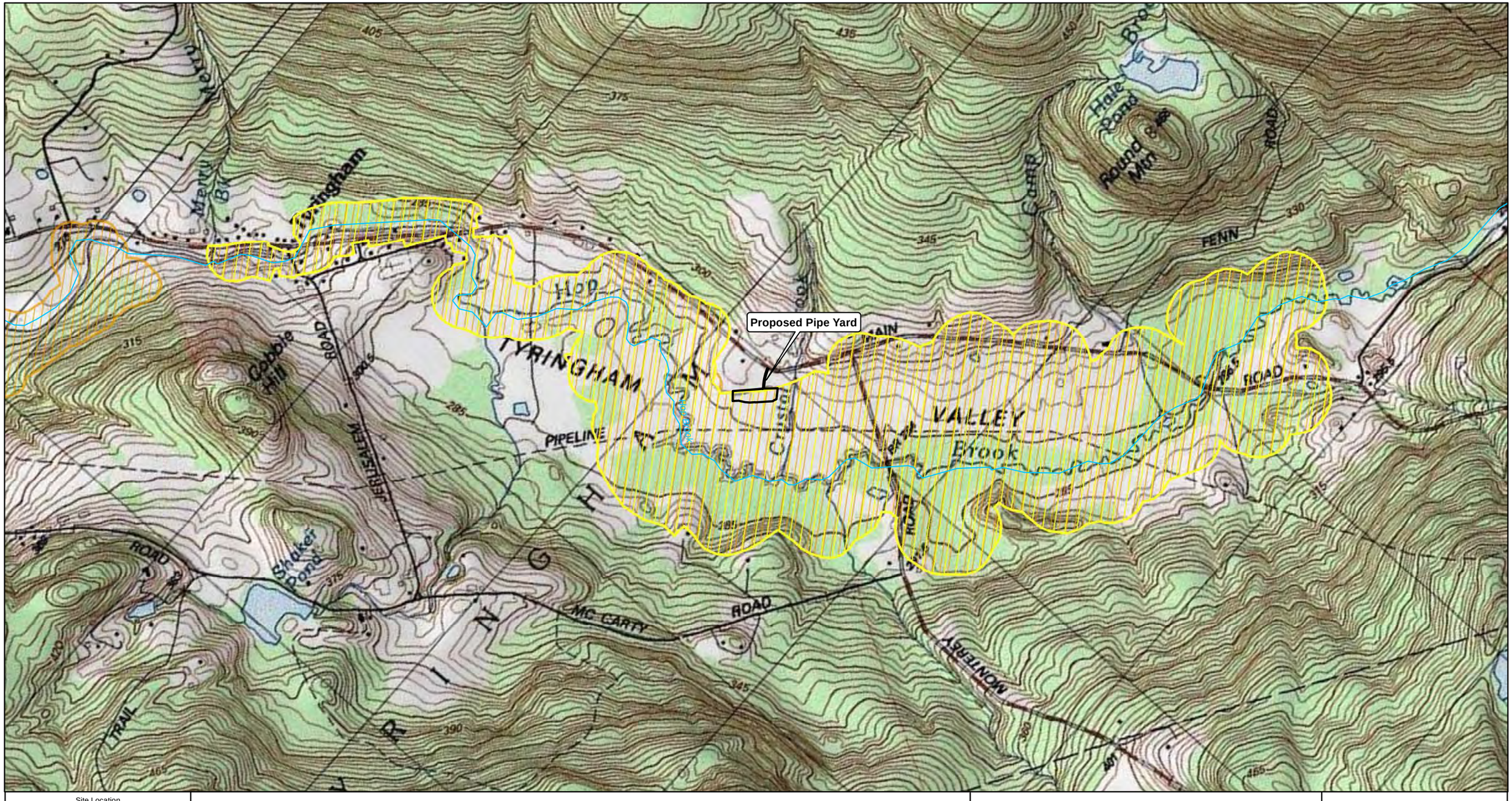
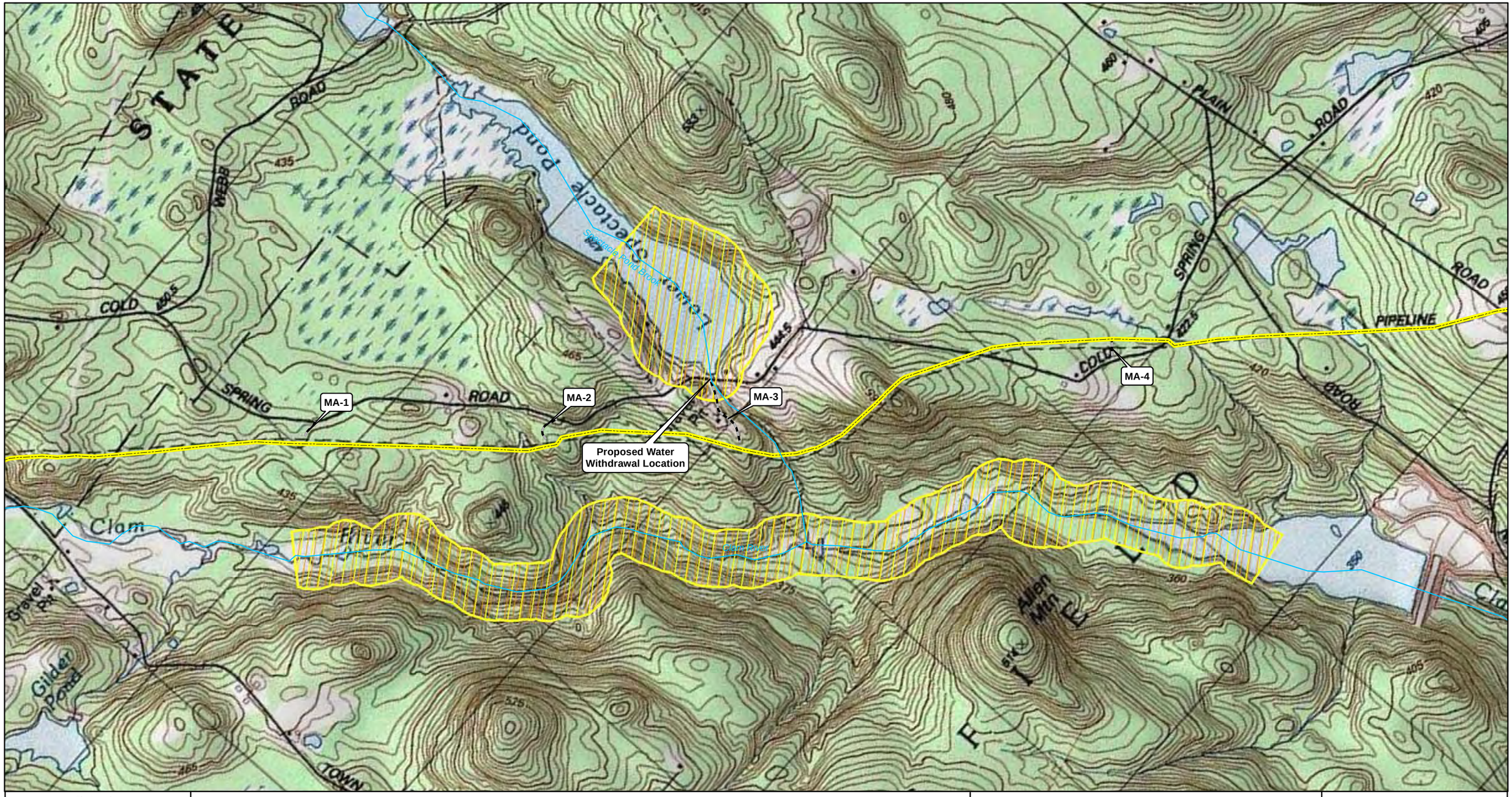
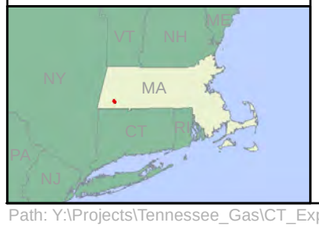

Proposed Pipe Yard
TYRINGHAM
VALLEY
Brook
Cobble Hill
ROAD
PIPELINE
Shaker Pond
MC CARTY
ROAD
MONTEREY
FENN
ROAD
Hale Pond
Round Mtn
Merry Br
Cold
Cold
Cold



Site Location



Legend

- Proposed Project Centerline
- Access Roads
- Pipeyards
- NHESP 2013 Estimated Habitats of Rare Wildlife
- NHESP 2009 Priority Habitats of Rare Species

Tennessee Gas Pipeline Company

CT Expansion Project

MA NHESP Areas

0 500 1,000 2,000 Feet

1 Inch = 1,140 feet

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

Figure 2

June 2014

Path: Y:\Projects\Tennessee_Gas\CT_Expansion_Project\Maps\MESA\CT_Expansion_MA_NHESP.mxd

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Appendix B

MA NHESP Letter to MEPA

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Commonwealth of Massachusetts

Division of Fisheries & Wildlife

MassWildlife

Wayne F. MacCallum, *Director*

June 30, 2014

Secretary Maeve Vallely Bartlett
Executive Office of Environmental Affairs
Attention: MEPA Office, Alex Strysky, EEA No. 15205
100 Cambridge St.
Boston, Massachusetts 02114

Project Name:	Connecticut Expansion Project
Proponent:	Tennessee Gas Pipeline Company, LLC
Location:	Agawam, Sandisfield, Tyringham
Document Reviewed:	Expanded Environmental Notification Form (EENF)
Project Description:	3.8 miles of new pipeline
NHESP Tracking No.	13-32620

Dear Secretary Bartlett:

The Natural Heritage & Endangered Species Program (NHESP) of the Massachusetts Division of Fisheries & Wildlife (Division) has reviewed the Expanded Environmental Notification Form (EENF) for the Connecticut Expansion Project and would like to offer the following comments.

There are two potential areas associated with this project located within *Priority Habitat* and *Estimated Habitat* as indicated in the 13th Edition of the *MA Natural Heritage Atlas* and therefore the project requires review through a direct filing with NHESP for compliance with the Massachusetts Endangered Species Act (MESA 321 CMR 10.00) and its implementing regulations (MESA, 321 CMR 10.00). Review of the NHESP database indicates that the proposed pipeline corridor is located within mapped habitat for the Umber Shadowdragon (*Neurocordulia obsoleta)*, a dragonfly listed as "Special Concern" pursuant to the MESA. The proposed pipeyard in Tyringham is mapped for Sedge Wren (*Cistothorus platensis*) and American Bittern (*Botaurus lentiginosus*); both birds are listed as "Endangered" pursuant to the MESA. Additionally, portions of this pipeyard area are mapped for the Wood Turtle (*Glyptemys insculpta*), a species listed as "Special Concern" pursuant to the MESA. Based on the preliminary information included in the EENF, it appears that the proposed activities (including the proposed hydrostatic pressure testing) could be conditioned to avoid a prohibited "take" of state-listed species. However, more detailed information on the limit of work, especially associated with the pipeyard, should be included in the MESA filing for review. The Division anticipates being able to resolve any outstanding state-listed species issues through the MESA review process.

The Division will not render a final decision until the MEPA review process and associated public and agency comment period is completed, and until all required MESA filing materials are submitted by the proponent to the Division. As our MESA review is ongoing, no alteration to the soil, surface, or vegetation and no work associated with the proposed project shall occur on the property until the Division has made a final determination. If you have any questions or need additional information, please contact Eve Schlüter, Ph.D., Senior Endangered Species Review Biologist, at (508) 389-6346 or eve.schluter@state.ma.us.

Division of Fisheries and Wildlife
Temporary Correspondence: 100 Hartwell Street, Suite 230, West Boylston, MA 01583
Permanent: Field Headquarters, North Drive, Westborough, MA 01581 (508) 389-6300 Fax (508) 389-7890
An Agency of the Department of Fish and Game

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FISHERIES COMMENTS

The Clam River itself is a coldwater fisheries resource. Fisheries surveys have yielded: Blacknose Dace (*Rhinichthys atratulus*), native Brook Trout (*Salvelinus fontinalis*), Brown Bullhead (*Ameiurus nebulosus*), reproducing Brown Trout (*Salmo trutta*), Common Shiner (*Notropis cornutus*), Creek Chub (*Semotilus atromaculatus*), Cutlips Minnow (*Exoglossum maxillingua*), Longnose Dace (*Rhinicthys cataractae*), Pumpkinseed (*Lepomis gibbosus*), Slimy Sculpin (*Cottus cognatus*), Smallmouth Bass (*Micropterus dolomieu*), Tessellated Darter (*Etheostoma olmstedi*), White Sucker (*Catastomus commersoni*) and Yellow Perch (*Perca flavescens*). Additionally, the river is annually stocked in the spring with Brook Trout, Brown Trout, Rainbow Trout (*Oncorhynchus mykiss*) and/or Tiger Trout (*Salmo trutta x Salvelinus fontinalis*). Coldwater fisheries resources are highly susceptible to changes in water quality and/or quantity such as siltation and run-off, water level fluctuations, loss of riparian habitat, stream fragmentation and alterations of the temperature regime. Therefore, the project must not in any way diminish the ability of the river to support coldwater fish species.

The Fisheries Section currently does not have fisheries survey information for the unnamed tributaries to the Clam River. However, surveys conducted by the Division have shown the importance of coldwater tributaries in helping maintain the coldwater status of their receiving waters. Until fisheries surveys are conducted, these unnamed tributaries should be treated as coldwater.

Fisheries surveys of Spectacle Pond Brook have yielded: Bluegill (*Lepomis macrochirus*), Brown Bullhead (*Ameiurus nebulosus*) and Largemouth Bass (*Micropterus salmoides*).

Lower Spectacle Pond contains a warmwater fishery. Fisheries surveys have yielded: Bluegill (*Lepomis macrochirus*), Brown Bullhead (*Ameiurus nebulosus*), Chain Pickerel (*Esox niger*), Golden Shiner (*Notemigonus crysoleucas*), Largemouth Bass (*Micropterus salmoides*), Pumpkinseed (*Lepomis gibbosus*) and Yellow Perch (*Perca flavescens*).

If you have any questions regarding fisheries information, please contact Rich Hartley, Fisheries Biologist, at (508) 389-6330 or richard.hartley@state.ma.us.

Sincerely,

Thomas W. French

Thomas W. French, Ph.D.
Assistant Director

cc: Mark Gardella, AECOM
Agawam Board of Selectmen
Agawam Conservation Commission
Agawam Planning Department
Sandisfield Board of Selectmen
Sandisfield Conservation Commission
Sandisfield Planning Department
Tyringham Board of Selectmen
Tyringham Conservation Commission
Tyringham Planning Department
DEP Western Regional Office, MEPA Coordinator

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Appendix C

Site Photographs

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Portion of Proposed Pipe Yard, Facing NW, Tyringham, MA



Proposed Water Withdrawal Location, Facing SW, Sandisfield, MA

Lower Spectacle Pond

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Appendix D

Mega Deck Specifications

MEGADECK®

MEGADECK PRODUCT SPECIFICATIONS



Mat Size

Full Size Mat (consists of two half mats permanently bolted together):
Actual: 4.2672m / 14ft (L) x 2.286m / 7.5ft (W) x 10.795cm / 4in (D)
Usable (due to flange): 3.9624m / 13ft (L) x 1.812m / 6.5ft (W) x 10.795cm / 4cm (D)

Half Size Mat:
Actual: 2.286m / 7.5ft (L) x 2.286m / 7.5ft (W) x 10.795cm / 4in (D)
Usable (due to flange): 1.812m / 6.5ft (L) x 1.812m / 6.5ft (W) x 10.795cm / 4cm (D)

Weight

1,050 lbs / 476.272 kg

Colors

Beige. Custom colors available.

Mat Design

Each MegaDeck mat is molded from a single piece of HDPE, with special proprietary fillers and additives that provide additional strength, rigidity, and impact resistance.

Mat sections incorporate a weight-saving ribbed interior structure that provides tremendous weight-bearing capacity, while allowing for sections to be easily handled by a standard forklift.

A solid HDPE plate is bolted to the top of each mat to close off the ribbed interior and to provide a water seal that prevents dirt, water, and debris from penetrating the mat. Each MegaDeck top section is sealed with a specialized gasket that handles mat flexure and other everyday abuses.

MegaDeck mats incorporate flanges on both sides that allow mats to connect to adjacent panels. Flanges are solid HDPE for added durability. Each flange incorporates a heavy radius design, providing additional strength and shear resistance. Once nested into adjacent panels, the solid HDPE flange system provides rigidity and strength.

Each mat may be reconfigured into 7.5' x 7.5' (2.286 m x 2.286 m) (half mats) at the user's request, allowing for greater layout flexibility. Half sections may be used to create straight edges as desired and allow for more options in site design and transportability.

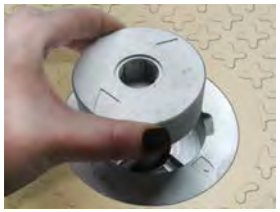
Material Composition

Each MegaDeck mat is manufactured using the highest quality virgin HDPE, with special impact modifiers and fillers to accommodate thermal expansion, incorporate UV resistance, and to provide tremendous strength. An anti-static (static dissipative) additive is molded into each mat, to allow for use in environments where static could pose a problem.

Connection System

MegaDeck sections may be interconnected using MegaDeck's proprietary connection system. This connection system consists of a self aligning locking mechanism that connects the overlapping flange from adjacent mats, allowing sections to bear tremendous weights. An ultra-secure connection between your MegaDeck panels is achieved with a simple twist of a standard hex key. All lock components are made from heavy-duty cast aluminum that will not rust, break, or corrode.








Surface Traction Design

Each mat incorporates our low-profile "pedestrian" design that provides traction and slip resistance in the field. The pattern is designed to be easily cleaned and to function well with mud, sand, dirt, and other common on-site substances such as oil and grease. This design provides good traction for pedestrians, vehicles, and all types of rolling equipment, including dozers and other tracked vehicles.

Packing and Loading

Mats may be loaded into standard ISO containers and are specially designed to maximize volume in containers for overseas transport. Mats are easily loaded onto BOTH flat bed and enclosed van trucks, allowing maximum flexibility in transport.

U.S. standard truck: 42 mats – 3 stacks each, 14 mats high
40ft ISO shipping container: 42 mats – 2 stacks each, 17 full mats high + 1 stack, 16 half mats high
20ft ISO shipping container: - 18 mats - 1 stack, 18 full mats high

Cleaning Method

Sections may be cleaned with a standard industrial grade pressure washer, brushes, and ordinary cleaning solutions. MegaDeck mats are easy to maintain and to clean and will not absorb water or other contaminants.

Inventory & Tracking

All mats have unique serial numbers for inventory control and tracking.

Optional RFID chips are available for each mat and are incorporated into the core of the mat during the manufacturing process. Simply specify if you are interested in tracking your mats using a computerize inventory control and tracking system.

Offered by: NEW SOUTH ACCESS & ENVIRONMENTAL SOLUTIONS

281 Old Jackson Road Madison, MS 39110
Toll-free: 866.922.6287 (MATS) Direct: 601.859.7472 Fax: 601.859.7462
http://www.newsouthmat.com

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AECOM
10 Orms Street, Suite 405
Providence, RI 02904

401.274.5685 tel
401.521.2730 fax

Massachusetts Natural Heritage and Endangered Species Program

MESA Pre-Filing Consultation Meeting Summary

By:	Tim O'Sullivan	Date:	7/15/14
Met with:	Ms. Eve Schlüter, PhD	Project number:	60306709
From (company):	MA NHESP	Project name:	CT Expansion
Phone number:	508-389-6346	Subject:	MESA

Distribution: Mark Gardella Eileen Banach

On July 15, 2014, I met with Ms. Eve Schlüter of the Massachusetts Natural Heritage and Endangered Species Program in West Boylston, MA regarding the Kinder Morgan CT Expansion Project and the pending Massachusetts Endangered Species Act (MESA) filing. During this pre-filing consultation meeting I present an overview of the Project components which occur within Priority Habitats (PH) and Estimated Habitats (EH) and would therefore be subject to the jurisdiction of MESA. Ms. Schlüter was familiar with the Project and had read the materials AECOM submitted to the MA NHESP via e-mail on July 8, 2014. Specifically, we discussed the anticipated activities at the proposed pipe yard in Tyringham and the water withdrawal process from Lower Spectacle Pond in Sandisfield and how we propose to reduce and/or eliminate negative impacts to state-listed species and/or their habitats. The discussion of each site is summarized below.

Proposed Pipe Yard, Tyringham

The MA NHESP, has records for three state-listed species in the vicinity of the proposed pipe yard. These species are identified in Table 1.

Table One. State-listed Species Potentially associated with the Tyringham Pipe Yard

Common Name	Scientific Name	State Status
Sedge Wren	*Cistothorus platensis*	Endangered
American Bittern	*Botaurus lentiginosus*	Endangered
Wood Turtle[1]	*Glyptemys insculpta*	Species of Special Concern

1 Only a portion of the proposed pipe yard is mapped as habitat for this species.

Conversations with Ms. Schlüter determined that the American bittern is not a concern for the pipe yard and no further action is required by Tennessee Gas Pipeline Company, LLC ("Tennessee") to address this species. As proposed by AECOM, MA NHESP agreed that isolating the pipe yard from the surrounding landscape prior to wood turtle emergence from overwintering locations within the adjacent Hop Brook would be sufficient to address any concerns for this species. If this was not done, and the pipe yard was not isolated from the surrounding areas prior to wood turtle emergence, we discussed the possibility of using a team of two biologists and a dog specifically trained to locate turtles to sweep the area for wood turtle as the silt/exclusion fencing was installed. Lastly, MA NHESP does have a concern regarding the use of the proposed pipe yard by the sedge wren. MA NHESP is requesting we make the pipe yard unsuitable habitat for this species in advance of their return for the breeding season to

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eliminate any possibility of this species utilizing the proposed pipe yard and potentially being in harm's way as a result. To address this concern and in addition to the proposed construction matting, I suggested that we keep the vegetation in peripheral areas of the pipe yard mowed short to prevent any sedge wrens from nesting inside the silt/exclusion fencing for the yard. Ms. Schlüter did express some reservation to this approach but indicated she would consult their Ornithologist for advice and get back to us. If MA NHESP does not approve this approach, we will need to propose an alternate method to address this issue.

Proposed Hydrostatic Testing Water Intake Location, Lower Spectacle Pond, Sandisfield

According to the MA NHESP, Lower Spectacle Pond provides habitat for the umber shadowdragon (*Neurocordulia obsoleta*). This species is listed as a species of special concern pursuant to MESA. MA NHESP indicated they have no concerns with our proposed method of withdrawing the hydrostatic testing water from Lower Spectacle Pond, as described in the 7/8/14 letter from AECOM to MA NHESP.

General

When submitting the MESA filing, and in order to more accurately determine the potential impacts to PH and EH, MA NHESP is requesting we include a site figure depicting the layout of the Tyringham pipe yard. This would include the layout of the yard and matting, and an indication of what materials and equipment is proposed to be stored there. As discussed above, we will need to wait for MA NHESP to let us know if keeping the peripheral areas of the pipe yard mowed short is an acceptable method to make the habitat unsuitable for the sedge wren. If it is acceptable to MA NHESP, regular mowing will likely be one of the conditions associated with their decision.

We discussed the fact that the hydrostatic testing water withdrawal location is located on land controlled by the MA Department of Conservation and Recreation and that said agency has refused Tennessee's request to represent them for the MESA filing. Ms. Schlüter indicated she would have to look into that and let us know how we are going to proceed.

The subject of the MESA filing fee was also discussed. Rather than the $4,000.00 dollar filing fee typically assessed for a linear project, because the impacts to PH and EH are not directly along the alignment, we can calculate the filing fee based upon the acreage of anticipated impacts to PH and EH. Based upon our impacts being less than two acres, the filing fee will be $300.00.

Ms. Schlüter reiterated the opinion of the MA NHESP that the Project can be conditioned to avoid a prohibited "Take" under MESA, as originally expressed in its letter to the Executive Office of Environmental Affairs (MEPA) dated June 30, 2014 and appreciated the additional information presented at the meeting.



Signature

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From: OSullivan, Tim
To: nancy.putnam@state.ma.us
Cc: Banach, Eileen
Subject: CT Expansion Project Vernal Pool Mapping
Date: Monday, September 15, 2014 9:47:43 AM
Attachments: CT_Expansion_MA_and_CT_Vernal_Pools_With_Wetlands_and_Workspace_rev1.pdf

---

Nancy,

It was nice to meet you last Friday.

To help you in your review of the Project, here is the mapping depicting the vernal pools along the Project alignment.

It is a complete set for CT and MA and it comes from the Project vernal pool report.

All DCR lands are covered. The left side of page 9 shows the location where everyone met on Friday.

Thank you.

Tim

Timothy P. O'Sullivan MS, PWS
Project Manager
Wetland and Wildlife Biologist
tim.osullivan@aecom.com

Cell Phone 978-621-6756

AECOM
500 Enterprise Drive
Suite 1A
Rocky Hill, CT 06067
www.aecom.com

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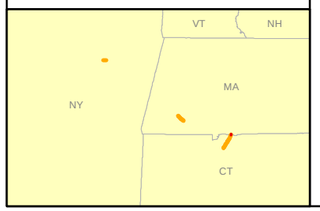
Site Location



Legend

- Access Roads
- Streams
- Wetland Lines
- Vernal Pools
- Waterbodies
- Wetlands
- County Boundary
- Town Boundary
- Workspace

N E S W

Tennessee Gas Pipeline Company

CT Expansion Project

Connecticut Vernal Pools

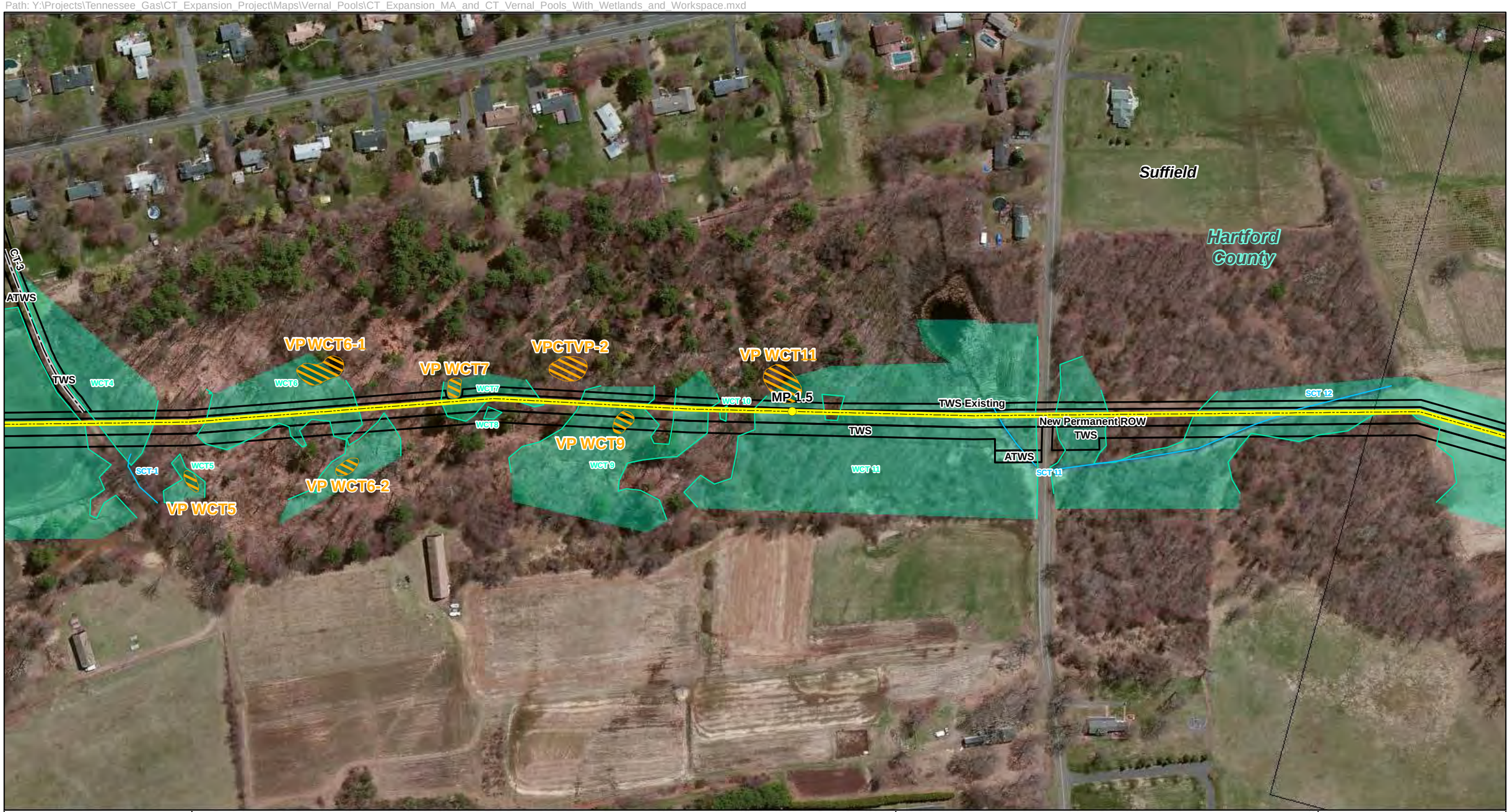
0 100 200 400 Feet

1 inch = 200 feet

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

August 2014

Path: Y:\Projects\Tennessee_Gas\CT_Expansion_Project\Maps\Vernal_Pools\CT_Expansion_MA_and_CT_Vernal_Pools_With_Wetlands_and_Workspace.mxd



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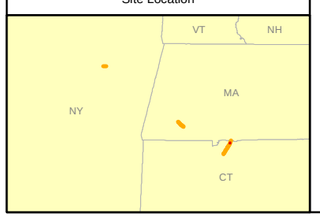


Legend

- Access Roads
- Streams
- Wetland Lines
- Vernal Pools
- Waterbodies
- Wetlands
- County Boundary
- Town Boundary
- Workspace

N E S W

Tennessee Gas Pipeline Company

CT Expansion Project

Connecticut Vernal Pools

0 100 200 400 Feet

1 inch = 200 feet

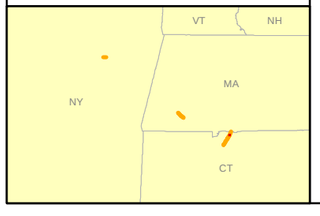
Tennessee Gas Pipeline Company, L.L.C.
a Kinder Morgan company

August 2014

Path: Y:\Projects\Tennessee_Gas\CT_Expansion_Project\Maps\Vernal_Pools\CT_Expansion_MA_and_CT_Vernal_Pools_With_Wetlands_and_Workspace.mxd



Site Location



Legend

- Access Roads
- Streams
- Wetland Lines
- Vernal Pools
- Waterbodies
- Wetlands
- County Boundary
- Town Boundary
- Workspace

Tennessee Gas Pipeline Company

CT Expansion Project

Connecticut Vernal Pools

0 100 200 400 Feet

1 inch = 200 feet

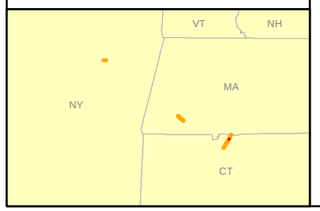
Tennessee Gas Pipeline Company, L.L.C.
a Kinder Morgan company

August 2014

Path: Y:\Projects\Tennessee_Gas\CT_Expansion_Project\Maps\Vernal_Pools\CT_Expansion_MA_and_CT_Vernal_Pools_With_Wetlands_and_Workspace.mxd



Site Location



Legend

- Access Roads
- Streams
- Wetland Lines
- Vernal Pools
- Waterbodies
- Wetlands
- County Boundary
- Town Boundary
- Workspace

N E S W

Tennessee Gas Pipeline Company

CT Expansion Project

Connecticut Vernal Pools

0 100 200 400 Feet

1 inch = 200 feet

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

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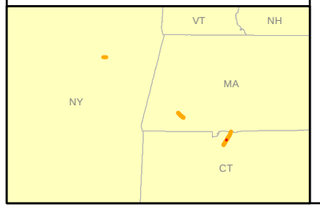

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- Access Roads
- Streams
- Wetland Lines
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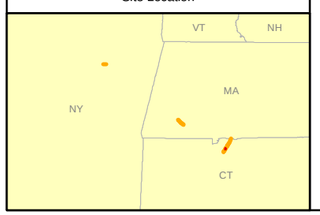

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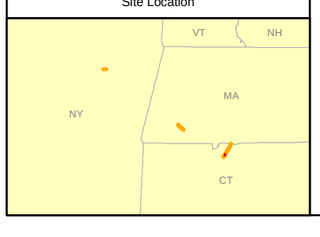

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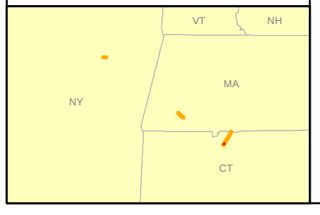

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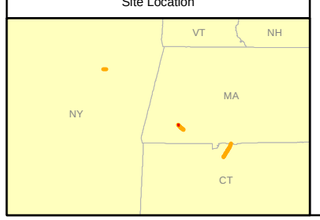

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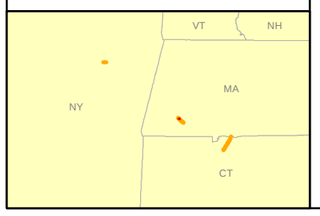

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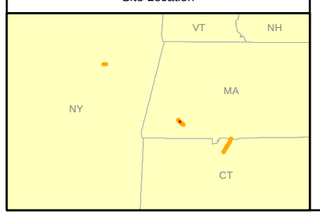

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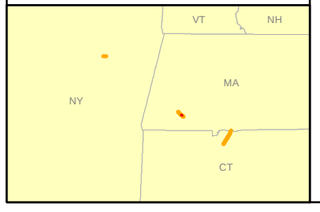

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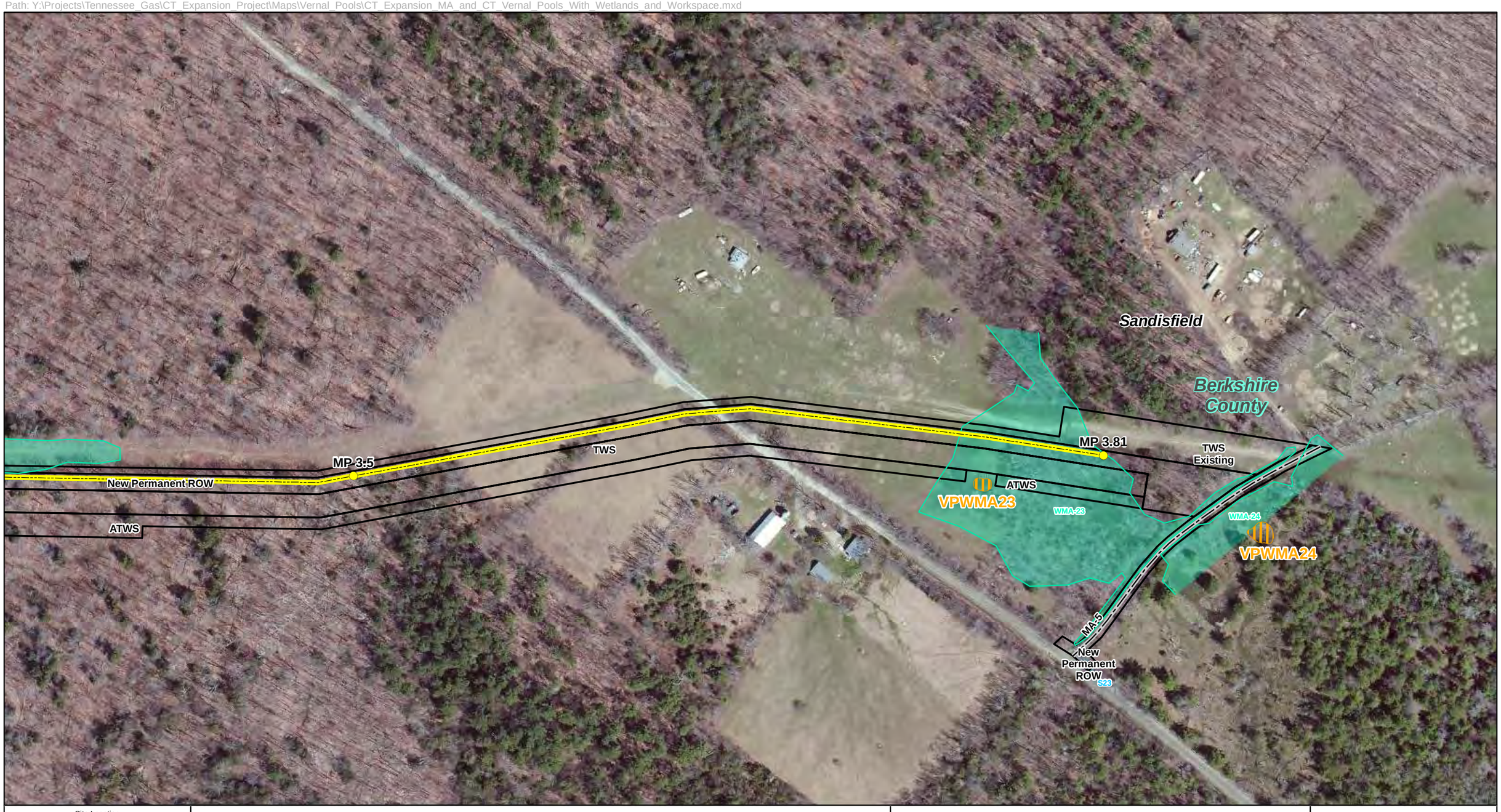

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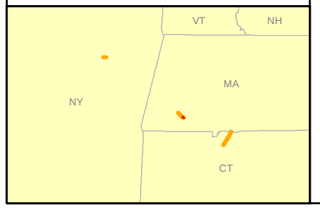

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Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

Western Regional Office • 436 Dwight Street, Springfield MA 01103 • 413-784-1100

DEVAL L. PATRICK
Governor

MAEVE VALLELY BARTLETT
Secretary

DAVID W. CASH
Commissioner

June 30, 2014

Maeve Vallely Bartlett, Secretary
Executive Office of Energy & Environmental Affairs
Massachusetts Environmental Policy Act Office
Alex Strysky, EEA No. 15205
100 Cambridge Street 9th Floor
Boston, MA 02114-2524

Re: Connecticut Expansion Project -
Sandisfield, Tyringham and Agawam

Dear Secretary Bartlett,

The Massachusetts Department of Environmental Protection (MassDEP), Western Regional Office (WERO) appreciates the opportunity to comment on the Environmental Notification Form (ENF) submitted for the proposed Connecticut Expansion Project (EEA #15205) in Sandisfield, Tyringham, and Agawam. Applicable MassDEP regulatory and permitting considerations regarding wetlands, waterways, wastewater, drinking water, air pollution, solid and hazardous waste, and waste site cleanup are discussed. MassDEP staff attended the MEPA site visit on June 10, 2014.

I. Project Description

The Connecticut Expansion Project involves improvements construct of approximately 3.8 miles of 36-inch outside diameter gas pipeline in Sandisfield, 0.11 miles of 24-inch outside diameter gas pipeline in Agawam, and appurtenances including a relocated mainline valve, two pig launchers, and a pig receiver. Both new pipelines will be located within or adjacent to the Tennessee Gas pipeline right-of-way. An approximately 2-acre pipe yard/staging area is proposed to be located in Tyringham. The project exceeds a threshold for a mandatory EIR.

The entire project includes the expansion of lines through New York and Connecticut. The Sandisfield portion of the work is to extend an existing pipeline 3.8 miles to create storage capacity of natural gas to meet increased demand.

The project will require filing a Notice of Intent (NOI) with each municipality where work is proposed, a 401 Water Quality Certificate from MassDEP, a permit from Army Corps

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

of Engineers, a permanent easement from DCR, and review by the Natural Heritage and Endangered Species Program. The EENF also includes a request for a Single EIR. The EENF includes the following environmental impacts:

- 19 l.f. Bank,
- 315,377 s.f temporary impacts to Bordering Vegetated Wetlands (BVW); 95,396 s.f permanent impacts,
- 18,295 s.f temporary impacts to Isolated Vegetated Wetlands (IVW); 0 s.f. permanent, and
- 96,267 s.f. temporary impacts to Riverfront Area; 24,828 s.f. permanent.

II. Required Mass DEP Permits and/or Applicable Regulations

Wetlands and Waterways
310 CMR 10.00
314 CMR 4.00
314 CMR 9.00
Wastewater
314 CMR 7.00
Air Pollution
310 CMR 7.00
Solid Waste
310 CMR 16.000
310 CMR 19.000
Bureau of Waste Site Cleanup
310 CMR 40.0000

III. Permit Discussion

Bureau of Resource Protection

Wetlands
The proposed project includes several miles of new gas pipeline installation, staging and system upgrades with work located in three communities. As noted by the Proponent in the EENF, the project area contains regulated resources areas of Bank (Inland), Bordering Vegetated Wetland, Riverfront Area and Isolated Vegetated Wetlands. Although not identified in the EENF, work may also impact Land Under Water Bodies as there are proposed stream crossings of the pipeline. The Proponent also identified at least one vernal pool.

The Proponent may consider filing an Abbreviated Notice of Resource Area Delineation (ANORAD) with each community Conservation Commission to legally establish the regulated resource areas, as the ANORAD may be extended and resource areas remain fixed. The Proponent may also consider filing the ANORAD for any preferred and alternative routes. This will allow the applicant to provide details regarding the replication and mitigation measures required.

When a NOI is submitted to the communities, the Conservation Commission should review the project for compliance with all of the provisions of the Act; prior to commencement of project construction, the Commissions must issue a final Order of Conditions. If a NOI is submitted prior to competition of the MEPA process, MassDEP will recommend that Commissions hold NOI hearings open until the Secretary issues a

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Certificate indicating the MEPA process is completed and the Army Corps of Engineers, and MassDEP (Section 401) issue permits, as applicable.

Isolated Vegetated Wetlands are not regulated under the Wetlands Protection Act (the Act). The Proponent should make every effort to distinguish between Isolated Vegetated Wetlands and Isolated Land Subject to Flooding when the ANORAD and/or NOI are filed with each community.

The Proponent is proposing to withdraw approximately 1,000,000 gallons of water from Lower Spectacle Pond at a rate of 2,000 gpm for the hydrostatic pressure testing of the pipeline. This withdrawal should be permitted though the Sandisfield Conservation Commission NOI. The Proponent should consider consultation with the Massachusetts Department of Fish & Game when designing the withdrawal.

The project will result in conversion of resource areas such as conversion of forested wetland to scrub/shrub wetland.

The project should also comply with MassDEP's Stormwater Management Standards, as applicable.

Water Quality Certification
Section 401 Water Quality Certification (WQC) issued by MassDEP is required for this project. The Proponent is required to provide sufficient information to adequately describe cumulative impacts to "Waters of the United States within the Commonwealth" (Bordering and Isolated Vegetated Wetlands and Land Under Water). The WQC regulations require impacts to be avoided, minimized and mitigated.

Limited Project Provisions
The Proponent has noted that the work may be submitted for review under the Limited Project provision. Proposed work must, where possible, meet *General Performance Standards;* work that cannot meet *General Performance Standards* may be approved as a limited project. Limited Project status requires the Proponent to demonstrate practicable avoidance and minimization of alteration to jurisdictional resource areas, and then describe appropriate mitigation measures for remaining, unavoidable alteration.

Boundary Determination and Delineation
All delineation of jurisdictional resource areas should be accomplished through flagging in the field, surveying, and then presented on a scaled site plan. The Proponent is referred to MassDEP guidance documents and the regulations for specific requirements and methods for all resource delineations. MassDEP is available to provide additional assistance and offers the following guidance for specific delineations:

- Boundaries of Bordering Vegetated Wetlands (BVW) - *"Wetlands Protection Program Policy: Bordering Vegetated Wetlands Delineation Criteria and Methodology" (MassDEP 1995), Delineating Bordering Vegetated Wetlands Under the Massachusetts Wetlands Protection Act (MassDEP 1995). Submittal of properly prepared "MassDEP Bordering Vegetated Wetland Delineation Field Data Forms" (Appendix Gs)*
- Delineation of the Mean Annual High Water Line (MAHWL) of all perennial rivers on site should be performed in accordance with

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

regulations; the Proponent should be aware that use of "bankfull field indicators" may be necessary and justification of the methodology may be required.

- USGS topographic quadrangle maps reviewed to identify "presumptive" perennial streams; streams should be included in plans. Regulations stipulate requirements necessary to overcome the presumptive status of a mapped perennial stream.
- Jurisdictional intermittent streams should have the Bank resource area identified and not just the centerline.

Bordering Vegetated Wetland

MassDEP notes that there is no reference to "temporary impacts" in the Act or regulations. The Proponent should describe these activities in terms of "in-situ" replacement, i.e., the excavation and fill disturbance will be "replaced" in accordance with regulation within the footprint of that disturbance. The Proponent is also referred to *Massachusetts Inland Wetland Replication Guidelines" (DEP March 2002)* for the planning and construction of Bordering Vegetated Wetland "replacement area".

Bordering Land Subject to Flooding

Although not initially identified, the Proponent should confirm no impacts to floodplain will occur though any portion of the project as plans progress. If floodplain is identified, site plans should show the boundaries of the "Lower Floodplain" and the Proponent should demonstrate that adequate compensatory flood storage is provided. In addition, if the "Lower Floodplain" proposed to be altered is naturally vegetated and/or composed of a natural substrate, the applicant will be required to meet the General Performance Standard.

Riverfront Area

At least one stream crossing is proposed within the project area. Streams shown as intermittent or not shown on the latest USGS map should be reviewed as to whether they may be considered perennial in accordance with 310 CMR 10.58(2)(a)1 to establish jurisdiction.

Work conducted in undisturbed Riverfront Area, must meet General Performance Standards; work conducted within existing degraded Riverfront Area may be submitted as "redevelopment". The Limited Project provisions noted above may also be applicable to work conducted in the Riverfront Area.

Massachusetts River and Stream Crossing Standards

Although not proposed at this time, the Proponent should be aware that any new permanent jurisdictional stream crossings must comply with the *Massachusetts River and Stream Crossing Standards*. Any improvements proposed to existing culverts should comply with *Design Standards for Culvert Replacement* in that document.

The Proponent should consider whether crossings will impact high quality streams. These include: NHESP Living Water Cores, NHESP BioMap cores, ACECs, Anadromous Fish Runs, and Cold Water Fisheries. These are shown at: www.streamcontinuity.org/assessing_crossing_structures/prioritzing_streams.htm.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Waterways
The Proponent has not identified work apparently subject to *Public Waterfront Act, Chapter 91.* Any Request for Determination of Applicability under 310 CMR 9.06, should be submitted to the MassDEP Boston Office Waterways Program.

Drinking Water & Wastewater
This project consists of several miles of new underground utility work within multiple municipalities. Although the proposed work lies within existing Rights of Way (ROWs) MassDEP strongly recommends contacting and coordinating within each community to ensure the routes do not include or potentially impact municipal water, sewer and stormwater structures.

Groundwater and Surface Water Quality Standards
The Proponent is referred to the following regulations for guidance regarding water quality standards:
310 CMR 4.00 Surface Water Quality Standards
310 CMR 40.0000 Massachusetts Contingency Plan

National Pollutant Discharge Elimination System (NPDES)
Discharge of the hydrostatic pressure testing of the new pipeline will require the Proponent to apply for and receive a NPDES permit. U.S. EPA requires the *Remediation General Permit* which would be issued jointly by EPA and MassDEP. Activities Category Section IV (3) of the General Permit identifies Hydrostatic Testing of Pipelines and Tanks:
http://www.epa.gov/region1/npdes/remediation/RGP2010_FactSheet.pdf
http://www.epa.gov/region1/npdes/remediation/Appendix-A.pdf

The Proponent is proposing to withdraw approximately 1,000,000 gallons of water from Lower Spectacle Pond; discharge is presently proposed to an upland area. The permitting process will include extensive testing to determine water quality and potential treatment.

Bureau of Waste Prevention

Air Pollution

Construction and Demolition Activities
The construction and demolition activity must conform to current Air Pollution Control Regulations. The proponent should implement measures to alleviate dust, noise, and odor nuisance conditions that may occur during the construction and demolition activities. Such measures must comply with the MassDEP's Bureau of Waste Prevention (BWP) Regulations 310 CMR 7.01, 7.09, and 7.10.

Construction Equipment
MassDEP believes it is necessary to mitigate the construction-period impacts of diesel emissions to the maximum extent feasible and recommends that the project proponent participate in the MassDEP Diesel Retrofit Program. As of June 1, 2010, all non-road engines shall be operated using only ultra low sulfur diesel (ULSD) with a sulfur content of no greater than 15 ppm pursuant to 40 CFR 80.510.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Solid Waste

The Proponent shall properly manage and dispose of all solid waste generated by this proposed project pursuant to 310 CMR 16.00 and 310 CMR 19.000, including the regulations at 310 CMR 19.017 (waste ban).

Asphalt, brick and concrete (ABC) generated through crushing and reuse on-site must be handled in accordance with regulation and policy. Otherwise, the proponent would need to obtain a site assignment and facility permit for the crushing activity and a Beneficial Use Determination (BUD) for the reuse of the crushed material. More information regarding the handling of ABC, and a copy of the 30-day notification form may be found at the following website: http://www.mass.gov/eea/agencies/massdep/recycle/reduce/using-or-processing-asphalt-pavement-brick-and-concrete-.html.

The BUD regulations at 310 CMR 19.060 establish levels of assessment for four categories of beneficial use. Similarly, the fee regulations at 310 CMR 4.00, et seq. were amended. These amended regulations would be applicable to reuse of any materials generated by this project that would otherwise be considered solid waste.

The project Proponent should be advised that construction activity at the site must comply with both Solid Waste and Air Quality Control regulations. The appropriate Solid Waste provisions addressing this include M.G.L. Chapter 40, Section 54.

Bureau of Waste Site Cleanup

There are no active/open disposal sites governed by the Massachusetts Oil and Hazardous Material Release Prevention and Response Act, M.G.L. c. 21E, and the Massachusetts Contingency Plan (MCP) within the project site. MassDEP did receive an A2 Response Action Outcome (RAO) Statement in 2006 for Release Tracking Number (RTN) 1-14946 located within the proposed work area in Tyringham.

If soil and/or groundwater contamination is encountered during work activities, the Proponent should retain a Licensed Site Professional (LSP); the MCP details procedures to follow for the parties conducting remediation and cleanup work. MassDEP staff are available for guidance.

Blasting

Although the environmental impacts from the use of perchlorate-containing blasting agents and explosives have not been fully defined, MassDEP recommends that contractors take the following reasonable steps to minimize potential problems:

- To the extent practical, avoid the use of perchlorate-containing explosives
- When the use of perchlorate-containing products is unavoidable:
    - Determine the perchlorate content of blasting agents and explosives to be used
    - Institute rigorous "housekeeping" practices.
    - Take reasonable steps to prevent and address misfires
    - In all cases, the safety of workers and the general public is of paramount concern

The following link provides additional information:
http://www.mass.gov/eea/agencies/massdep/cleanup/regulations/contamination-perchlorate-containing-explosive-products.html

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Spills Prevention
A spills contingency plan addressing prevention and management of potential releases of oil and/or hazardous materials from pre- and post-construction activities should be presented to workers at the site and enforced. The plan should include but not be limited to, refueling of machinery, storage of fuels, and potential future on-site activity releases.

IV. Section 61 Findings, Comments/Guidance

This project is subject to the Greenhouse Gas initiative and Section 61 Findings. At this time, there is inadequate information regarding proposed mitigation associated with wetlands impacts; Section 61 Findings were not presented for comment. With regard to GHG, the Proponent should consider assessing potential impacts from construction as well as long term operation and maintenance of the pipeline.

As noted previously, the Proponent has requested that a Single EIR be allowed. Mass DEP has no objection to the Secretary granting that request as she deems appropriate. MassDEP has adequate authority through the permitting process for the NPDES and 401 WQC to determine the potential environmental impacts from the project and to ensure that all feasible measures are taken to avoid, minimize and mitigate any negative impacts as necessary.

MassDEP encourages pre-permitting of complex projects and have previously met with the Proponent in the initial phase of planning this project. MassDEP staff are available to provide further guidance and to meet with the Proponent upon request. If you have any questions regarding this comment letter or would like to schedule pre-permitting, please contact Catherine Skiba at (413) 755-2119 or catherine.skiba@state.ma.us.

Sincerely,

Michael Gorski
Regional Director

cc: MEPA File

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

APPENDIX D

- Compensatory Mitigation Plan
- Invasive Species Management Plan

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APPENDIX D

Compensatory Mitigation Plan

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Conceptual Compensatory Wetland Mitigation Plan

New England Portion

for the

Connecticut Expansion Project

July 2014

Prepared For:

Tennessee Gas Pipeline Company, L.L.C

Prepared By:

AECOM Environment
10 Orms Street, Suite 405
Providence, RI 02904

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

TABLE OF CONTENTS

1.0 OVERALL COMPENSATORY WETLAND MITIGATION PLAN FOR THE CONNECTICUT EXPANSION PROJECT—NEW ENGLAND 1-1

1.1 INTRODUCTION AND OVERVIEW 1-1

1.2 PROJECT DESCRIPTION 1-2

1.3 WETLAND IMPACTS 1-3

1.4 COMPENSATORY WETLAND MITIGATION NEEDS AND OPTIONS 1-7

2.0 COMPENSATORY WETLAND MITIGATION PLAN FOR THE CONNECTICUT EXPANSION PROJECT – CONNECTICUT SECTION 2-1

2.1 INTRODUCTION AND OVERVIEW 2-1

2.2 DESCRIPTION OF WETLANDS AND FUNCTIONS/VALUES 2-2

2.3 WETLAND IMPACTS 2-3

2.4 MITIGATION NEEDS AND OPTIONS 2-12

2.4.1 Wetland Restoration 2-12

2.4.2 Connecticut in Lieu Fee Program 2-14

2.4.3 Permittee Responsible Mitigation 2-15

3.0 COMPENSATORY WETLAND MITIGATION PLAN FOR THE CONNECTICUT SECTION EXPANSION PROJECT –MASSACHUSETTS SECTION 3-1

3.1 INTRODUCTION AND OVERVIEW 3-1

3.2 DESCRIPTION OF WETLANDS AND FUNCTIONS/VALUES 3-2

3.3 WETLAND IMPACTS 3-3

3.4 MITIGATION NEEDS AND OPTIONS 3-9

3.4.1 Wetland Restoration 3-11

3.4.2 Massachusetts in Lieu Fee Program 3-12

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

LIST OF TABLES

Table 1-1 Estimated Acreage of Waters of the United States to be Impacted - New England Portion 1-5

Table 1-2 Summary of Temporary and Permanent Impacts by Municipality for Massachusetts and Connecticut 1-6

Table 1-3 USACE NED Recommended Compensatory Mitigation Ratios for Direct Permanent Impacts 1-8

Table 1-4 Recommended Compensatory Mitigation for Temporary and/or Secondary Impacts 1-9

Table 2-1 Watersheds Crossed by the Connecticut Expansion Project 2-2

Table 2-2 USACE Highway Methodology FVA: Wetlands Potentially Impacted by the CT Expansion Project 2-4

Table 2-3 Estimated Acreage of Waters of the United States to be Impacted – CT Loop 2-7

Table 2-4 Wetlands Associated with the Connecticut Expansion Project – Connecticut Loop .. 2-8

Table 2-5 Summary of Mitigation Burden for CT Portion of the Connecticut Expansion Project 2-13

Table 3-1 Watersheds Crossed by the Connecticut Expansion Project 3-2

Table 3-2 Functions and Values of Massachusetts Wetlands 3-4

Table 3-3 Estimated Acreage of Waters of the United States to be Impacted – MA Loop 3-6

Table 3-4 Wetlands Associated with the Connecticut Expansion Project – MA Loop 3-7

Table 3-5 Summary of Mitigation Burden for MA Portion of Connecticut Expansion Project 3-10

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

1.0 OVERALL COMPENSATORY WETLAND MITIGATION PLAN FOR THE CONNECTICUT EXPANSION PROJECT—NEW ENGLAND

1.1 INTRODUCTION AND OVERVIEW

Tennessee Gas Pipeline Company, L.L.C (“Tennessee”) is filing an application for a certificate of public convenience and necessity with the Federal Energy Regulatory Commission (“Commission” or “FERC”) for the Connecticut Expansion Project (the “Project”) in Albany County, New York, Berkshire and Hampden Counties, Massachusetts and Hartford County, Connecticut. In addition to the FERC filing, Tennessee is filing with the appropriate regulatory agencies, including the U.S. Army Corps of Engineers (“the Corps” or USACE”) and state and local agencies to account for and mitigate potential wetland and watercourse impacts associated with the proposed Project. The enclosed Compensatory Wetland Mitigation Plan (“Wetland Mitigation Plan”, “WMP”, or “Plan”) was prepared for the New England portion of the Project in support of these regulatory filings. This Plan is conceptual in nature and will be expanded upon during the Project’s review, design and permitting process.

The proposed Project involves the construction of two sections of new 36-inch pipeline looping totaling 1.35 miles in New York and 3.81 miles in Massachusetts, and one section of new 24-inch pipeline looping totaling 8.10 miles in Massachusetts and Connecticut. To the extent that it is practicable, feasible, and in compliance with existing law, Tennessee proposes to locate the approximately 13.3 miles of pipeline loops within or adjacent to the right-of-way (“ROW”) associated with its existing pipelines designated as the 200 and 300 Lines. Tennessee proposes to begin construction of the Project facilities in fourth quarter 2015 and, provided the required regulatory approvals are received, place the facilities in-service by November 2016. Additional detail regarding the proposed project is presented in the sections below and in the accompanying regulatory filings.

The Project is proposed by Tennessee, a wholly-owned subsidiary of Kinder Morgan, Inc. and a major supplier of natural gas to utilities and power generators in the Northeast. The total estimated cost of the Connecticut Expansion Project is approximately $81.2 million. Connecticut Natural, Yankee Gas and Southern Connecticut have signed long term agreements with Tennessee for the additional transportation capacity that CT Expansion Project will add to the Tennessee Gas Pipeline system.

The Connecticut portion of the Project will traverse the municipalities of Suffield and East Granby. The Massachusetts portion of the Project will traverse the municipalities of Sandisfield and Agawam. Additional detail regarding the Connecticut and Massachusetts portions of this project are presented below. As noted, the Project contains a New York component; however, the Conceptual Mitigation Plan for the Connecticut Expansion Project – New York Portion is being prepared under separate cover, in support of the New York Department of Environmental Conservation / USACE Joint Application for Permit. USACE personnel have indicated that the New York and New England Districts (“NED”) will collaborate closely regarding this authorization request. Tennessee will be pleased to provide a copy of the New York Conceptual WMP Plan or any other requested documentation upon NED’s request.

Because the Project is predominantly sited within and directly adjacent to existing ROWs, thereby eliminating the need for a new or “Greenfield ROW”, environmental impacts of the Project were minimized. Additionally, effects to wetlands and waterbodies have been avoided or minimized by locating structures, access roads and staging areas outside of resource areas to the extent practicable. The Project will not traverse any watercourses that are designated as navigable or otherwise subject to jurisdiction under Section 10 of the Rivers and Harbors Act of 1899, or that are designated as a National Wild and Scenic River under the National Wild and Scenic Rivers Act (16 U.S.C. 1271-1287). Unavoidable effects, however, will occur to jurisdictional Waters of the United States (i.e., those regulated under Sections 401 and 404 of the Federal Clean Water Act (“CWA”) – 33 U.S.C. § 1341 and

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

33 U.S.C. § 1344) from construction activities. In addition to the CWA, the Project is subject to state wetlands-related statutes and regulations.

According to USACE regulations, the fundamental objective of compensatory mitigation is to offset environmental losses resulting from unavoidable impacts to waters of the United States (33 CFR 332.3(a)). The criteria for compensatory mitigation are set forth in the USACE's mitigation regulations, the U.S. Environmental Protection Agency's ("USEPA's") companion CWA regulations (40 CFR 230) and in the "USACE's NED Compensatory Mitigation Guidance (July 2010)". Both the USACE and the USEPA have established a national goal of no overall loss of wetland functions, as detailed in the agencies' 1990 Memorandum of Understanding and respective mitigation regulations (33 CFR Parts 325 and 332; 40 CFR 230)). The NED Compensatory Mitigation Guidance incorporates these mitigation requirements, as well as those contained in the "USACE's Regulatory Guidance Letter No. 08-03: Minimum Monitoring Requirements for Compensatory Mitigation Projects Involving Restoration, Establishment, and/or Enhancement of Aquatic Resources (October 10, 2008)". In addition to these federal requirements, Connecticut and Massachusetts (as well as New York) have each established general goals and objectives for compensatory mitigation of aquatic resource impacts that the Conceptual Wetland Mitigation Plans are intended to address.

The enclosed plan is conceptual in nature and the final Compensatory Wetland Mitigation Plan will be developed to follow the USACE NED Compensatory Mitigation Guidance and Checklist Instructions contained therein. The Plan includes a description of Project impacts, objectives and preliminary mitigation strategies, in addition to required graphics and additional supporting information. Additional information pertaining to the anticipated impacts and construction sequencing are available in the Project's permit authorization requests. This Plan includes state-specific compensatory mitigation programs (see Sections II and III) to offset the resource impacts associated with the Project in each state. Tennessee intends to expand upon this conceptual Plan, as based on consultation with and comments from USACE, USEPA, state and local regulatory authorities, and other stakeholders in the compensatory wetland mitigation discussions.

1.2 PROJECT DESCRIPTION

The proposed project, as currently configured, would involve the construction of approximately 13.3-miles of pipeline looping (i.e., the installation of additional pipe to adjacent to the existing pipeline) in New York, Massachusetts, and Connecticut. The proposed Connecticut Expansion Project facilities are as follows:

- 1.4-miles of 36-inch pipeline loop in Albany County, New York;
- 3.8-miles of 36-inch pipeline loop in Berkshire County, Massachusetts;
- 8.1-miles of 24-inch pipeline loop in Hampden County, Massachusetts and Hartford County, Connecticut;
- Minor tie-in piping;
- One new Main-line-valve ("MLV"), and;
- Moving and relocating certain pigging facilities.

The pipeline loop segments will be located within or directly adjacent to Tennessee's existing permanent ROWs, to the extent practical. Additional permanent ROW will be required along with temporary workspace ("TWS") and additional temporary workspace ("ATWS") to facilitate construction of the pipeline. The routing for the pipeline loop was conducted in a manner to avoid significant areas of residential development, minimize the number of affected landowners, and effectively minimize environmental impacts. The majority of the existing land use in the Project area consists of upland forests, open land, agricultural land and wetlands. There are virtually no residential land impacts and the pipeline alignment itself does not cross any residential land use.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Typically, pipeline construction will require between 100 to 125 feet of workspace depending on the size of the pipeline to be installed. This Project limits workspace within wetlands to 75 feet in width, unless topographic conditions or other safety concerns require additional workspace. The varying construction ROW widths for this project for the 36-inch loops in New York and Massachusetts and the 24-inch loop in Massachusetts and Connecticut are based on guidelines for safe construction of similarly sized pipelines developed by the Interstate Natural Gas Association of America ("INGAA"). The proposed standard construction ROW widths are expected to allow for safe installation of the pipeline facilities based on the variable topographic terrain and diverse land use types crossed by the Project.

Following construction, vegetation within the permanent ROW will be maintained in an herbaceous state, except in wetlands and adjacent to perennial streams, where maintenance clearing of woody vegetation will be limited. In these areas, a 10-foot wide corridor centered over the pipeline will be permanently maintained in an herbaceous state and trees with roots that could compromise the integrity of pipeline coating within 15 feet of the pipeline will be selectively cut and removed from the permanent ROW while the remaining temporary and permanent ROW will revert to its pre-construction land use/land cover once construction is complete.

1.3 WETLAND IMPACTS

The Project has been designed to avoid or minimize adverse impacts to water resources to the extent practicable. For example, contractor pipeyards and appurtenant facilities (including pig launchers/receivers and mainline valves) are located outside of aquatic resource areas. Pipeyard facilities will be constructed outside the boundaries of any nearby wetlands and BMPs consisting of silt fencing and other appropriate sedimentation controls will be installed to prevent the disturbance of wetland habitat and the transport of sediments from active Project locations to wetlands.

However, due to the linear nature of the existing pipeline, current ROW ownership alignment and physical requirements of the proposed looping, some Project activities will affect wetlands and watercourses, and some new structures, access roads, and work sites will necessarily be located within wetlands. Due to these unavoidable conditions, the Project will result in temporary and permanent direct and indirect impacts to state- and federally- regulated wetlands.

Temporary impacts to wetlands and watercourses are associated with the construction of the new ROW, access routes, TWSs and ATWSs. Temporary wetland impacts within these areas may include soil disturbance, temporary alteration of hydrology and loss of vegetation during construction. Upon completion of construction, topsoil, contour elevations and hydrologic patterns will be restored, and disturbed areas will be reseeded or replanted to promote the re-establishment of native hydrophytic vegetation. All TWS and ATWS areas will be restored to pre-construction grades and contours, and reseeded and/or replanted during restoration activities.

Following construction and restoration, the TWS and ATWS areas will not be maintained during operation of the proposed facilities and will be allowed to revert back to their pre-construction land use and vegetation cover type.

No permanent filling or other loss of wetlands is proposed for any of the loop pipelines in Connecticut or Massachusetts. All wetlands will be substantially restored to their pre-construction grades, contours, and drainage patterns, and reseeded or replanted with native hydrophytic vegetation species. As such, the permanent impacts to wetlands associated with the Project will consist of a conversion of forested wetlands to scrub shrub / emergent wetland cover types and the conversion of scrub shrub wetlands to emergent wetland cover types.

Woody vegetation within the new permanent ROW will be allowed to regenerate within such ROW except for a 10-foot wide area centered over the pipeline loops that will be maintained in an herbaceous/scrub-shrub state to allow for inspection and maintenance of the pipeline loops once the

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Project is in-service. In addition, trees with roots that could compromise the integrity of pipeline coating within 15 feet of the pipeline may be selectively cut and removed from the new permanent ROW. Additional detail pertaining to the wetland functions and values as well as the minimization and mitigation of impacts to these functions and values is presented in the Functions and Values sections (Sections 2.2 and 3.2).

A summary of impacts to Waters of the United States anticipated for the entire Project is provided in Table 1-1 below. These impact estimates are conservative and represent a worst case scenario. Actual impacts to wetlands are likely to be less than these estimated values. Section 2 and Section 3 provide detail regarding the state-specific wetland and watercourse resource impacts and proposed mitigation in Connecticut and in Massachusetts.

Project impacts were categorized into “Permanent” and “Temporary” impacts, as well as into “Direct” and “Indirect” (or Secondary) impacts. “Direct permanent” impact associated with this Project are limited to the fill required for the construction of access roads; however this fill is relatively minimal (0.07 acres, or approximately 113 cubic yards combined in MA and CT). The remainder of the Project’s impacts may be considered indirect or secondary and are associated with the conversion of wetland vegetation type. The construction impacts noted in Table 1-1 may be considered “temporary indirect” impacts and operational impacts noted in Table 1-1 may be considered “permanent indirect” impacts. Additional information pertaining to wetland impacts by municipality is presented in Table 1-2.

TABLE 1-1
ESTIMATED ACREAGE OF WATERS OF THE UNITED STATES TO BE IMPACTED - NEW ENGLAND PORTION

Facility ID[a]	Palustrine Emergent (acres affected)		Palustrine Forested (acres affected)		Palustrine Scrub-Shrub (acres affected)		Total (acres affected)	
	Construction[b]	Operation[c]	Construction[b]	Operation[c]	Construction[b]	Operation[c]	Construction[b]	Operation[c]
Massachusetts Loop	3.34	0.00	6.03	2.11	0.21	0.09	9.58	2.20
Connecticut Loop	24.43	0.00	18.66	6.72	1.88	0.15	44.97	6.87
PROJECT TOTAL	**27.77**	**0.00**	**24.69**	**8.83**	**2.09**	**0.24**	**54.55**	**9.07**

a: These values do not include 0.37 ac of temporary impacts associated with stream crossings in CT and MA, where benthic habitats and banks will be restored in-place consistent with pre-existing conditions, or improved where possible.

b: Construction Acreage = all workspace during construction activities (TWS and ATWS plus permanent easement).

c: Operation Acreage = For conventional crossing methods: 30-foot width permanently maintained through forested wetlands, 10-foot width permanently maintained through scrub-shrub wetlands; there are no operation impacts to PEM wetlands as there is no change in the pre- and post-construction vegetation cover type.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

TABLE 1-2
SUMMARY OF TEMPORARY AND PERMANENT IMPACTS BY MUNICIPALITY FOR MASSACHUSETTS AND CONNECTICUT

Municipality	Pipeline Impacts (acres)		Pipeyard / Contractor Yard Impacts (acres)		Wetland Tree Removal (acres)[2]		Access Roads in Wetlands (acres)		Non-wetland Tree Removal (acres)[3]	
	Temporary	Permanent[1]	Temporary	Permanent	Temporary	Permanent	Temporary	Permanent	Temporary	Permanent
Massachusetts										
Agawam	0.58	0.13	0.00	0.00	0.32	0.13	0.00	0.00	0.16	0.14
Sandisfield	9.70	2.20	0.00	0.00	6.03	2.11	0.00	0.06	27.52	8.89
Tyringham	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Massachusetts Total[4,5]	10.28	2.33	0.00	0.00	6.36	2.24	0.00	0.06	27.68	9.03
Connecticut										
East Granby	4.27	1.53	0.00	0.00	2.47	1.51	0.00	0.00	2.55	1.60
Suffield	40.01	5.21	0.00	0.00	15.96	5.08	0.00	<0.01	5.84	3.87
Connecticut Total[4,5]	44.28	6.74	0.00	0.00	18.34	6.59	0.00	0.01	8.39	5.47
PROJECT TOTAL[4,5]	**54.56**	**9.07**	**0.00**	**0.00**	**24.69**	**8.83**	**0.00**	**0.07**	**36.07**	**14.50**

*Note: Impact areas are of federal wetlands and do not include impacts to the state-regulated upland review areas, buffer areas or floodplains.

[1] - These impacts include numbers of acres converted from forested wetland to scrub-shrub or emergent wetland and from scrub-shrub to emergent during operation of the pipeline.

[2] - These impacts represent the number of acres of wetland forest impacted during construction and operation. These wetland forest impacts are a total of all Project facilities (pipeline, access roads, pipeyards) constructed and operated as part of the Project.

[3] - These impacts represent numbers of acres of secondary upland impacts due to vegetation removal.

[4] - Minor apparent discrepancies between totals and sums of individual impacts are a result of rounding.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

1.4 COMPENSATORY WETLAND MITIGATION NEEDS AND OPTIONS

In developing and preparing the wetland mitigation strategy for Project components located in Connecticut and Massachusetts, the proponent considered the 2010 NED Compensatory Mitigation Guidance document as well as the In-lieu fee programs for both these states. These programs/guidelines incorporate both the 2008 federal Compensatory Mitigation for Losses of Aquatic Resources; Final Rule (4/10/08; 33 CFR Parts 325 and 332 ("Mitigation Rule")) and the USACE Regulatory Guidance Letter 08-03: Minimum Monitoring Requirements for Compensatory Mitigation Projects Involving the Restoration, Establishment, and/or Enhancement of Aquatic Resources.

As based upon Tennessee's pre-application consultation with USACE personnel, the proponent understands that the New York and New England District will issue separate Section 404 authorizations for activities within their respective Districts. Information pertaining to mitigation strategies included herein is based upon discussions held during the above-noted consultation, the 2010 NED Compensatory Mitigation Guidance document, the In-lieu fee program instruments, and subsequent discussions with state and federal regulatory personnel. Again, the enclosed WMP is conceptual in nature and will be further developed as the project advances and subsequent to additional stakeholder and agency input.

As summarized in Table 1-1 and Table 1-2, the Project in New England will result in a total of 0.07 acres of permanent fill impacts (~113 CY associated with access road construction), 54.55 acres of temporary impacts (construction-related activities), and 9.07 acres of secondary impacts (permanent conversion of wetland vegetation type) to water resources of the United States located in Massachusetts and Connecticut (i.e., these values exclude impacts to Waters of the U.S. located in the New York portion of the project). In accordance with the USACE and USEPA goal of no net loss of wetland functions, Tennessee evaluated various approaches for compensating for the Project's impacts to water resources. Three basic types of compensation mechanisms were reviewed:

- Mitigation banks;
- In-lieu fee mitigation; and
- Permittee-responsible mitigation.

As part of this conceptual Plan, Tennessee conducted thorough evaluations of mitigation alternatives that would be appropriate to compensate for state-specific impacts. No mitigation banks currently exist in the Project area. Inland wetland in-lieu programs have been developed fairly recently in both Connecticut and Massachusetts, and permittee-responsible mitigation has been the primary compensation mechanism to mitigate wetland impacts in Connecticut and Massachusetts up to the present time. Consideration of both in-lieu fee mitigation and permittee responsible mitigation is anticipated for this Project in Connecticut Massachusetts.

The Connecticut In-lieu fee program (ILFP) and the Massachusetts ILFP are considered by Tennessee to be viable mitigation options, provided the details and accounting process for this type of utility project can be developed in an acceptable manner. Tennessee recognizes that both IFLPs have been established on a watershed basis to meet the 2008 Compensatory Mitigation Rule. The Connecticut and Massachusetts ILFPs were developed as a programmatic response to the historic loss of and continuing threat to aquatic resources in the region. These ILFP were designed to provide high quality mitigation and offer an alternative to USACE permittee-responsible, on-site compensatory mitigation. Historically, a portion of nationwide permittee-responsible wetland mitigation projects were unsuccessful, as they either were not completed or monitored; and/or monitoring revealed failure to meet project success criteria. The implementation of these ILFPs will allow a transfer of compensatory mitigation responsibility to ensure that high-quality wetland habitats are created and successfully established. The administering agencies have a proven history of successfully completing wetland habitat restoration projects. The Massachusetts ILFP is administered by the Department of Fish and Game and the Connecticut ILFP program is administered by the National Audubon Society, Inc.-Connecticut.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Under an ILFP, a permittee purchases mitigation credits for impacts within a specific area. These credits are paid to the administering agency who assumes the legal responsibility for compensatory mitigation implementation success and cover all costs associated with land acquisitions, engineering, permitting, construction, long term monitoring, and administrative costs for the mitigation areas, as well as a contingency amount to provide for any necessary corrective actions.

In general, when considering permittee-responsible compensation, "in kind" mitigation is typically preferred in order to most closely replicate impacted water resources. According to the NED Compensatory Mitigation Guidance, compensation sites should be located to provide the desired water resource functions, taking into consideration factors such as watershed location, aquatic habitat diversity, connectivity, and, for wetlands and streams, a balance of wetlands and uplands. Options include water resource restoration, creation, enhancement, and preservation. Of these, the NED Compensatory Mitigation Guidance states a preference for restoration but also acknowledges that "good restoration sites can be hard to find in New England".

In providing compensatory mitigation, Tennessee's overall goal for the Project is to provide no net loss of existing wetland functional values and statutory interests within the affected watersheds through the preservation, restoration, enhancement, and/or creation of wetlands. As detailed in the Compensatory Mitigation Guidance, the NED has developed standard compensatory mitigation ratios to provide a framework for compensatory mitigation. The compensation ratios focus on direct permanent impacts, with additional mitigation required to address temporary fill impacts and secondary impacts, such as conversion of forested wetlands to scrub-shrub or emergent wetlands. While these ratios are the starting point for developing appropriate compensatory mitigation, there is flexibility on a project-by-project basis in order to achieve the most appropriate mitigation for a specific project. Tables 1-3 and 1-4 reproduce the USACE NED guidance regarding compensatory mitigation ratios for permanent and temporary / secondary impacts, respectively. Note that these ratios do not fully account for pipeline construction that primarily impacts emergent wetlands and provides in-place restoration.

TABLE 1-3
USACE NED RECOMMENDED COMPENSATORY MITIGATION RATIOS FOR DIRECT PERMANENT IMPACTS
(Table 1 in the NED Compensatory Mitigation Guidance)

Mitigation/ Impacts	Restoration[1] (reestablishment)	Creation (establishment)	Enhancement (rehabilitation)	Preservation (protection/ management)
Emergent Wetlands (ac)	2:1	2:1 to 3:1	3:1 to 10:1[2]	15:1
Scrub-shrub Wetlands (ac)	2:1	2:1 to 3:1	3:1 to 10:1[2]	15:1
Forested Wetlands (ac)	2:1 to 3:1	3:1 to 4:1	5:1 to 10:1[2]	15:1
Open Water (ac)	1:1	1:1	project specific[3]	project specific
Submerged Aquatic Vegetation (ac)	5:1	project specific[4]	project specific[5]	N/A
Streams[6] (lf)	2:1[7]	N/A	3:1 to 5:1[8]	10:1 to 15:1[9]
Mudflat (ac)	2:1 to 3:1	2:1 to 3:1	project specific	project specific
Upland[10] (ac)	≥10:1[11]	N/A	project specific	15:1[12]

[1] Assumes no irreversible change has occurred to the hydrology. If there has been such a change, then the corresponding creation ratio should be used.

[2] Based on types of functions enhanced and/or degree of functional enhancement.

[3] Might include planting submerged and/or floating aquatics and/or removal of invasive species.

[4] Rare cases, e.g., removal of uplands, old fill, etc.

[5] E.g., remove pollutant source such as an outfall, remove moorings.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

TABLE 1-3
USACE NED RECOMMENDED COMPENSATORY MITIGATION RATIOS FOR DIRECT PERMANENT IMPACTS
(Table 1 in the NED Compensatory Mitigation Guidance)

Mitigation/ Impacts	Restoration[1] (reestablishment)	Creation (establishment)	Enhancement (rehabilitation)	Preservation (protection/ management)

[6] Note that this assumes both banks will be restored/enhanced/protected. If only one bank will be restored/ enhanced/protected, use half the linear foot credit.

[7] E.g., daylighting stream, elimination of concrete channel.

[8] Enhancement of denuded banks and channelized streams = 3:1.

Enhancement of denuded banks when there is a natural channel = 4:1.

Enhancement when there are vegetated banks but the stream has been channelized = 5:1.

[9]Preserving buffer within the 100-foot minimum from channel = 10:1.

Preserving additional buffer 100 to 250 feet from channel = 15:1.

[10] This is when upland is used for wetland mitigation, NOT mitigation for upland impacts, which are not regulated.

[11] Only applies if existing condition is pavement or structure AND should complement aquatic functions.

[12] 100' upland buffer recommended for restoration, creation, and enhancement sites would be credited here.

TABLE 1-4
RECOMMENDED COMPENSATORY MITIGATION FOR TEMPORARY AND/OR SECONDARY IMPACTS
(Excerpted from Table 2 in the NED Compensatory Mitigation Guidance)

Impact	% Of Standard[1] Amount[2]
Temporary fill (swamp mats, fill over membrane) in forested wetlands; area to revegetate to forest.	10-25%
Temporary fill in emergent or scrub-shrub; area to revert to previous condition.	5-20%
Temporary fill in forest and will be permanently converted to scrub-shrub or emergent.	15-45%[3]
Permanent conversion of forested wetlands to other cover types.	15-40%
Removal of forested wetland cover for new corridor.	Project specific
Removal of forested cover of vernal pool buffer (w/in 250' of pool) when percentage of disturbance exceeds 25% of the total VP buffer area.	Project specific[4]
Streams – clearing of upland forest and/or scrub-shrub vegetation within 100' of stream bank or outermost channel of braided stream.	Project specific[5]

[1] "Standard" refers to amount of compensation that would be recommended under either the Corps' mitigation ratios for permanent fill (NED TABLE 1) or that required in In-lieu fee payments using the standard calculation.

[2] Percentages may be reduced if appropriate project-specific BMPs are incorporated into the project.

[3] For widening existing corridors only, not new. This does not take into account fragmentation impacts.

[4] Considerations in determining appropriate mitigation for secondary impacts to vernal pools should be on overall impact to the upland vernal pool buffer and how this affects the functions of the pool.

[5] Considerations in determining appropriate mitigation for secondary impacts to streams from loss of upland buffer should be on overall impact to the upland stream buffer and how this affects the functions of the stream.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Under the permittee-responsible mitigation option, to compensate for the Project's impacts to state and Federally-regulated wetland resource areas, Tennessee would anticipate developing a proposal that would consider various measures of in-situ/in-kind wetland restoration, land preservation, and/or other wetland enhancement measures.

On-ROW mitigation will occur in each state and will involve the restoration of wetlands and watercourses temporarily affected by Project construction activities, such as the installation of temporary fills (e.g., timber swamp mat access roads, timber work pads). Such water resources will be restored and stabilized to pre-existing conditions to the extent practicable during the Project ROW restoration efforts. As noted above, TWAs will be regraded and revegetated upon completion of construction activities.

To minimize the effects of the unavoidable impacts to state and Federally-regulated wetland resource areas during construction, Tennessee will implement best management practices ("BMPs") as outlined in the Project's "Wetland Invasive Species Management Plan " ("WISMP") (See the accompanying USACE Section 404 Attachment). The WISMP identifies the invasive wetland plant species that are of concern in the Project region and then reviews the wetlands along the Project ROWs where such species have been found. Although not all of the delineated wetlands proximate to the pipeline ROWs will be affected as a result of Project construction activities, those that will be disturbed could be more susceptible to colonization by invasive species. In addition, movement of construction equipment and materials through wetlands that presently contain invasive plants could promote the spread of invasive species to nearby, un-infested wetlands. The overall objective of the WISMP is to define the procedures to be used during Project construction to preserve the value and functions of wetlands along the Project ROWs that presently do not contain invasive species and to minimize the further spread of invasive plants within wetlands that already contain them. Construction best management practices will also be employed throughout the final design and implementation of the project, consistent with the procedures documented in submittals to the USACE as part of the Section 404 application.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

2.0 COMPENSATORY WETLAND MITIGATION PLAN FOR THE CONNECTICUT EXPANSION PROJECT – CONNECTICUT SECTION

2.1 INTRODUCTION AND OVERVIEW

The Connecticut Loop commences in Agawam, Massachusetts, in the yard of Compressor Station 261 at MP 0.0 and extends southward approximately 8.1 miles to the terminus in Suffield, Connecticut. The portion of the pipeline along this loop section in Connecticut consists of approximately 7.99 miles of 24-inch OD pipeline co-located within or adjacent to Tennessee's existing ROW beginning at the Massachusetts and Connecticut state line.

The pipeline loop segments will be located within or directly adjacent to Tennessee's existing permanent ROW in Suffield and East Granby, Connecticut. Additional permanent ROW will be required along with TWS and ATWS to facilitate construction of the pipeline. The routing for the pipeline loop was conducted in a manner to avoid significant areas of residential development, minimize the number of affected landowners, and effectively minimize environmental impacts.

In accordance with the Council on Environmental Quality (CEQ) and Clean Water Act Section 404 (b)(1) guidance, Tennessee has designed this project to (1) avoid impacts to aquatic resources to the extent practicable; (2) minimize unavoidable impacts; and, (3) finally, compensate for any remaining impacts to aquatic resources. Additional detail regarding the project's avoidance and minimization strategies are presented in the accompanying permit authorization requests and in Section 1, above. The remainder of Section 2 focuses on the compensatory mitigation efforts proposed to address the Project's impacts to aquatic resources that could not be avoided or minimized.

Tennessee and AECOM representatives discussed the Connecticut portion of the proposed Project with USACE and Connecticut Department of Energy and Environmental Protection wetland resource regulatory personnel on December 3, 2013 and December 5, 2013, respectively. Issues, suggestions and concerns raised in those meetings regarding mitigation strategies have been incorporated into this proposed Conceptual WMP.

Per the NED guidance document, compensatory mitigation may be accomplished via mitigation banks or in-lieu fee programs where they exist, or though permittee-responsible mitigation. Section 2.4, below, addresses two potential compensatory mitigation strategies for the Connecticut portion of this Project: In-Lieu Fee mitigation and Permittee Responsible mitigation.

Table 2-1 denotes the USGS-classified watersheds crossed by the Connecticut portion of the Project. Restoration and preservation activities will be undertaken within the Lower Connecticut (HUC 8) watershed. Additional details regarding these mitigation strategies are presented in the subsequent sections.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

TABLE 2-1
WATERSHEDS CROSSED BY THE CONNECTICUT EXPANSION PROJECT

Facility ID	County	Major Basin	HUC 8	HUC 10	HUC 12
Connecticut Loop					
Connecticut Loop	Hampden, MA Hartford, CT	Lower Connecticut	Mill River-Connecticut River	Pecousic Brook-Connecticut River	Muddy Brook Pecousic Brook-Connecticut River Stony Brook

Source: HUC Watershed Data - USGS National Hydrography Dataset (USGS 2011).

2.2 DESCRIPTION OF WETLANDS AND FUNCTIONS/VALUES

In support of meeting the USACE and USEPA goal of no net loss of wetland functions, a Functions and Values Assessment (FVA) has been completed to identify those wetland attributes that may be impacted as a result of the proposed Project.

The basic concept behind most wetland evaluation or assessment methods is that wetland characteristics contribute to give rise to wetland functions that have certain value to natural systems, including man. By assessing the relative importance of certain characteristics indicated by research or experience to contribute toward particular functions (e.g., the dominant vegetative class affects wildlife habitat value), and then weighting the various conditions which that characteristic may occur in wetlands (e.g., shallow marsh, wooded swamp, etc.), some picture of the relative significance a particular wetland may play in providing certain functions can be developed. This concept is fundamental to the wetland evaluation procedures that were drawn from to assess the functional values of the wetland areas on the site.

As listed and described in The Highway Methodology Workbook Supplement – Wetland Function and Values/A Descriptive Approach (U.S. Army Corps of Engineers, New England Division; September 1999), eight (8) functions and five (5) values may be associated with a given wetland. These functions/values include:

FUNCTIONS

- *Groundwater Recharge/Discharge* - This function considers the potential for the wetland to serve as a groundwater recharge and /or discharge area. It refers to the fundamental interaction between wetlands and aquifers, where there is potential for the wetland to contribute water to an aquifer (recharge) or to function as a groundwater discharge area.
- *Floodflow Alteration (Storage and Desynchronization)* - This function considers the effectiveness of the wetland in reducing flood damage by attenuating floodwaters for prolonged periods following precipitation and snow melt events.
- *Fish and Shellfish Habitat* - This function considers the effectiveness or importance of seasonal or permanent waterbodies associated with the wetlands in question for fish and shellfish habitat.
- *Sediment/Toxicant/Pathogen Retention* - This function reduces or prevents degradation of water quality. It relates to the effectiveness of the wetland to act as a trap for sediments, toxicants, or pathogens that may be contained in river or runoff water.
- *Nutrient Removal/Retention/Transformation* - This wetland function considers the effectiveness of the wetland to prevent adverse effects of excess nutrients entering aquifers or surface water.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

The effectiveness is related to the ability of the wetland to trap and process these nutrients into other forms or tropic levels.

- *Production Export* - This function evaluates the effectiveness of the wetland to produce food or useable products for humans or other living organisms.
- *Sediment/Shoreline Stabilization* - This function considers the effectiveness of a wetland to stabilize stream banks and shorelines against erosion.
- *Wildlife Habitat* - This function considers the effectiveness of the wetland to provide habitat for various types and population of animals typically associated with wetlands and the wetland edge. Both resident and/or migrating species are considered.

VALUES

- *Recreation (Consumptive and Non-Consumptive)* - This value considers the suitability of the wetland and associated watercourses to provide recreational opportunities such as hiking, canoeing, boating, fishing, hunting, and other active or passive recreational activities. Both "consumptive" and "non-consumptive" types of recreation are considered.
- *Education/Scientific Value* - This function considers the Suitability of the wetland as a site for an "outdoor classroom" or as a location for scientific study or research.
- *Uniqueness/Heritage* - This value relates to the effectiveness of the wetland or its associated watersheds to provide certain special values such as archeological sites, unusual aesthetic qualities, historical events, unique plants, animals, geologic features, etc.
- *Visual Quality/Aesthetics* - This value relates to the visual and aesthetic qualities of the wetland.
- *Threatened or Endangered Species Habitat* - This function considers the suitability of the wetland or associated watersheds to support rare, threatened, or endangered species.

To document the functions and values of the Connecticut Expansion Project wetlands, each of the factors associated with the presence/absence of a specific function/value was evaluated relative to each project area wetland. Table 2-2, below, presents an inventory of the Connecticut wetlands potentially impacted by the proposed Project, and enumerates which of these 13 functions and values are associated with wetlands within or proximate to the Project footprint.

The majority of wetlands within the Connecticut portion of the Project which will be impacted by the Project's ROW expansion area provide forested habitat and are located in relatively large, contiguous tracts. These forested areas are located relatively high in their respective watersheds and the Project is located proximate to several steep gradient headwater streams. As such, the surrounding PFO wetlands provide important water quality and flood attenuation benefits, as well as offer habitat value.

While the project is an expansion of an existing pipeline ROW, expanded edge effects on wildlife habitat, and alteration of flood storage capacity and sediment retention capabilities may be anticipated as a result of the permanent conversion of PFO habitat. Additional detail regarding the impacts to these wetlands is presented in Section 2.3, below.

2.3 WETLAND IMPACTS

Construction of the Project pipeline facilities in Connecticut will temporarily alter approximately 44.28 acres of wetlands in Connecticut (44.97 acres will be temporarily altered in the entire CT Loop, which includes impacts in Agawam, MA). Within the CT Loop wetlands, 6.72 acres of palustrine forested and 0.15 acres of scrub-shrub wetlands will be permanently maintained post-construction in an emergent or low scrub-shrub vegetated cover type. Table 2-3 presents the impacts to Connecticut wetlands anticipated as a result of the proposed Project. Table 2-4 presents this information broken down by impact and wetland type.

20141112-5142 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

TABLE 2-2
USACE HIGHWAY METHODOLOGY FVA: WETLANDS POTENTIALLY IMPACTED BY THE CT EXPANSION PROJECT

Town/State	Wetland Number	Wetland Classification[1]	Comments	Wetland Functions and Values[2]												
				GWR/D	FFA	F&SH	S&TR	NR&T	PE	S&S	WLH	REC	ED/S	U/H	VQ/A	T&E
Agawam, MA Suffield, CT	WCT-01/01B	PFO/PSS/PEM	Wetland crosses state boundaries.	X	X		X	X			X					
Suffield, CT	WCT-01A	PSS/PEM	Isolated Wetland	X	X		X	X			X					
Suffield, CT	WCT-01/01B	PFO/PSS/PEM	Drainage though agricultural fields	X	X		X	X			X					
Suffield, CT	WMA-02	PEM	Agricultural field.	X	X						X					
Suffield, CT	WCT-02	PSS/PEM		X	X		X	X			X					
Suffield, CT	WCT-03	PSS/PEM	Agricultural field.	X	X		X	X			X					
Suffield, CT	WCT-04	PFO		X	X		X	X	X		X				X	
Suffield, CT	WCT-05	PFO	Isolated. Contains (1) vernal pool.	X	X		X	X	X		X					
Suffield, CT	WCT-06	PFO/PEM	Contains (2) vernal pools.	X	X	X	X	X	X		X				X	
Suffield, CT	WCT-07	PFO/PEM	Contains (1) vernal pool.	X	X	X	X	X	X		X					
Suffield, CT	WCT-08	PFO	Small isolated wetland.	X				X			X					
Suffield, CT	WCT-09	PFO	Contains (1) vernal pool.	X			X	X	X		X			X		
Suffield, CT	WCT-10	PFO	Small isolated wetland.	X			X	X			X					
Suffield, CT	WCT-11	PFO/PSS/PEM	Headwaters of Clay Brook.	X	X		X	X			X					
Suffield, CT	WCT-12	PFO/PEM	Associated with Clay Brook perennial stream and agricultural field.	X	X	X	X	X			X					X
Suffield, CT	WCT-13	PFO	Vernal pool	X			X	X	X		X			X		X
Suffield, CT	WCT-14	PEM	Storm water collection basin.	X	X		X	X								X
Suffield, CT	WCT-15	PEM	Associated with Clay Brook, perennial stream. Portions used for a horse race track.	X	X		X	X		X						X
Suffield, CT	WCT-16	PFO/PEM	Large marsh associated with Clay Brook, perennial stream, and WCT-15. Includes agricultural fields.	X	X		X	X		X						X
Suffield, CT	WCT-17	PEM	Agricultural field.(hay)	X	X		X	X			X					
Suffield, CT	WCT-18	PEM	Contains vernal pool, and associated with Philo Brook, perennial stream Agricultural land present	X	X	X	X	X	X	X	X	X	X	X		X
Suffield, CT	WCT-19	PFO/PSS	Associated with intermittent tributary of Philo Brook.	X	X	X	X	X	X	X						X
Suffield, CT	WCT-20	PSS	Associated with intermittent tributary of Philo Brook.	X	X	X	X	X	X	X						
Suffield, CT	WCT-21	PEM	Agricultural field.(hay)	X	X		X	X			X					
Suffield, CT	WCT-21B	PEM	Mowed area	X	X		X	X			X					
Suffield, CT	WCT-22	PFO/PSS/PEM	Mostly Agricultural field (hay), with some mowed areas.	X	X		X	X			X					
Suffield, CT	WCT-23	PEM	Agricultural land	X	X		X	X			X					

20141112-5142 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

TABLE 2-2
USACE HIGHWAY METHODOLOGY FVA: WETLANDS POTENTIALLY IMPACTED BY THE CT EXPANSION PROJECT

Town/State	Wetland Number	Wetland Classification[1]	Comments	Wetland Functions and Values[2]												
				GWR/D	FFA	F&SH	S&TR	NR&T	PE	S&S	WLH	REC	ED/S	U/H	VQ/A	T&E
Suffield, CT	WCT-24	PFO/PEM	Much of understory cleared out and most of area id maintained.	X	X		X	X			X					
Suffield, CT	WCT-25	PFO/PSS/PEM		X	X		X	X			X					
Suffield, CT	WCT-26	PFO/PEM	Combination of Agricultural land (hay) and PFO.	X	X		X	X			X					
Suffield, CT	WCT-27	PFO/PEM	Combination of Agricultural land (hay) and PFO.	X	X		X	X			X					
Suffield, CT	WCT-28	PFO/PEM	Combination of Agricultural land (hay) and PFO.	X	X		X	X			X					
Suffield, CT	WCT-29	PEM	Active Agricultural land.	X	X		X	X			X					
Suffield, CT	WCT-30	PEM	Associated with intermittent tributary of Stoney Brook. Within agricultural field	X	X	X			X		X					
Suffield, CT	WCT-31	PFO	Associated with intermittent tributary of Stoney Brook	X	X	X	X	X	X		X				X	
Suffield, CT	WCT-32	PFO	Contains two vernal pools	X	X		X	X			X		X	X	X	
Suffield, CT	VP-1 (next to WCT-32	PFO	In ROW but located in unflagged wetland on other side of centerline	X	X		X				X		X	X	X	
Suffield, CT	WCT-33	PFO	Contains 6 vernal pools	X	X		X	X	X		X		X	X	X	
Suffield, CT	WCT-34	PFO	Contains 2 vernal pools	X	X		X	X			X		X	X	X	
Suffield, CT	WCT-35	PFO	Isolated Wetland	X			X	X			X					
Suffield, CT	WCT-36	PFO/PSS	Contains 1 vernal pool and old agricultural fields	X			X	X			X					
Suffield, CT	WCT 37		Associated with Stony Brook and unnamed perennial stream. Floodplains and agricultural fields	X	X	X	X	X	X	X	X	X	X	X	X	X
Suffield, CT	WCT 38	PEM	agricultural Fields	X	X		X	X								
Suffield, CT	WCT 39	PFO/PSS	Contains 1 vernal pool	X	X		X	X			X		X			
Suffield, CT	WCT 40	PFO/PEM	Portion is within agricultural field	X	X		X	X								
Suffield, CT	WCT 41	PFO/PSS/PEM	Contains intermittent tributary to Stony Brook. agricultural Fields and 2 vernal pools	X	X	X	X	X	X		X			X	X	
Suffield, CT	WCT 42	PSS	agricultural Ditch, eventually drains into Stony Brook	X		X	X									
Suffield, CT	WCT 43	PFO	Portion is within agricultural field	X		X	X	X			X					
Suffield, CT	WCT 44	PFO	Contains intermittent tributary to Stony Brook	X	X	X	X	X	X		X					
Suffield, CT	WCT-45	PFO	Contains 2 vernal pools and intermittent tributary to Stony Brook	X	X	X	X	X	X	X	X		X	X	X	X
Suffield/East Granby, CT	WCT-46	PFO	Contains 2 vernal pools and 2 intermittent tributary to De Grayes Brook	X	X	X	X	X	X	X	X		X	X	X	X
East Granby, CT	WCT-47	PFO	Contains intermittent tributary to De Grayes Brook	X	X	X	X	X	X	X				X		X

20141112-5142 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

TABLE 2-2
USACE HIGHWAY METHODOLOGY FVA: WETLANDS POTENTIALLY IMPACTED BY THE CT EXPANSION PROJECT

Town/State	Wetland Number	Wetland Classification[1]	Comments	Wetland Functions and Values[2]												
				GWR/D	FFA	F&SH	S&TR	NR&T	PE	S&S	WLH	REC	ED/S	U/H	VQ/A	T&E
East Granby, CT	WCT-48	PFO		X			X	X			X					X
East Granby, CT	WCT-48A	PFO/PEM		X			X	X			X					X
East Granby, CT	WCT-49	PSS	Contains 1 vernal pool	X	X		X	X			X		X	X	X	X
East Granby, CT	WCT-50	PFO/PSS/PEM	Contains De Grayes Brook and two intermittent tributaries to De Grayes Brook	X	X	X	X	X	X	X	X	X	X	X	X	X
East Granby, CT	WCT-50A	PFO/PSS/PEM	Contains De Grayes Brook	X	X	X	X	X	X	X	X	X	X	X	X	X
East Granby, CT	WCT-50B	PFO	Contains 1 vernal pool	X			X	X			X					
East Granby, CT	WCT-50C	PFO	Isolated wetland	X			X	X			X					
East Granby, CT	WCT-50D	PFO	Contains 1 vernal pool	X			X	X			X					
East Granby, CT	WCT-51	PFO/PEM	Contains 1 vernal pool and agricultural fields	X	X		X	X			X					X
East Granby, CT	WCT-52	PFO/PEM		X			X	X								
East Granby, CT	WCT-53	PFO/PEM	Contains De Grayes Brook and two intermittent tributaries to De Grayes Brook	X	X	X	X	X	X	X	X			X	X	
East Granby, CT	WCT-54	PFO/PSS/PEM	Contains De Grayes Brook and adjacent floodplains	X	X	X	X	X	X	X	X	X			X	
East Granby, CT	WCT-55	PSS	Contains De Grayes Brook and adjacent floodplains	X	X	X	X	X	X	X	X	X	X	X	X	X
Suffield, CT	WCT-56	PFO/PSS/PEM	Large wetland complex, includes areas of active agricultural fields.	X	X		X	X			X					X

1 Wetland Classification: PFO – Palustrine Forested Wetland, PSS – Palustrine Scrub-Shrub Wetland, PEM – Palustrine Emergent Wetland

2 Wetland Functions and Values:
GWR/D – Groundwater Recharge/Discharge,
FFA – Floodflow Alteration,
F&SH – Fish and Shellfish Habitat,
S&TR – Sediment/Toxicant Removal,
NR&T – Nutrient Removal,
PE – Production Export,
S&S – Sediment/Shoreline Stabilization,
WLH – Wildlife habitat,
REC – Recreation,
ED/S – Education/Scientific Value,
U/H – Uniqueness/Heritage,
VQ/A – Visual Quality/Aesthetics,
T&E – Endangered Species Habitat.

TABLE 2-3
ESTIMATED ACREAGE OF WATERS OF THE UNITED STATES TO BE IMPACTED – CT LOOP

Facility ID[a]	Palustrine Emergent (acres affected)		Palustrine Forested (acres affected)		Palustrine Scrub-Shrub (acres affected)		Total (acres affected)	
	Construction[b]	Operation[c]	Construction[b]	Operation[c]	Construction[b]	Operation[c]	Construction[b]	Operation[c]
Connecticut Loop	24.43	0.00	18.66	6.72	1.88	0.15	44.97	6.87

a: These values do not include 0.26 ac of temporary impacts associated with stream crossings in CT, where benthic habitats and banks will be restored in-place consistent with pre-existing conditions, or improved where possible.

b: Construction Acreage = all workspace during construction activities (TWS and ATWS plus permanent easement).

c: Operation Acreage = For conventional crossing methods: 30-foot width permanently maintained through forested wetlands, 10-foot width permanently maintained through scrub-shrub wetlands; there are no operation impacts to PEM wetlands as there is no change in the pre- and post-construction vegetation cover type.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

TABLE 2-4
WETLANDS ASSOCIATED WITH THE CONNECTICUT EXPANSION PROJECT – CONNECTICUT LOOP

Wetland ID[a]	Milepost	Latitude Longitude	Town / County	Quadrangle	Wetland Class[b]	Crossing Length (ft)[c]	Wetland Impact (acres)[d]					State Wetland Classification[e]	Crossing Method[f]	Comments
							Construction			Operation				
							PEM	PFO	PSS	PFO	PSS			
Wetlands Associated With Pipeline Facilities														
WMA 01	0.07	42.03244/ -72.63412	Agawam/Hampden	West Springfield	PFO/PEM	337.53	0.16	0.32	0.11	0.13	-	BVW	II	Low lying forested wetland.
WMA 02	0.16	42.03113/ -72.63419	Suffield/Hartford	West Springfield	PEM	65.38	0.11	-	-	-	-	BVW	II	Low lying forested wetland.
WCT1	0.26	42.02957/ -72.63444	Suffield/Hartford	West Springfield	PEM/PFO	211.20	0.35	-	0.01	-	-	-	II	Low lying portion of an agricultural field
WCT2	0.37	42.02802/ -72.63468	Suffield/Hartford	West Springfield	PSS/PFO	25.13	0.07	0.06	-	0.00	-	-	II	Scrub shrub wetland associated with low lying portion of ag field and intermittent stream.
WCT 56	0.56	42.02556/ -72.6362	Suffield/Hartford	West Springfield	PEM/PSS/ PFO	1637.90	2.46	0.79	0.37	0.19	-	-	II	Large wetland associated with agricultural fields and wet forested areas.
WCT3	1.10	42.01949/ -72.64177	Suffield/Hartford	West Springfield	PEM	1164.92	2.07	-	0.05	-	-	-	II	Wet agricultural field
WCT4	1.23	42.01765/ -72.64264	Suffield/Hartford	West Springfield	PFO	119.35	-	0.18	-	0.08	-	-	II	Forested wetland associated with a high water table
WCT6	1.29	42.01677/ -72.64302	Suffield/Hartford	West Springfield	PFO	325.06	0.21	0.29	-	0.08	-	-	II	Forested wetland with potential vernal pool east of ROW
WCT7	1.37	42.01564/ -72.64343	Suffield/Hartford	West Springfield	PFO	168.08	0.12	0.08	-	0.04	-	-	II	Forested wetland
WCT8	1.38	42.01562/ -72.64356	Suffield/Hartford	West Springfield	PFO	0.00	-	0.01	-	-	-	-	II	Isolated forested wetland, potential vernal pool
WCT 9	1.44	42.01481/ -72.64396	Suffield/Hartford	West Springfield	PFO	212.20	0.18	0.23	-	0.01	-	-	II	Forested wetland associated with a high water table
WCT 10	1.47	42.01435/ -72.64419	Suffield/Hartford	West Springfield	PFO	14.59	-	0.01	-	0.01	-	-	II	Isolated forested wetland, potential vernal pool
WCT 11	1.55	42.01338/ -72.64476	Suffield/Hartford	West Springfield	PFO/PEM	560.60	0.54	0.44	0.07	0.00	0.01	-	II	Forested and emergent marsh associated with surface water and Clay Brook (SCT-12).
WCT 12	1.80	42.01012/ -72.64676	Suffield/Hartford	West Springfield	PEM/PFO	1510.15	1.78	0.67	-	0.21	-	-	II	Forested and emergent marsh associated with surface water and Clay Brook (SCT-12).
WCT 13	1.99	42.00786/ -72.64892	Suffield/Hartford	West Springfield	PFO	6.91	-	0.03	-	0.00	-	-	II	Forested wetland associated with surface water, potential vernal pool.
WCT 14	2.00	42.00762/ -72.6489	Suffield/Hartford	West Springfield	PEM	0.00	0.01	-	-		-	-	II	Emergent marsh that receives flow from WCT-13 via a small culvert under a cart path
WCT 15	2.08	42.00679/ -72.64993	Suffield/Hartford	West Springfield	PEM	447.49	0.76	-	-	-	-	-	II	Emergent marsh drains to Clay Brook
WCT 16	2.36	42.00338/ -72.6526	Suffield/Hartford	West Springfield	PFO/PSS/ PEM	2337.03	3.59	0.58	0.05	0.09	-	-	II	Large forest and emergent wetland drains east Clay Brook
WCT 17	2.59	42.00028/ -72.6543	Suffield/Hartford	West Springfield	PSS/PEM	0.00	0.07	-	-	-	-	-	II	Large emergent wetland drains east to Clay Brook

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

TABLE 2-4
WETLANDS ASSOCIATED WITH THE CONNECTICUT EXPANSION PROJECT – CONNECTICUT LOOP

Wetland ID[a]	Milepost	Latitude Longitude	Town / County	Quadrangle	Wetland Class[b]	Crossing Length (ft)[c]	Wetland Impact (acres)[d]					State Wetland Classification[e]	Crossing Method[f]	Comments
							Construction			Operation				
							PEM	PFO	PSS	PFO	PSS			
WCT 18	2.81	41.99791/ -72.65714	Suffield/Hartford	Windsor Locks	PFO/PEM	1676.00	1.22	1.27	0.35	0.57	0.05	-	II	Large emergent wetland and agricultural field adjacent to Muddy Brook
WCT 21	3.34	41.99115/ -72.66198	Suffield/Hartford	Windsor Locks	PEM/PFO	1068.22	1.84	-	-	-	-	-	II	Emergent agricultural field and forested wetland associated with high water table.
WCT 22	3.56	41.98839/ -72.66383	Suffield/Hartford	Windsor Locks	PFO/PEM	758.31	1.73	-	0.15	-	0.00	-	II	Emergent agricultural field associated with high water table.
WCT 24	3.73	41.98648/ -72.66604	Suffield/Hartford	Windsor Locks	PFO/PEM	537.85	0.48	0.08	0.37	0.02	0.05	-	II	Emergent and forested wetland associated with high water table
WCT 25	3.95	41.98409/ -72.6687	Suffield/Hartford	Windsor Locks	PFO	524.82	0.28	0.64	-	0.22	-	-	II	Emergent and forested wetland associated with high water table
WCT 26	4.04	41.98297/ -72.66952	Suffield/Hartford	Windsor Locks	PEM	127.56	0.13	0.11	-	0.03	-	-	II	Emergent agricultural field associated with high water table.
WCT 27	4.09	41.98235/ -72.66999	Suffield/Hartford	Windsor Locks	PEM	337.48	0.31	0.21	-	0.08	-	-	II	Emergent agricultural field associated with high water table.
WCT 28	4.15	41.98143/ -72.67052	Suffield/Hartford	Windsor Locks	PFO/PEM	0.00	0.01	0.04	-	0.00	-	-	II	Forested/emergent wetland at the lower edges of ag fields.
WCT 29	4.21	41.98071/ -72.67112	Suffield/Hartford	Windsor Locks	PEM	465.53	0.76	-	-	-	-	-	II	Emergent wetland associated with high water table of an ag field.
WCT 30	4.43	41.97822/ -72.67364	Suffield/Hartford	Windsor Locks	PEM	184.99	0.32	-	-	-	-	-	II	Emergent wetland associated with high water table and intermittent drainage channel within ag field.
WCT 31	4.61	41.97614/ -72.67589	Suffield/Hartford	Windsor Locks	PFO/PEM	379.95		0.68	-	0.26	-	-	II	Primarily a forested wetland associated with high water table.
WCT 32	4.78	41.97418/ -72.67798	Suffield/Hartford	Windsor Locks	PFO/PEM	269.52	0.00	0.48	-	0.19	-	-	II	Primarily a forested wetland associated with high water table and intermittent surface water
WCT 33	5.02	41.97151/ -72.68083	Suffield/Hartford	Windsor Locks	PFO	1572.94	0.27	2.39	-	1.04	-	-	II	Primarily a forested wetland associated with a high water table with emergent vegetation on the ROW
WCT 34	5.20	41.96942/ -72.68303	Suffield/Hartford	Windsor Locks	PFO/PSS/ PEM	108.00	0.00	-	0.19	-	0.02	-	II	Forested, scrub shrub, and emergent wetland associated with a high water table
WCT 36	5.33	41.96798/ -72.68457	Suffield/Hartford	Windsor Locks	PFO/PSS/ PEM	927.76	0.02	1.57	0.03	0.64	0.00	-	II	Forested, scrub shrub, and emergent wetland associated with a high water table and intermittent drainage.
WCT 37	5.58	41.96504/ -72.6873	Suffield/Hartford	Windsor Locks	PFO/PSS/ PEM	437.88	0.75	0.10	-	0.04	-	-	II	Wetland associated with Stony Brook banks and flood plain
WCT 38	5.80	41.96216/ -72.68905	Suffield/Hartford	Windsor Locks	PEM/PFO	472.40	0.99	-	-	-	-	-	II	Primarily an emergent wetland associated with ag field high water table.
WCT 39	5.94	41.96034/ -72.69027	Suffield/Hartford	Windsor Locks	PFO/PEM	22.14	0.06	0.02	-	0.01	-	-	II	Primarily a forested wetland associated with an intermittent channel
WCT 40	5.98	41.95982/ -72.6906	Suffield/Hartford	Windsor Locks	PFO/PEM	152.23	0.05	0.12	-	0.09	-	-	II	Primarily a forested wetland associated with an intermittent channel

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

TABLE 2-4
WETLANDS ASSOCIATED WITH THE CONNECTICUT EXPANSION PROJECT – CONNECTICUT LOOP

Wetland ID[a]	Milepost	Latitude Longitude	Town / County	Quadrangle	Wetland Class[b]	Crossing Length (ft)[c]	Wetland Impact (acres)[d]					State Wetland Classification[e]	Crossing Method[f]	Comments
							Construction			Operation				
							PEM	PFO	PSS	PFO	PSS			
WCT 41	6.18	41.95717/ -72.69217	Suffield/Hartford	Windsor Locks	PFO/PEM	1557.60	0.83	1.81	-	0.74	-	-	II	Primarily a forested wetland associated with surface water and intermittent channels.
WCT 42	6.36	41.95493/ -72.69381	Suffield/Hartford	Windsor Locks	PSS/PEM	93.80	0.00	0.10	-	0.06	-	-	II	Scrub shrub and emergent wetland associated with an intermittent channel.
WCT 43	6.42	41.95417/ -72.69444	Suffield/Hartford	Windsor Locks	PFO/PEM	126.65	0.13	0.08	-	0.01	-	-	II	Forested and emergent wetland downslope of an ag field.
WCT 44	6.45	41.9537/ -72.69483	Suffield/Hartford	Windsor Locks	PFO/PEM	38.99	0.01	0.07	-	0.03	-	-	II	Forested and emergent wetland associated with an intermittent channel.
WCT 45	6.53	41.95278/ -72.69561	Suffield/Hartford	Windsor Locks	PFO/PEM	483.05	-	0.82	-	0.33	-		II	Primarily a forested associated with an unnamed perennial stream with emergent vegetation at ROW
WCT 46	6.82	41.94922/ -72.69871	East Granby/Hartford	Windsor Locks	PFO/PEM	912.21	0.43	1.21	-	1.21	-	-	II	Forested wetland associated with perennial streams, and with emergent vegetation at ROW.
WCT 46	6.82	41.94922/ -72.69871	Suffield/Hartford	Windsor Locks	PFO/PEM	1142.29	0.08	1.89	-		-		II	
WCT 47	7.11	41.946/ -72.70232	East Granby/Hartford	Windsor Locks	PFO	23.61	-	0.06	-	0.02	-	-	II	Forested wetland associated with perennial streams.
WCT 48A	7.19	41.94532/ -72.70335	East Granby/Hartford	Windsor Locks	PEM/PFO	64.56	0.09	0.08	-	0.04	-	-	II	Forested and emergent wetland
WCT 49	7.23	41.94486/ -72.70395	East Granby/Hartford	Windsor Locks	PFO	86.53	-	-	0.13	-	0.02	-	II	Forested wetland
WCT 50	7.27	41.94444/ -72.70456	East Granby/Hartford	Windsor Locks	PFO/PEM	14.86	0.01	0.06	-	0.01	-	-	II	Forested wetland and emergent marsh associated with DeGrayes Brook
WCT 50 A	7.30	41.94421/ -72.705	East Granby/Hartford	Windsor Locks	PFO	41.18	-	0.07	-	0.03	-	-	II	Forested wetland associated with DeGrayes Brook
WCT 51	7.34	41.9439/ -72.70557	East Granby/Hartford	Windsor Locks	PFO/PEM	214.51	0.22	0.08	-	0.03	-	-	II	Primarily emergent marsh
WCT 52	7.42	41.9431/ -72.7067	East Granby/Hartford	Windsor Locks	PFO/PEM	149.59	0.09	-	-	-	-	-	II	Forested and emergent wetland
WCT 53	7.56	41.94131/ -72.70798	East Granby/Hartford	Windsor Locks	PSS/PFO	1063.46	0.82	0.93	-	0.15	-	-	II	Primarily scrub shrub wetland associated with DeGrayes Brook
WCT 54	7.81	41.9382/ -72.70964	East Granby/Hartford	Windsor Locks	PFO/PSS/ PEM	0	-	-	-	-	-	-	IV	Large wetland system associated with DeGrayes Brook and floodplain.
Pipeline Facilities Total						**25180**	**24.43**	**18.66**	**1.88**	**6.72**	**0.15**			
Wetlands Associated With Proposed Pipeyards														
None Identified (workspace layout will avoid impacting identified wetlands)														

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

TABLE 2-4
WETLANDS ASSOCIATED WITH THE CONNECTICUT EXPANSION PROJECT – CONNECTICUT LOOP

Wetland ID[a]	Milepost	Latitude Longitude	Town / County	Quadrangle	Wetland Class[b]	Crossing Length (ft)[c]	Wetland Impact (acres)[d]					State Wetland Classification[e]	Crossing Method[f]	Comments
							Construction			Operation				
							PEM	PFO	PSS	PFO	PSS			
Wetlands Associated With Access Roads														
WCT4	1.20	42.01788/ -72.64205	Suffield/Hartford	West Springfield	PFO	-	-	-	-	-	-	-	N/A	Forested wetland associated with a high water table
WCT 21	3.34	41.99135/ -72.66224	Suffield/Hartford	Windsor Locks	PEM/PFO	-	-	-	-	-	-	-	N/A	Emergent agricultural field and forested wetland associated with high water table.
WCT 21B	3.40	41.99062/ -72.66291	Suffield/Hartford	Windsor Locks	PEM/PFO	-	-	-	-	-	-	-	N/A	Primarily an agriculture field, Impacts to pipeline workspace and access road # 4
WCT 22	3.47	41.98964/ -72.66325	Suffield/Hartford	Windsor Locks	PFO/PEM	-	-	-	-	-	-	-	N/A	
WCT 26	4.05	41.98319/ -72.66962	Suffield/Hartford	Windsor Locks	PEM	-	-	-	-	0.0036	-	-	N/A	Emergent agricultural field associated with high water table. Impacts to pipeline and access road #5
WCT 27	4.03	41.98318/ -72.66978	Suffield/Hartford	Windsor Locks	PEM	-	-	-	-	0.0001	-	-	N/A	Emergent agricultural field associated with high water table. Impacts to pipeline and access road #5
WCT 29	4.17	41.98118/ -72.67048	Suffield/Hartford	Windsor Locks	PEM	-	-	-	-	-	-	-	N/A	Forested/emergent wetland at the lower edges of ag fields. Impacts to pipeline and access road #5
WCT 41	6.28	41.9561/ -72.69363	Suffield/Hartford	Windsor Locks	PFO/PEM	-	-	-	-	-	-	-	N/A	Emergent wetland associated with high water table of an ag field. Impacts to pipeline and access road #5
WCT 41A	6.20	41.95737/ -72.69371	Suffield/Hartford	Windsor Locks	PFO/PEM	-	-	-	-	-	-	-	N/A	Primarily a forested wetland associated with surface water and intermittent channels. Adjacent to access road # 7 no impact to pipeline workspace.
WCT 41D	6.27	41.95626/ -72.69371	Suffield/Hartford	Windsor Locks	PFO/PEM	-	-	-	-	-	-	-	N/A	Primarily a forested wetland associated with surface water and intermittent channels. Adjacent to access road # 7 no impact to pipeline workspace.
Access Roads Total							0	0	0	0.0037	0			
Connecticut Loop Total						25180	24.43	18.66	1.88	6.72	0.15			

N/A: Not applicable
a: Field wetland Identification Number.
b: Wetland classifications according to Cowardin et al 1979: PEM = Palustrine Emergent Wetland; PSS = Palustrine Scrub-Shrub Wetland; PFO = Palustrine Forested Wetland.
c: 0.0 = wetland is not crossed by pipeline but is in workspace.
d: Construction Acreage = all workspace during construction activities (TWS and ATWS plus permanent easement); Operation Acreage = 10-foot wide corridor permanently maintained in herbaceous vegetated cover through PSS wetlands, and 30-foot wide corridor permanently maintained through PFO wetlands where trees taller than 15 feet will be selectively cut and removed. The permanently maintained corridors represent a change in cover type from PFO to PSS and PEM or PSS to PEM; there is no operation impact on PEM wetlands, since there is no change in the pre- and post-construction vegetation cover type. Construction impacts were calculated using a proposed construction footprint surface area and existing landuse based on field surveys. Surface area of operational maintenance corridor as described above were used to calculate acres of operation impact to each pre-construction wetland vegetation cover type for each wetland included in the table. The ROW width at all wetland crossings is 75 feet, except for those wetlands described in Table 2.3-8.
e: Massachusetts Wetlands Classification BVW = Bordering Vegetated Wetland, Connecticut Inland Wetland and Watercourses Act (Section 22a-36 through 45 of the Connecticut General Statue) does not provide specific state wetland classifications.
f: Methods for wetlands are described in Section 2.3.5; I = Standard Crossing; II = Conventional Crossing; III = Push/Pull Crossing; IV = Horizontal Directional Drill; N/A = Wetland not crossed by pipeline
Note: The totals shown in this table may not equal the sum of addends due to rounding.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

2.4 MITIGATION NEEDS AND OPTIONS

As noted above, the proponent anticipates that mitigation planning will be an ongoing process and that the mitigation approach outlined in this conceptual WMP will be further refined during future dialogue with regulators and other invested stakeholders.

In-Lieu Fee and Permittee Responsible mitigation strategies were explored as potential options for meeting compensatory mitigation requirements within Connecticut. As compensation for the unavoidable impacts proposed in associated with the Connecticut Loop portion of the Project, the following measures are considered viable components of a proposed compensatory mitigation approach:

- In-Situ restoration and plantings within areas of temporary impacts in the ROW in accordance with USACE wetland replication guidelines and monitoring of restoration success. Tennessee will restore (via regrading, re-vegetating using an appropriate New England seed mix and plantings) 24.43 acres of PEM wetlands, 18.66 acres of PFO wetlands and 1.88 acres of PSS wetlands.
- Following the Connecticut ILFP, provided the details and accounting process for this type of utility project can be developed in an acceptable manner.
- The permanent preservation of land parcels within the Lower Connecticut River watershed. In following this mitigation option, Tennessee would identify properties that contain appropriate acreage (as identified in Table 2-5) of forested wetland and other aquatic resources to compensate for the 6.72 acres of PFO wetland habitat that will be permanently converted to PEM habitat and for the <0.01 acres of permanent fill associated with Project construction in Connecticut.
- Tennessee will work with the identified property owner to place the site(s) into a permanent conservation easement.

Table 2-5 presents the summary of mitigation burden for the Connecticut portion of the Project using guidance obtained from USACE NED.

2.4.1 Wetland Restoration

Tennessee will conduct restoration planting of the proposed temporary workspace for pipeline construction within impacted wetland areas. Tennessee will maintain the integrity of wetlands within the Project alignment during construction the pipeline facilities through implementation of the Commission's Procedures as provided within the Environmental Assessment and enclosed in the accompanying USACE Section 404 of the CWA Individual Permit application. Supplemental restoration planting will be conducted after all major pipeline construction activities have been completed and the Project alignment has been restored to pre-existing contours and soil morphology.

Restoration planting will be consistent with USACE wetland mitigation guidelines that require plant densities of 600 plants-per-acre within forested wetlands, 400 of which shall consist of tree species. Tree species to be planted will consist of two-to-three foot whip-sized individuals in a variety of facultative wetland species obtained from a reputable plant nursery. No cultivars or other ornamental sub-species will be allowed as substitutes.

20141112-5140 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

TABLE 2-5
SUMMARY OF MITIGATION BURDEN FOR CT PORTION OF THE CONNECTICUT EXPANSION PROJECT

Duration of Impacts	Wetland Habitat Type	Disclosed Impacts (Acres)	Duration Factor	Min Std Ratio	Mitigation Strategies	Restoration (Acres)	Creation (Acres)	Enhancement (Acres)	Preservation (Acres)
Temporary[1]	PEM/PSS	26.31	0.05	2	Restoration	2.63			
			0.05	2	Creation		2.63		
			0.05	3	Enhancement			3.95	
			0.05	15	Preservation				19.73
Temporary[1]	PFO	18.66	0.1	2	Restoration	3.73			
			0.1	2	Creation		3.73		
			0.1	3	Enhancement			5.60	
			0.1	15	Preservation				27.99
Secondary[2]	PFO	6.72	0.15	2	Restoration	2.02			
			0.15	3	Creation		3.02		
			0.15	5	Enhancement			5.04	
			0.15	15	Preservation				15.12
Permanent3	PFO	0	1	2	Restoration	0.00			
			1	3	Creation		0.00		
			1	5	Enhancement			0.00	
			1	15	Preservation				0.00
	PEM/PSS	0.01	1	2	Restoration	0			
			1	2	Creation		0		
			1	3	Enhancement			0	
			1	15	Preservation				0
If all compensation was accomplished using a single strategy, this would be the minimum burden for this project:						8.40	9.41	14.61	62.99

Notes:
1. The strategies presume that the impacted area is restored and is not permanently impacted.
2. Involves permanent conversion of forest to other cover types; excludes operational impacts to PSS
3. Involves fill/loss of any wetland type.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

To ensure successful completion of the mitigation plan and increased survivorship of individual plantings, Tennessee will conduct the planting in mid-fall 2016 following completion of Project construction in early-fall of 2016. If actual construction timeframes do not accommodate a fall 2016 planting schedule, Tennessee shall conduct the planting as soon as practicable within the 2017 growing season with the understanding that installation of the plantings will be logistically impractical during inundated conditions that typically occur during early spring, while planting during drought or excessively hot conditions typically occurring in early- to mid-summer will be greatly increase the potential for individual mortality due to heat or water stress and supplemental irrigation of plantings is impractical if not impossible.

Planting will be conducted by a qualified and reputable landscape contractor under the supervision of a qualified wetland scientist contracted by Tennessee to provide oversight of the restoration activities. The landscape contractor and wetland scientist will be provided a copy of this wetland mitigation plan and apprised of Tennessee's obligations under the plan and USACE permit conditions. A wetland scientist / environmental inspector shall be on-site to monitor replanting of wetlands within TWSs to ensure compliance with the mitigation plan and to make adjustments when appropriate to meet mitigation goals.

Installation of the plantings will be conducted via foot traffic and hand tools to the extent practicable to avoid unnecessary impacts to restored wetland areas as a result of the planting activities. Where necessary, the landscape contractor shall use sheets of plywood or equivalent material for weight distribution along travel routes within saturated wetlands to protect soils from excessive rutting, compaction, or topsoil and subsoil mixing by foot traffic. If the use of mechanized equipment is necessary, the landscape contractor shall utilize small, lighter pieces of equipment such as a "bobcat" skid steer or equivalent, in conjunction with plywood sheeting to prevent impacts to saturated wetlands. Additionally, the number of required trips within a saturated wetland will be limited to the minimum number of trips necessary to accomplish the specific task. Any inadvertent impacts that occur during restoration planting activities, including but not limited to impacts outside of permitted work limits or excessive soil rutting, shall be immediately reported to Tennessee construction managers and restored to pre-existing conditions as soon as practicable. Spacing of individual plants will be conducted so as to maintain consistent areal canopy coverage and adequate sun exposure within the wetland as the plantings grow and mature. Additionally, consistent pre-determined spacing of individuals will ensure thorough and adequate replanting of the entire disturbed area, as well as limit the potential for confusion and subjective in-field spacing decisions by planting laborers.

Upon completion of wetland restoration activities, post construction monitoring will be completed. Invasive species control will be monitored, as outlined in the attached Wetland Invasive Species Control Plan (Attachment 1).

2.4.2 Connecticut in Lieu Fee Program

To address compensatory mitigation requirements remaining after the in-situ/in-kind wetland restoration activities described above are completed, the applicant examined several options. The National Audubon Society, Inc.-Connecticut (Audubon CT) and the USACE have a vehicle in place to complete off-site In-Lieu Fee mitigation projects within Connecticut. This option is considered a viable mitigation route by Tennessee provided the details and accounting process for this type of utility project can be developed in an acceptable manner. Implementation of the CT ILFP for this Project would occur within the Housatonic Service Area.

As noted in Table 2-5, the USACE NED standard ratio of 3:1 – 4:1 for creation of PFO habitat may be multiplied by a conversion factor of 15 – 40% for permanent conversion of forested wetlands to other cover types. This equates to a mitigation burden of 3.024 – 8.064 acres at the low end to 4.032 – 10.752 acres of wetland at the high end for the 6.72 acres of PFO habitat conversions.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

In addition, the 0.01 acres of permanent fill placed into PEM/PSS wetlands would be compensated for at a mitigation burden of 2:1 to 3:1, for creation of PEM/PSS habitat. This equates to 0.02 to 0.03 acres of mitigation burden for the PEM/PSS wetland fill. Total range of mitigation values are 3.044 acres (132,597 sf) to 10.782 acres (469,664 sf) of mitigation burden.

Should the In-Lieu Fee option not be acceptable, Tennessee anticipates completing the required mitigation via land preservation activities, as described in Section 2.4.3, below.

2.4.3 Permittee Responsible Mitigation

As an option or a component of the mitigation program, Tennessee may propose land preservation initiatives to meet the remaining requirements relative to compensating for wetland function loss. Specifically, wetlands that will be permanently converted from palustrine forested (PFO) to scrub shrub or emergent (PSS/PEM) and the minor amount of fill in agricultural field PEM wetlands could be compensated for by such mitigation.

The search for appropriate land preservation parcels is ongoing and will be further refined concurrently with the permit application process, if warranted. Generalized details regarding the land preservation strategy are presented below. The proponent will search for a parcel, or multiple parcels, that meets the following requirements:

- Parcel(s) is/are located within the Lower Connecticut River (HUC 8) Watershed. An emphasis will be placed upon identifying parcels for preservation that are located as proximate to the impacted areas as possible.
- The selected parcel will provide some component of PFO wetland habitat. Parcels that include wetlands which provide the functions and values identified in Table 2-2 will be prioritized.
- The proposed pipeline route traverses predominantly forested areas. As such, forested areas within this watershed would be the primary acquisition target for land preservation.

Upon identifying an appropriate parcel for preservation, Tennessee would work with the landowner to purchase the parcel either fee simple or to acquire the development rights to the land and then place a conservation mandate, deed restriction or other restrictive covenant upon the land. The proponent would work with a land trust organization, or possibly a governmental agency, to transfer this parcel or development rights to ensure its preservation and management in perpetuity. A land trust (or state agency) would be selected to receive the conservation easement. The land trust ultimately selected for receivership would depend upon the geographic location of the selected parcel. Possible candidate land trusts working in the subject area include:

Potential National Land Trust Organizations:

Access Fund
American Land Conservancy
Appalachian Trail Conservancy
Civil War Trust
The Conservation Fund
Ducks Unlimited
Garden Conservancy
Humane Society Wildlife Land Trust
National Park Trust
National Trust for Historic Preservation
The Nature Conservancy
North American Land Trust
Trust for Public Land
Wilderness Land Trust

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Potential Local Land Trust Organizations:

Suffield Land Conservancy
East Granby Land Trust
Granby Land Trust
Connecticut Farmland Trust

As noted in the NED compensatory wetland mitigation guidance document, "endowments to provide a funding source in perpetuity to long-term stewards are generally encouraged." Sufficient funds would be provided to ensure that the land trust may complete long-term easement monitoring and reporting requirements associated with the preserved lands.

The land preservation document would be prepared and submitted for USACE review prior to or in conjunction with the submission of the final mitigation plan. In order to avoid temporal losses associated with the Project, the proponent would attempt to initiate and/or complete land preservation efforts (parcel identification, legal documentation, development rights acquisition/fee simple purchase, and establishment of land management plan) prior to Project construction commencement in the fourth quarter winter 2015.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

3.0 COMPENSATORY WETLAND MITIGATION PLAN FOR THE CONNECTICUT SECTION EXPANSION PROJECT – MASSACHUSETTS SECTION

3.1 INTRODUCTION AND OVERVIEW

The Massachusetts Loop of the Connecticut Expansion Project is located in Sandisfield, Massachusetts and consists of approximately 3.8 miles of new 36-inch outside diameter ("OD") pipeline co-located within or adjacent to Tennessee's existing 200 Line Mainline right-of-way ("ROW"). The loop segment commences near Tennessee's existing Mainline Valve ("MLV") 258 at MP 0.0 adjacent to Town Hill Road and extends southeast to approximately MP 3.8 southeast of South Beech Plain Road. The Connecticut Loop commences in Agawam, Massachusetts, in the yard of Compressor Station 261 at MP 0.0 and extends southward approximately 8.1 miles to the terminus in Suffield, Connecticut. The portion of the pipeline along this loop section in Massachusetts consists of approximately 0.11 miles of 24-inch OD pipeline co-located within or adjacent to Tennessee's existing ROW terminating at the Massachusetts and Connecticut state line.

The pipeline loop segments will be located within or directly adjacent to Tennessee's existing permanent ROW in Sandisfield and Agawam, Massachusetts. Additional permanent ROW will be required along with TWS and ATWS to facilitate construction of the pipeline. The routing for the pipeline loop was conducted in a manner to avoid significant areas of residential development, minimize the number of affected landowners, and effectively minimize environmental impacts.

Appurtenant facilities associated with the Project will include two pig launchers, one pig receiver and one relocated mainline valve to be constructed by Tennessee. One pig launcher will be constructed within the existing workspace at the Agawam Compressor Station property (in Agawam, MA) at the beginning of the Connecticut looping segment and a second pig launcher will be constructed within the workspace at MP 0.0 in Sandisfield off of Town Hill Road at the beginning the Massachusetts looping segment. A pig receiver will be located at the terminus of the Project at MP 3.8 in Sandisfield. Tennessee plans to relocate the existing valve site located off of Town Hill Road to the terminus at MP 3.8 to minimize impacts to state lands and place the valve site on private property at the terminus of the loop. All appurtenant facilities will be constructed within the proposed workspace in the pipeline ROW and will not require additional impacts.

In accordance with the Council on Environmental Quality (CEQ) and Clean Water Act Section 404 (b)(1) guidance, Tennessee has designed this project to (1) avoid impacts to aquatic resources to the extent practicable; (2) minimize unavoidable impacts; and, (3) finally, compensate for any remaining impacts to aquatic resources. Additional detail regarding the project's avoidance and minimization strategies are presented in the accompanying permit authorization requests and in Section 1, above. The remainder of Section 3 focuses on the compensatory mitigation efforts proposed to address the Project's impacts to aquatic resources that could not be avoided or minimized.

Tennessee and AECOM representatives discussed the Massachusetts portion of the proposed Project with USACE and Massachusetts Department of Environmental Protection (MA DEP) wetland resource regulatory personnel on December 3, 2013. Issues, suggestions and concerns raised in those meetings regarding mitigation strategies have been incorporated into this proposed Conceptual CMP.

Per the NED guidance document, compensatory mitigation may be accomplished via mitigation banks or in-lieu fee programs where they exist, or though permittee-responsible mitigation. Section 3.4, below, addresses two potential compensatory mitigation strategies for the Massachusetts portion of this Project: In-Lieu Fee mitigation and Permittee Responsible mitigation. To satisfy MA DEP and USACE requirements and requests, the proponents are considering a combination of In-Lieu Fee mitigation and

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

permittee-directed mitigation activities within Massachusetts. Specifically, on-ROW wetland restoration and participation in the USACE-Massachusetts Department of Fish and Game (MA DFG) In-lieu fee program are currently considered as viable options to achieve compensatory mitigation requirements.

Table 3-1 denotes the USGS-classified watersheds crossed by the Massachusetts portion of the Project. The permittee-responsible mitigation strategies described below activities will be undertaken within the Farmington River (HUC 8) watershed.

TABLE 3-1
WATERSHEDS CROSSED BY THE CONNECTICUT EXPANSION PROJECT

Facility ID	County	Major Basin	HUC 8	HUC 10	HUC 12
Massachusetts Loop					
Massachusetts Loop	Berkshire	Connecticut	Farmington River	West Branch Farmington River	Clam River

Source: HUC Watershed Data - USGS National Hydrography Dataset (USGS 2011).

3.2 DESCRIPTION OF WETLANDS AND FUNCTIONS/VALUES

In support of meeting the USACE and USEPA goal of no net loss of wetland functions, a Functions and Values Assessment (FVA) has been completed to identify those wetland attributes that may be impacted as a result of the proposed Project.

The basic concept behind most wetland evaluation or assessment methods is that wetland characteristics contribute to give rise to wetland functions that have certain value to natural systems, including man. By assessing the relative importance of certain characteristics indicated by research or experience to contribute toward particular functions (e.g., the dominant vegetative class affects wildlife habitat value), and then weighting the various conditions which that characteristic may occur in wetlands (e.g., shallow marsh, wooded swamp, etc.), some picture of the relative significance a particular wetland may play in providing certain functions can be developed. This concept is fundamental to the wetland evaluation procedures that were drawn from to assess the functional values of the wetland areas on the site.

As listed and described in The Highway Methodology Workbook Supplement – Wetland Function and Values/A Descriptive Approach (U.S. Army Corps of Engineers, New England Division; September 1999), eight (8) functions and five (5) values may be associated with a given wetland. These functions/values include:

FUNCTIONS

- *Groundwater Recharge/Discharge* - This function considers the potential for the wetland to serve as a groundwater recharge and /or discharge area. It refers to the fundamental interaction between wetlands and aquifers, where there is potential for the wetland to contribute water to an aquifer (recharge) or to function as a groundwater discharge area.
- *Floodflow Alteration (Storage and Desynchronization)* - This function considers the effectiveness of the wetland in reducing flood damage by attenuating floodwaters for prolonged periods following precipitation and snow melt events.
- *Fish and Shellfish Habitat* - This function considers the effectiveness or importance of seasonal or permanent waterbodies associated with the wetlands in question for fish and shellfish habitat.
- *Sediment/Toxicant/Pathogen Retention* - This function reduces or prevents degradation of water quality. It relates to the effectiveness of the wetland to act as a trap for sediments, toxicants, or pathogens that may be contained in river or runoff water.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

- *Nutrient Removal/Retention/Transformation* - This wetland function considers the effectiveness of the wetland to prevent adverse effects of excess nutrients entering aquifers or surface water. The effectiveness is related to the ability of the wetland to trap and process these nutrients into other forms or tropic levels.
- *Production Export* - This function evaluates the effectiveness of the wetland to produce food or useable products for humans or other living organisms.
- *Sediment/Shoreline Stabilization* - This function considers the effectiveness of a wetland to stabilize stream banks and shorelines against erosion.
- *Wildlife Habitat* - This function considers the effectiveness of the wetland to provide habitat for various types and population of animals typically associated with wetlands and the wetland edge. Both resident and/or migrating species are considered.

VALUES

- *Recreation (Consumptive and Non-Consumptive)* - This value considers the suitability of the wetland and associated watercourses to provide recreational opportunities such as hiking, canoeing, boating, fishing, hunting, and other active or passive recreational activities. Both "consumptive" and "non-consumptive" types of recreation are considered.
- *Education/Scientific Value* - This function considers the Suitability of the wetland as a site for an "outdoor classroom" or as a location for scientific study or research.
- *Uniqueness/Heritage* - This value relates to the effectiveness of the wetland or its associated watersheds to provide certain special values such as archeological sites, unusual aesthetic qualities, historical events, unique plants, animals, geologic features, etc.
- *Visual Quality/Aesthetics* - This value relates to the visual and aesthetic qualities of the wetland.
- *Threatened or Endangered Species Habitat* - This function considers the suitability of the wetland or associated watersheds to support rare, threatened, or endangered species.

To document the functions and values of the Connecticut Expansion Project wetlands, each of the factors associated with the presence/absence of a specific function/value was evaluated relative to each project area wetland. Table 3-2, below, presents an inventory of the Massachusetts wetlands potentially impacted by the proposed Project, and enumerates which of these 13 functions and values are associated with wetlands within or proximate to the Project footprint.

The majority of wetlands within the Massachusetts portion of the Project which will be impacted by the Project's ROW expansion area provide forested habitat and are located in relatively large, contiguous tracts. These forested areas are located relatively high in their respective watersheds and the Project is located proximate to several steep gradient headwater streams. As such, the surrounding PFO wetlands provide important water quality and flood attenuation benefits, as well as offer habitat value.

While the project in an expansion of an existing pipeline ROW, expanded edge effects on wildlife habitat, and minor alteration of flood storage capacity and sediment retention capabilities may be anticipated as a result of the permanent conversion of PFO habitat. Additional detail regarding the impacts to these wetlands is presented in Section 3.3, below.

3.3 WETLAND IMPACTS

Construction of the Project pipeline facilities will temporarily alter approximately 10.28 acres of wetlands in Massachusetts (9.58 acres of temporary impacts in the MA Loop). Within the MA Loop wetlands, 2.11 acres of palustrine forested and 0.09 acres of scrub-shrub wetlands will be permanently maintained post-construction in an emergent or low scrub-shrub vegetated cover type. Table 3-3 presents the impacts to Massachusetts wetlands anticipated as a result of the proposed Project. Table 3-4 presents this information broken down by impact and wetland type.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

TABLE 3-2
FUNCTIONS AND VALUES OF MASSACHUSETTS WETLANDS

Town/State	Wetland Number	Wetland Classification[1]	Comments	Wetland Functions and Values[2]												
				GWR/D	FFA	F&SH	S&TR	NR&T	PE	S&S	WLH	REC	ED/S	U/H	VQ/A	T&E
Agawam, MA	WMA-01	PFO/PEM	Depicted on CT loop mapping.	X			X	X			X					
Agawam, MA	WMA-01A	PFO	Contains a vernal pool. Depicted on CT loop mapping.	X	X		X	X			X				X	
Agawam, MA	WMA-01B	PFO	Depicted on CT loop mapping.	X	X		X	X			X					
Agawam, MA Suffield, CT	WCT-01/01B	PFO/PSS/PEM	Wetland crosses state boundaries.	X	X		X	X			X					
Sandisfield, MA	WMA-03	PFO/PEM	Contains (2) vernal pools.	X			X	X			X					
Sandisfield, MA	WMA-04	PFO	Isolated.	X	X		X	X			X					
Sandisfield, MA	WMA-05	PFO/PEM	Contains (1) vernal pool.	X	X		X	X			X				X	
Sandisfield, MA	WMA-06	PFO/PEM	Contains (1) vernal pool.	X	X		X	X			X					
Sandisfield, MA	WMA-07	PFO/PSS/PEM	Very large wetland, contains (6) vernal pools.	X	X		X	X	X		X				X	
Sandisfield, MA	WMA-08	PFO		X	X		X	X			X					
Sandisfield, MA	WMA-09	PFO		X	X		X	X			X					
Sandisfield, MA	WMA-10	PFO/PEM		X	X		X	X			X					
Sandisfield, MA	CVP-1	PFO	This area did not qualify as a wetland (no hydric soil or hydrophytic veg.) but did as a vernal pool.													
Sandisfield, MA	WMA-11	PFO		X	X		X	X			X					
Sandisfield, MA	WMA-12	PFO/PEM	Area contains (1) vernal pool.	X	X		X	X	X		X					
Sandisfield, MA	WMA-13	PFO/PEM	Isolated Area contains (1) vernal pool.	X	X		X	X	X		X					
Sandisfield, MA	WMA-14	PFO/PEM		X			X	X			X					
Sandisfield, MA	WMA-15	PFO/PEM		X			X	X			X					
Sandisfield, MA	WMA-16	PFO/PEM	Contains a vernal pool.	X	X		X	X	X		X					

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

TABLE 3-2
FUNCTIONS AND VALUES OF MASSACHUSETTS WETLANDS

Town/State	Wetland Number	Wetland Classification[1]	Comments	Wetland Functions and Values[2]												
				GWR/D	FFA	F&SH	S&TR	NR&T	PE	S&S	WLH	REC	ED/S	U/H	VQ/A	T&E
Sandisfield, MA	WMA-17	OW	Small pond	X	X	X	X	X			X					
Sandisfield, MA	WMA-18	PFO/PEM	Contains a vernal pool.	X	X			X			X			X	X	
Sandisfield, MA	WMA-19	PFO/PEM		X				X			X					
Sandisfield, MA	WMA-20	PFO/PEM	Associated with a perennial stream.	X	X	X	X	X			X					
Sandisfield, MA	WMA-21	PEM/PFO	Large marsh.	X	X	X	X	X		X	X		X	X	X	
Tyringham, MA	WMA-22	PEM	Ag field.	X	X						X					X
Sandisfield, MA	WMA-23	PFO/PEM	Entire wetland is an active pasture and contains (1) vernal pool.	X	X		X	X			X					
Sandisfield, MA	WMA-24	PFO/PEM	Entire wetland is an active pasture and contains (1) vernal pool.	X	X		X	X			X					
Sandisfield, MA	WMA-31	PFO	Associated with perennial tributary of Clam River.	X	X	X	X	X		X						

[1] Wetland Classification: PFO – Palustrine Forested Wetland, PSS – Palustrine Scrub-Shrub Wetland, PEM – Palustrine Emergent Wetland

[2] Wetland Functions and Values: GWR/D – Groundwater Recharge/Discharge, FFA – Floodflow Alteration, F&SH – Fish and Shellfish Habitat, S&TR – Sediment/Toxicant Removal, NR&T – Nutrient Removal, PE – Production Export, S&S – Sediment/Shoreline Stabilization, WLH – Wildlife habitat, REC – Recreation, ED/S – Education/Scientific Value, U/H – Uniqueness/Heritage, VQ/A – Visual Quality/Aesthetics, T&E – Endangered Species Habitat.

TABLE 3-3
ESTIMATED ACREAGE OF WATERS OF THE UNITED STATES TO BE IMPACTED – MA LOOP

Facility ID[a]	Palustrine Emergent (acres affected)		Palustrine Forested (acres affected)		Palustrine Scrub-Shrub (acres affected)		Total (acres affected)	
	Construction[b]	Operation[c]	Construction[b]	Operation[c]	Construction[b]	Operation[c]	Construction[b]	Operation[c]
Massachusetts Loop	3.34	0.00	6.03	2.11	0.21	0.09	9.58	2.20

a: These values do not include 0.11 ac of temporary impacts associated with stream crossings in MA, where benthic habitats and banks will be restored in-place consistent with pre-existing conditions, or improved where possible.

b: Construction Acreage = all workspace during construction activities (TWS and ATWS plus permanent easement).

c: Operation Acreage = For conventional crossing methods: 30-foot width permanently maintained through forested wetlands, 10-foot width permanently maintained through scrub-shrub wetlands; there are no operation impacts to PEM wetlands as there is no change in the pre- and post-construction vegetation cover type.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

TABLE 3-4
WETLANDS ASSOCIATED WITH THE CONNECTICUT EXPANSION PROJECT – MA LOOP

Wetland ID[a]	Milepost	Latitude Longitude	Town / County	Quadrangle	Wetland Class[b]	Crossing Length (ft)[c]	Wetland Impact (acres)[d]					State Wetland Classification[e]	Crossing Method[f]	Comments
							Construction			Operation				
							PEM	PFO	PSS	PFO	PSS			
Wetlands Associated With Pipeline Facilities														
WMA-3	0.01	42.17803/ -73.1449	Sandisfield/Berkshire	Monterey	PEM/PFO	11.58	0.15	0.03	-	0.01		BVW	II	Forested and emergent wetland associated with an intermittent stream
WMA-5	0.33	42.17475/ -73.14061	Sandisfield/Berkshire	Monterey	PEM/PFO	19.09	0.01	0.04	-	0.01		BVW	II	Forested and emergent wetland associated with an intermittent stream channel
WMA-6	0.46	42.1734/ -73.13877	Sandisfield/Berkshire	Monterey	PEM/PFO	94.40	0.02	0.16	-	0.06		BVW	II	Forested and emergent wetland slopes west
WMA-7	0.89	42.16882/ -73.13324	Sandisfield/Berkshire	Monterey	PEM/PFO	1118.82	0.16	1.63	-	0.78		BVW	II	Large emergent and forested swamp
WMA-10	1.27	42.16438/ -73.12857	Sandisfield/Berkshire	Monterey	PEM/PFO	21.82	0.00	0.06	-	0.02		BVW	II	Emergent marsh vegetation within ROW with forested wetlands off ROW
WMA-12	1.51	42.16244/ -73.12504	Sandisfield/Berkshire	Monterey	PEM/PFO	461.44	0.39	0.34	-	0.04		BVW	II	Emergent marsh vegetation within ROW with forested wetlands off ROW
WMA-13	1.63	42.16098/ -73.12362	Sandisfield/Berkshire	Otis	PEM	502.31	0.39	-	-	-	-	N/A (isolated)	II	Emergent marsh
WMA-14	1.94	42.15728/ -73.12034	Sandisfield/Berkshire	Otis	PEM/PFO	388.57	0.36	0.39	-	0.09	-	BVW	II	Emergent marsh vegetation within ROW with forested wetlands off ROW
WMA-15	2.01	42.15679/ -73.11913	Sandisfield/Berkshire	Otis	PEM/PFO	241.83	0.22	0.21	-	0.09	-	BVW	II	Emergent marsh vegetation within ROW with forested wetlands off ROW
WMA-16	2.76	42.15148/ -73.10709	Sandisfield/Berkshire	Otis	PEM/PFO	888.50	0.47	0.97	0.15	0.40	0.03	BVW	II	Large emergent and forested swamp associated with a ponded area and a perennial stream
WMA-18	2.54	42.15384/ -73.11001	Sandisfield/Berkshire	Otis	PEM/PFO	305.01	0.20	0.34	-	0.10	-	BVW	II	Large forested and emergent swamp
WMA-19	2.45	42.15472/ -73.11135	Sandisfield/Berkshire	Otis	PEM/PFO	275.80	0.22	0.19	-	-	-	BVW	II	Forested and emergent wetland with disturbed soils in ROW.
WMA-20	2.89	42.15008/ -73.10563	Sandisfield/Berkshire	Otis	PEM/PFO	130.25	0.23	0.19	-	0.04	-	BVW	II	Large emergent and forested wetland associated with a perennial stream
WMA-21	3.30	42.14573/ -73.10016	Sandisfield/Berkshire	Otis	PEM/PFO	557.89	0.18	0.72	-	0.31	-	BVW	II	Large emergent marsh associated with a perennial stream
WMA-23	3.79	42.14078/ -73.09342	Sandisfield/Berkshire	Otis	PEM/PFO	311.38	0.37	0.76	0.06	0.16	-	BVW	II	
WMA-24	3.81	42.13976/ -73.09195	Sandisfield/Berkshire	Otis	PEM	0.00	0.00	-	-	-	-	BVW	N/A	
Pipeline Facilities Total						**5328.67**	**3.34**	**6.03**	**0.21**	**2.11**	**0.03**			

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:30 AM

TABLE 3-4
WETLANDS ASSOCIATED WITH THE CONNECTICUT EXPANSION PROJECT – MA LOOP

Wetland ID[a]	Milepost	Latitude Longitude	Town / County	Quadrangle	Wetland Class[b]	Crossing Length (ft)[c]	Wetland Impact (acres)[d]					State Wetland Classification[e]	Crossing Method[f]	Comments
							Construction			Operation				
							PEM	PFO	PSS	PFO	PSS			
Wetlands Associated With Proposed Pipeyards														
No wetlands will be impacted from the use of Pipeyards														
Wetlands Associated With Access Roads														
WMA-16	2.73	42.15152/ -73.10795	Sandisfield/Berkshire	Otis	PEM/PFO	-	-	-	-	-		BVW	N/A	
WMA-23	3.81	42.13994/ -73.09325	Sandisfield/Berkshire	Otis	PEM/PFO	-	-	-	-	-	0.09	BVW	N/A	
WMA-24	3.81	42.13991/ -73.09319	Sandisfield/Berkshire	Otis	PEM	-	-	-	-	-		BVW	N/A	
Access Roads Total						**0**	**0**	**0**	**0**	**0**	**0.09**			
MA Loop Total						**5328.67**	**3.34**	**6.04**	**0.21**	**2.11**	**0.09**			

N/A: Not applicable

a: Field Wetland Identification Number.

b: Wetland classifications according to Cowardin et al 1979: PEM = Palustrine Emergent Wetland; PSS = Palustrine Scrub-Shrub Wetland; PFO = Palustrine Forested Wetland.

c: 0.0 = wetland is not crossed by pipeline but is in workspace.

d: Construction Acreage = all workspace during construction activities (TWS and ATWS plus permanent easement); Operation Acreage = 10-foot wide corridor permanently maintained in herbaceous vegetated cover through PSS wetlands, and 30-foot wide corridor permanently maintained through PFO wetlands where trees taller than 15 feet will be selectively cut and removed. The permanently maintained corridors represent a change in cover type from PFO to PSS and PEM or PSS to PEM; there is no operation impact on PEM wetlands, since there is no change in the pre- and post-construction vegetation cover type. Construction impacts were calculated using a proposed construction footprint surface area and existing landuse based on field surveys. Surface area of operational maintenance corridor as described above were used to calculate acres of operation impact to each pre-construction wetland vegetation cover type for each wetland included in the table. The ROW width at all wetland crossings is 75 feet, except for those wetlands described in Table 2.3-8.

e: Massachusetts Wetlands Classification BVW = Bordering Vegetated Wetland

f: Methods for wetlands are described in Section 2.3.5; I = Standard Crossing; II = Conventional Crossing; III = Push/Pull Crossing; IV = Horizontal Directional Drill; N/A = Wetland not crossed by pipeline

Note: The totals shown in this table may not equal the sum of addends due to rounding.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

3.4 MITIGATION NEEDS AND OPTIONS

As noted above, the proponent anticipates that mitigation planning will be an ongoing process and that the mitigation approach outlined in this conceptual CMP will be further refined during future dialogue with regulators and other invested stakeholders.

In-Lieu Fee and Permittee Responsible mitigation strategies were explored as potential options for meeting compensatory mitigation requirements within Massachusetts. As compensation for the unavoidable impacts proposed in associated with the Massachusetts Loop portion of the Project, the following measures are proposed:

- In-Situ restoration and plantings within areas of temporary impacts in the ROW in accordance with USACE wetland replication guidelines and monitoring of restoration success. Tennessee will restore (via regrading, re-vegetating using an appropriate New England seed mix and plantings) 3.34 acres of PEM wetlands, 6.03 acres of PFO wetlands and 0.21 acres of PSS wetlands.
- Application of the Massachusetts ILFP, administered by the MA DFG, provided the accounting process for this type of utility project can be developed in an acceptable manner. Application of this mitigation option is considered primarily to address the compensatory mitigation burden for the 2.11 acres of PFO habitat that will be permanently converted to PSS habitat. The mitigation burden for 0.059 acres of permanent fill within WMA-23 could also be addressed via the ILFP.
- As an option to use of the Massachusetts In-lieu fee program, Tennessee would consider permittee-responsible compensatory mitigation options such as land preservation.

Table 3-5 presents the summary of mitigation burden for the Massachusetts portion of the Project.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

TABLE 3-5
SUMMARY OF MITIGATION BURDEN FOR MA PORTION OF CONNECTICUT EXPANSION PROJECT

Duration of Impacts		Disclosed Impacts (Acres)	Duration Factor	Min Std Ratio	Mitigation Strategies	Restoration (Acres)	Creation (Acres)	Enhancement (Acres)	Preservation (Acres)
Temporary[1]	PEM/PSS	3.55	0.05	2	Restoration	0.358			
			0.05	2	Creation		0.358		
			0.05	3	Enhancement			0.537	
			0.05	15	Preservation				2.685
Temporary1	PFO	6.03	0.1	2	Restoration	1.208			
			0.1	2	Creation		1.208		
			0.1	3	Enhancement			1.812	
			0.1	15	Preservation				9.06
Secondary[2]	PFO	2.11	0.15	2	Restoration	0.633			
			0.15	3	Creation		0.9495		
			0.15	5	Enhancement			1.5825	
			0.15	15	Preservation				4.7475
Permanent[3]	PFO	0	1	2	Restoration	0			
			1	3	Creation		0		
			1	5	Enhancement			0	
			1	15	Preservation				0
	PEM/PSS	0.06	1	2	Restoration	0.12			
			1	2	Creation		0.12		
			1	3	Enhancement			0.18	
			1	15	Preservation				0.9
If all compensation was accomplished using a single strategy, this would be the minimum burden for this project:						2.32	2.64	4.11	17.39

Notes:
1. The strategies presume that the impacted area is restored and is not permanently impacted.
2. Involves permanent conversion of forest to other cover types; excludes operational impacts to PSS
3. Involves permanent fill/loss of any wetland type.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

3.4.1 Wetland Restoration

Tennessee will conduct restoration planting of the proposed temporary workspace for pipeline construction within impacted wetland areas. Tennessee will maintain the integrity of wetlands within the Project alignment during construction the pipeline facilities through implementation of the Commission's Procedures as provided within the Environmental Assessment Report enclosed in the accompanying USACE Section 404 of the CWA Individual Permit application. Supplemental restoration planting will be conducted after all major pipeline construction activities have been completed and the Project alignment has been restored to pre-existing contours and soil morphology.

Restoration planting will be consistent with USACE wetland mitigation guidelines that require plant densities of 600 plants-per-acre within forested wetlands, 400 of which shall consist of tree species. Tree species to be planted will consist of two-to-three foot whip-sized individuals in a variety of facultative wetland species obtained from a reputable plant nursery. No cultivars or other ornamental sub-species will be allowed as substitutes.

To ensure successful completion of the mitigation plan and increased survivorship of individual plantings, Tennessee will conduct the planting in mid-fall 2016 following completion of Project construction in early-fall of 2016. If actual construction timeframes do not accommodate a fall 2016 planting schedule, Tennessee shall conduct the planting as soon as practicable within the 2017 growing season with the understanding that installation of the plantings will be logistically impractical during inundated conditions that typically occur during early spring, while planting during drought or excessively hot conditions typically occurring in early- to mid-summer will be greatly increase the potential for individual mortality due to heat or water stress and supplemental irrigation of plantings is impractical if not impossible.

Planting will be conducted by a qualified and reputable landscape contractor under the supervision of a qualified wetland scientist contracted by Tennessee to provide oversight of the restoration activities. The landscape contractor and wetland scientist will be provided a copy of this wetland mitigation plan and apprised of Tennessee's obligations under the plan and USACE permit conditions. A wetland scientist / environmental inspector shall be on-site to monitor replanting of wetlands within TWSs to ensure compliance with the mitigation plan and to make adjustments when appropriate to meet mitigation goals.

Installation of the plantings will be conducted via foot traffic and hand tools to the extent practicable to avoid unnecessary impacts to restored wetland areas as a result of the planting activities. Where necessary, the landscape contractor shall use sheets of plywood or equivalent material for weight distribution along travel routes within saturated wetlands to protect soils from excessive rutting, compaction, or topsoil and subsoil mixing by foot traffic. If the use of mechanized equipment is necessary, the landscape contractor shall utilize small, lighter pieces of equipment such as a "bobcat" skid steer or equivalent, in conjunction with plywood sheeting to prevent impacts to saturated wetlands. Additionally, the number of required trips within a saturated wetland will be limited to the minimum number of trips necessary to accomplish the specific task. Any inadvertent impacts that occur during restoration planting activities, including but not limited to impacts outside of permitted work limits or excessive soil rutting, shall be immediately reported to Tennessee construction managers and restored to pre-existing conditions as soon as practicable. Spacing of individual plants will be conducted so as to maintain consistent areal canopy coverage and adequate sun exposure within the wetland as the plantings grow and mature. Additionally, consistent pre-determined spacing of individuals will ensure thorough and adequate replanting of the entire disturbed area, as well as limit the potential for confusion and subjective in-field spacing decisions by planting laborers.

Upon completion of wetland restoration activities, post construction monitoring will be completed. Invasive species control will be monitored, as outlined in the attached Wetland Invasive Species Monitoring Plan (Attachment 1). In accordance with USACE NED wetland mitigation guidance, the restoration success will be monitored consecutively for the first five years at the site.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

3.4.2 Massachusetts in Lieu Fee Program

The USACE and the MA Department of Fish and Game ("DFG") have entered into an agreement to have DFG administer a state-wide in-lieu fee program for compensatory wetland mitigation. MA DFG's recently developed a Final Instrument and guidance documents offer a comprehensive description of how DFG will administer this in-lieu fee program in Massachusetts. Based upon the December 3, 2013 conversations with USACE personnel, ILFP mitigation is the USACE NED's preferred approach for compensating for impacts associated with this Project in Massachusetts.

As outlined in the Final In-Lieu Fee Program Fact Sheet, "*the ILFP allows Corps permittees, as compensation for their project impacts to aquatic resources of the U.S. in Massachusetts, to make a monetary payment in-lieu of doing the permittee required mitigation. These in-lieu fee payments are made to the ILFP administered by DFG. As the ILFP sponsor, DFG, in turn, assumes legal responsibility for implementing the required mitigation, which it will accomplish by aggregating and expending the in-lieu funds received from Corps permittees for mitigation projects. DFG's state-wide ILFP covers impacts to all types of aquatic resources from both small-sized projects authorized under the General Permit and larger projects that require an individual permit from the Corps.*"

Provided acceptable to all involved parties, Tennessee would consider purchasing mitigation credits within the Massachusetts ILFP Berkshire/Taconic Service Area. These credits cover all costs associated with land acquisitions, engineering, permitting, construction, long term monitoring, and administrative costs for the mitigation areas, as well as a contingency amount to provide for any necessary corrective actions.

As noted in Tables 1-2 and 1-3, above, USACE NED standard ratio of 3:1 – 4:1 for creation of PFO habitat may be multiplied by a conversion factor of 15 – 40% for permanent conversion of forested wetlands to other cover types. This equates to a mitigation burden of 0.9495 – 1.266 acres at the low end to 2.532 – 3.376 acres of wetland at the high end for the 2.11 acres of PFO habitat conversions. In addition, the 0.059 acres of permanent fill placed into PEM/PSS wetlands associated with access road construction would be compensated for at a mitigation burden of 2:1 to 3:1, for creation of PEM/PSS habitat. This equates to 0.118 – 0.177 acres of mitigation burden for the PEM/PSS wetland fill.

Tennessee understands that the ILFP accounting will also consider the full range of Project elements, including all best management practices such as construction sequencing, avoidance/minimization of impacts, erosion and sediment control measures, stormwater management, invasive species control measures, and in-situ restoration measures. Tennessee believes that their proposed application of state-of-the-art best management measures as detailed in the Section 404 application materials warrant appropriate consideration in the accounting of mitigation costs under the Massachusetts ILFP.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

APPENDIX D

Invasive Species Management Plan

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM



Application of Tennessee Gas Pipeline Company for a Certificate of Public Convenience and Necessity

FERC Docket No. CP14-___-000

CONNECTICUT EXPANSION PROJECT

Connecticut, Massachusetts and New York

VOLUME II

ENVIRONMENTAL REPORT

APPENDIX R

INVASIVE SPECIES MANAGEMENT PLAN

JULY 2014

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Prepared for:



Houston, TX

Invasive Species Management Plan

Connecticut Expansion Project

New York, Massachusetts, and Connecticut

AECOM
July 2014

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TABLE OF CONTENTS

1.0 INTRODUCTION 1

2.0 EXISTING CONDITIONS 1

2.1 Pipeline Facilities 1

2.2 Invasive Species 4

3.0 INVASIVE SPECIES MANAGEMENT 5

3.1 General Management Activities 5

3.2 Application Considerations 5

3.3 Species-Specific Management 6

3.4 Timing Considerations 7

3.5 Yearly Monitoring and Herbicide Reapplication 7

4.0 SUMMARY / CONCLUSIONS 8

LIST OF APPENDICES

Appendix A – Invasive Species Fact Sheets

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

1.0 INTRODUCTION

Tennessee Gas Pipeline Company, L.L.C. ("Tennessee") is filing an application seeking issuance of a certificate of public convenience and necessity from the Federal Energy Regulatory Commission ("Commission" or "FERC") for the construction and operation of the Connecticut Expansion Project (the "Project") in Albany County, New York, Berkshire and Hampden Counties, Massachusetts and Hartford County, Connecticut. The proposed Project involves the construction of two sections of new 36-inch outside diameter ("OD") pipeline looping totaling 1.35 miles in New York ("New York Loop") and 3.81 miles in Massachusetts ("Massachusetts Loop"), and one section of new 24-inch OD pipeline looping totaling 8.10 miles in Massachusetts and Connecticut ("Connecticut Loop") "), and appurtenant facilities, including main line valves ("MLV"), cathodic protection, and internal inspection device launchers and receivers. To the extent that it is practicable, feasible, and in compliance with existing law, Tennessee proposes to locate the pipeline loops within or adjacent to the right-of-way ("ROW") associated with its existing pipelines designated as the 200 and 300 Lines. Tennessee proposes to begin construction of the Project facilities in winter 2015 and to place the facilities in-service by November 2016. Please refer to Resource Report 1 of this Environmental Report ("ER") for a more complete description of the Project components.

The specific objective of the Invasive Species Management Plan ("ISMP") is to control invasive plant species within the disturbed pipeline right-of-way ("ROW") by means of limited herbicide use, by approved licensed companies who specialize in invasive species control, in concert with other control methods such as mechanical removal, mowing and cutting, if necessary. The rationale for controlling invasive species with herbicides is to ensure that the existing ecosystem is not compromised by the colonization and dominance of these species. Invasive species reduce the effectiveness of the ecosystem by competing with existing native species for light, nutrients and water. They can also change habitat structure, adversely affect native seed production and alter hydrologic regimes in wetlands. By implementing this ISMP, Tennessee will effectively maintain the site in its existing condition and allow for natural successional processes to occur with native vegetation.

2.0 EXISTING CONDITIONS

2.1 Pipeline Facilities

The pipeline alignment is characterized by several ecological communities including several types of upland forests, palustrine emergent ("PEM") wetlands, palustrine scrub shrub ("PSS") wetlands, palustrine forest ("PFO") wetlands, cultural grasslands, agricultural land, and developed land. The following subsections provide a brief description of each community.

2.1.1 Appalachian Oak-Hickory Forest

These occur on well-drained sites, usually ridgetops, upper slopes, or south- and west-facing slopes and generally identified north and south of the existing Project ROW. The soils are usually loams or sandy loams. Dominant trees include one or more the following oaks: red oak (*Quercus rubra*), white oak (*Q. alba*), and black oak (*Q. velutina*). Mixed with the oaks, usually at lower densities, are one or more of the following hickories: pignut (*Carya glabra*), shagbark (*C. ovata*), and sweet pignut (*C. ovalis*). Common associates are white ash (*Fraxinus americana*), red maple (*Acer rubrum*), and Eastern hop hornbeam (*Ostrya virginiana*). There is typically a subcanopy of stratum of small trees and tall shrubs including flowering dogwood (*Cornus florida*), witch hazel (*Hamamelis virginiana*), shadbush (*Amelanchier arborea*), and choke cherry (*Prunus virginiana*). Common low shrubs include maple-leaf viburnum (*Viburnum acerifolium*), blueberries (*Vaccinium angustifolium, V. pallidum*), red raspberry (Rubus idaeus), gray dogwood (*Cornus foemina* ssp. *racemosa*), and beaked hazelnut (*Corylus cornuta*). The shrublayer and groundlayer flora may be diverse.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Charateristic groundlayer herbs are wild sarsaparilla (*Aralia mudicaulis*), false Solomon's seal (*Smilacina racemosa*), Pennsylvania sedge (*Carex pensylvanica*), tick-trefoil (*Desmodium glutinosum, D. paniculatum*), black cohosh (*Cimicifuga racemosa*), rattlesnake root (*Prenanthes alba*), white goldenrod (*Solidago bicolor*), and hepatica (*Hepatica americana*).

2.1.2 Successional Northern Hardwoods

Successional northern hardwoods is described as a hardwood or mixed forest that occurs on sites that have been cleared or otherwise disturbed.

Characteristic trees and shrubs include any of the following: quaking aspen (*Populus tremuloides*), bigtooth aspen (*P. grandidentata*), balsam poplar (*P.balsamifera*), paper birch (*Betula papyrifera*), or gray birch (*B. populifolia*), pin cherry (*Prunus pensylvanica*), black cherry (*P. serotina*), red maple, white pine (*Pinus strobus*), with lesser amounts of white ash, green ash (*F. pensylvanica*), and American elm (*Ulmus americana*). Northern indicators include aspens, birches, and pin cherry. This is a broadly defined community and several seral and regional variants are known.

This cover type category covers all non-forested vegetated areas that are not in agricultural production or landscaped. It includes grasslands, successional old fields and shrublands, and maintained utility ROWs. Open lands are typically previously disturbed lands that have been cleared for farming, utility construction, or other developments and then abandoned.

2.1.3 Northern Hardwoods – Hemlock – White Pine Forest

This community type is common within upland areas along the proposed pipeline route in Massachusetts and Connecticut and is characterized as a closed canopy forest dominated by a mix of evergreen and deciduous trees, with sparse shrub and herbaceous layers. Common tree species of this plant community include sugar maple (*Acer saccharum*), Northern red maple, Eastern white pine, black cherry, sweet birch *(Betula lenta*), red oak and hemlock (*Tsuga canadensis*). The shrub layer is usually open, but included scattered clumps of witch-hazel, red elderberry (*Sambucus pubens*), tartarian honeysuckle (*Lonicera tartarica*), multiflora rose (*Rosa multiflora*) and Rhododendron (*Rhododendron canadense*) along the Project alignment. A sparse herbaceous layer included hayscented fern (*Dennstaedtia punctilobula*), false Solomon's seal, starflower (*Trientalis borealis*), partridberry (*Mitchella repens*), poison ivy (*Toxicodendron radicans*), Canada mayflower (*Maianthemum canadense*) and wild sarsaparilla (*Aralia nudicaulis*).

2.1.4 Mixed Oak Forest

The mixed oak forest, found in the Project area, includes a variable mix of oak species that dominates the canopy: black oak, scarlet oak (*Q. coccinea*), red oak, chestnut oak (*Q. prinus*), and white oak. The canopy is somewhat open. An understory of saplings of canopy species, as well as gray birch, aspen, big-toothed aspen, sweet birch, red maple, and chestnut (*Castanea dentata*) is dense in patches. Blueberries, huckleberry (*Gaylussacia baccata*), sweet fern (*Comptonia peregrina*), scrub oak (*Quercus ilicifolia*), and mountain laurel (*Kalmia latifolia*) are also dense in patches. A scattered herbaceous layer includes Pennsylvania sedge, wild sasparilla, poverty grass, pinweed (*Lechea intermedia*), and pale corydalis (*Corydalis sempervirens*).

2.1.5 Successional White Pine Forest

Successional white pine forests are abandoned agricultural land, usually pasture. Sometimes selective logging maintains the pine as a dominant. White pine dominates the forest, with scattered white oak, red oak, and red maple in the canopy. The shrub layer is variable in density, from sparse to thick: Elderberry (*Sambucus canadensis*), black cherry, maple-leaved viburnum, and often non-native species such as buckthorn (*Rhamnus frangula*), honeysuckle (*Lonicera morrowii*), or/and multiflora rose. A variety of

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

blackberry vines (often forming thickets), and poison ivy often covers the ground near openings or in formerly open disturbed areas. Low bush blueberries form patches, mixed with black huckleberry exist on sites with less disturbed soils. The herbaceous layer is variable; large patches of Canada mayflower and starflower with clubmosses (*Lycopodium obscurum* and related species) are particularly common on formerly plowed soil. Bracken fern (*Pteridium aquilinum*) is often common. Partridgeberry, fringed polygala (*Polygala uniflora*), and pink lady slipper (*Cypripedium acaule*) grow in many longer established sites.

2.1.6 Palustrine Emergent Wetlands

Emergent wetlands are non-tidal wetlands characterized by erect, rooted, herbaceous hydrophytes. Emergent wetlands are generally dominated by perennial plants and maintain the same appearance through the years. Plant species commonly found in PEM wetlands along the Project alignment included soft rush (*Juncus effusus*), broad-leaved cattail (*Typha latifolia*), purple loosestrife (*Lythrum salicaria*), woolgrass (*Scirpus cyperinus*), lurid sedge (*Carex lurida*), sensitive fern (*Onoclea sensibilis*), spotted touch-me-not (*Impatiens capensis*), skunk cabbage (*Symplocarpus foetidus*), reed canary grass (*Phalaris arundinacea*) and blue flag (*Iris versicolor*).

2.1.7 Palustrine Scrub Shrub Wetlands

Scrub-shrub wetland types may represent a successional stage leading to a forested wetland and include shrubs, young trees, and trees or shrubs that are small and/or stunted due to environmental conditions. Shrub swamps are widespread, highly variable communities with shrub-dominated wetlands that occur on mineral or mucky mineral soils that are either seasonally or temporarily flooded. They are typically found in flat areas in which the water table is at or above the soil surface for most of the year. Shrub swamps are generally found on the transition zone of emergent and forested wetland areas that have been previously disturbed by vegetation control practices or past land use patterns. Common wetland shrubs observed in the Project area include meadowsweet (*Spirea latifolia*), willow (*Salix* spp), silky dogwood (*Cornus amomum*), maleberry (*Lyonia ligustrina*), cinnamon fern (*Osmunda cinnamomea*), soft rush (*Juncus effusus*), sensitive fern (*Onoclea sensibilis*), and false hellebore (*Veratrum viride*)

2.1.8 Palustrine Forested Wetland

Dominant species within these wetlands included red maple, American elm *(Ulmus americana)*, Eastern white pine and American hornbeam *(Carpinus caroliniana)* in the canopy and subcanopy layers, with silky dogwood *(Cornus amomum)* and northern arrowwood (*Viburnum dentatum*) in the understory. Dominant plants in the herbaceous layer included sensitive fern, cinnamon fern (*Osmunda cinnamomea*), Canada mayflower, spotted touch-me-not and poison ivy.

2.1.9 Cultural Grasslands

Cultural grassland is a human created and maintained open community dominated by grasses, normally maintained by mowing, and primarily of conservation interest for the grassland bird community. A grassland community generally occurs on sand or other droughty, low nutrient soils. Surroundings in many areas include Pitch pine/Scrub oak communities. Many small airports with surrounding grasslands were built on sand plains. Pastures and hayfields occur in all areas, and surroundings reflect the regional variations. Airports, cemeteries, pastures, and hayfields provide different habitats, and support different species of plants and animals. Grasslands at many smaller airports are dominated by graminoids, usually little blue stem grass (*Schizachyrium scoparium*), Pennsylvania sedge (*Carex pensylvanica*), and poverty grass (*Danthonia spicata*), and many non-native species. Some cultural grasslands do have some mix of herbaceous species, such as goldenrods (*Solidago* and *Euthamia* spp.) and milk weeds including butterfly weed (*Asclepias* spp. and *A. tuberosa*).

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

2.1.10 Agricultural Land

The agricultural cover type includes land used for grazing or raising crops. Approximately 2.23-miles of the Project alignment crosses through agricultural land. The remaining agricultural terrain crossed by the Project functions as grazing land for cattle.

2.1.11 Developed Land

Developed lands comprise approximately 0.16-miles of the Project area and include residential areas, industrial and commercial lands. These lands are typically devoid of undisturbed vegetation, and are more commonly defined by mowed lawns, other landscaped areas, and impervious surfaces.

2.2 Invasive Species

Non-native invasive plant species are present within the existing Tennessee ROW and, to a lesser extent, within the adjacent uplands and wetlands to be used for temporary workspace. Invasive species colonization is more prevalent within the ROW due to the early-successional habitat created through ROW management practices, the extent of edge habitat and disturbance by unauthorized all-terrain vehicle use. Although certain species may be abundant in localized areas within the ROW, they do not dominate the ROW to an overall extent that precludes native species. The invasive plant species that have been documented as being present within the ROW and potentially posing a threat to native plant communities are identified below.

2.2.1 Invasive Species Present

2.2.1.1 Purple Loosestrife

Purple loosestrife is a species that spreads rapidly in all forms of emergent and saturated wetland systems. It is tolerant of a variety of different growing conditions, and each plant is capable of producing up to 2.5 million seeds annually. Loosestrife forms large dense stands within wetlands that limit plant diversity, reduce wildlife habitat quality and can adversely affect water quality.

2.2.1.2 Common Reed

Common reed (*Phragmites austalis*) has been observed in several wetlands along the existing ROW in all three loops. The propagation of common reed usually occurs at a relatively high rate through underground rhizomes or wind-dispersed seeds. The establishment of common reed in the existing wetlands and proposed restoration areas would result in a lower diversity of aquatic vegetation as common reed out-competes other species.

2.2.1.3 Reed Canary Grass

Reed canary grass is a tall, perennial grass that commonly forms extensive single-species stands along the margins of lakes, streams, and wet open areas. This species can form huge colonies and overwhelm wetland systems, limiting plant diversity and reducing habitat quality. The species flourishes in disturbed areas, and can be found in the majority of the PEM wetland communities within successional and agricultural areas of the existing ROW in all three loops.

2.2.1.4 Multiflora Rose

Multiflora rose is an extremely aggressive, fast propagating shrub that out-competes native vegetation by forming dense thickets. This species is present within uplands along the majority of the loop segments. It has not created significant thickets across the ROW, but conditions are favorable for expansion of the population should no management be conducted.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

3.0 INVASIVE SPECIES MANAGEMENT

3.1 General Management Activities

Herbicides will be applied according to manufacturers' printed recommendations and in accordance with Federal and state regulations governing herbicide application. Table 3.3-1 provides a matrix of invasive species identified within the ROW to date as well as the recommended herbicide per the Connecticut Invasive Plant Working Group *Invasive Plant Management Guide* (2001). The following herbicides are being considered for use:

1) **Glyphosate (Roundup / Rodeo)** – applied to foliage for control of invasive herbaceous (including grasses) and woody plants; also used as a treatment on cut stumps to prevent re-sprouting. Because glyphosate is non-selective, selective application methods and seasonal timing will be used to prevent impacts on non-target species.

2) **Triclopyr (Garlon)** – applied to foliage for control of invasive, broadleaf herbaceous and woody plants; also used as a treatment on cut stumps to prevent re-sprouting, or as a basal bark application to kill woody plants.

3.2 Application Considerations

Per the *Invasive Plant Management Guide* (2001), use of a systemic herbicide is often necessary to achieve adequate control of invasive plants. Systemic herbicides absorb into the plant foliage and/or stems, then translocate (move) and accumulate to toxic levels in the growing points or roots. Following foliar applications in late summer or fall (prior to leaf color change), systemic herbicides will accumulate in storage tissues below ground. In this way, the herbicide is more likely to prevent re-growth the following year.

Herbicides may be applied by the following methods to control invasive plants:

1) Post-emergence (Foliar) Applications
    a. Spray properly diluted herbicide (in water) onto plant foliage.
    b. Wipe herbicide (more concentrated form) onto leaves with wiper applicator.
2) Cut Stump Treatments
    a. Paint concentrated form of herbicide on freshly cut stumps of woody plants.
3) Application equipment
    a. hand-held sprayers, backpack sprayers, paint brush or sprayer for stump and bark treatments

Addition of a non-ionic surfactant [@ 0.5 fluid ounce (1 tablespoon) per gallon of spray] will improve coverage of spray droplets on treated leaves and enhance absorption of the herbicide into the plant. Surfactants (sold under many trade names) can be purchased at fertilizer and pesticide dealerships. Some herbicide formulations already contain a surfactant.

In accordance with FERC's Upland Erosion Control, Revegetation, and Maintenance Plan (Section V.D.) no herbicide application will occur in or within 100 feet of any watercourses without prior authorization by all applicable land management or state agencies.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

3.3 Species-Specific Management

3.3.1 Purple Loosestrife

To the extent practicable, loosestrife shall be removed by hand and disposed of off-site. Should significant populations of loosestrife become established, alternative control methods such as limited herbicide application (Rodeo – within wetland areas) shall be considered.

3.3.2 Common Reed

Early control of common reed will be conducted via hand removal or cutting. Stems will be cut below the lowest leaf, leaving a 6-inch or shorter stump, and cut or pulled material we be disposed of off site. Herbicide application treatment (Rodeo – within wetland areas) will be reserved for dense stands where hand removal or cutting is not effective.

3.3.3 Reed Canary Grass

Small populations of reed canary grass will be controlled by hand removal. Isolated plants or small patches can successfully be removed by digging out and removing the entire root mass. Applications of Rodeo will be applied if populations continue to thrive to prevent the development of large infestations.

3.3.4 Multiflora Rose

A combination of mechanical removal and herbicide applications are the preferred management method for this species. All plants will be removed and disposed of off site. Additional control measure will include herbicide applications with a foliar glyphosate treatment. Subsequent management will likely be conducted through regular mowing to prevent seedling establishment.

TABLE 3.3-1

CONNECTICUT EXPANSION PROJECT INVASIVE SPECIES MANAGEMENT HERBICIDE APPLICATION CHART

Invasive Species	Herbicide	Application Rate	Application Method	Frequency / Time of Year
Purple Loosestrife (*Lythrum salicaria*)	Glyphosate (Rodeo only)	Foliar – 1-2% solution Cut Stump – 20%	Foliar and/or Cut Stump	Foliar – Late August Cut Stump – Early Fall
Common Reed (*Phragmites australis)*	Glyphosate (Rodeo only)	25% solution	Cut Stump	September
Reed Canary Grass (*Phalaris arundinacea*)	Glyphosate (Rodeo only)	2%	Foliar	Mid-June to late July
Multiflora Rose (*Rosa multiflora*)	Glyphosate / Triclopyr	1-2% solution	Foliar and/or Cut Stump	Throughout growing season

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

3.4 Timing Considerations

Construction of the Project facilities is currently scheduled to commence in winter 2015, with an in-service date of November 1, 2016. Through construction activities including vegetation clearing and grading, the majority of the invasive species present within the ROW and temporary workspace shall be removed. Upon completion of construction, the ROW will be reseeded and stabilized in accordance with the FERC's Upland Erosion Control, Revegetation, and Maintenance Plan and Wetland and Waterbody Construction and Mitigation Procedures. Tennessee anticipates conducting limited mechanical treatment of invasive species in fall 2016 and will focus on herbicide applications to prevent colonization of the ROW by invasive species.

3.5 Yearly Monitoring and Herbicide Reapplication

Monitoring will be conducted on a yearly basis up to five years post-construction as stipulated by regulatory agencies. During the first five years following construction, invasive species monitoring will occur at least annually and possibly more frequently during the growing season, as recommended by the qualified contractor hired by Tennessee to conduct invasive species control activities. These surveys will be performed during the first five years to determine growth by re-sprouting plants or re-colonization. Treatment and retreatment will be conducted accordingly, with timing to be determined by Tennessee and its qualified contractor. After the fifth year of monitoring, annual surveys may continue if invasive continue to present a significant threat to re-establishment of native vegetation, as determined by appropriate regulatory agencies. Herbicide applications will be managed on an as-needed basis, and eradication efforts will be incorporated into the current ROW mechanical mowing maintenance plan. Please refer to Table 3.5-1 for a detailed schedule for management activities.

TABLE 3.5-1
CONNECTICUT EXPANSION PROJECT
INVASIVE SPECIES MANAGEMENT PLAN SCHEDULE

Month	Application/Removal Method	Comments
2016		
May	Foliar Herbicide	As necessary to control invasives
September	Foliar Herbicide /Manual	As necessary to control invasives
	Corridor monitoring	Conducted on a yearly basis
	ROW mowing	Conducted on a five year basis
2017		
May	Foliar Herbicide	As necessary to control invasives
September	Foliar Herbicide /Manual	As necessary to control invasives
	Corridor monitoring	Conducted on a yearly basis
2018		
May	Foliar Herbicide	As necessary to control invasives
September	Foliar Herbicide /Manual	As necessary to control invasives
	Corridor monitoring	Conducted on a yearly basis
2019		
May	Foliar Herbicide	As necessary to control invasives
September	Foliar Herbicide /Manual	As necessary to control invasives
	Corridor monitoring	Conducted on a yearly basis
2020		
	Corridor monitoring	Conducted on a yearly basis
2021		
	Corridor monitoring	Conducted on a yearly basis

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

	ROW mowing	Conducted on a five year basis
2026		
	Corridor monitoring	Conducted on a yearly basis
	ROW mowing	Conducted on a five year basis

4.0 SUMMARY/CONCLUSIONS

Tennessee anticipates conducting the invasive species management within the Projects ROW in a manner that is consistent with the objective of controlling invasive species such that they do not pose a threat to the native ecosystems. Based on the results of the field surveys conducted to support the Project, invasive species are present within both wetland and upland portions of the ROW. The proposed management activities within this plan will reduce the existing populations of invasive species while promoting the establishment of native plant populations.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

APPENDIX A

INVASIVE SPECIES FACT SHEETS

Department of Environmental Protection
Environmental and Geographic Information Center
79 Elm St., Hartford, CT 06106 (860) 424-3540

Invasive Plant Information Sheet



Purple Loosestrife Lythrum salicaria Loosestrife Family (Lythraceae)

Ecological Impact: Purple loosestrife is a rapidly spreading herb that forms dense stands in wetlands, especially those that have been disturbed by draining, drawdown, bulldozing, siltation, shoreline manipulation, cattle trampling, or dredging. Exposed soil provides ideal conditions for seed germination. A few pioneering plants produce a large seed bank in the soil. Mature individuals can produce up to two to three million seeds per year. Seeds are mainly wind-dispersed, but can be transported on the feet of waterfowl or by other wetland animals. When growing conditions are optimal, seeds germinate in high densities and suppress the growth of native seedlings. The plants also reproduce vegetatively from underground stems. Purple loosestrife displaces native vegetation and can overrun wetlands thousands of acres in size. The buildup of debris around the roots nearly eliminates shallow water habitat, and enables the plants to colonize deeper waters where it forms dense stands that shade out other emergents. Explosive growth of purple loosestrife leads to a loss of plant diversity, which, in turn, leads to a loss of wildlife diversity. The plants produce abundant nectar for insect pollinators, but are otherwise of little value for wildlife.

Control Methods: The most effective control method for Purple loosestrife is to prevent establishment by annually monitoring for and removing isolated plants. To control established stands, managers should first consider the size of the population. Small populations up to three acres in size can be eradicated by hand pulling and/or herbicide treatment. Large populations covering more than three acres are difficult or impossible to eradicate. The most effective control method for large infestations is biological. However, large stands can be contained by hand pulling new plants along the periphery or treating stray plants with herbicide.

Mechanical Control: Small populations and isolated plants can be hand pulled or removed with a shovel before seed set (before August). After flowering, this method should be avoided so as not to scatter seeds. Be sure to remove the entire plant including all roots, since new plants can sprout from root fragments. Caution need be taken when removing plants, since soil disturbance encourages seedling establishment. Pulled plants should be bagged at the site so that fragments are not dropped when leaving the area. Removed plants should be burned. Follow-up treatments are recommended for at least three years to remove new plants that sprout from seeds persisting

in the soil. After working in infested areas, rinse all equipment and footwear and change clothing before moving to uninfested sites.

Chemical Control: Herbicides can be applied as a foliar spray or as cut stump treatments.
1) Foliar Spray: This method is effective throughout the growing season, but is best done after peak bloom, usually in late August. At this time plants are easily seen and less likely to be overlooked. Spray a 1-2% solution of glyphosate (RodeoTM) and water to no more than 25-50% of the plantÕs foliage. This will help prevent overspraying and protect adjacent native vegetation. Glyphosate is a non-selective herbicide that will kill all vegetation. Follow-up treatments may be needed for at least three years.
2) Cut Stump Treatment: This method is most effective on larger plants in small populations. It is best done in late summer or early fall, when plants are translocating nutrients to the roots. Cut stems about 6 inches from the ground and treat cut surfaces with a 20% solution of glyphosate (RodeoTM) and water. RoundupTM should not be used as it is not approved for use in wetlands. Keep in mind that a DEP permit is required for herbicide use near water. Apply the herbicide with a sponge or paint brush or drip onto the cut surface. To ensure uptake before the plant seals off the cut, apply herbicide immediately after cutting, within 5-15 minutes. Cut stems should be bagged and removed from the site. Follow-up treatments may be needed for at least three years.

Biological Control: This method provides the most effective long-term control of large populations. Biocontrol will not eradicate Purple loosestrife, but can significantly reduce population size and keep it in check. Four insect species from Europe have been approved by the U.S. Department of Agriculture as biological control agents. These include a root-mining weevil (Hylobius transversovittatus), two leaf-eating beetles (Galerucella calmariensis and Galerucella pusilla), and one flower-feeding weevil (Nanophyes marmoratus). Most of the insects depend exclusively on Purple loosestrife and will not threaten native plants. However, some beetle cross-over to native loosestrife has been observed.

October 1999

Department of Environmental Protection
Environmental and Geographic Information Center
79 Elm St., Hartford, CT 06106 (860) 424-3540

Invasive Plant Information Sheet




Common Reed Phragmites australis Grass Family (Poaceae/Gramineae)

Ecological Impact: Common reed is a rapidly growing wetland grass that thrives along freshwater and brackish marshes, riverbanks, and lakeshores. It is particularly prevalent in disturbed or polluted soils along roadsides and in ditches and dredged areas. In undisturbed sites, it can be non-invasive. Common reed quickly establishes and displaces native vegetation. Dense stands provide cover and nesting sites for marsh wrens, swamp sparrows, and red-winged blackbirds, but deter short-grass nesters like willet and seaside sparrow, a species of special concern in Connecticut. Standing dead stems that persist through the winter create a fire hazard.

Control Methods: The most effective control method for Common reed is to prevent establishment by minimizing land disturbance and water pollution. Land management practices that guard against erosion, sedimentation, fluctuating water levels, and nutrient loading in wetlands offer the best long-term protection. Once established, Common reed is very difficult to eradicate. In coastal marshes, reintroducing tidal flow can limit growth, as the species is sensitive to salt levels. Otherwise, control of established stands is possible using a combination of cutting or burning and herbicide treatment.

Mechanical Control: Small, newly-established populations can be hand cut to remove above-ground stems. Digging up plants is labor intensive and not recommended since digging tends to spread rhizome fragments which generate new shoots. Cutting greatly reduces rhizome reserves. Large stands can be mowed or controlled with prescribed burns. A follow-up treatment is needed the second year to control resprouts. Afterwards, cutting or burning should be repeated every three to five years. Burns are best conducted in the winter when standing dead stems provide abundant fuel.

Chemical Control: This method is most effective if done in early fall when plants are translocating nutrients to the rhizomes. Cut stems about two inches above ground level and immediately pour a 25% solution of glyphosate (RodeoTM) and water into the hollow stems. RoundupTM should not be

used as it is not approved for use in wetlands. Keep in mind that a DEP permit is required for herbicide use near water. Glyphosate is a non-selective herbicide that will kill all vegetation. By pouring RodeoTM directly into cut stems, the herbicide is contained and damage to native plants is prevented. Stem cuttings with attached plumes (seed heads) should be bagged and removed from the site. This will help prevent the spread of seeds. Cuttings can be burned or composted, as composting temperatures will kill the seeds. A follow-up treatment is generally needed at the end of the second growing season to control resprouts.

Biological Control: Currently, there are no known biological control methods. Two insect pests, a lepidopterous stem borer (Rhizedra lutosa) and a chloropid (Lipara similis), have shown significant impacts in some research sites. Continued research is needed to determine whether an effective biocontrol program is possible.

October 1999

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

USDA NRCS
United States Department of Agriculture
Natural Resources Conservation Service

Plant Fact Sheet

REED CANARYGRASS

Phalaris arundinacea L.

Plant Symbol = PHAR3

Contributed by: USDA NRCS Plant Materials Program



Robert H. Mohlenbrock
USDA NRCS 1991
Southern Wetland Flora
@ USDA NRCS PLANTS

Uses

Erosion control: The extensive, rhizomatous root system and dense growth of reed canarygrass provide excellent erosion control, especially along stream banks, shorelines and waterways. Reed canarygrass invades wet areas so its use along ditches, canals and drains can create maintenance problems; it can also be troublesome in wetland habitats.

Filter fields: Reed canarygrass is a heavy user of fertilizer and actively grows throughout a long season. Because of this and its excellent adaptation to wet sites, it is well suited for use in seeding filter fields which collect wastewater from food processing industries, livestock operations, and sewage treatment plants. Cutting and removal of biomass is required for good nutrient uptake performance, but a 6 to 8 inch cut height is recommended for rapid regrowth under these conditions. Any forage produced can be used for livestock feed.

Forage: Reed canarygrass is primarily adapted for permanent hay or pasture on sites too wet for good performance of other forage plants. The forage should be grazed or mowed prior to heading as both quality and palatability decline rapidly after heading. A common mistake is to use reed canarygrass on wet sites where timely harvest is not possible.

Wildlife: This grass provides excellent nesting and escape cover and the shattered seeds are readily eaten by many species of birds.

Status

Please consult the PLANTS Web site and your State Department of Natural Resources for this plant's current status (e.g. threatened or endangered species, state noxious status, and wetland indicator values).

Weediness

This plant may become weedy or invasive in some regions or habitats and may displace desirable vegetation if not properly managed. Please consult with your local NRCS Field Office, Cooperative Extension Service office, or state natural resource or agriculture department regarding its status and use. Weed information is also available from the PLANTS Web site at plants.usda.gov.

Description

Phalaris arundinacea L., reed canarygrass, is a vigorous, productive, long-lived, perennial, sod-forming grass. It is a widespread species native to North America, Europe, and Asia. The numerous broad, moderately harsh, erect leaves are dominantly basal. The coarse, erect stems may reach a height of 6 to 8 feet. Seed is borne in an open panicle which ripens from the top down and shatters readily as it matures. The seed has a short storage life, up to 5 years, and should be checked for germination within 6 months of its use. Reed canarygrass has excellent frost tolerance and is well suited to wet soils that are poorly drained or subject to flooding. It also has good drought tolerance. Growth begins in early spring and continues through the growing season. Regrowth following mowing or grazing is rapid on fertile sites. Forage quality is good prior to heading but then declines rapidly.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Adaptation and Distribution
Reed canarygrass is adapted to soils too wet for bromegrass, fescue, and orchardgrass. It is very cold tolerant and will withstand temperatures well below -30 °F. It is moderately drought tolerant but requires 18 inches annual precipitation or irrigation for good performance. It is adapted to a wide range of soil conditions but its major use is on poorly drained soils or those subject to inundation. Once established, it will withstand continuous inundation for 60 to 70 days. It does well on soils that range from moderately acidic to weakly saline-alkaline. It will tolerate saltier soils with frequent irrigation or natural flooding.

Reed canarygrass is distributed throughout the west, north, and northeastern United States. For a current distribution map, please consult the Plant Profile page for this species on the PLANTS Website.

Establishment
A firm, moist, clean seedbed is needed for good emergence. Old fields or meadows should be cropped to annual crops for 1 to 2 years to eliminate perennial weeds, grasses and sedges before seeding reed canarygrass. The seed germinates readily but is somewhat slow to establish. Seed in pure stands at a rate of 5 to 7 pounds per acre. Seeding should be done in late fall or early spring. Plant shallow, no deeper than 1/2 inch. If necessary, irrigate to maintain surface moisture until plants are well established.

Management
New seedings should not be grazed until fully established. It is best to harvest for hay one to two times before grazing. To maintain plant vigor and promote rapid regrowth, leave a stubble of 6 inches after mowing or grazing. Start spring grazing after plants reach a height of 10 to 12 inches. Harvest hay when the first seedheads appear. Reed canarygrass will persist under close, frequent use but yield will be greatly reduced. Its persistence under heavy use does make it well suited for calving, lambing, holding areas or other special-use pastures.

To maintain good yields an annual application of nitrogen will be required on most sites.

Pests and Potential Problems
The leaf disease *Helminthosporium giganteum* sometimes attacks reed canarygrass and work in Pennsylvania led to the discovery of the disease tawny blotch (*Stagonospora foliicola*) on this plant.

Cultivars, Improved, and Selected Materials (and area of origin)
Improved cultivars and places of development are 'Castor', 'Grove', 'Rival' (Canada) and 'Ioreed', 'Palaton', 'R.P. 200', 'Vantage', 'Venture' (Iowa). 'Palaton', 'Rival', and 'Venture' are low alkaloid-containing cultivars and are greatly preferred for all uses in the Northeast. Common types of reed canarygrass are available from most commercial sources.

Control
Please contact your local agricultural extension specialist or county weed specialist to learn what works best in your area and how to use it safely. Always read label and safety instructions for each control method. Trade names and control measures appear in this document only to provide specific information. USDA, NRCS does not guarantee or warranty the products and control methods named, and other products may be equally effective.

Prepared By & Species Coordinator:
USDA NRCS Plant Materials Program

Edited: 05Feb2002 JLK; 060802 jsp

For more information about this and other plants, please contact your local NRCS field office or Conservation District, and visit the PLANTS Web site<http://plants.usda.gov> or the Plant Materials Program Web site <http://Plant-Materials.nrcs.usda.gov>

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Read about Civil Rights at the Natural Resources Conservation Service.

Department of Environmental Protection
Environmental and Geographic Information
Center 79 Elm St., Hartford, CT 06106 (860) 424-3540

Invasive Plant Information Sheet




Multiflora Rose Rosa multiflora Rose Family (Rosaceae)
Ecological

Ecological Impact: Multiflora rose is an extremely prolific shrub that forms dense, impenetrable thickets which crowd and shade out native species. Individual plants can produce up to 500,000 seeds per year, many of which germinate near the parent. Seeds remain viable in the soil for up to 20 years. Fruits are sought after by birds and mammals, which subsequently disperse the seeds. The shrubs are highly competitive for soil nutrients and can lower crop yields in adjacent fields.

Control Methods: The most effective control method for Multiflora rose is to prevent establishment by annually monitoring for and removing small plants. Repeated cutting and/or mowing over several consecutive years will reduce plant vigor and help prevent spread. However, herbicide use in combination with cutting may be more effective for larger plants.

Mechanical Control: Small, scattered plants can be removed with a shovel, weed wrench, or grubbing hoe. Be sure to remove the entire plant, including all roots, since new plants can sprout from root fragments. Root sprouts resemble seedlings, but are attached to a lateral root and are nearly impossible to pull up. Large patches of plants can be mowed or cut three to six times a growing season for two to four years. Mowing will prevent seedling establishment and is particularly effective where grass cover is dense. Large plants can be top cut with hedge cutters, then mowed annually. Hand cutting large clumps is difficult and time consuming. As an alternative, heavy equipment like a bulldozer can be used to knock down clumps, but further control is necessary due to resprouting and seed germination on disturbed soil. In high quality natural areas, hand cutting is preferred to mowing or bulldozing to minimize habitat disturbance.

Chemical Control: Herbicides can be applied broad scale as a foliar spray, or to select individuals as cut stump treatments. Foliar sprays are highly effective, but should be used only where contact with nearby native vegetation can be prevented.

1) Foliar Sprays: This method can be used throughout the growing season, but results will not be

fully seen until the following spring. Spray a 1-2% v/v solution of glyphosate (e.g., RoundupTM or RodeoTM) or a 0.5% v/v solution of glyphosate plus a surfactant. If plants are in or near wetlands, only RodeoTM should be used. Glyphosate is a non-selective herbicide that will kill all vegetation. Managers should be cautious not to spray so heavily that herbicide drips off the leaves. Other foliar sprays found to be effective include water-soluble triclopyr (Garlon 3ATM) and dicamba (BanvelTM), both specific for broadleaf plants, and fosamine (KreniteTM), a bud inhibitor for woody species. Dicamba is most effective if used when plants are flowering. Fosamine is effective throughout the growing season.

2) Cut Stump Treatment: This method can be used throughout the growing season or during dormancy. Fall application is recommended since, at this time, plants are translocating nutrients to the roots. To ensure uptake of the herbicide before the plant seals off the cut, apply immediately after cutting, within 5-15 minutes. Use a solution of water-soluble triclopyr (Garlon 3ATM) and apply with a hand-held sprayer.

Biological Control: Currently, there are no known biological control methods. A native pathogen which causes rose-rosette disease, and a seed-infesting wasp (European rose chalicid) are being investigated as potential control agents.

October 1999

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APPENDIX E

- Tennessee Best Management Practices
- FERC Upland Erosion Control, Revegetation and Maintenance Plan
- FERC Wetland and Waterbody Construction and Mitigation Procedures
- Site Specific Wetland and Waterbody Crossing Drawings
- Erosion Control Drawings
- Silt Fence Calculation Report
- Access Road Hydraulic Report

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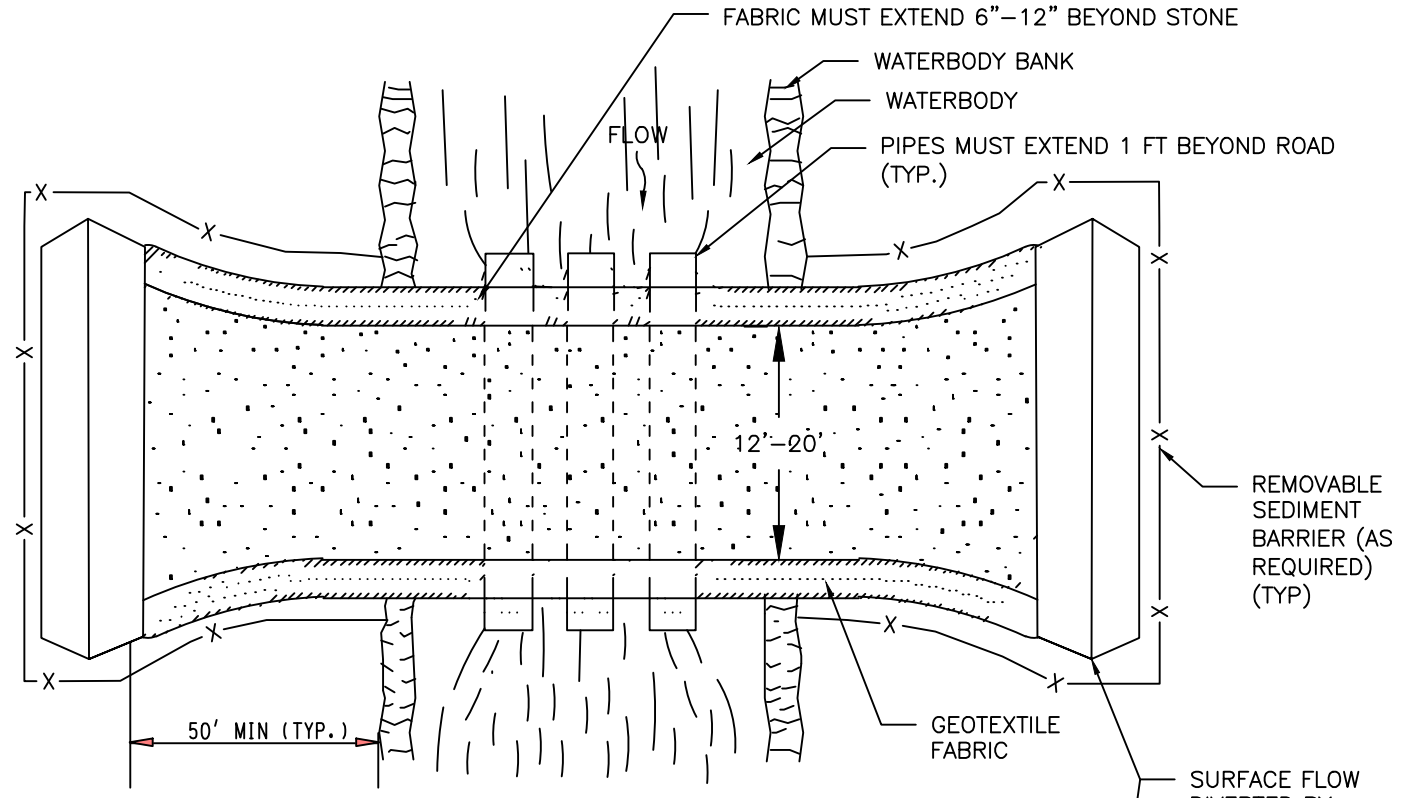
APPENDIX E

Tennessee Best Management Practices



PLAN VIEW

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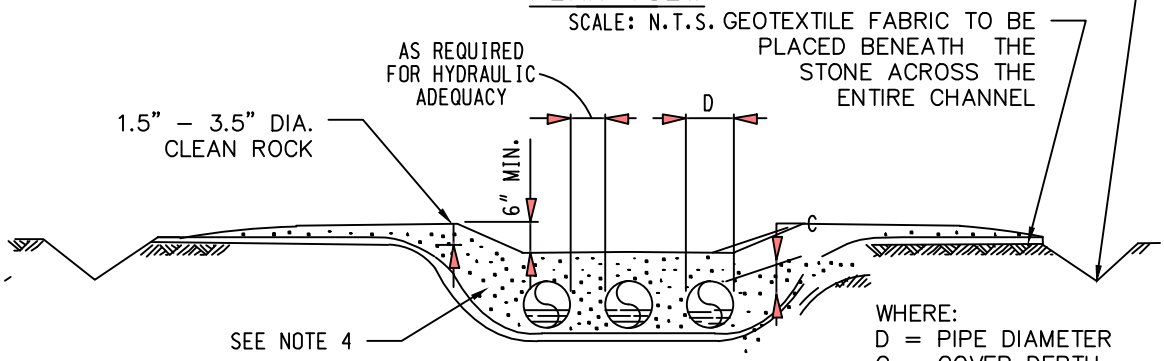

PROFILE

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NOTES:

1. TEMPORARY STREAM CROSSING SHALL BE INSPECTED ON A DAILY BASIS AND BUILD–UP OF SEDIMENT OR DEBRIS ON BRIDGE SHALL BE REMOVED.
2. CULVERTS SHALL BE PLACED AT LEAST ONE– HALF (1/2) THEIR DIAMETER APART.
3. ALL MATERIAL AND EQUIPMENT PLACED IN THE WATERBODY CHANNEL SHALL BE COMPLETELY REMOVED DURING FINAL CLEAN–UP. REMOVAL OF THESE ITEMS ARE NOT CONTINGENT UPON ESTABLISHMENT OF PERMANENT VEGETATION.
4. ONLY CLEAN ROCK WILL BE USED. THE ROCK MUST BE SIZED ACCORDING TO THE ANTICIPATED FLOW CONDITIONS. THE ROCK SIZE USED SHALL CONFORM TO CHAPTER 105 GENERAL PERMIT REQUIREMENTS. THE ROCK FILL SHOULD BE EXTENDED A MINIMUM OF 50' FROM THE TOP OF BANK ON EACH SIDE OF THE CROSSING. THE FILL SHOULD BE DEPRESSED A MINIMUM OF 6" OVER THE CHANNEL TO ALLOW FOR OVERFLOW. THE MAXIMUM DEPTH OF FILL OVER THE CULVERT IS THE MINIMUM THE MANUFACTURER REQUIRES.
5. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ALL LOAD CALCULATIONS REQUIRED TO ENSURE THE INSTALLED PIPES CAN STRUCTURALLY SUPPORT THE CONSTRUCTION EQUIPMENT. THIS SHALL INCLUDE, BUT IS NOT LIMITED TO, PIPE MATERIAL SELECTION AND REQUIRED PIPE COVER DEPTH.

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TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
CULVERT EQUIPMENT CROSSING

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

FIG. NO. 1

Sheet: 1 of 127
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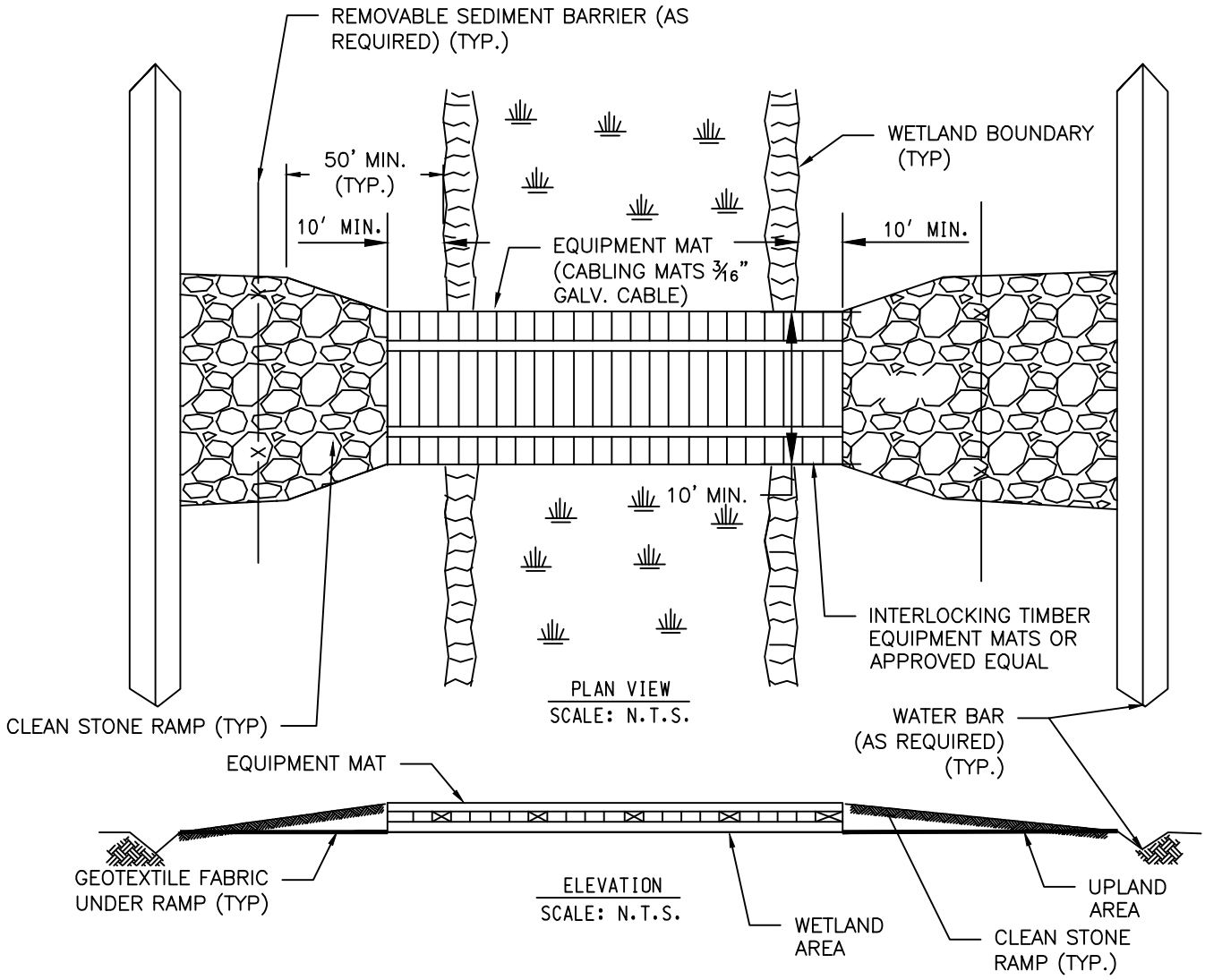

NOTES:

1. INSPECT ON A DAILY BASIS AND REMOVE BUILD–UP OF SEDIMENT AND DEBRIS.
2. MATERIALS PLACED IN WETLANDS SHALL BE COMPLETELY REMOVED DURING FINAL CLEAN–UP. REMOVAL OF THESE MATERIALS IS NOT CONTINGENT UPON ESTABLISHMENT OF PERMANENT VEGETATION.
3. IF A WATERBODY IS LOCATED WITHIN A WETLAND, EXTEND EQUIPMENT MATS TO THE BRIDGE EQUIPMENT CROSSING CONSTRUCTED TO CROSS THE WATERBODY IN ORDER TO ALLOW FOR CONTINUOUS EQUIPMENT MAT COVERAGE THROUGH THE WETLAND AND WATERBODY AREA.
4. USE ADDITIONAL EQUIPMENT MATS TO RAISE THE CROSSING ABOVE THE ELEVATION WHERE POOR SOIL CONDITIONS EXIST. A MAXIMUM OF 2 TIMBER MAT LAYERS MAY BE USED WITHIN WETLANDS UNLESS OTHERWISE APPROVED BY THE ENVIRONMENTAL INSPECTOR.
5. EQUIPMENT MATS SHALL EXTEND A MINIMUM OF 10 FEET OUTSIDE OF THE WETLAND AND WATERBODY BOUNDARIES.
6. INSTALL CLEAN STONE RAMP APPROACHES TO EQUIPMENT MATS IN WETLAND AREAS.
7. EQUIPMENT MATS ARE TO BE CONSTRUCTED OF 4'X4' WOOD MEMBERS, LINKED WITH 3/16 GALVANIZED STEEL CABLE TO ENSURE REMOVAL OF ALL MATS.

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TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
WETLAND EQUIPMENT CROSSING

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

FIG. NO. 2

Sheet: 2 of 127
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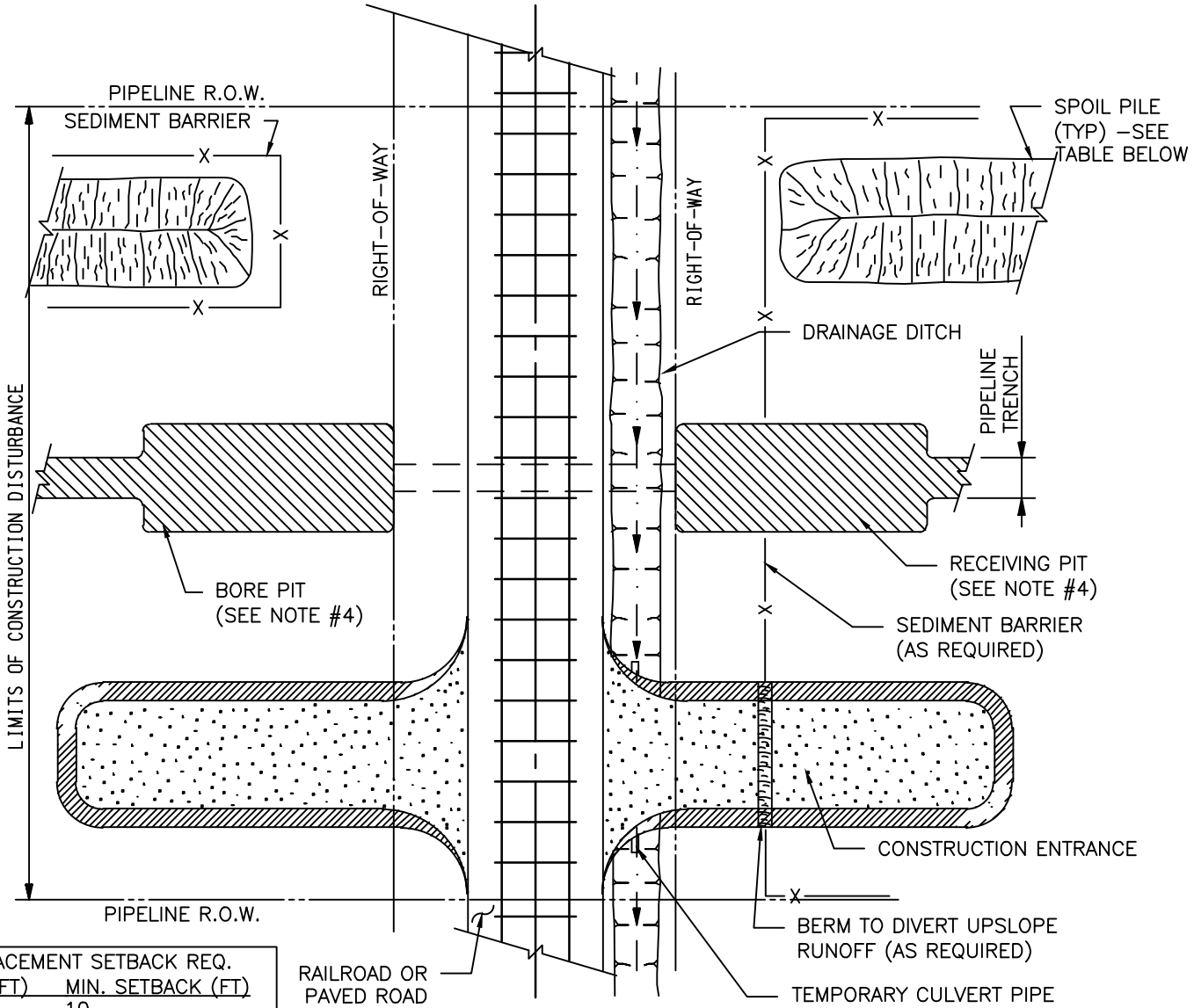

PLAN VIEW
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SPOIL PLACEMENT SETBACK REQ.	
HT. FILL (FT)	MIN. SETBACK (FT)
<10	10
10–25	25
25–50	50
>50	1 FT/FT HEIGHT

NOTES:

1. A SEDIMENT BARRIER SHALL BE INSTALLED AT THE BASE OF SLOPES ADJACENT TO THE CROSSING WHERE VEGETATION IS DISTURBED TO INTERCEPT SURFACE RUNOFF.
2. PROTECTION FOR SPOIL PILES SHALL BE INSTALLED ONLY WHERE SEDIMENT BARRIERS ACROSS THE ENTIRE DISTURBED AREA ARE NOT REQUIRED.
3. SEDIMENT BARRIERS SHALL BE MAINTAINED IN PLACE UNTIL PERMANENT REVEGETATION IS ESTABLISHED.
4. ANY WATER REMOVED FROM THE BORE PIT OR RECEIVING PIT SHALL BE FILTERED THROUGH AN APPROVED DEWATERING STRUCTURE OR FILTER BAG.
5. IF WELL POINTING IS REQUIRED, THE CONTRACTOR SHALL CONSULT WITH THE ENVIRONMENTAL INSPECTOR PRIOR TO COMMENCEMENT OF WORK IN ORDER TO DETERMINE PROPER DEWATERING LOCATIONS AND METHODS.
6. THE CONTRACTOR SHALL BE REQUIRED TO KEEP THE CROSSING CLEAR OF DEBRIS AT ALL TIMES.
7. THE CONTRACTOR MAY ELECT TO UTILIZE SHEET PILING IN ORDER TO STABILIZE THE BORE PITS AND RECEIVING PITS.
8. DEPENDING ON TOPOGRAPHY AND STATE AGENCY REQUIREMENTS, A SEDIMENT BARRIER MAY BE REQUIRED ACROSS THE ENTIRE CONSTRUCTION RIGHT OF WAY AT THE EDGE OF CROSSING. IN ADDITION TO THIS DETAIL, REFER TO THE ENVIRONMENTAL ALIGNMENT DRAWINGS FOR PLACEMENT OF SEDIMENT BARRIERS.

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TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
BORED ROAD/RAILROAD CROSSING

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

FIG. NO. 3

Sheet: 3 of 127
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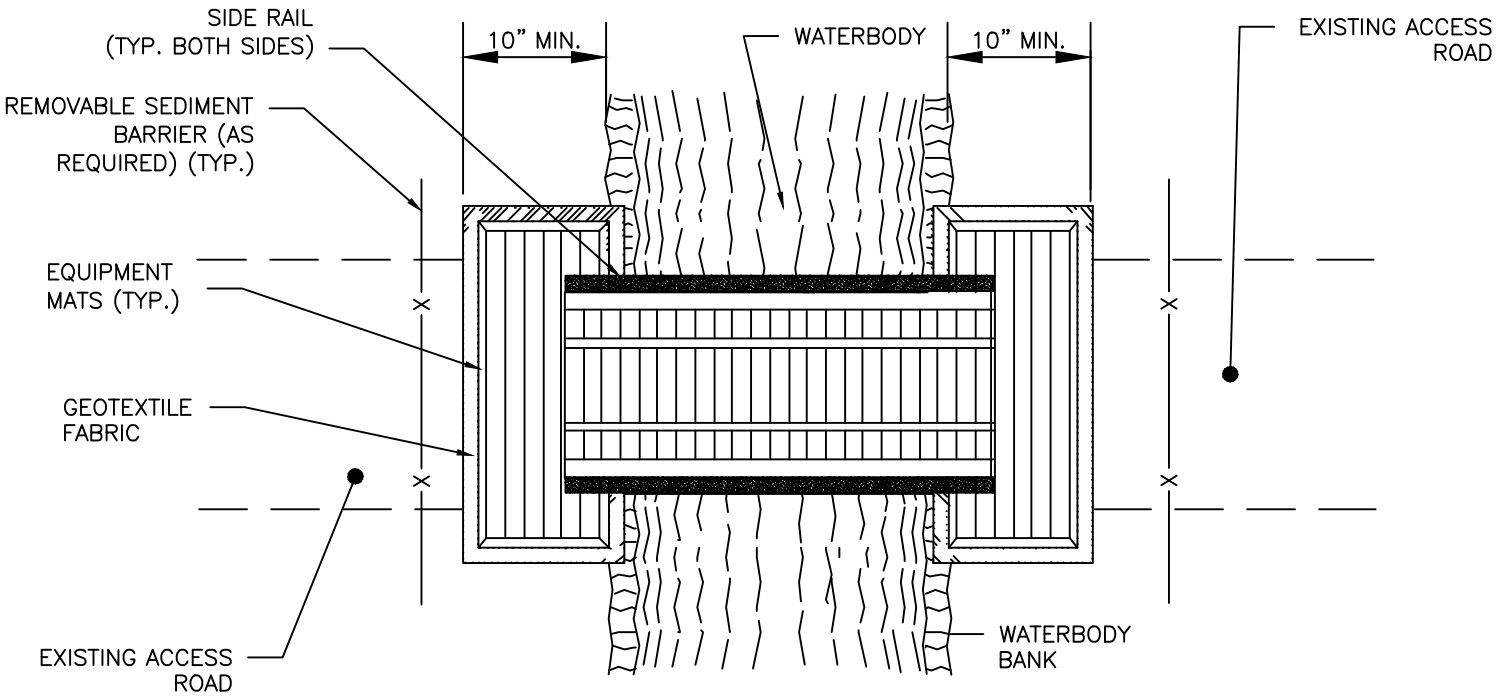

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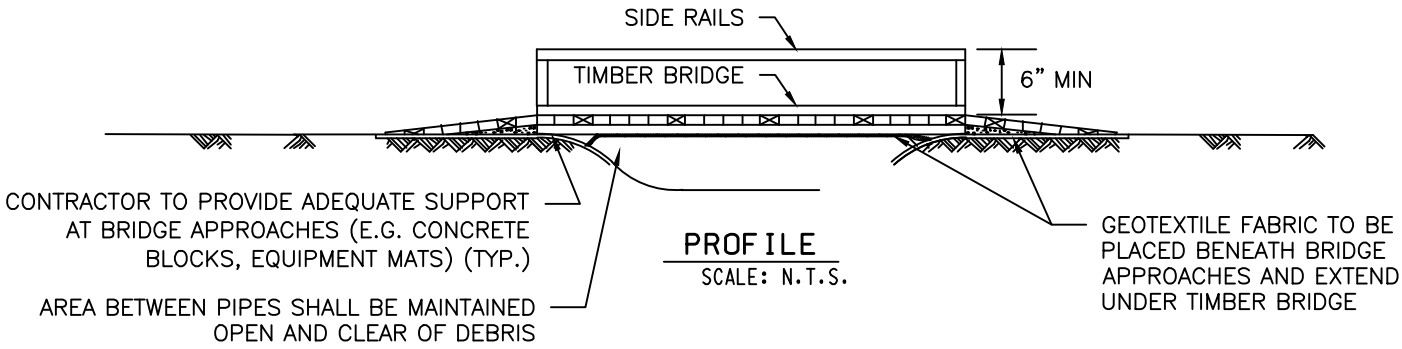

PROFILE
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NOTES:

1. TIMBER BRIDGES SHALL BE ADEQUATELY ANCHORED AT BOTH ENDS.
2. TEMPORARY STREAM CROSSINGS SHALL BE INSPECTED ON A DAILY BASIS AND BUILD UP OF SEDIMENT OR DEBRIS SHALL BE REMOVED.
3. BRIDGE APPROACHES SHALL BE SUPPORTED WITH EQUIPMENT MATS OR APPROVED EQUAL.
4. SIDE RAILS SHALL BE INSTALLED ON BOTH SIDES OF THE BRIDGE EQUIPMENT CROSSING IN ORDER TO PREVENT SEDIMENT FROM ENTERING THE WATERBODY. SIDE RAILS ARE TO BE CONSTRUCTED OF PLYWOOD NAILED TO THE OUTER EDGES OF THE EQUIPMENT MATS.
5. EQUIPMENT MATS SHALL EXTEND A MINIMUM OF 10 FEET OUTSIDE OF THE WATERBODY OR WETLAND BOUNDARIES.
6. UNLESS OTHERWISE INDICATED ON PLAN, CROSSING SHALL BE REMOVED IMMEDIATELY AFTER CONSTRUCTION IS COMPLETED.
7. THE CONTRACTOR SHALL BE RESPONSIBLE FOR PROVIDING ALL LOAD CALCULATIONS REQUIRED TO ENSURE THE INSTALLED MATS/EQUIPMENT BRIDGE CAN STRUCTURALLY SUPPORT THE CONSTRUCTION EQUIPMENT TO BE UTILIZED.

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TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
BRIDGE EQUIPMENT CROSSING

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

FIG. NO. 4

Sheet: 4 of 127
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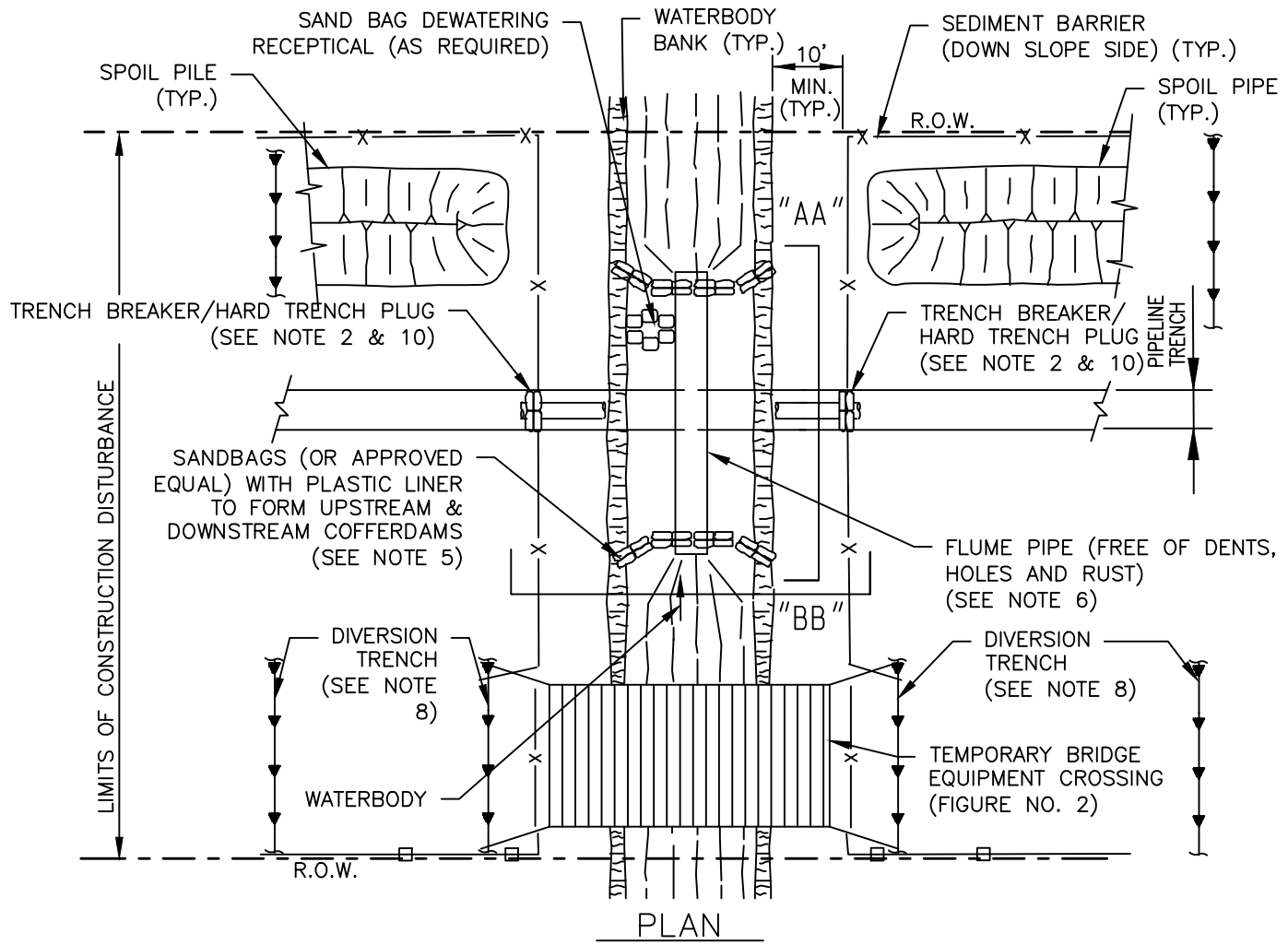

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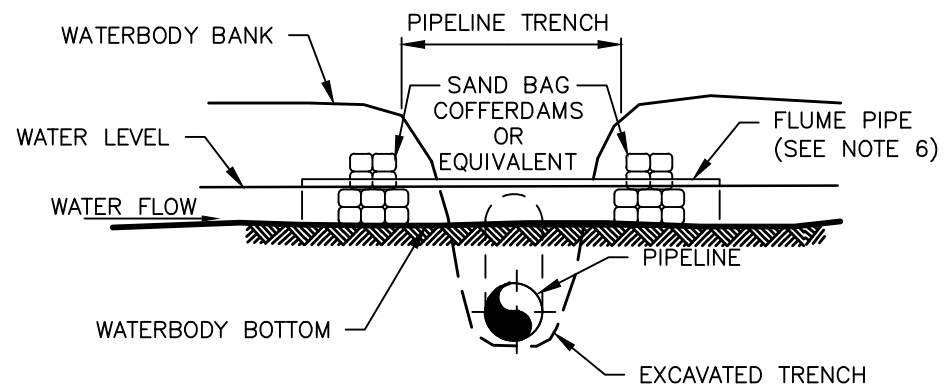

SECTION "A–A"

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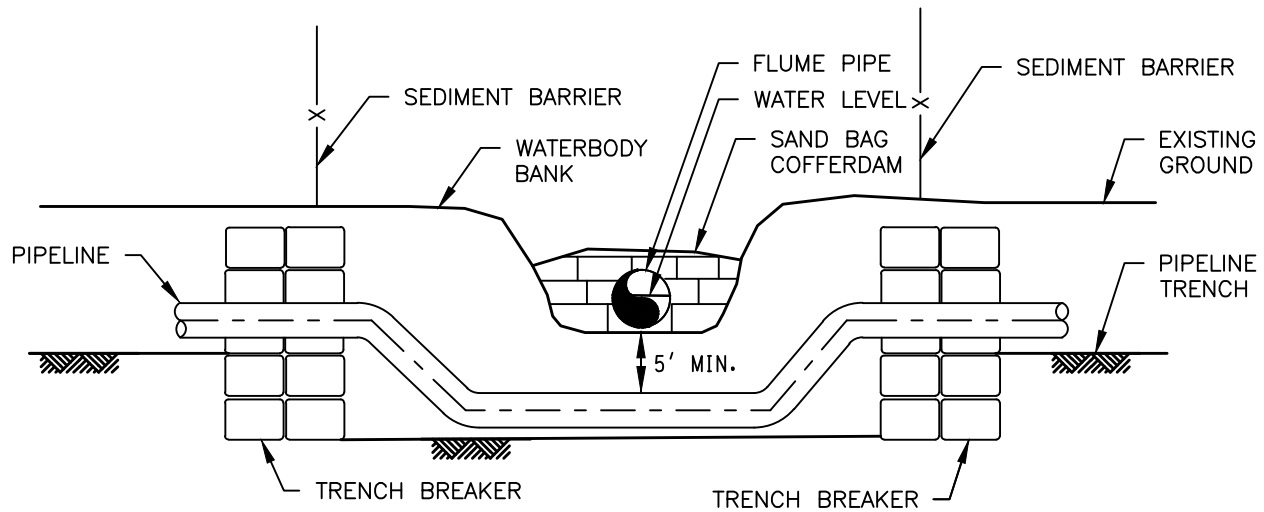

SECTION "B–B"

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NOTES:

1. SEDIMENT BARRIERS SHALL BE INSTALLED AS DEPICTED AND ALONG DOWN GRADIENT SIDES OF WORK AREAS AND STAGING AREAS SUCH THAT NO HEAVY SILT LADEN WATER ENTERS THE WATERBODY OR LEAVES THE CONSTRUCTION RIGHT–OF–WAY.

2. HARD TRENCH PLUGS MUST REMAIN IN PLACE AT CONVENIENT LOCATIONS TO SEPARATE THE MAINLINE DITCH FROM THE WATERBODY CROSSING UNTIL THE WATERBODY CROSSING IS INSTALLED AND BACKFILLED.

3. EQUIPMENT OPERATING IN THE WATERBODY SHALL BE LIMITED TO THAT NEEDED TO PERFORM CONSTRUCTION. IF OTHER TYPES OF EQUIPMENT MUST CROSS THE WATERBODY, THE CONTRACTOR SHALL PROVIDE AND USE A TEMPORARY BRIDGE EQUIPMENT CROSSING.

4. STAGING AREA(S) FOR WATERBODY CROSSING(S), WHEN REQUIRED, SHALL BE LOCATED AT LEAST 50 FEET FROM THE WATER'S EDGE AND SHALL BE OF A MINIMUM SIZE NEEDED FOR CONVENIENT PREPARATION.

5. FLUME CROSSING METHOD REQUIREMENTS INCLUDE:
   (A) INSTALL FLUME PIPE(S) AFTER BLASTING (IF NECESSARY), BUT BEFORE ANY TRENCHING.
   (B) USE SAND BAG OR SAND BAG AND PLASTIC SHEETING DIVERSION STRUCTURES OR EQUIVALENT TO DEVELOP AN EFFECTIVE SEAL AND TO DIVERT WATERBODY FLOW THROUGH THE FLUME PIPE (SOME MINOR MODIFICATIONS TO THE WATERBODY BOTTOM MAY BE REQUIRED TO ACHIEVE AN EFFECTIVE SEAL).
   (C) PROPERLY ALIGN FLUME PIPE(S) TO PREVENT BANK EROSION AND WATERBODY CHANNEL BED SCOUR.
   (D) DO NOT REMOVE FLUME PIPE DURING TRENCHING, PIPE LAYING, OR BACKFILLING ACTIVITIES, OR INITIAL STREAM BED RESTORATION EFFORTS.
   (E) REMOVE ALL FLUME PIPES AND DAMS THAT ARE NOT ALSO PART OF THE EQUIPMENT BRIDGE AS SOON AS FINAL CLEANUP OF THE STREAM BED AND BANK IS COMPLETE.

6. THE FLUME PIPE MUST BE SIZED TO ADEQUATELY CONVEY MAXIMUM ANTICIPATED FLOW RATE AT THE TIME OF THE CROSSING WITHOUT FLOODING THE TRENCH, WHILE TO MAINTAINING ADEQUATE FLOW RATES TO PROTECT AQUATIC LIFE AND PREVENT THE INTERRUPTION OF EXISTING DOWNSTREAM USES.

7. EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSPECTED DAILY AND REPAIRED IF NECESSARY.

8. INSTALL DIVERSION TRENCHES AT THE BASE OF ALL SLOPES ADJACENT TO THE WATERBODY AND AT 50' FROM WATERBODY BANKS.

9. CHEMICALS, FUELS AND LUBRICATING OILS SHALL NOT BE STORED AND EQUIPMENT SHALL NOT BE REFUELED WITHIN 100 FEET OF THE WATERBODY UNLESS OTHERWISE APPROVED BY THE ENVIRONMENTAL INSPECTOR.

10. ANY WATER ACCUMULATING IN THE WORK SPACE SHALL BE PUMPED TO A FILTER BAG PRIOR TO DISCHARGE TO A WATERBODY.

10. INSTALL TRENCH BREAKERS ON BOTH SIDES OF THE WATERBODY TO PREVENT DIVERSION OF WATER INTO UPLAND PORTIONS OF THE PIPELINE TRENCH AND TO KEEP ANY ACCUMULATED TRENCH WATER OUT OF THE WATERBODY.

11. ALL MATERIAL AND EQUIPMENT PLACED IN THE WATERBODY CHANNEL SHALL BE COMPLETELY REMOVED DURING FINAL CLEAN–UP. REMOVAL OF THESE ITEMS ARE NOT CONTINGENT UPON ESTABLISHMENT OF PERMANENT VEGETATION.

12. THE CONTRACTOR SHALL POSTPONE ROUGH GRADING AND GRUBBING OF THE RIGHT OF WAY WITHIN 50' OF TOP OF BANK UNTIL THE STAGING AREA IS PREPARED AND WORK IN THE WATERBODYIS READY TO COMMENCE. ALL DISTURBED AREAS WITHIN 50 FEET OF TOP OF BANK SHALL BE BLANKETED OR MATTED WITHIN 24 HOURS OF INITIAL DISTURBANCE FOR MINOR STREAMS OR 48 OF INITIAL DISTURBANCE FOR MAJOR STREAMS UNLESS OTHERWISE AUTHORIZED.

13. EXCEPT FOR BLASTING AND OTHER ROCK BREAKING MEASURES, THE CONTRACTOR SHALL COMPLETE IN WATERBODY CONSTRUCTION ACTIVITIES (INCLUDING TRENCHING, PIPE INSTALLATION, BACKFILL, AND RESTORATION OF THE WATERBODY CHANNEL CONTOURS) WITHIN 24 HOURS. WATERBODY BANKS AND UNCONSOLIDATED WATERBODY CHANNELS MAY REQUIRE ADDITIONAL RESTORTION AFTER THIS PERIOD.

14. THE CONTRACTOR SHALL COORDINATE THE ENVIRONMENTAL INSPECTOR TO DETERMINE THE APPROPAITE DRY CROSSING METHOD THAT SHOULD BE UTILIZED DURING CONSTRUCTION.

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TENNESSE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
FLUME CROSSING

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

FIG. NO. 5

Sheet: 5 of 127
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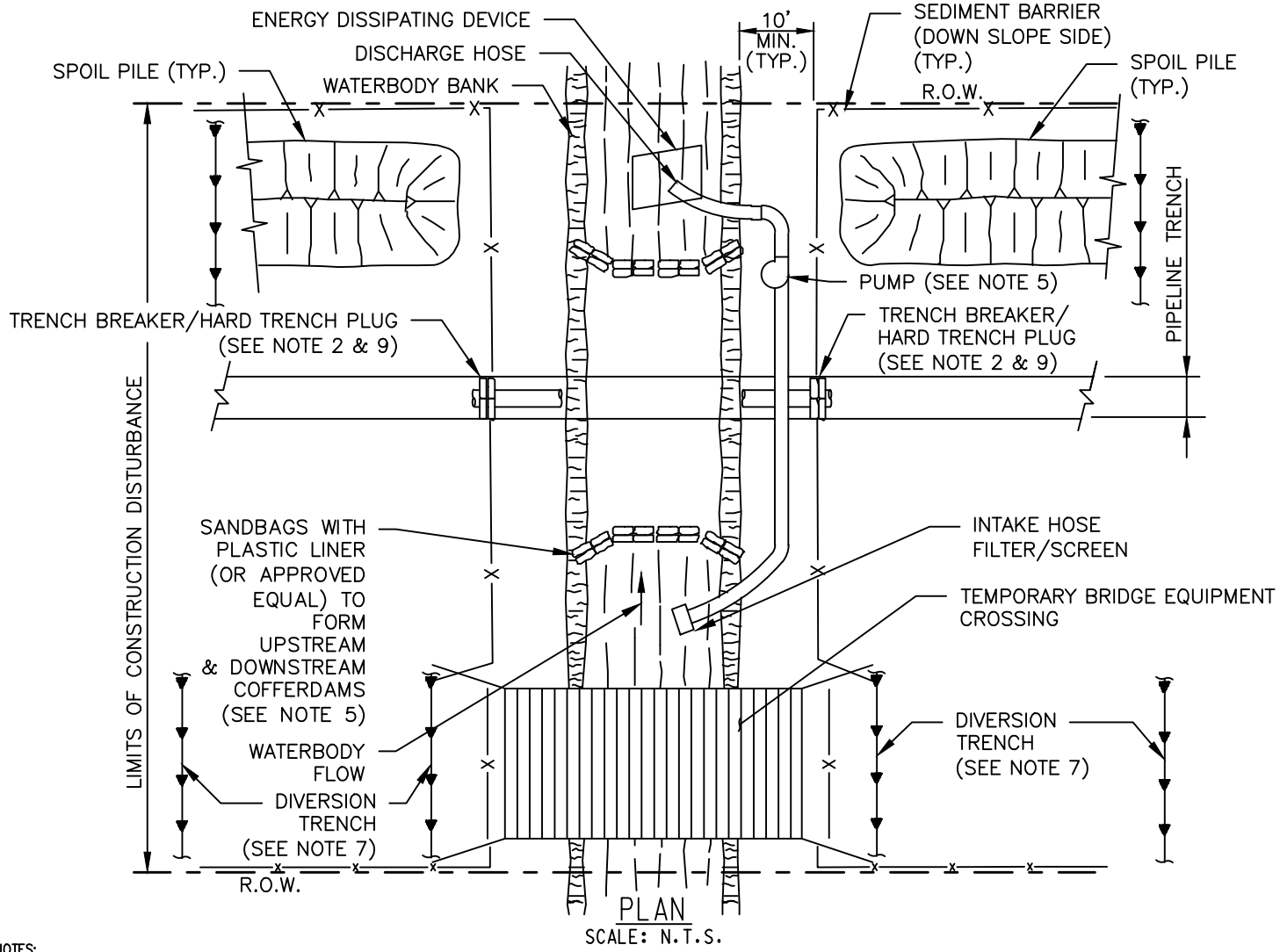

PLAN

SCALE: N.T.S.

NOTES:

1. SEDIMENT BARRIERS SHALL BE INSTALLED AS DEPICTED AND ALONG DOWN GRADIENT SIDES OF WORK AREAS AND STAGING AREAS SUCH THAT NO HEAVY SILT LADEN WATER ENTERS THE WATERBODY OR LEAVES THE CONSTRUCTION RIGHT-OF-WAY
2. HARD TRENCH PLUGS MUST REMAIN IN PLACE AT CONVENIENT LOCATIONS TO SEPARATE THE MAINLINE DITCH FROM THE WATERBODY CROSSING UNTIL THE WATERBODY CROSSING IS INSTALLED AND BACKFILLED.
3. EQUIPMENT OPERATING IN THE WATERBODY SHALL BE LIMITED TO THAT NEEDED TO PERFORM CONSTRUCTION. IF OTHER TYPES OF EQUIPMENT MUST CROSS THE WATERBODY, THE CONTRACTOR SHALL PROVIDE AND USE A TEMPORARY BRIDGE EQUIPMENT CROSSING.
4. STAGING AREA(S) FOR WATERBODY CROSSING(S), WHEN REQUIRED, SHALL BE LOCATED AT LEAST 50 FEET FROM WATER'S EDGE AND SHALL BE OF A MINIMUM SIZE NEEDED FOR PREPARATION TO SAFELY AND EFFICIENTLY CONSTRUCT THE CROSSING.
5. IMPLEMENTATION OF THE DAM-AND-PUMP CROSSING METHOD MUST MEET THE FOLLOWING PERFORMANCE CRITERIA:
   (A) USE SUFFICIENT PUMPS, INCLUDING ON-SITE BACKUP PUMPS, TO MAINTAIN DOWNSTREAM FLOWS.
   (B) CONSTRUCT DAMS WITH MATERIALS THAT PREVENT SEDIMENT AND OTHER POLLUTANTS FROM ENTERING THE WATERBODY (E.G., SANDBAGS OR CLEAN GRAVEL WITH PLASTIC LINER).
   (C) SCREEN PUMP INTAKES;
   (D) PREVENT STREAM BED SCOUR AT PUMP DISCHARGE WITH AN ENERGY DISSIPATING DEVICE.
   (E) MONITOR THE DAM AND PUMPS TO ENSURE PROPER OPERATION THROUGHOUT THE WATERBODY CROSSING. INTAKE SHALL BE MAINTAINED A SUFFICIENT DISTANCE FROM THE BOTTOM TO PREVENT PUMPING OF SUBSTRATE MATERIALS.
   (F) INTAKE SHALL BE MAINTED AT A SUFFICIENT DISTANCE FROM THE CHANNEL BOTTOM TO PREVENT PUMPING OF SUBSTRATE MATERIALS.
6. EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSPECTED DAILY AND REPAIRED IF NECESSARY.
7. INSTALL DIVERSION TRENCHES AT THE BASE OF ALL SLOPES ADJACENT TO THE WATERBODY AND AT MINIMUM 50' FROM WATERBODY BANK.
8. CHEMICALS, FUELS AND LUBRICATING OILS SHALL NOT BE STORED AND EQUIPMENT SHALL NOT BE REFUELED WITHIN 100 FEET OF THE WATERBODY, UNLESS OTHERWISE APPROVED BY THE ENVIRONMENTAL INSPECTOR. ANY WATER ACCUMULATING IN THE WORK SPACE SHALL BE PUMPED TO A FILTER BAG PRIOR TO DISCHARGE TO WATERBODY.
9. INSTALL TRENCH BREAKERS ON BOTH SIDES OF THE WATERBODY TO PREVENT DIVERSION OF WATER INTO UPLAND PORTIONS OF THE PIPELINE TRENCH AND TO KEEP ANY ACCUMULATED TRENCH WATER OUT OF THE WATERBODY.
10. THE CONTRACTOR SHALL POSTPONE GRUBBING AND ROUGH GRADING OF THE RIGHT-OF-WAY WITIN 50' OF TOP OF BANK UNTIL ALL MATERIALS REQUIRED TO COMPLETE CROSSING ARE ON SITE , THE STAGING AREA IS PREPARED, AND WORK IN THE WATERBODY IS READY TO COMMENCE. ALL DISTURBED AREAS WITHIN 50' OF TOP OF BANK SHALL BE STABILIZED WITHIN 24 HOURS OF INITIAL DISTURBANCE FOR MINOR STREAMS OR 48 HOURS OF INITIAL DISTURBANCE FOR MAJOR STREAMS UNLESS OTHERWISE AUTHORIZED. APPROPRIATE STREAMBANK PROTECTION SHALL BE PROVIDED WITHIN THE CHANNEL.
11. ANY WATER ACCUMULATING IN THE WORKSPACE SHALL BE PUMPED TO A FILTER BAG PRIOR TO DISCHARGE.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
DAM AND PUMP CROSSING

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

FIG. NO. 6

Sheet: 6 of 127

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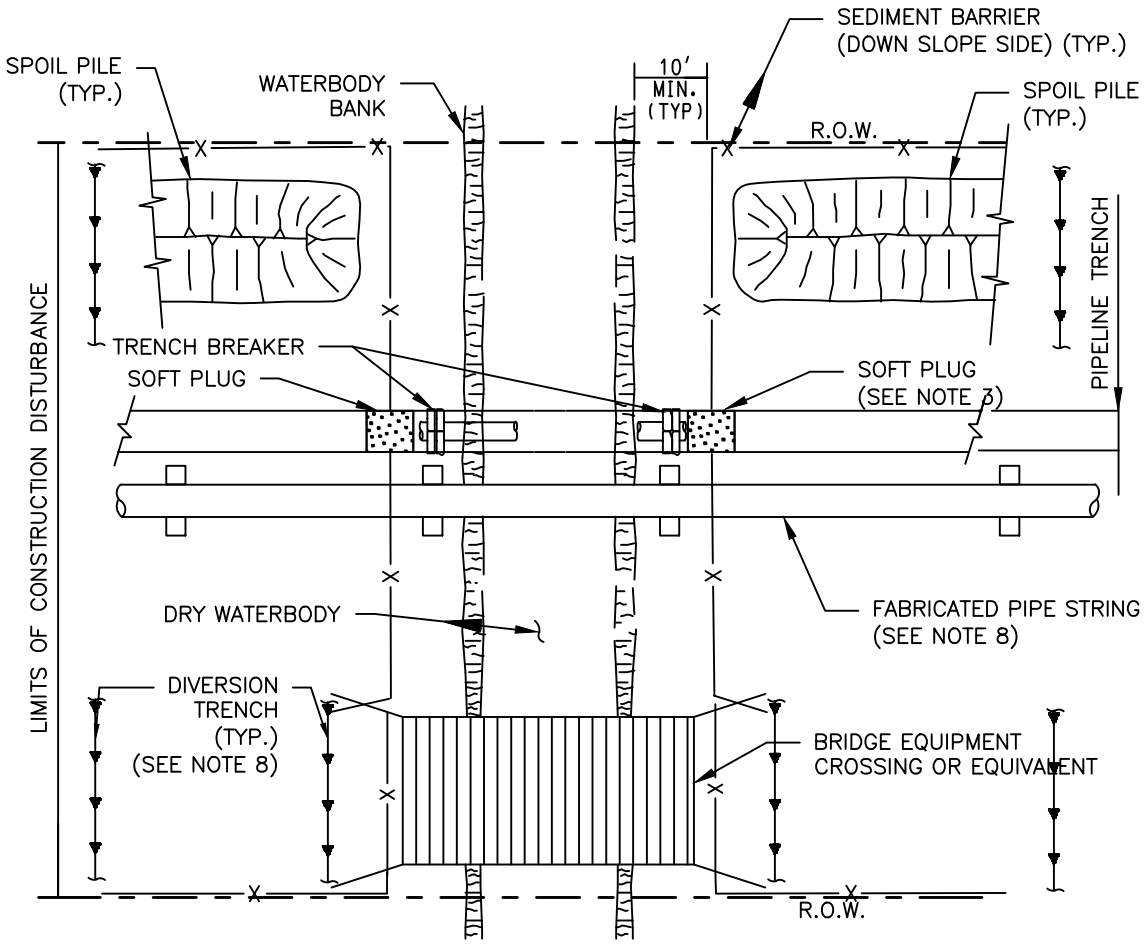

NOTES:

1. THIS METHOD APPLIES TO WATERBODIES THAT ARE DRY AT THE TIME OF CROSSING.
2. SEDIMENT BARRIERS SHALL BE INSTALLED AS DEPICTED AND ALONG DOWN GRADIENT SIDES OF WORK AREAS SUCH THAT NO HEAVILY SILT LADEN WATER ENTERS THE WATERBODY OR LEAVES THE CONSTRUCTION RIGHT OF WAY.
3. SOFT PLUGS SHALL BE INSTALLED FOLLOWING EXCAVATION OF THE MAINLINE TRENCH THROUGH THE WATERBODY.
4. INSTALL TRENCH BREAKERS ON BOTH SIDES OF THE WATERBODY TO PREVENT DIVERSION OF WATER INTO UPLAND PORTIONS OF THE PIPELINE TRENCH AND TO KEEP ANY ACCUMULATED TRENCH WATER OUT OF THE WATERBODY.
5. EQUIPMENT OPERATING IN THE WATERBODY SHALL BE LIMITED TO THAT NEEDED TO PERFORM CONSTRUCTION. IF OTHER TYPES OF EQUIPMENT MUST CROSS THE WATERBODY, THE CONTRACTOR SHALL PROVIDE AND USE A TEMPORARY BRIDGE EQUIPMENT CROSSING OR EQUIVALENT AS APPROVED BY THE ENVIRONMENTAL INSPECTOR.
6. EROSION AND SEDIMENT CONTROL MEASURES SHALL BE INSTALLED DAILY AND REPAIRED IF NECESSARY.
7. CHEMICALS, FUELS AND LUBRICATING OILS SHALL NOT BE STORED AND EQUIPMENT SHALL NOT BE REFUELED WITHIN 100 FEET OF WATERBODY, UNLESS OTHERWISE APPROVED BY THE REGULATORY AUTHORITY. ANY WATER ACCUMULATING IN THE WORKSPACE SHALL BE PUMPED TO A FILTER BAG PRIOR TO DISCHARGE TO A WATERBODY.
8. INSTALL DIVERSION TRENCHES AT THE BASE OF ALL SLOPES ADJACENT TO THE WATERBODY AND AT MINIMUM 50' FROM WATERBODY BANK.
9. THE FABRICATED PIPE STRING MAY SPAN THE DRY WATERBODY CROSSING IN PREPARATION FOR THE LOWERING–IN PHASE OF CONSTRUCTION.
10. THE DRY WATERBODY MAY BE TRENCHED IN SEQUENCE WITH NORMAL TRENCHING OPERATIONS AND THE PIPE INSTALLED THROUGH THE DRY WATERBODY CROSSING IN CONJUCTION WITH UPSTREAM AND DOWN STREAM PIPE.
11. THE CONTRACTOR SHALL POSTPONE GRUBBING AND ROUGH GRADING OF THE RIGHT–OF–WAY WITHIN 50' OF TOP OF BANK UNTIL ALL MATERIALS REQUIRED TO COMPLETE CROSSING ARE ON SITE, THE STAGING AREA IS PREPARED AND WORK IN THE WATERBODY IS READY TO COMMENCE. ALL DISTURBED AREAS WITHIN 50 FEET OF TOP OF BANK SHALL BE BLANKETED OR MATTED WITHIN 24 HOURS OF INITIAL DISTURBANCE OR MINOR STREAMS OR 48 HOURS OF INITIAL DISTURBANCE FOR MAJOR STREAMS UNLESS OTHERWISE AUTHORIZED. APPROPRIATE STREAMBANK PROTECTION SHALL BE PROVIDED WITHIN THE CHANNEL.
12. ANY WATER ACCUMULATING IN THE WORKSPACE SHALL BE PUMPED TO A FILTER BAG PRIOR TO DISCHARGE.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
DRY WATERBODY CROSSING

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

FIG. NO. 7

Sheet: 7 of 127
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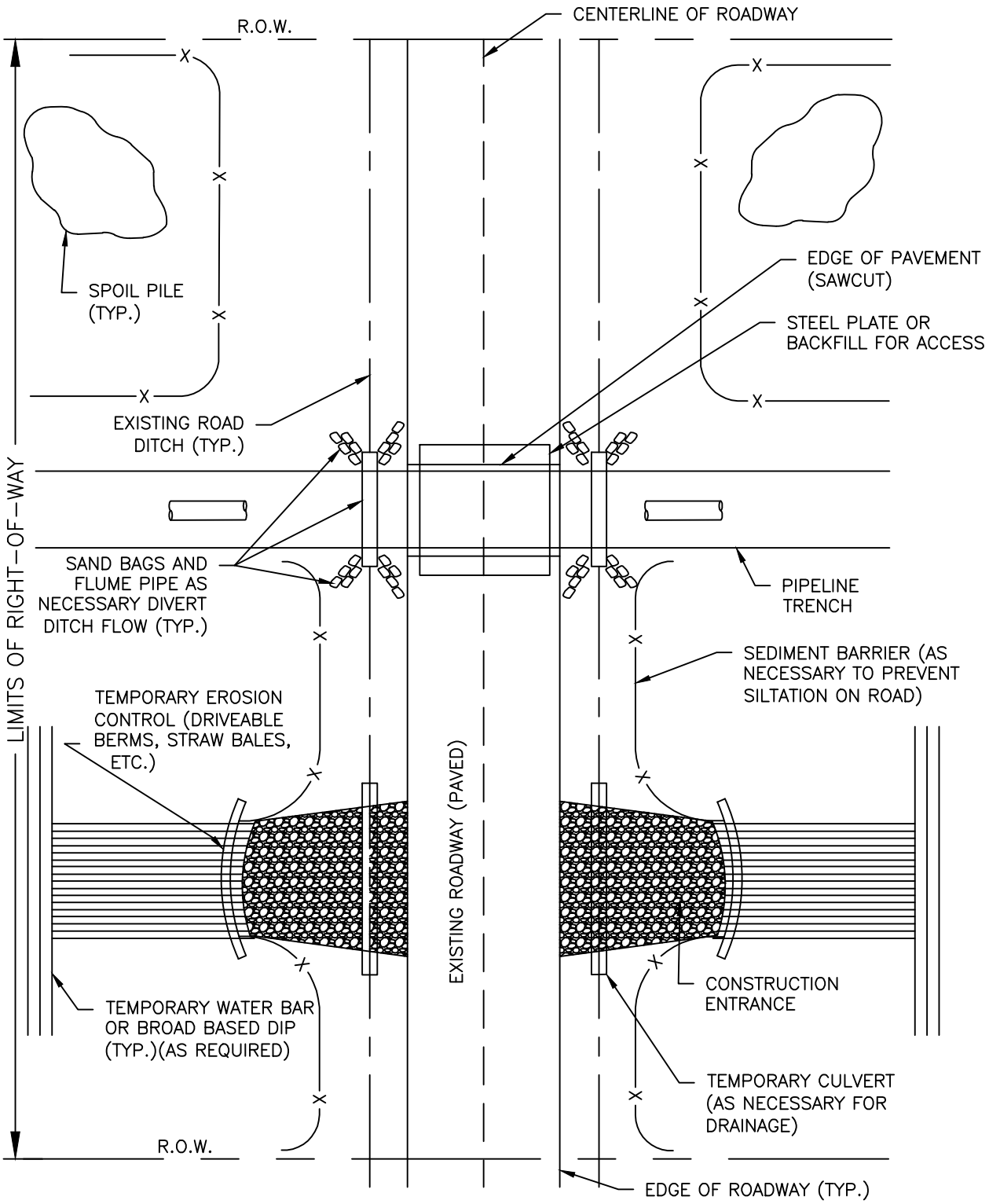

NOTES:
1. THE CONTRACTOR SHALL MAINTAIN ACCESS FOR ALL EMERGENCY VEHICLES.
2. THE CONTRACTOR SHALL COORDINATE ACCESS RESTRICTIONS WITH ALL IMPACTED PARTIES PRIOR TO CROSSING THE ROAD.
3. THE CONTRACTOR SHALL MAINTAIN ONSITE ADEQUATELY SIZED STEEL PLATES TO COVER THE OPEN TRENCH AND ALLOW FOR EMERGENCY OR GENERAL ACCESS IN THE EVENT THAT CONSTRUCTION ACTIVITIES HAVE TO BE HALTED.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
TYPICAL OPEN CUT PAVED
ROAD CROSSING

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

FIG. NO. 8

Sheet: 8 of 127
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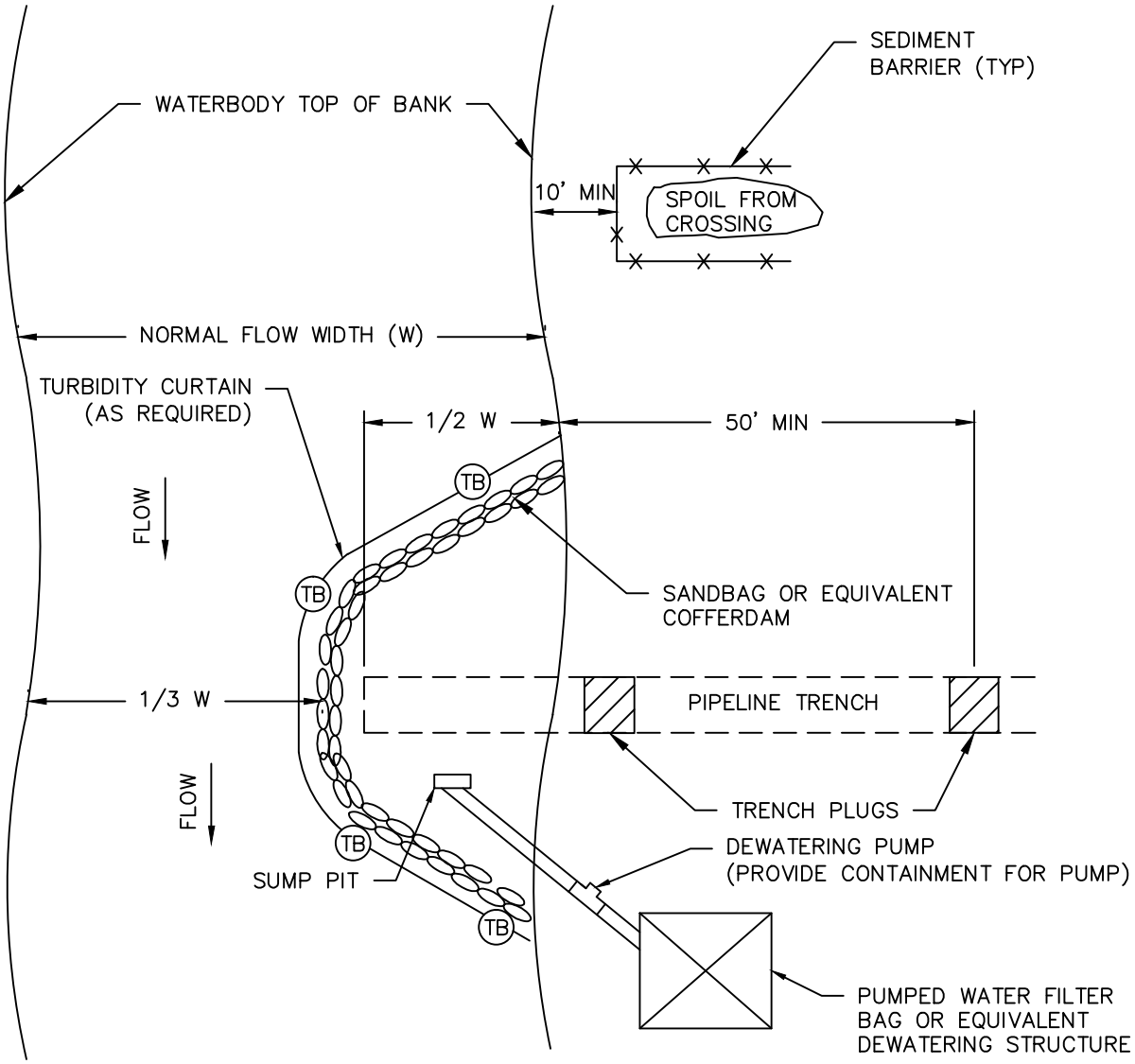

PLAN VIEW

NOTES:

1. GRUBBING SHALL NOT TAKE PLACE WITHIN 50 FEET OF TOP–OF–BANK UNTIL ALL MATERIALS REQUIRED TO COMPLETE CROSSING ARE ON SITE AND PIPE IS READY FOR INSTALLATION.
2. TRENCH BREAKER SHALL BE INSTALLED WITHIN THE TRENCH ON BOTH SIDES OF THE WATERBODY CHANNEL.
3. WATER ACCUMULATING WITHIN THE WORK AREA SHALL BE PUMPED TO A PUMPED WATER FILTER BAG OR SEDIMENT TRAP PRIOR TO DISCHARGING INTO ANY SURFACE WATER.
4. HAZARDOUS OR POLLUTANT MATERIAL STORAGE AREAS SHALL BE LOCATED AT LEAST 100 FEET BACK FROM THE TOP OF WATERBODY BANK.
5. ALL EXCESS EXCAVATED MATERIAL SHALL BE IMMEDIATELY REMOVED FROM THE WATERBODY CROSSING AREA.
6. ALL DISTURBED AREAS WITHIN 50 FEET OF TOP–OF–BANK SHALL BE BLANKETED OR MATTED WITHIN 24 HOURS OF INITIAL DISTURBANCE FOR MINOR WATERBODIES OR 48 HOURS OF INITIAL DISTURBANCE FOR INTERMEDIATE WATERBODIES UNLESS OTHERWISE AUTHORIZED.
7. APPROPRIATE WATERBODY BANK PROTECTION SHALL BE PROVIDED WITHIN THE CHANNEL.
8. THE WATERBODY CROSSING WILL GENERALLY BE COMPLETED IN 2 STAGES. THE DETAIL DEPICTS STAGE 1. STAGE 2 WILL GENERALLY BE COMPLETED USING THE SAME CONFIGURATION FROM THE OPPOSITE BANK.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
TYPICAL UTILITY LINE CROSSING
WITH COFFERDAM

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

FIG. NO. 9

Sheet: 9 of 127
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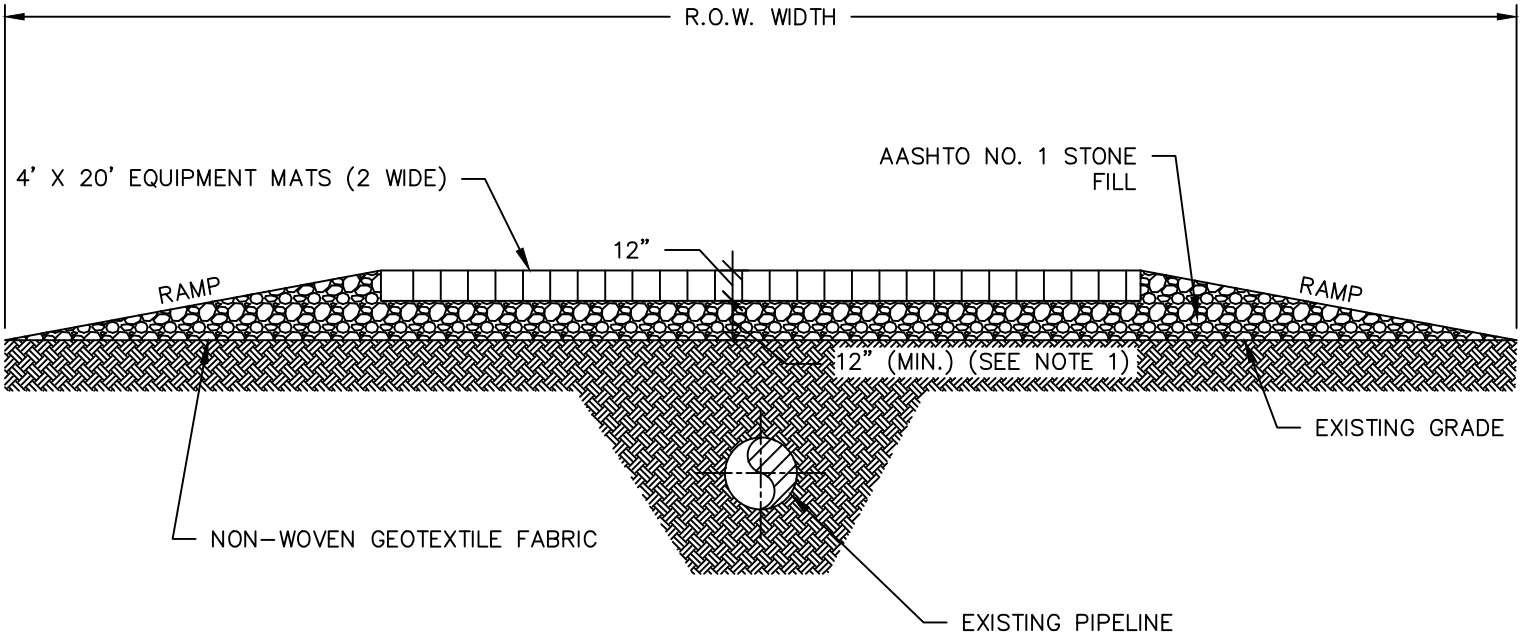

NOTES:

1. ADDITIONAL STONE DEPTH MAY BE REQUIRED DEPENDING ON THE DEPTH OF COVER OVER THE EXISTING PIPE. THE CONTRACTOR SHALL COORDINATE WITH THE ENGINEER FOR THE REQUIRED DEPTH OF STONE.
2. INSTALL 1 (ONE) LAYER OF NON–WOVEN GEOTEXTILE FABRIC PRIOR TO INSTALLING THE STONE.
3. THE CONTRACTOR SHALL COORDINATE WITH THE ENGINEER TO DETERMINE THE NUMBER OF EQUIPMENT MATS REQUIRED.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
TEMPORARY WOODEN MAT PIPELINE CROSSING

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

FIG. NO. 10

Sheet: 10 of 127
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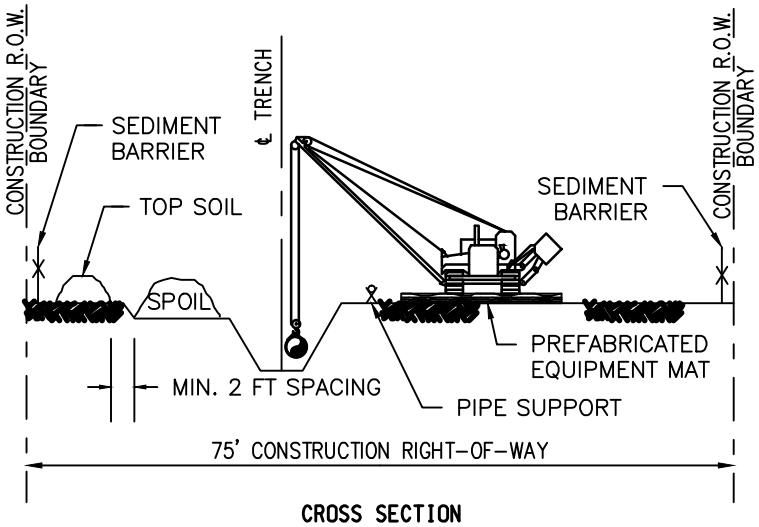

CROSS SECTION

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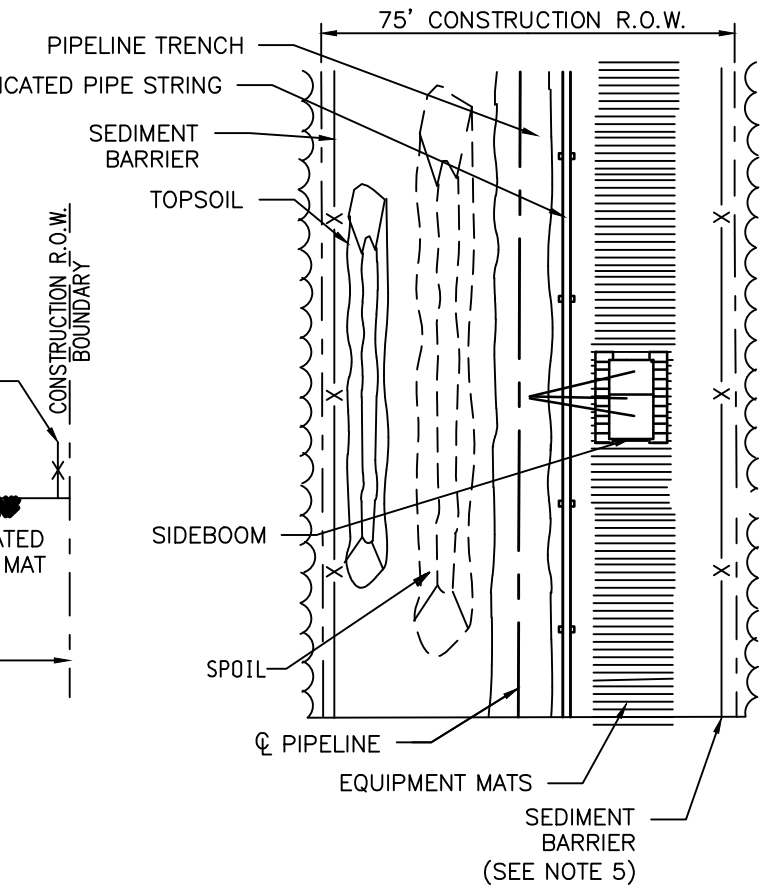

PLAN VIEW

SCALE: N.T.S.

CONSTRUCTION PROCEDURE NOTES:

1. FLAG WETLAND BOUNDARIES AND INSTALL BOUNDARY SIGNS PRIOR TO CLEARING.
2. NO OVERNIGHT PARKING OR REFUELING OF MOBILE EQUIPMENT IS ALLOWED WITHIN 100 FEET OF WETLAND. PLACE "NO FUELING" SIGN POSTS 100 FEET BACK FROM WETLAND BOUNDARY. REFUEL STATIONARY EQUIPMENT AS PER SPCP PLAN.
3. INSTALL TEMPORARY SLOPE BREAKERS UPSLOPE OF WETLAND BOUNDARIES.
4. INSTALL PREFABRICATED EQUIPMENT MATS THROUGH THE ENTIRE WETLAND AREA ON THE WORKING SIDE OF THE CONSTRUCTION CORRIDOR.
5. AVOID ADJACENT WETLANDS. INSTALL SEDIMENT BARRIERS AT THE OUTER BOUNDARIES OF THE WETLAND. INSTALL SEDIMENT BARRIERS ALONG THE EDGE OF THE SPOIL SIDE OF THE CONSTRUCTION CORRIDOR THROUGH THE WETLAND AND ALONG THE DOWN SLOPE EDGE OF THE WETLAND. IF THE DOWN SLOPE EDGE OF THE WETLAND IS THE SPOIL SIDE, THEN SEDIMENT BARRIERS ARE NOT REQUIRED ON THE WORKING SIDE OF THE CORRIDOR UNLESS EQUIPMENT TRAVERSING THROUGH THE WETLAND CAUSES SPOIL AND SEDIMENT TO EXIT THE CONSTRUCTION CORRIDOR.
6. LIMIT PULLING OF TREE STUMPS AND GRADING ACTIVITIES TO DIRECTLY OVER THE TRENCH LINE. DO NOT GRADE OR REMOVE STUMPS OR ROOT SYSTEMS FROM THE REST OF THE RIGHT-OF-WAY IN WETLANDS UNLESS THE CHIEF INSPECTOR AND COMPANY ENVIRONMENTAL INSPECTOR DETERMINE THAT SAFETY RELATED CONSTRUCTION CONSTRAINTS REQUIRE REMOVAL OF TREE STUMPS FROM UNDER THE WORKING SIDE OF THE RIGHT-OF-WAY.
7. CONDUCT TRENCH LINE TOPSOIL STRIPPING (IF TOPSOIL IS NOT SATURATED OR FROZEN). SALVAGE TOPSOIL TO ACTUAL DEPTH OR A MAXIMUM DEPTH OF 12 INCHES, AS DETERMINED BY THE ENVIRONMENTAL INSPECTOR. SEGREGATED TOPSOIL PILE MAY BE LOCATED ON SPOIL SIDE, AS REQUIRED.
8. LEAVE HARD PLUGS AT THE EDGES OF WETLAND UNTIL JUST PRIOR TO TRENCHING.
9. TRENCHING THROUGH WETLANDS MAY PROCEED WHEN THE PIPE SECTION IS FABRICATED AND READY TO LAY. ONCE TRENCHING COMMENCES, CONSTRUCTION THROUGH THE WETLAND IS TO PROCEED CONTINUOUSLY UNTIL THE CROSSING IS COMPLETED, BACK FILLED AND RESTORED IN ORDER TO MINIMIZE THE LENGTH OF TIME THE TRENCH IS OPEN.
10. PIPE SECTION MAY BE FABRICATED WITHIN THE WETLAND ADJACENT TO PIPE TRENCH, OR IN STAGING AREA OUTSIDE THE WETLAND AND WALKED IN. NO CONCRETE COATING ACTIVITY SHALL OCCUR WITHIN 100 FEET OF WETLAND BOUNDARY UNLESS APPROVED BY ENVIRONMENTAL INSPECTOR.
11. LOWER-IN PIPE. PRIOR TO BACK FILLING TRENCH, INSTALL TRENCH BREAKERS IN ACCORDANCE WITH DRAWINGS AND SPECIFICATIONS.
12. RESTORE GRADE TO NEAR PRE-CONSTRUCTION TOPOGRAPHY, REPLACE TOPSOIL AND INSTALL PERMANENT EROSION CONTROL MEASURES.
13. REMOVE PREFABRICATED MATS FROM WETLANDS UPON COMPLETION.
14. SEED DISTURBED WETLAND AREAS (UNLESS STANDING WATER IS PRESENT) AS DETERMINED BY THE ENVIRONMENTAL INSPECTOR AND AS SHOWN ON DRAWINGS AND ECP. 48 LB PLS/ACRE ANNUAL RYE GRASS AND STRAW MULCH AT 3T/ACRE OR AS APPROVED BY THE APPLICABLE PERMITTING AGENCY.
15. NO FERTILIZER OR LIME IS PERMITTED.
16. DO NOT USE LIQUID MULCH BINDERS WITHIN 100 FT OF WETLANDS OR WATERBODIES.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

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Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
TYPE I "NON-SATURATED WETLAND"
INSTALLATION PROCEDURE

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

FIG. NO. 11

Sheet: 11 of 127

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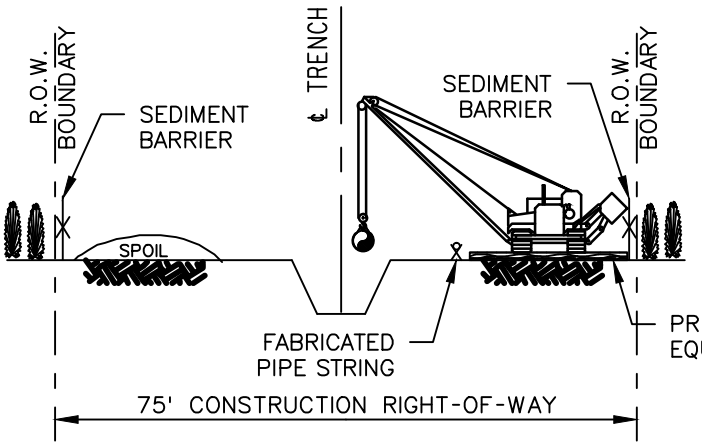

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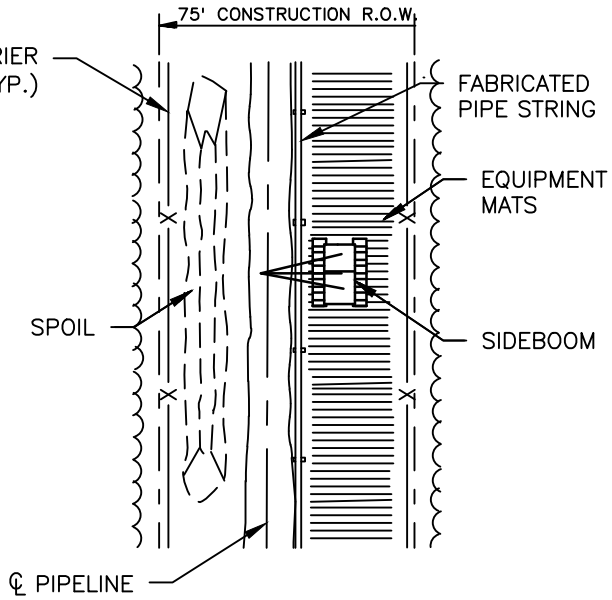

PLAN VIEW
SCALE: N.T.S.

CONSTRUCTION PROCEDURE NOTES:

1. FLAG WETLAND BOUNDARIES AND INSTALL BOUNDARY SIGNS PRIOR TO CLEARING.
2. NO OVERNIGHT PARKING OR REFUELING OF MOBILE EQUIPMENT IS ALLOWED WITHIN 100 FEET OF WETLAND. PLACE "NO FUELING" SIGN POSTS 100 FEET BACK FROM WETLAND BOUNDARY. REFUEL STATIONARY EQUIPMENT AS PER SPCC PLAN.
3. INSTALL TEMPORARY SLOPE BREAKERS UPSLOPE OF WETLAND BOUNDARIES.
4. INSTALL PREFABRICATED EQUIPMENT MATS THROUGH ENTIRE WETLAND AREA ON THE WORKING SIDE OF THE CONSTRUCTION CORRIDOR.
5. AVOID ADJACENT WETLANDS. INSTALL SEDIMENT BARRIERS AT OUTER BOUNDARIES OF WETLAND AND ALONG BOTH WETLAND EDGES.
6. LIMIT PULLING OF TREE STUMPS AND GRADING ACTIVITIES TO DIRECTLY OVER THE TRENCHLINE. DO NOT GRADE OR REMOVE STUMPS OR ROOT SYSTEMS FROM THE REST OF THE RIGHT-OF-WAY IN WETLANDS UNLESS THE CHIEF INSPECTOR AND COMPANY ENVIRONMENTAL INSPECTOR DETERMINE THAT SAFETY RELATED CONSTRUCTION CONSTRAINTS REQUIRE REMOVAL OF TREE STUMPS FROM UNDER THE WORKING SIDE OF THE RIGHT-OF-WAY.
7. TOPSOIL STRIPPING SHALL NOT BE REQUIRED IN SATURATED SOIL CONDITIONS.
8. LEAVE HARD PLUGS AT THE EDGES OF WETLAND UNTIL JUST PRIOR TO TRENCHING.
9. TRENCHING THROUGH WETLANDS MAY PROCEED WHEN THE PIPE SECTION IS FABRICATED AND READY TO LAY. ONCE TRENCHING COMMENCES, CONSTRUCTION THROUGH THE WETLAND IS TO PROCEDE CONTINUOUSLY UNTIL THE CROSSING IS COMPLETED, BACKFILLED AND RESTORED IN ORDER TO MINIMIZE THE LENGTH OF TIME THE TRENCH IS OPEN.
10. PIPE SECTION MAY BE FABRICATED WITHIN THE WETLAND ADJACENT TO PIPE TRENCH, OR IN STAGING AREA OUTSIDE THE WETLAND AND WALKED IN. NO CONCRETE COATING ACTIVITY WITHIN 100 FEET OF WETLAND BOUNDARY, UNLESS APPROVED BY COMPANY ENVIRONMENTAL INSPECTOR.
11. LOWER-IN PIPE PRIOR TO BACKFILLING, INSTALL TRENCH PLUGS IN ACCORDANCE WITH DRAWINGS AND SPECIFICATIONS.
12. RESTORE GRADE TO NEAR PRE-CONSTRUCTION TOPOGRAPHY AND INSTALL PERMANENT EROSION CONTROL MEASURES.
13. REMOVE PREFABRICATED MATS FROM WETLANDS UPON COMPLETION.
14. SEED DISTURBED WETLAND AREA (UNLESS STANDING WATER IS PRESENT) AS DETERMINED BY THE ENVIRONMENTAL INSPECTOR AND AS SHOWN ON DRAWINGS AND ECP. 48 LB PLS/ACRE ANNUAL RYE GRASS AND STRAW MULCH AT 3T/ACRE OR AS APPROVED BY THE APPLICABLE PERMITTING AGENCY.
15. NO FERTILIZER OR LIME IS PERMITTED.
16. DO NOT USE LIQUID MULCH BINDERS WITHIN 100 FT OF WETLANDS OR WATERBODIES.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
TYPE II "SATURATED WETLAND"
INSTALLATION PROCEDURE

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

FIG. NO. 12

Sheet: 12 of 127
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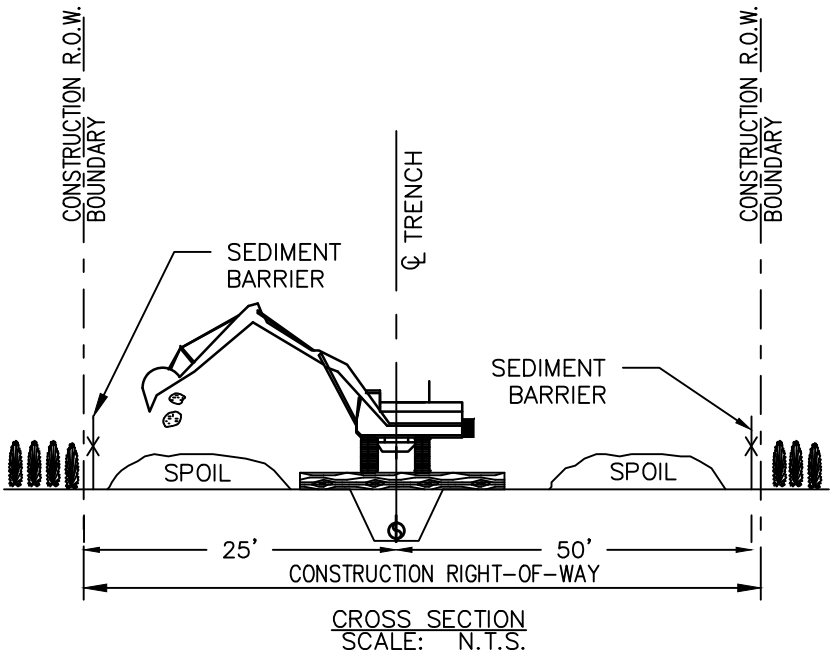

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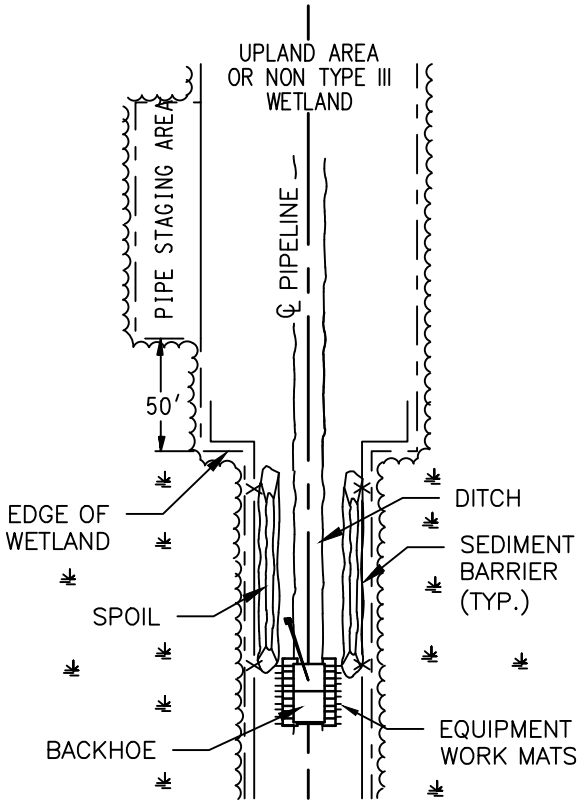

PLAN VIEW
SCALE: N.T.S.

CONSTRUCTION PROCEDURE NOTES:

1. FLAG WETLAND BOUNDARIES AND INSTALL WETLAND BOUNDARY SIGNS PRIOR TO CLEARING.
2. NO OVERNIGHT PARKING OR REFUELING OF MOBILE EQUIPMENT IS ALLOWED WITHIN 100 FEET OF WETLAND. PLACE "NO FUELING" SIGN POSTS 100 FEET BACK FROM WETLAND BOUNDARY. REFUEL STATIONARY EQUIPMENT AS PER SPCC PLAN.
3. INSTALL TEMPORARY SLOPE BREAKERS WITHIN 50' UPSLOPE OF WETLAND BOUNDARIES.
4. AVOID ADJACENT WETLANDS. INSTALL SEDIMENT BARRIERS AT OUTER BOUNDARIES OF WETLAND AND ALONG BOTH WETLAND EDGES.
5. LIMIT PULLING OF TREE STUMPS AND GRADING ACTIVITIES TO DIRECTLY OVER TRENCH LINE. DO NOT REMOVE STUMPS OR ROOT SYSTEMS FROM THE REST OF THE RIGHT-OF-WAY IN WETLANDS UNLESS THE CHIEF INSPECTOR AND COMPANY ENVIRONMENTAL INSPECTOR DETERMINE THAT SAFETY RELATED CONSTRUCTION CONSTRAINTS REQUIRE REMOVAL OF TREE STUMPS FROM UNDER THE WORKING SIDE OF THE RIGHT-OF-WAY.
6. TOPSOIL STRIPPING SHALL NOT BE REQUIRED IN SATURATED SOIL CONDITIONS.
7. UTILIZE AMPHIBIOUS EXCAVATORS (PONTOON MOUNTED BACKHOES) OR TRACKED BACKHOES SUPPORTED BY PREFABRICATED EQUIPMENT MATS OR FLOATS, TO EXCAVATE TRENCH. IF PREFABRICATED EQUIPMENT MATS ARE USED FOR STABILIZATION, THE BACKHOE SHALL GRADUALLY MOVE ACROSS THE WETLAND BY MOVING THE MATS FROM IMMEDIATELY BEHIND TO IMMEDIATELY IN FRONT OF THE BACKHOE'S PATH.
8. FABRICATE PIPE IN A STAGING AREA OUTSIDE THE TYPE III WETLAND AS INDICATED ON THE CONSTRUCTION DRAWINGS. NO CONCRETE COATING ACTIVITY SHALL OCCUR WITHIN 100 FEET OF THE WETLAND BOUNDARY, UNLESS APPROVED BY THE ENVIRONMENTAL INSPECTOR.
9. LEAVE HARD PLUGS AT THE EDGE OF TYPE III WETLAND UNTIL JUST PRIOR TO PIPE PLACEMENT.
10. FLOAT PIPE IN PLACE, LOWER-IN, INSTALL TRENCH PLUGS IN ACCORDANCE WITH DRAWINGS AND SPECIFICATIONS, AND BACKFILL.
11. RESTORE GRADE TO NEAR PRE-CONSTRUCTION TOPOGRAPHY AND INSTALL PERMANENT EROSION CONTROL.
12. REMOVE ANY MATS UTILIZED TO SUPPORT AMPHIBIOUS EQUIPMENT FROM WETLANDS UPON COMPLETION.
13. WETLANDS CROSSED USING PUSH/PULL METHOD TEND TO BE TOO WET FOR EFFECTIVE SEEDING AND WILL NOT BE SEEDED IF STANDING WATER IS PRESENT.
14. NO FERTILIZER OR LIME IS PERMITTED.
15. DO NOT USE LIQUID MULCH BINDERS WITHIN 100 FT OF WETLANDS OR WATERBODIES.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
TYPE III "INUNDATED WETLAND"
INSTALLATION PROCEDURE

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

FIG. NO. 13

Sheet: 13 of 127
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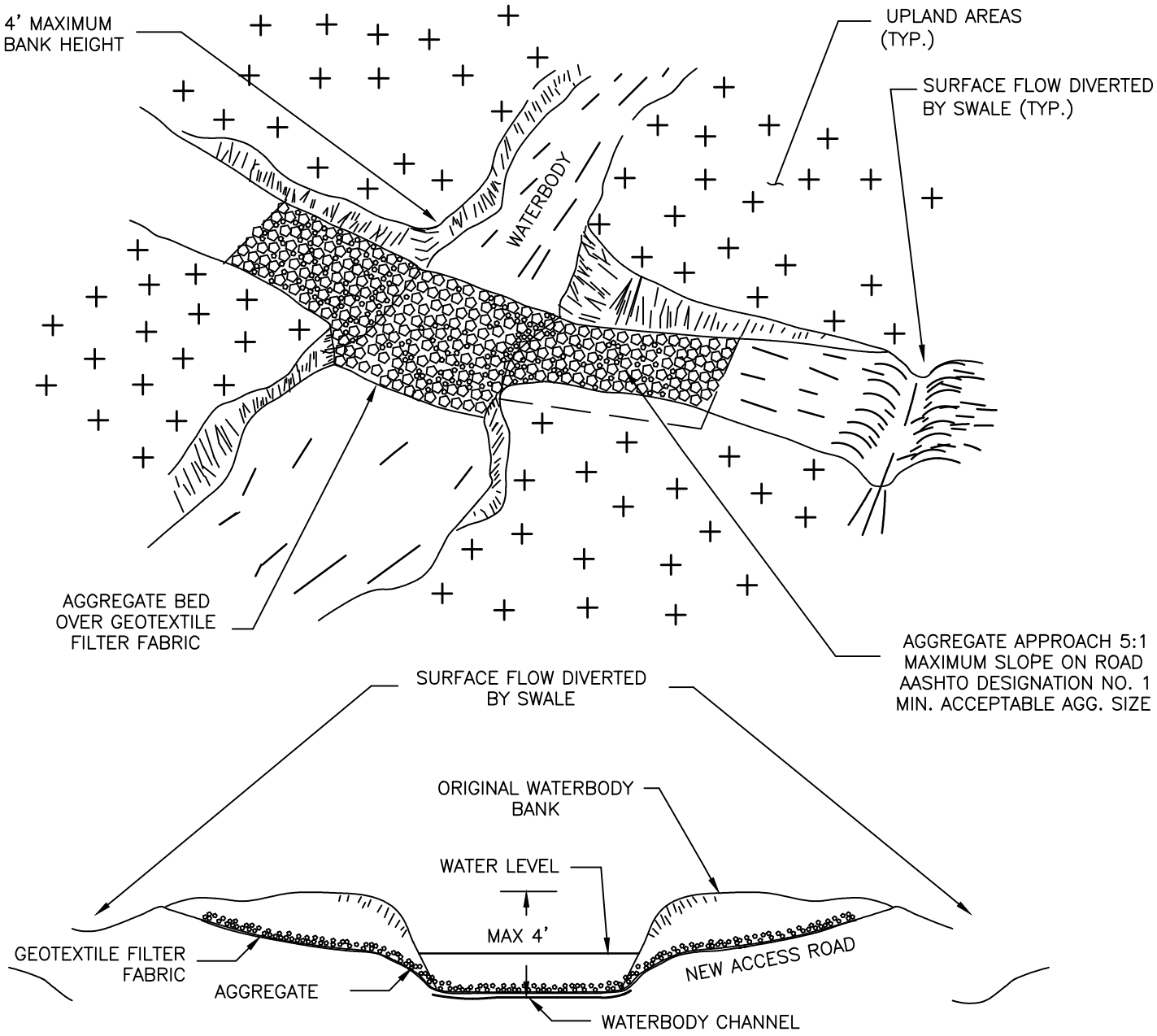

NOTES

1. THIS METHOD IS INTENDED FOR USE BY CLEARING EQUIPMENT AND CONSTRUCTION EQUIPMENT REQUIRED TO CONSTRUCT A TEMPORARY BRIDGE CROSSING PRIOR TO PIPE INSTALLATION (E.G. TRENCHING), UNLESS OTHERWISE APPROVED BY THE APPLICABLE REGULATORY AGENCY. UNLESS OTHERWISE APPROVED, THE CONTRACTOR SHALL LIMIT THE NUMBER OF CROSSINGS TO ONE PER PIECE OF EQUIPMENT.
2. THIS METHOD SHALL ONLY BE USED IF IT WILL NOT AFFECT AQUATIC LIFE SUCH AS FISH MIGRATION OR SPAWNING. COORDINATION WITH THE APPLICABLE PERMITTING AGENCY WILL BE REQUIRED PRIOR TO INSTALLATION.
3. THE ACCESS FORD SHALL BE CONSTRUCTED PERPENDICULAR TO THE WATERBODY BANKS TO MINIMIZE IMPACTS
4. A SWALE SHALL BE CONSTRUCTED AT BOTH APPROACHES A MAXIMUM OF 50' FROM THE EDGE OF THE WATERBODY BANK TO DIVERT RUNOFF AND PREVENT IT FROM DIRECTLY ENTERING THE WATERBODY.
5. THE MAXIMUM HEIGHT BETWEEN THE INVERT OF THE WATERBODY AND THE WATERBODY TOP OF BANK IS 4'. THIS METHOD SHALL NOT BE USED IF THE BANK HEIGHT EXCEEDS 4'.
6. ALL AREAS DISTURBED BY THE ACCESS FORD SHALL BE STABILIZED AS SOON AS PRACTICAL, BUT NO LATER THAN 14 CALENDAR DAYS AFTER REMOVAL.

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Division:	Op. Area:	
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Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
TEMPORARY ACCESS FORD

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

FIG. NO. 14

Sheet: 14 of 127
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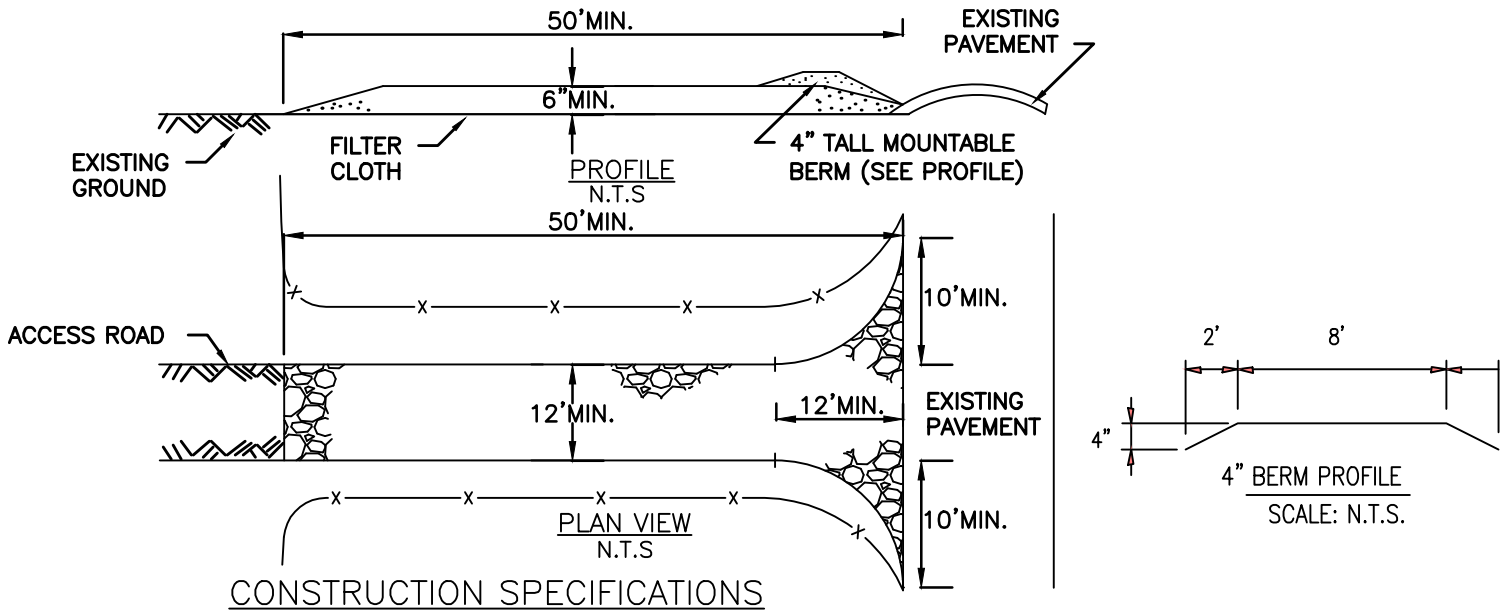

CONSTRUCTION SPECIFICATIONS

1. STONE SIZE – 1–4" STONE PERMITTED FOR USE, OR RECLAIMED OR RECYCLED CONCRETE EQUIVALENT.
2. LENGTH – NOT LESS THAN 50 FEET (EXCEPT ON A SINGLE RESIDENCE LOT WHERE A 30 FOOT MINIMUM LENGTH WOULD APPLY).
3. THICKNESS – NOT LESS THAN SIX (6) INCHES.
4. WIDTH – TWELVE (12) FOOT MINIMUM, BUT NOT LESS THAN THE FULL WIDTH AT POINTS WHERE INGRESS OR EGRESS OCCURS. TWENTY–FOUR (24) FOOT IF SINGLE ENTRANCE TO SITE.
5. FILTER CLOTH – WILL BE PLACED OVER THE ENTIRE AREA PRIOR TO PLACING OF STONE. GEOTEXTILE MUST MEET CRITERIA IN TABLE BELOW.
6. SURFACE WATER – ALL SURFACE WATER FLOWING OR DIVERTED TOWARD CONSTRUCTION ENTRANCES SHALL BE PIPED ACROSS THE ENTRANCE. IF PIPING IS IMPRACTICAL, A MOUNTABLE BERM WITH 5:1 SLOPES WILL BE PERMITTED.
7. MAINTENANCE – THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS–OF–WAY, ALL SEDIMENT SPILLED, DROPPED, WASHED OR TRACKED ONTO PUBLIC RIGHTS–OF–WAY MUST BE REMOVED IMMEDIATELY.
8. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH STONE AND WHICH DRAINS INTO AN APPROVED SEDIMENT TRAPPING DEVICE.
9. PERIODIC INSPECTION AND NEEDED MAINTENANCE SHALL BE PROVIDED AFTER EACH RAIN EVENT.

TABLE: CRITERIA FOR GEOTEXTILE

FABRIC PROPERTIES	LIGHT DUTY ROADS GRADE SUBGRADE	HEAVY DUTY HAUL ROADS ROUGH GRADED	TEST METHOD
GRAB TENSILE STRENGTH (LBS)	200	220	ASTM D1682
ELONGATION AT FAILURE (%)	50	60	ASTM D1682
MULLEN BRUST STRENGTH (LBS)	190	430	ASTM D3786
PUNCTURE STRENGTH (LBS)	40	125	ASTM D3786 MODIFIED
EQUIVALENT OPENING SIZE	40–80	40–80	US STD SIEVE CW–02215
AGGREGATE DEPTH	6	10	

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:		Op. Area:	
St.:		Co./Par.:	
Section:	Township:		Range:
Dft:	Date:	Project ID:	
Chk:	Date:	Scale:	
Appr:	Date:	Filename:	

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
STABILIZED CONSTRUCTION ENTRANCE

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

FIG. NO. 15

Sheet: 15 of 127
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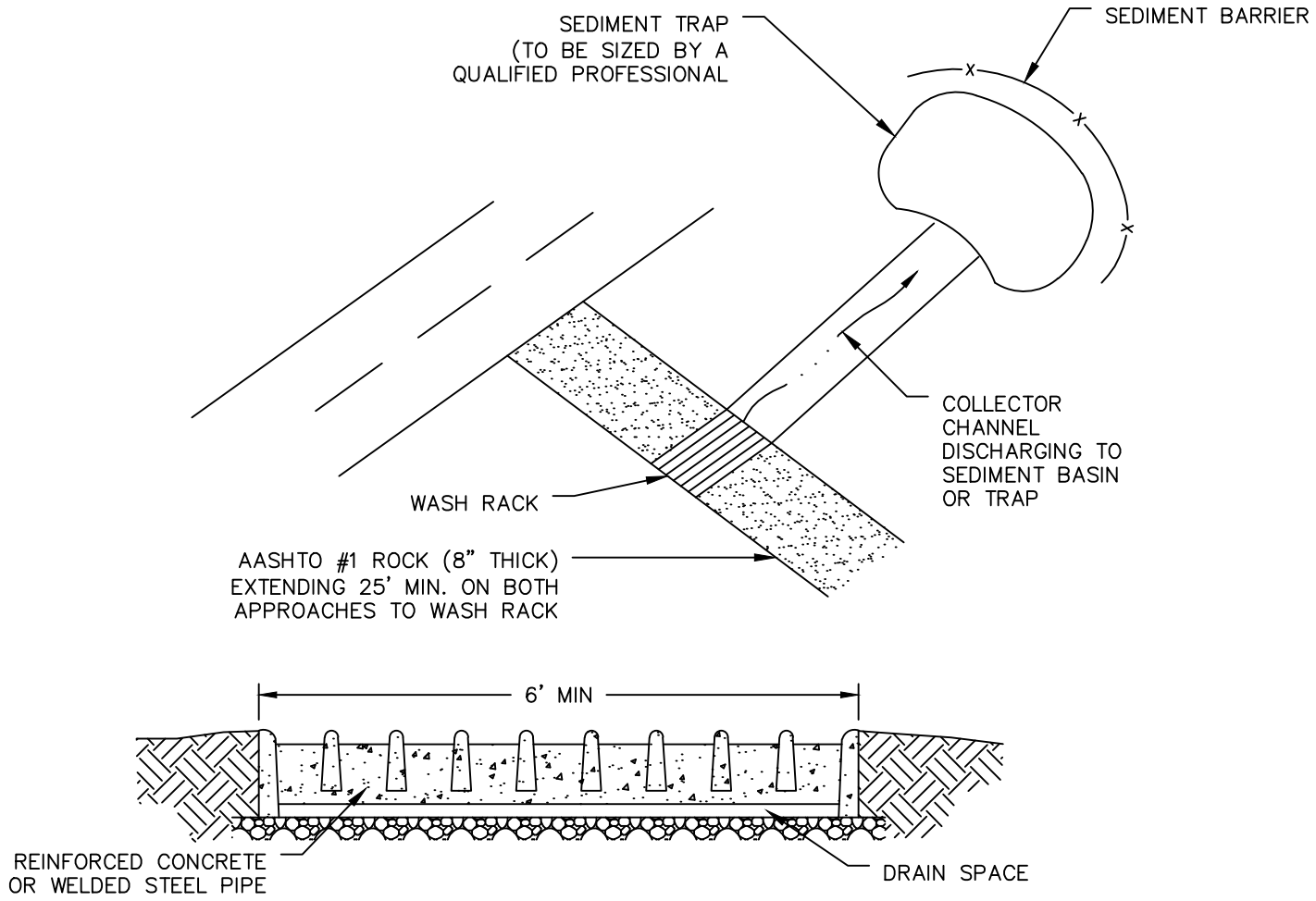

NOTES:

1. WASH RACK SHALL BE 20 FEET (MIN.) WIDE OR TOTAL WIDTH OF ACCESS.
2. WASH RACK SHALL BE DESIGNED AND CONSTRUCTED TO ACCOMMODATE ANTICIPATED CONSTRUCTION VEHICULAR TRAFFIC.
3. A WATER SUPPLY SHALL BE MADE AVAILABLE TO WASH THE WHEELS OF ALL VEHICLES EXITING THE SITE.
4. MAINTENANCE: ROCK CONSTRUCTION ENTRANCE THICKNESS SHALL BE CONSTANTLY MAINTAINED TO THE SPECIFIED DIMENSIONS BY ADDING ROCK. A STOCKPILE OF ROCK MATERIAL SHALL BE MAINTAINED ON SITE FOR THIS PURPOSE. DRAIN SPACE UNDER WASH RACK SHALL BE KEPT OPEN AT ALL TIMES. DAMAGE TO THE WASH RACK SHALL BE REPAIRED PRIOR TO FURTHER USE OF THE RACK. ALL SEDIMENT DEPOSITED ON ROADWAYS SHALL BE REMOVED AND RETURNED TO THE CONSTRUCTION SITE IMMEDIATELY. WASHING THE ROADWAY OR SWEEPING THE DEPOSITS INTO ROADWAY DITCHES, SEWERS, CULVERTS, OR OTHER DRAINAGE COURSES IS NOT ACCEPTABLE.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
STABILIZED CONSTRUCTION ENTRANCE
WITH WASHRACK

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

FIG. NO. 16

Sheet: 16 of 127
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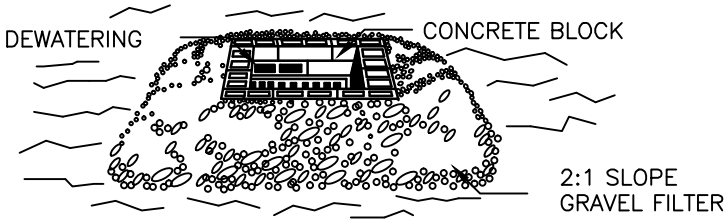
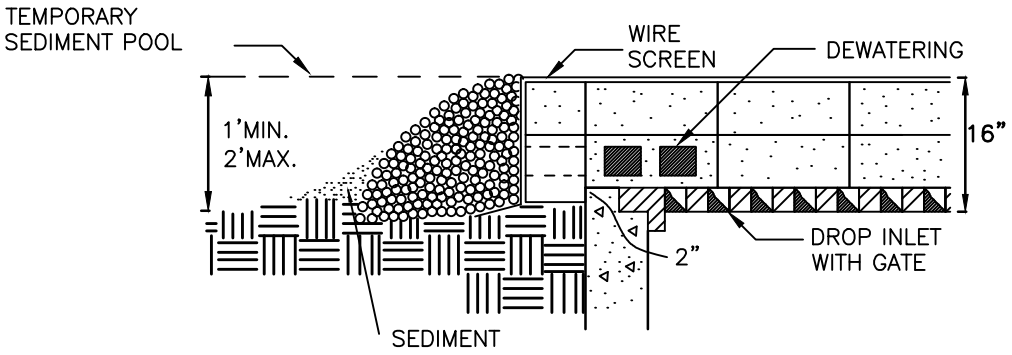
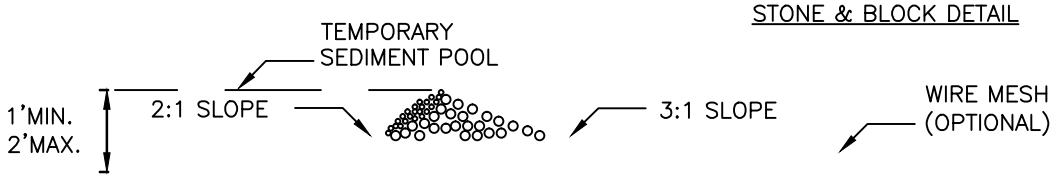


STONE & BLOCK PERSPECTIVE VIEW



STONE & BLOCK DETAIL



"DOUGHNUT" DETAIL

CONSTRUCTION SPECIFICATIONS

1. LAY ONE BLOCK ON EACH SIDE OF THE STRUCTURE ON ITS SIDE FOR DEWATERING. FOUNDATION SHALL BE 2 INCHES MINIMUM BELOW REST OF INLET AND BLOCKS SHALL BE PLACED AGAINST INLET FOR SUPPORT.
2. HARDWARE CLOTH OR 1/2" WIRE MESH SHALL BE PLACED OVER BLOCK OPENINGS TO SUPPORT STONE.
3. USE CLEAN STONE OR GRAVEL 1/2–3/4 INCH IN DIAMETER PLACED 2 INCHES BELOW TOP OF THE BLOCK ON A 2:1 SLOPE OR FLATTER.
4. FOR STONE STRUCTURES ONLY, A 1 FOOT THICK LAYER OF THE FILTER STONE WILL BE PLACED AGAINST THE 3 INCH STONE AS SHOWN ON THE DRAWINGS.
5. MAXIMUM DRAINAGE AREA 1 ACRE.
6. THIS SHALL BE USED IN ADDITION TO A SEDIMENT TRAPPING DEVICE (E.G. SEDIMENT BASIN, FILTER SACK, ETC.)

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
STONE & BLOCK DROP INLET
PROTECTION STRUCTURE

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

FIG. NO. 17

Sheet: 17 of 127
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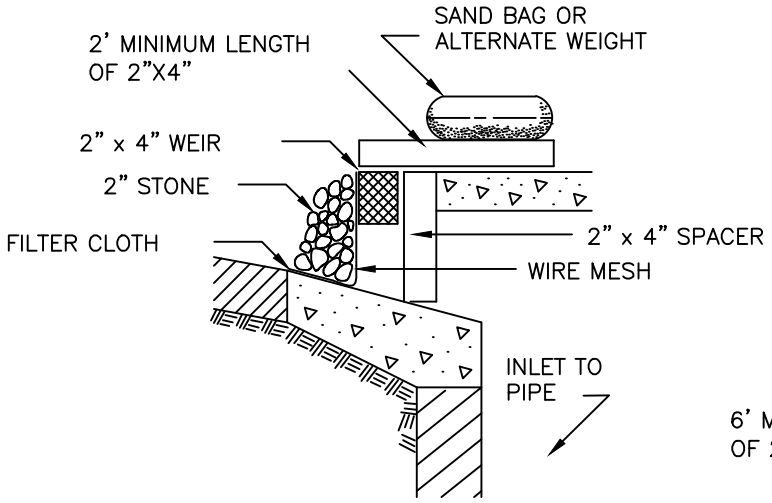

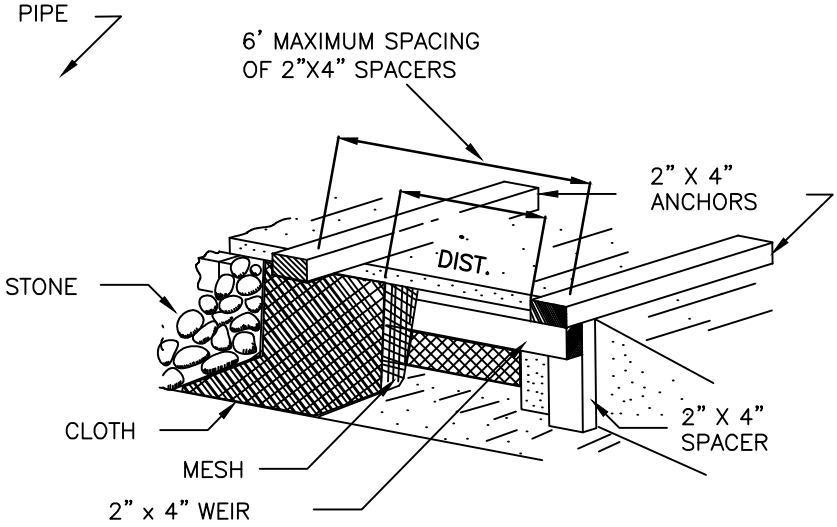

CONSTRUCTION SPECIFICATIONS

1. FILTER FABRIC SHALL HAVE AN EOS OF 40–85.
2. WOODEN FRAME SHALL BE CONSTRUCTED OF 2" x 4" CONSTRUCTION GRADE LUMBER.
3. WIRE MESH ACROSS THROAT SHALL BE A CONTINUOUS PIECE 30 INCH MINIMUM WIDTH WITH A LENGTH 4 FEET LONGER THAN THE THROAT. IT SHALL BE SHAPED AND SECURELY NAILED TO A 2" x 4" WEIR.
4. THE WEIR SHALL BE SECURELY NAILED TO 2" x 4" SPACERS 9 INCHES LONG SPACED NO MORE THAN 6 FEET APART.
5. THE ASSEMBLY SHALL BE PLACED AGAINST THE INLET AND SECURED BY 2" x 4" ANCHORS 2 FEET LONG EXTENDING ACROSS THE TOP OF THE INLET AND HELD IN PLACE BY SANDBAGS OR ALTERNATE WEIGHTS.
6. MAXIMUM DRAINAGE AREA 1 ACRE

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
CURB DROP INLET PROTECTION
STRUCTURE

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

FIG. NO. 18

Sheet: 18 of 127
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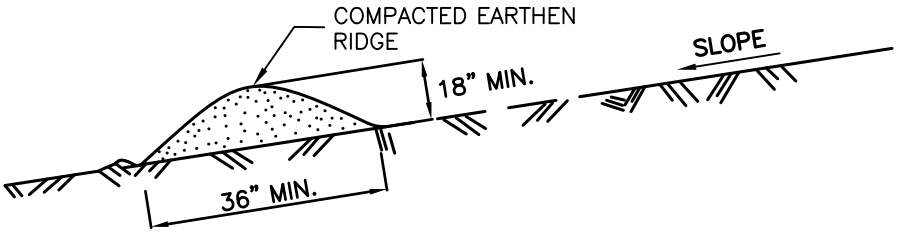
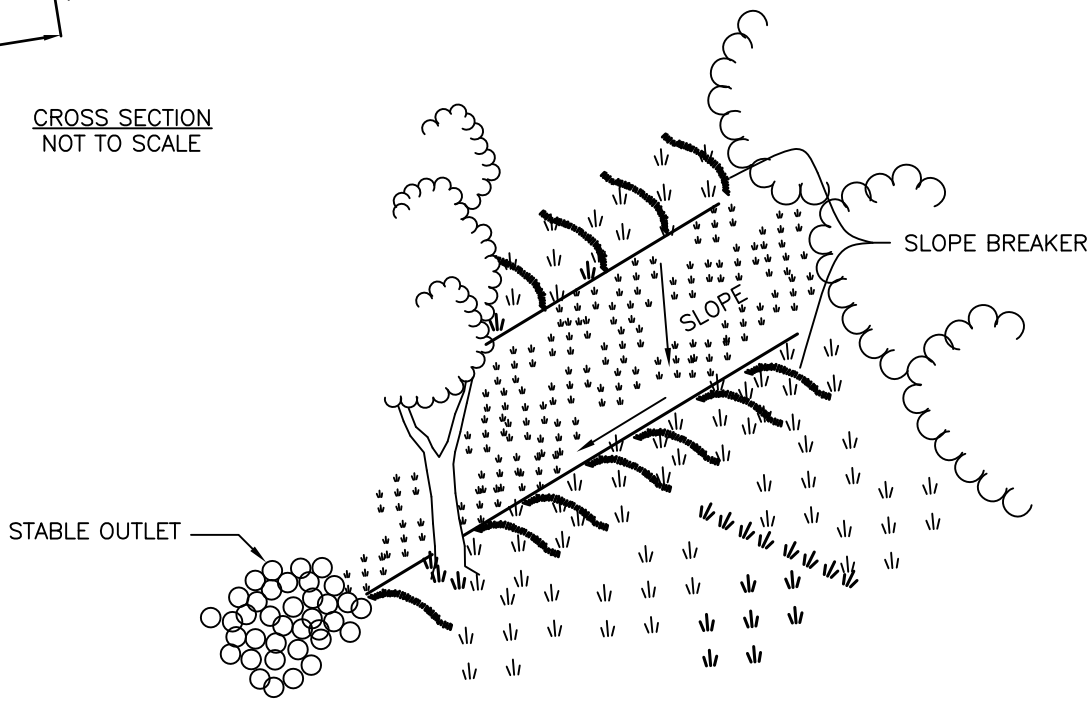


CROSS SECTION
NOT TO SCALE



CONSTRUCTION SPECIFICATIONS

1. INSTALL THE SLOPE BREAKER AS SOON AS THE RIGHT OF WAY IS CLEARED AND GRADED.
2. DISK OR STRIP THE SOD FROM THE BASE FOR THE CONSTRUCTED RIDGE BEFORE PLACING FILL.
3. TRACK THE RIDGE TO COMPACT IT TO THE DESIGN CROSS SECTION.
4. SLOPE BREAKERS MAY BE CURVED ALONG THE SLOPE TO CONFORM TO THE CONTOURS. REGARDLESS OF CURVATURE, ALL SLOPE BREAKERS SHALL BE CONSTRUCTED WITH A POSITIVE SLOPE TOWARDS A STABLE OUTLET.
5. THE OUTLET SHALL BE LOCATED ON AN UNDISTURBED AREA. FIELD SPACING WILL BE ADJUSTED TO USE THE MOST STABLE OUTLET AREAS. OUTLET PROTECTION WILL BE PROVIDED WHEN NATURAL AREAS ARE NOT ADEQUATE.
6. VEHICLE CROSSING SHALL BE STABILIZED WITH GRAVEL. EXPOSED AREAS SHALL BE IMMEDIATELY SEEDED AND MULCHED.
7. PERIODICALLY INSPECT SLOPE BREAKERS FOR EROSION DAMAGE AND SEDIMENT. CHECK OUTLET AREAS AND MAKE REPAIRS AS NEEDED TO RESTORE OPERATION.
8. THE POSITIVE GRADE OF THE SLOPE BREAKER SHALL NOT EXCEED 8%. A CROSSING ANGLE OF APPROX. 60 DEGREES IS PREFERRED. SLOPE BREAKERS FLOW MUST BE CONVEYED TO STABLE OUTLETS.

MAXIMUM SPACING OF PERMANENT
AND TEMPORARY SLOPE BREAKERS

PERCENT SLOPE	SPACING (FT)
<5	125
5 TO 10	100
10 TO 20	75
20 TO 35	50
>35	25

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
SLOPE BREAKER (WATERBAR)

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

FIG. NO. 19

Sheet: 19 of 127
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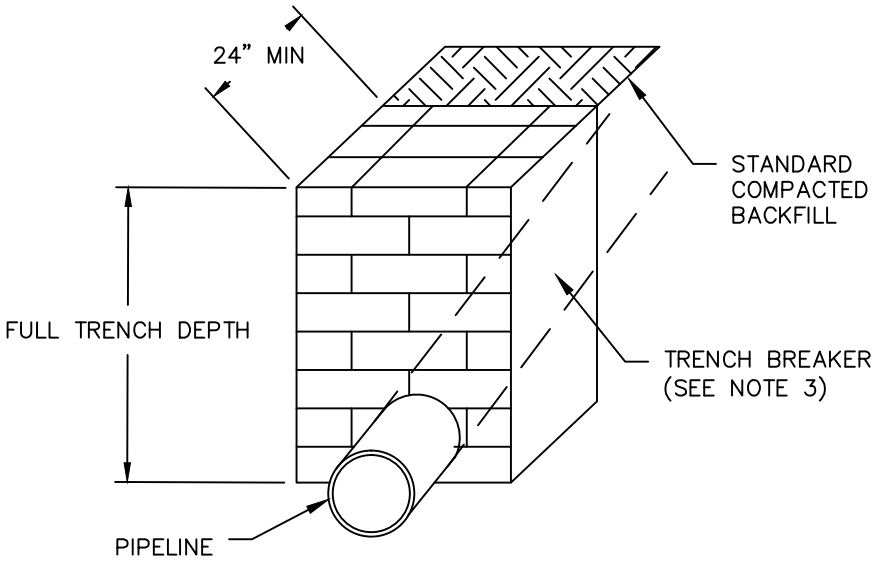
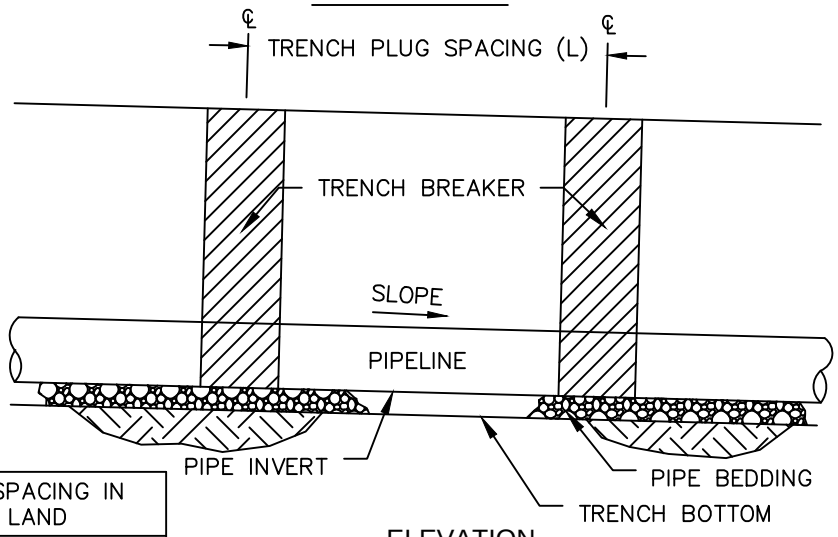


SECTION VIEW



ELEVATION

TRENCH BREAKER SPACING IN AGRICULTURAL LAND	
SLOPE (%)	SPACING (L) (FT)
< 5	AS REQUIRED
5 – 10	150
>10 – 15	100
>15 – 20	80
>20 – 30	70
>30 – 40	50
>40 – 100	40
>100	25

TRENCH BREAKER SPACING IN NON–AGRICULTURAL LAND	
SLOPE (%)	SPACING (L) (FT)
< 5	AS REQUIRED
5 – 10	150
>10 – 20	100
>20 – 35	80
<35 –	70

NOTES
1. TOPSOIL SHALL NOT BE USED TO FILL SACKS.
2. IMPERVIOUS TRENCH BREAKERS ARE REQUIRED FOR ALL STREAM, RIVER, WETLAND, OR OTHER WATER BODY CROSSINGS.
3. BREAKER MATERIAL MAY CONSIST OF STACKED CLAY, BENTONITE, SAND BAGS OR FOAM.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
TRENCH BREAKER (TRENCH PLUG)

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

FIG. NO. 20

Sheet: 20 of 127
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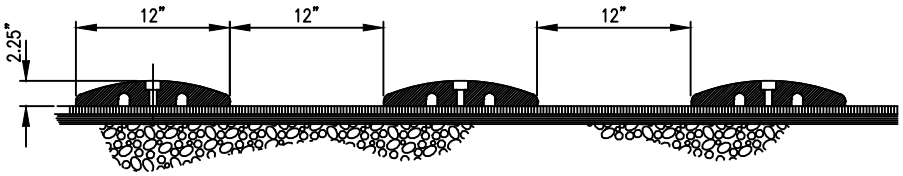
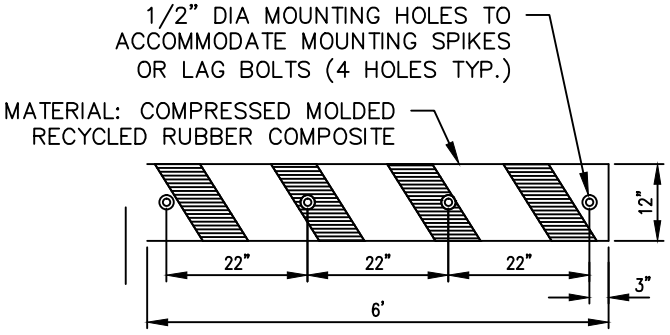


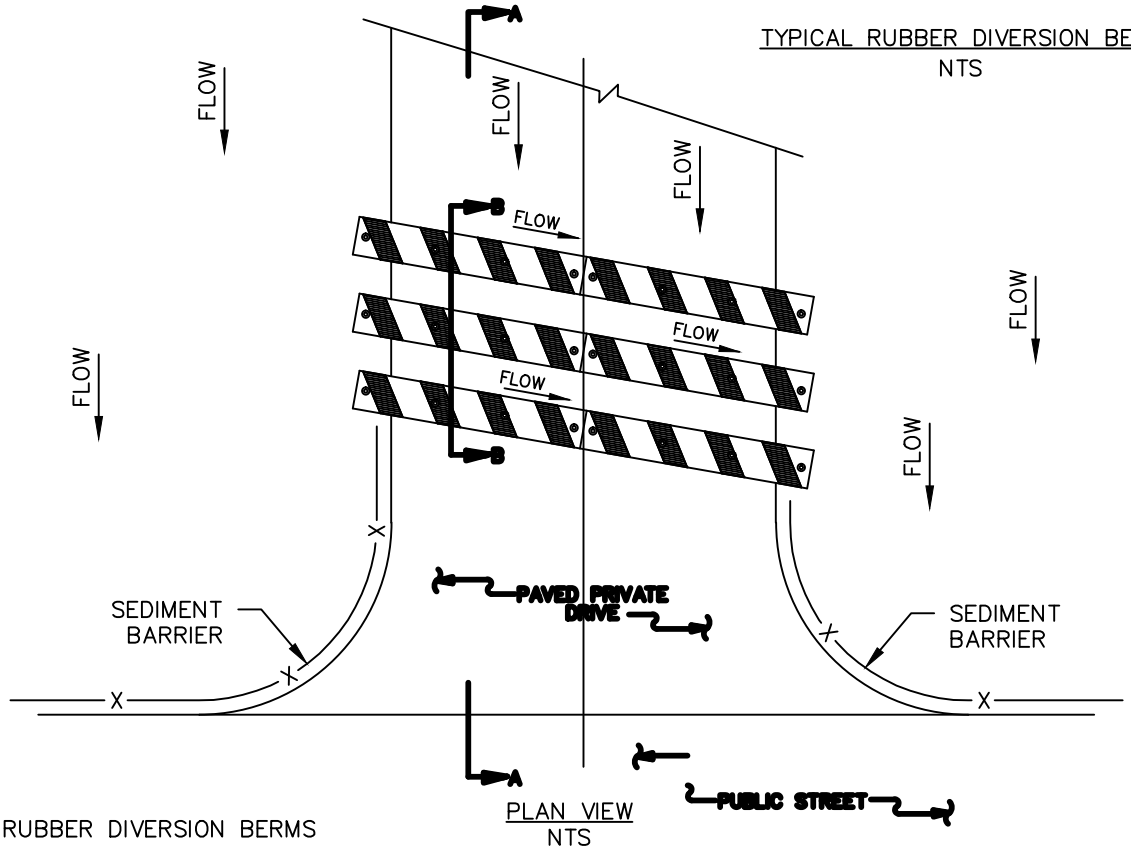
SECTION BB
NTS

NOTES:

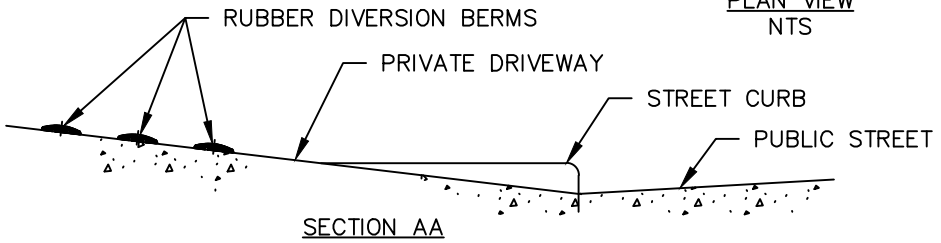
1. DIVERSION BERM TO BE SLOMO SPEED BUMPS BY CHECKER INDUSTRIAL SAFTEY PRODUCTS INC OR APPROVED EQUAL. SPEED BUMPS ARE MANUFACTURED FROM RECYCLED RUBBER COMPOSITE. MODEL NUMBER SB6D–H IS 72" L x 12" W x 2.25" H.
2. EACH 72" SECTION OF BERM TO HAVE MOUNTING HOLES SPACED ON 22" MAXIMUM, CENTERS.
3. BERM TO DIVERT RUNOFF TO EXISTING SEDIMENT BARRIER.
4. WHEN REMOVED, ALL HOLES AND DAMAGE TO EXISTING DRIVEWAY SURFACES SHALL BE REPAIRED.



TYPICAL RUBBER DIVERSION BERM
NTS



PLAN VIEW
NTS



SECTION AA
NTS

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

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Division:		Op. Area:	
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Section:	Township:	Range:	
Dft:	Date:	Project ID:	
Chk:	Date:	Scale:	
Appr:	Date:	Filename:	

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
DRIVEWAY DIVERSION BERM

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

FIG. NO. 21

Sheet: 21 of 127
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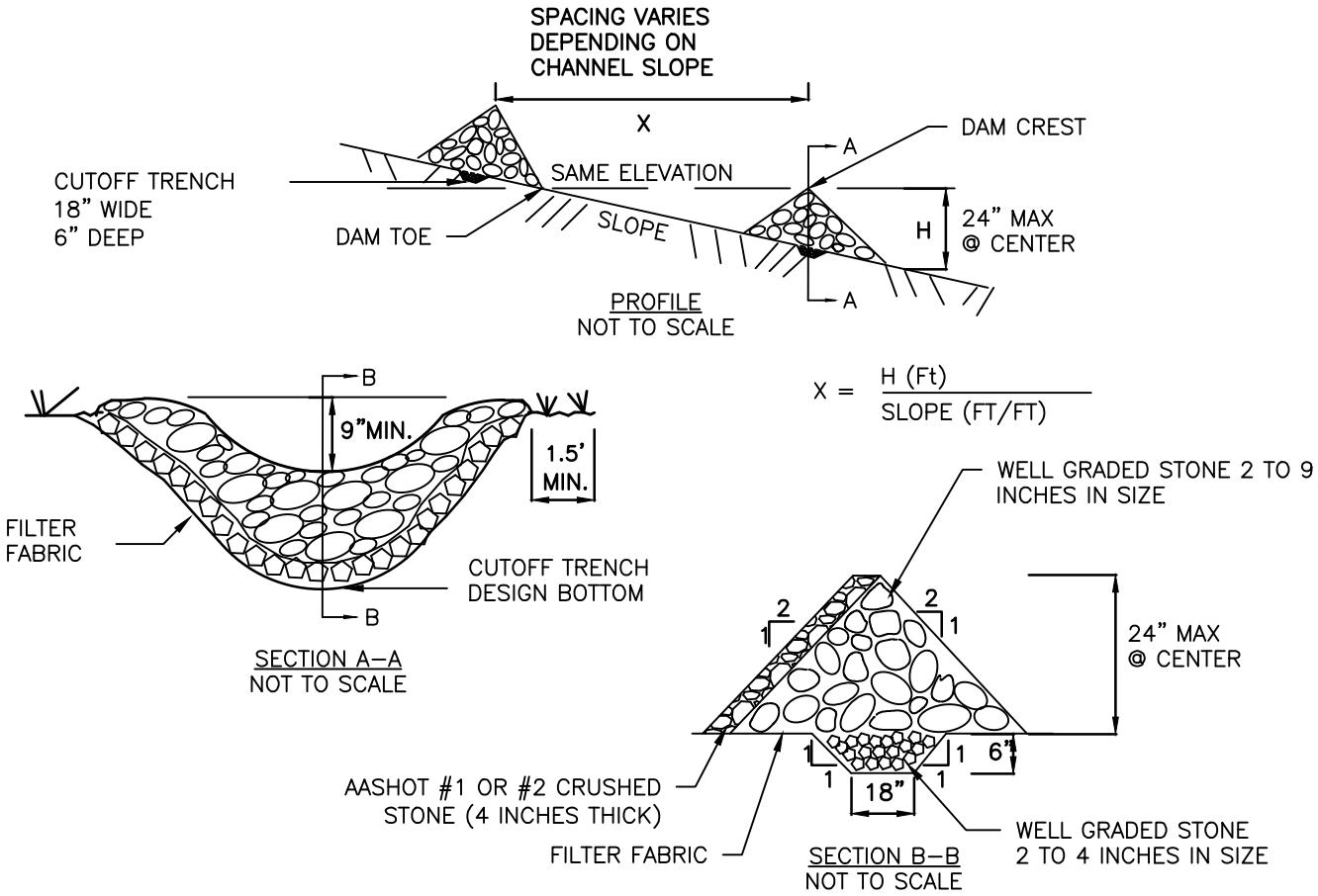

CONSTRUCTION SPECIFICATIONS

1. STONE WILL BE PLACED ON A FILTER FABRIC FOUNDATION TO THE LINES, GRADES AND LOCATIONS SHOWN IN THE PLAN.
2. SET SPACING OF CHECK DAMS TO ASSUME THAT THE ELEVATIONS OF THE CREST OF THE DOWNSTREAM DAM IS AT THE SAME ELEVATION OF THE TOE OF THE UPSTREAM DAM.
3. EXTEND THE STONE A MINIMUM OF 1.5 FEET BEYOND THE DITCH BANKS TO PREVENT CUTTING AROUND THE DAM.
4. PROTECT THE CHANNEL DOWNSTREAM OF THE LOWEST CHECK DAM FROM SCOUR AND EROSION WITH STONE OR LINER AS APPROPRIATE.
5. ENSURE THAT CHANNEL APPURTENANCES SUCH AS CULVERT ENTRANCES BELOW CHECK DAMS ARE NOT SUBJECT TO DAMAGE OR BLOCKAGE FROM DISPLACED STONE.
6. MAXIMUM DRAINAGE AREA 2 ACRES.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
CHECK DAM

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

FIG. NO. 22

Sheet: 22 of 127
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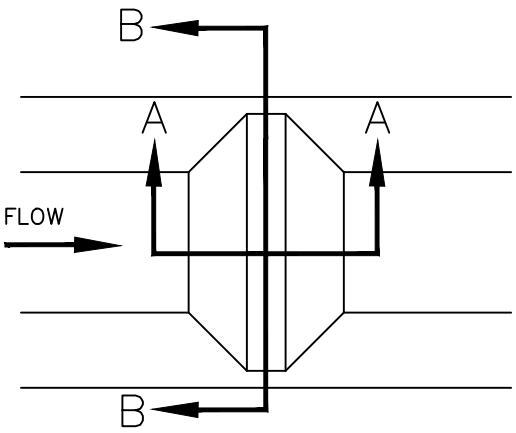
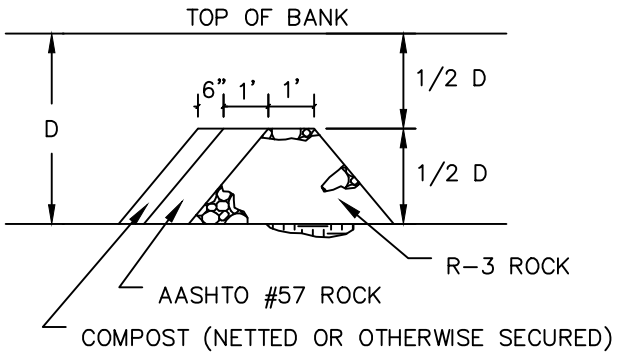
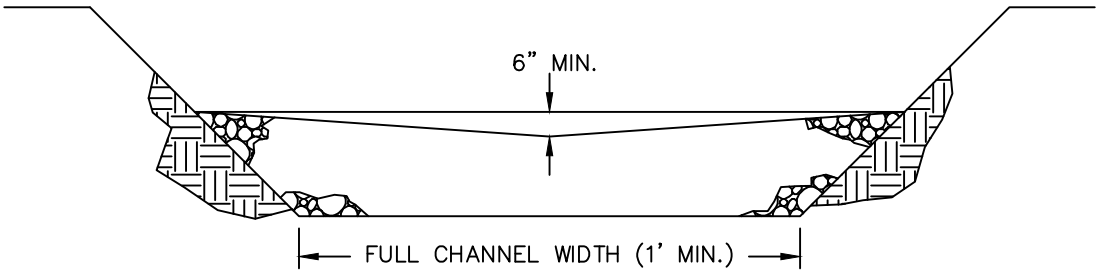


PLAN VIEW



SECTION A-A



SECTION B-B

FOR 3' ≤ D USE R–4
FOR 2' ≤ D < 3' USE R–3
NOT APPLICABLE FOR D<2'

ROCK FILTER NO.	LOCATION	D (FT.)	RIPRAP SIZE

THIS TABLE IS INTENTIONALLY LEFT BLANK AND SHOULD BE FILLED IN BY THE PLAN PREPARER.

NOTES:

1. SEDIMENT SHALL BE REMOVED WHEN ACCUMULATIONS REACH 1/2 THE HEIGHT OF THE FILTER.
2. IMMEDIATELY UPON STABILIZATION OF EACH CHANNEL, INSTALLER SHALL REMOVE ACCUMULATED SEDIMENT, REMOVE ROCK FILTER, AND STABILIZE DISTURBED AREAS.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
ROCK FILTER

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

FIG. NO. 23

Sheet: 23 of 127
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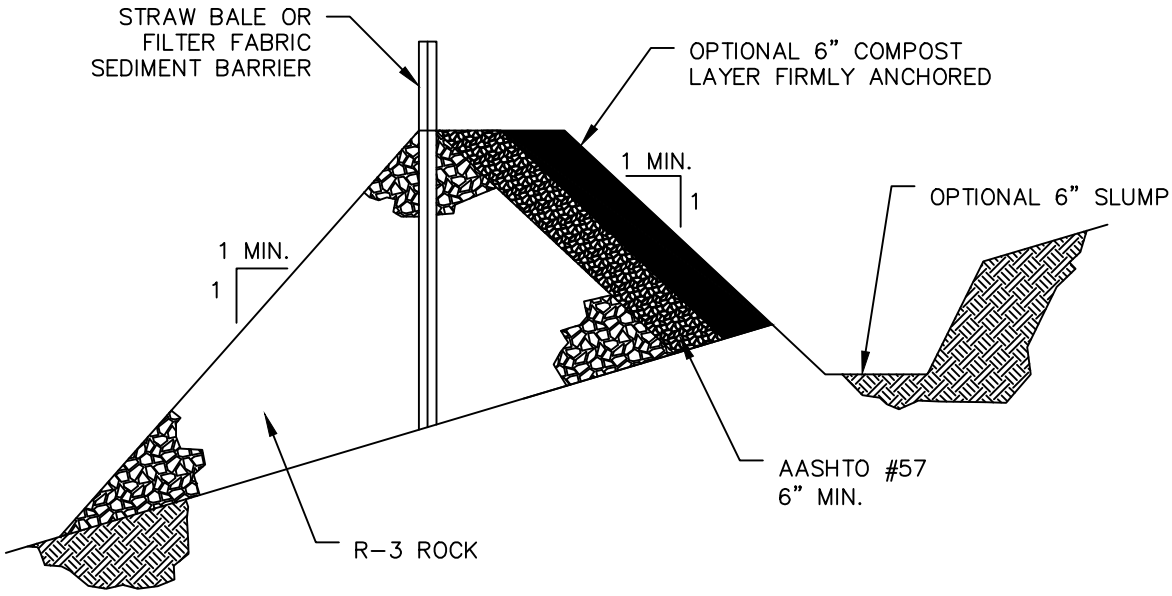
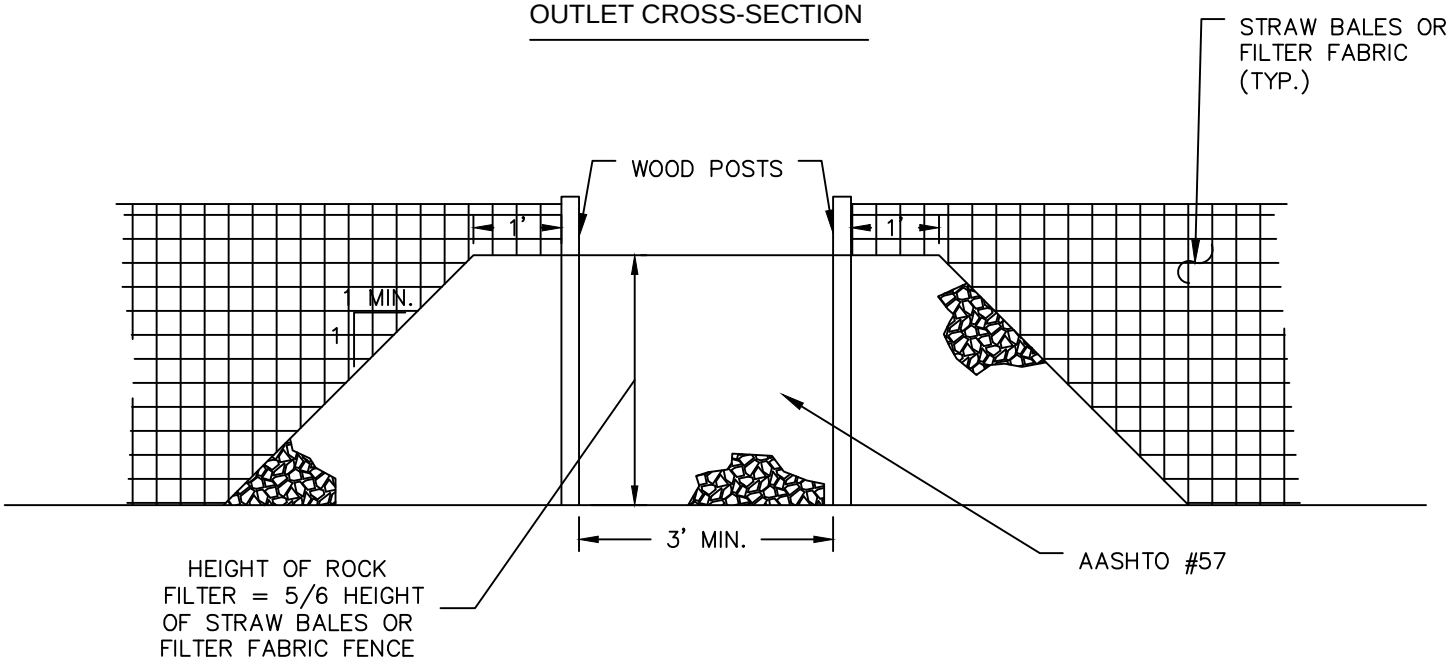


OUTLET CROSS-SECTION



UP-SLOPE FACE

NOTES:

1. A ROCK FILTER OUTLET SHALL BE INSTALLED WHERE FAILURE OF A SILT FENCE OR STRAW BALE BARRIER HAS OCCURRED DUE TO CONCENTRATED FLOW. ANCHORED COMPOST LAYER SHALL BE USED ON UPSLOPE FACE IN HIGH QUALITY AND EXCEPTIONAL VALUE WATERSHEDS.

2. SEDIMENT SHALL BE REMOVED WHEN ACCUMULATIONS REACH 1/3 THE HEIGHT OF THE OUTLET.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
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TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
ROCK FILTER OUTLET

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

FIG. NO. 24

Sheet: 24 of 127
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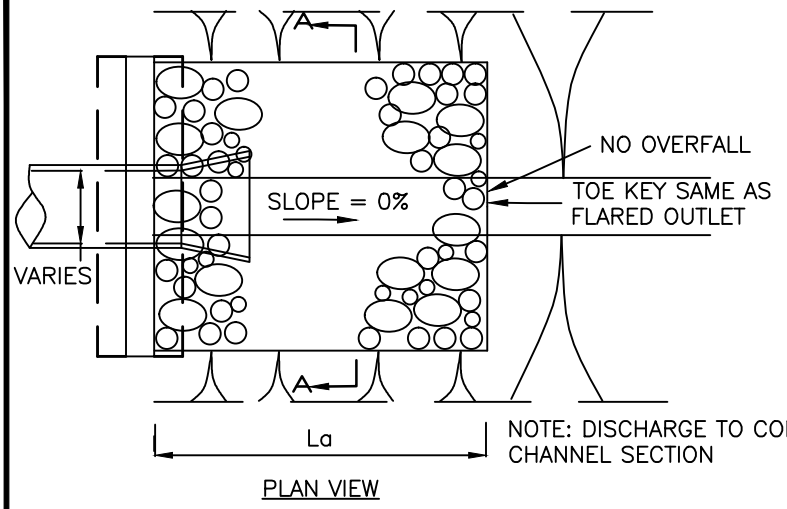
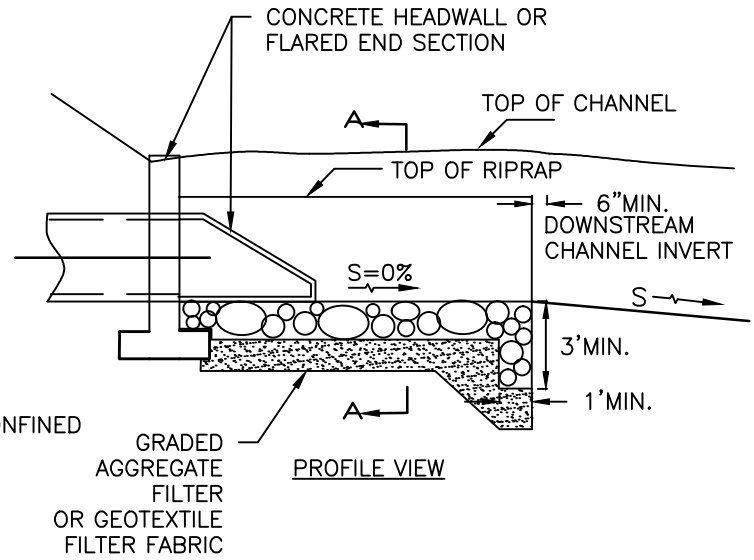
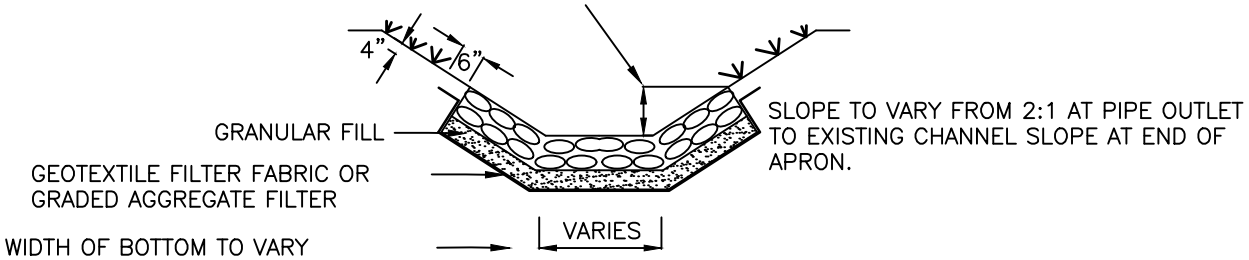


PLAN VIEW



PROFILE VIEW

MINIMUM DEPTH OF RIPRAP = MAXIMUM DEPTH OF FLOW (DOWNSTREAM NORMAL DEPTH OR DISCHARGE DEPTH, WHICHEVER IS GREATER).



CROSS SECTION A–A

NOTES:

1. THE OUTLET PROTECTION MAY BE DONE USING ROCK RIPRAP, GROUTED RIPRAP, OR GABIONS. RIPRAP SHALL BE COMPOSED OF A WELL–GRADED MIXTURE OF STONE SIZE SO THAT 50 PERCENT OF THE PIECES, BY WEIGHT, SHALL BE LARGER THAN THE D50 SIZE DETERMINED BY USING THE CHART. A WELL–GRADED MIXTURE, AS USED HEREIN, IS DEFINED AS A MIXTURE COMPOSED PRIMARILY OF LARGER STONE SIZES, BUT WITH A SUFFICIENT MIXTURE OF OTHER SIZES TO FILL THE SMALLER VOIDS BETWEEN THE STONES. THE DIAMETER OF THE LARGEST STONE SIZE IN SUCH A MIXTURE SHALL BE 1.5 TIMES THE D50 SIZE.

2. THE MINIMUM THICKNESS OF THE RIPRAP LAYER SHALL BE 1.5 TIMES THE MAXIMUM STONE DIAMETER FOR D50 OF 15 INCHES OR LESS; AND 1.2 TIMES THE MAXIMUM STONE SIZE FOR D50 GREATER THAN 15 INCHES.

D 50 (IN)	d max (in)	MIN. BLANKET THICKNESS (IN)
4	6	9
6	9	14
9	14	20
12	18	27
15	22	32
18	27	32
21	32	38
24	36	43

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

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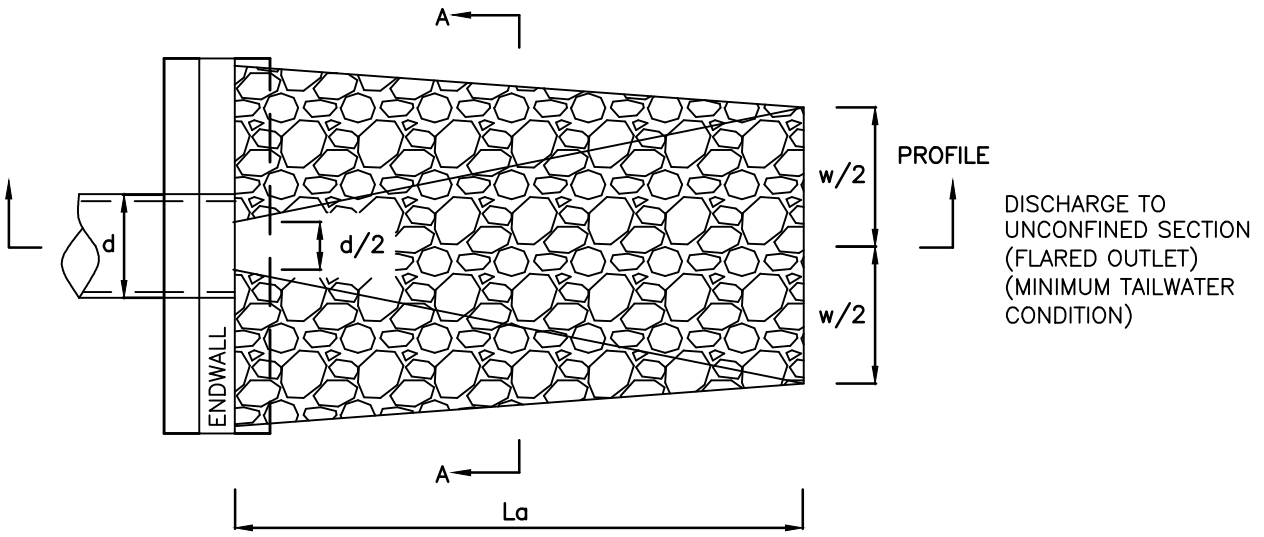
Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
RIPRAP OUTLET PROTECTION–GENERAL

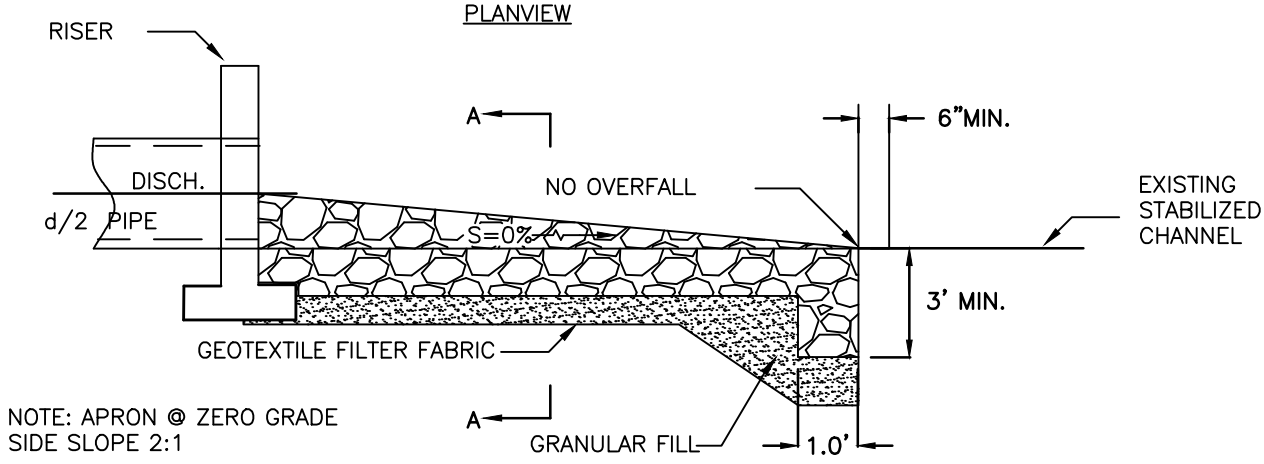
Tennessee Gas Pipeline Company, L.L.C.
a Kinder Morgan company

FIG. NO. 25

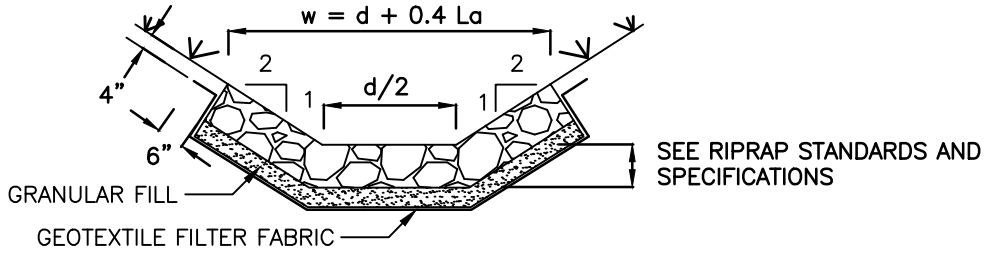
Sheet: 25 of 127
Type:



PLANVIEW



PROFILE VIEW



CROSS SECTION A–A

NOTE:
SEE FIGURE 24 FOR NOTES AND TABLE REGARDING MINIMUM RIPRAP THICKNESS.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

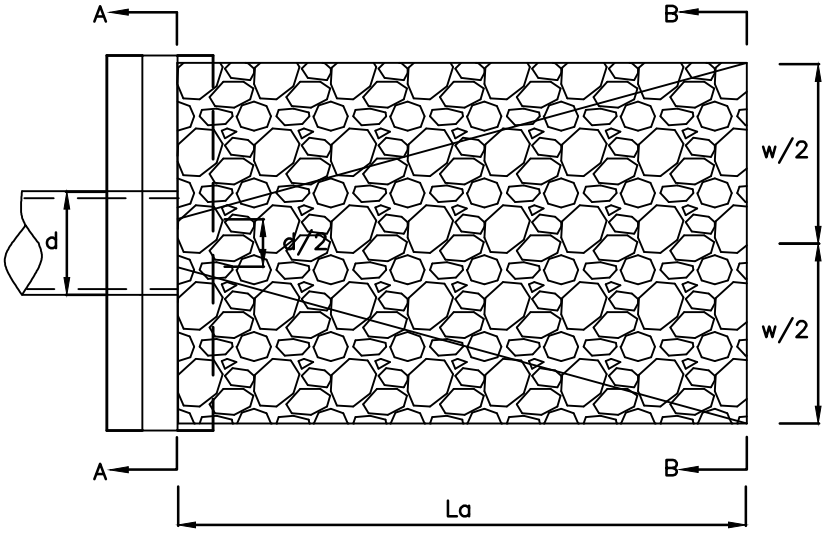
Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
RIPRAP OUTLET PROTECTION
MINIMUM TAIL WATER

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

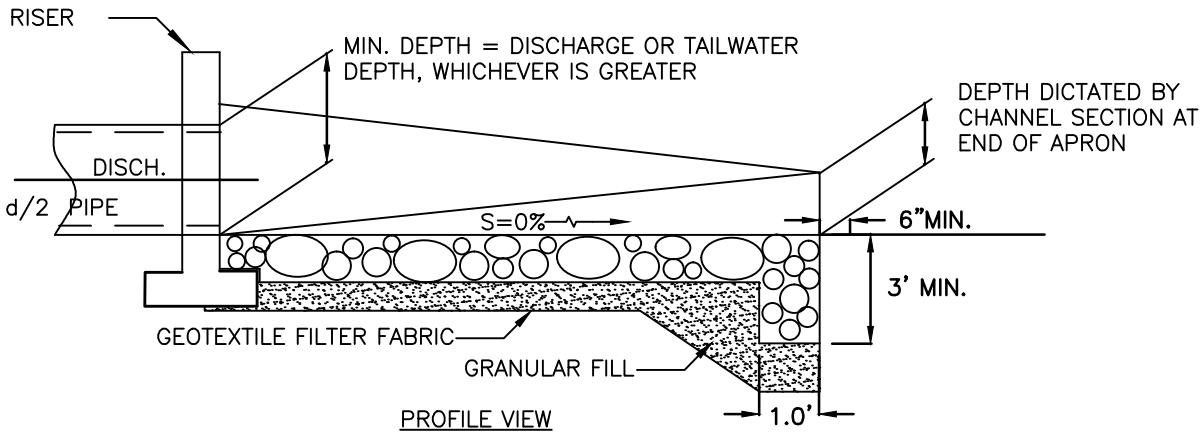
FIG. NO. 26

Sheet: 26 of 127
Type:

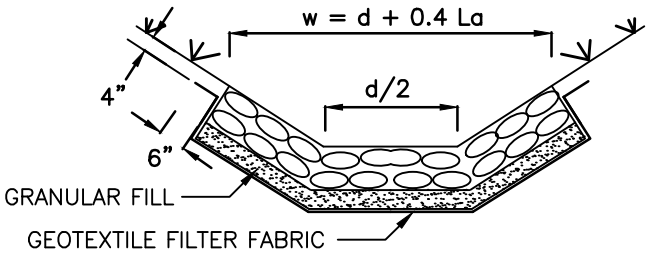


DISCHARGE TO SEMI–CONFINED SECTION
(MAXIMUM TAILWATER CONDITION)

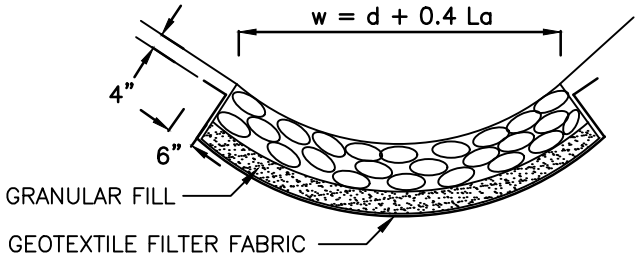
PLAN VIEW



PROFILE VIEW



SECTION A–A
(AT END OF CULVERT)



SECTION B–B
(AT END OF APRON)

NOTE:
SEE FIGURE 24 NOTES AND TABLE FOR MINIMUM RIPRAP THICKNESS.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
RIPRAP OUTLET PROTECTION
MAXIMUM TAIL WATER

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

FIG. NO. 27

Sheet: 27 of 127
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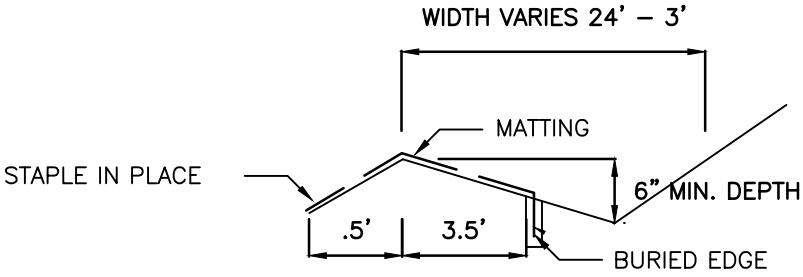
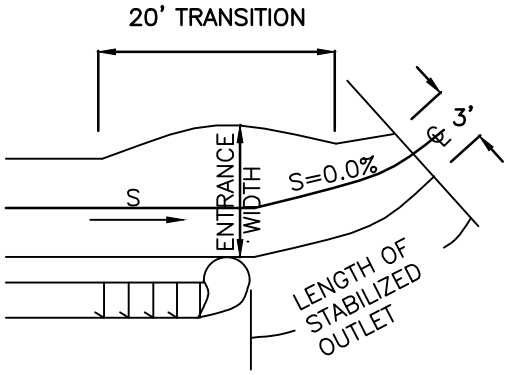


CROSS SECTION
NOT TO SCALE



PLAN VIEW
NOT TO SCALE

Q(cfs)	E.W.(FT)	D(FT)	END WIDTH(FT)	LENGTH(FT)
0–10	10	0.5	3	10
10–20	16	0.6	3	20
20–30	24	0.7	3	30

CONSTRUCTION SPECIFICATIONS

1. THE MATTING SHOULD BE A MINIMUM OF 4FT. WIDE EXTENDING 6 INCHES OVER THE LIP AND BURIED 6 INCHES DEEP IN A VERTICAL TRENCH ON THE LOWER EDGE. THE UPPER EDGE SHOULD BUTT AGAINST SMOOTHLY CUT SOD AND BE SECURELY HELD IN PLACE WITH CLOSELY SPACED HEAVY DUTY WIRE STAPLES AT LEAST 12 INCHES IN LENGTH.
2. ENSURE THAT THE LIP IS LEVEL TO UNIFORMLY SPREAD DISCHARGE.
3. THE LIP SHALL BE CONSTRUCTED ON UNDISTURBED SOIL NOT FILL.
4. A 20 FOOT TRANSITION SECTION WILL BE CONSTRUCTED FROM THE DIVERSION CHANNEL TO THE SPREADER TO SMOOTHLY BLEND THE DIFFERENT DIMENSION AND GRADES.
5. THE RUNOFF DISCHARGE WILL BE OUTLETED ONTO A STABILIZED VEGETATED SLOPE NOT EXCEEDING 10%.
6. SEED AND MULCH THE DISTURBED AREA IMMEDIATELY AFTER CONSTRUCTION.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

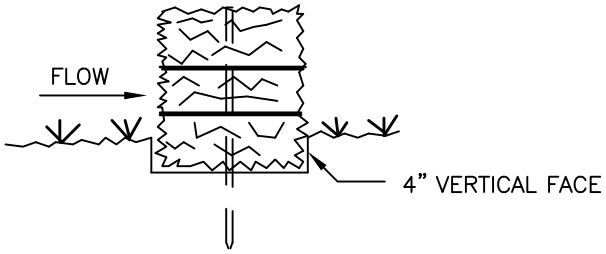
TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
EARTHEN LEVEL SPREADER

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

FIG. NO. 28

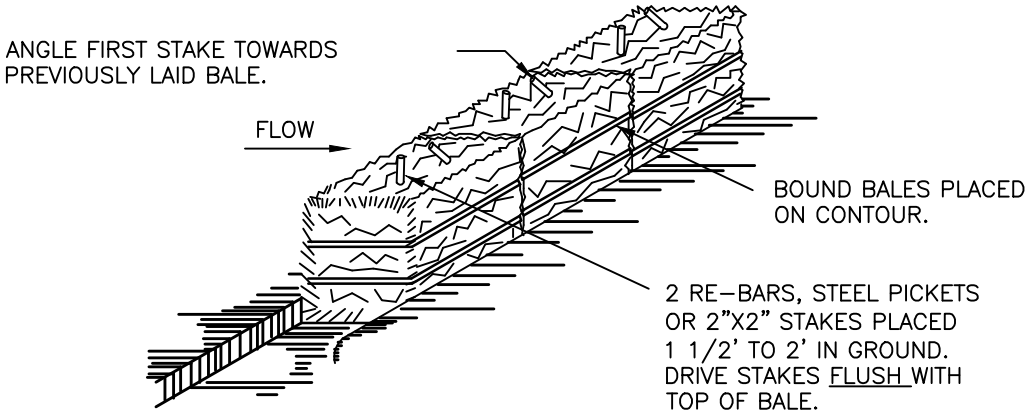
Sheet: 28 of 127
Type:

CONSTRUCTED SLOPE	PERCENT SLOPE	SLOPE LENGTH (FT)
2:1	50	25
3:1	33	50
4:1	25	75



BEDDING DETAIL
NOT TO SCALE

DRAINAGE AREA NO MORE THAN 1/4 ACRE PER 100 FEET OF STRAW BALE DIKE FOR SLOPES LESS THAN 25%.



ANCHORING DETAIL
NOT TO SCALE

CONSTRUCTION SPECIFICATIONS

1. BALES SHALL BE PLACED AT THE TOE OF A SLOPE OR ON THE CONTOUR AND IN A ROW WITH ENDS TIGHTLY ABUTTING THE ADJACENT BALES.
2. EACH BALE SHALL BE EMBEDDED IN THE SOIL A MINIMUM OF (4) INCHES, AND PLACED SO THE BINDINGS ARE HORIZONTAL.
3. BALES SHALL BE SECURELY ANCHORED IN PLACE BY EITHER TWO STAKES OR RE–BARS DRIVEN THROUGH THE BALE. THE FIRST STAKE IN EACH BALE SHALL BE DRIVEN TOWARD THE PREVIOUSLY LAID BALE AT AN ANGLE TO FORCE THE BALES TOGETHER. STAKES SHALL BE DRIVEN FLUSH WITH THE BALE.
4. INSPECTION SHALL BE FREQUENT AND REPAIR REPLACEMENT SHALL BE MADE PROMTLY AS NEEDED.
5. BALES SHALL BE REMOVED WHEN THEY HAVE SERVED THEIR USEFULLNESS SO AS NOT TO BLOCK OR IMPEDE STORM FLOW OR DRAINAGE.
6. BALES SHALL NOT BE USED AS A SEDIMENT BARRIER IN LOCATIONS WHERE THEY ARE EXPECTED TO LAST LONGER THAN 3 MONTHS DUE TO NATURAL DEGRADATION.
7. LENGTH OF SLOPE ABOVE THE STRAW BALE DIKE SHOULD NOT EXCEED THE LIMITS BELOW.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
STRAW BALE DIKE

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

FIG. NO. 29

Sheet: 29 of 127
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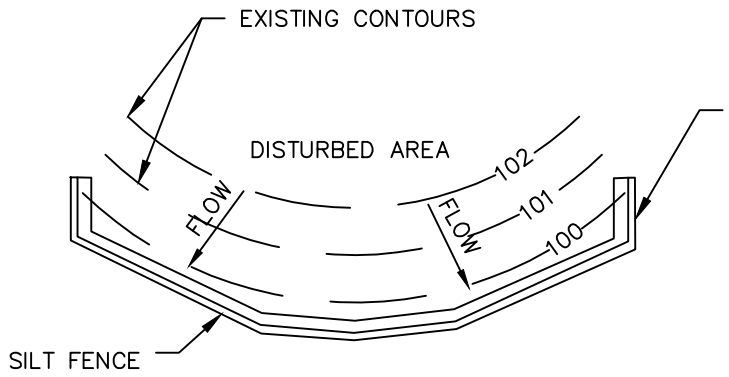
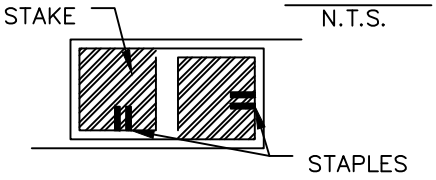
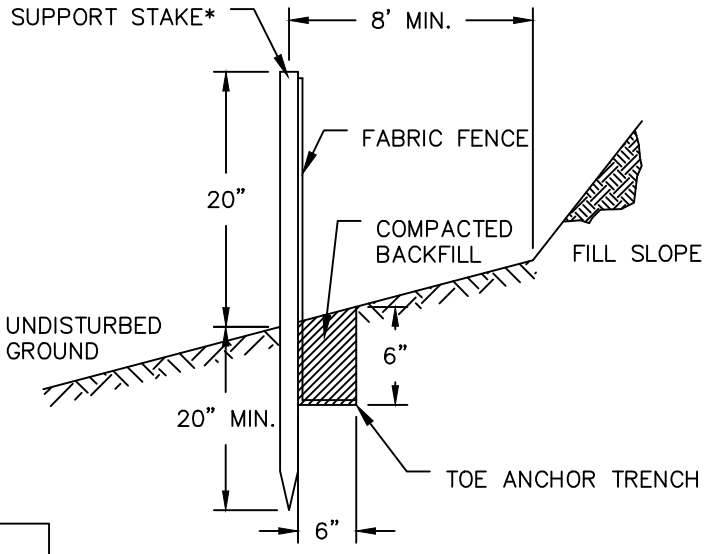


PLAN VIEW
N.T.S.



JOINING FENCE SECTION
N.T.S.

*STAKES SPACED @ 8' MAX.
USE 2" X 2" (+/– 3/8")
WOOD OR EQUIVALENT STEEL
(U OR T) STAKES



ELEVATION VIEW
N.T.S.

CONSTRUCTED SLOPE	PERCENTMAX. SLOPE	SLOPE LENGTH (FT)
2:1	50	25
3:1	33	50
4:1	25	75
5:1	20	100

NOTES:

1. FABRIC SHALL HAVE THE MINIMUM PROPERTIES AS SHOWN IN THE TABLE BELOW.
2. FABRIC WIDTH SHALL BE 30" MINIMUM. STAKES SHALL BE HARDWOOD OR EQUIVALENT STEEL (U OR T) STAKES.
3. SILT FENCE SHALL BE PLACED AT LEVEL EXISTING GRADE. BOTH ENDS OF THE FENCE SHALL BE EXTENDED AT LEAST 8 FEET UP SLOPE AT 45 DEGREES TO THE MAIN FENCE ALIGNMENT.
4. SEDIMENT SHALL BE REMOVED WHEN ACCUMULATIONS REACH HALF THE ABOVEGROUND HEIGHT OF THE FENCE.
5. ANY SECTION OF SILT FENCE WHICH HAS BEEN UNDERMINED OR TOPPED SHALL BE IMMEDIATELY REPLACED WITH A ROCK FILTER OUTLET
6. FENCE SHALL BE REMOVED AND PROPERLY DISPOSED OF WHEN TRIBUTARY AREA IS PERMANENTLY STABILIZED.
7. SILT FENCE SHOULD NOT BE INSTALLED ON UNCOMPACTED FILLS OR IN EXTREMELY LOOSE SOILS (E.G. SANDY LOAM), IN ROCKY SOIL WHERE ANCHORING MAY BE DIFFICULT, OR IN FORESTED AREAS WHERE TREE ROOTS MAY BE SEVERED DURING INSTALLATION.
8. MAXIMUM ALLOWABLE SLOPE LENGTHS FOR RUNOFF CONTRIBUTING TO SILT FENCING ARE SHOWN ABOVE.

FABRIC PROPERTIES FOR SILT FENCE		
FABRIC PROPERTY	MINIMUM ACCEPTABLE VALUE	TEST METHOD
GRAB TENSILE STRENGTH (LB)	120	ASTM D1682
ELONGATION AT FAILURE (%)	50% MAX.	ASTM D1682
MULLEN BURST STRENGTH (PSI)	200	ASTM D3786
TRAPEZOIDAL TEAR STRENGTH (LB)	50	
PUNCTURE STRENGTH (LB)	40	ASTM D751 (MODIFIED)
SLURRY FLOW RATE (GAL/MIN/SF)	0.3	ASTM 5141
EQUIVALENT OPENING SIZE	40 – 80	US STD. SIEVE CW–02215
ULTRAVIOLET RADIATION STABILITY (%)	90	ASTM G–26

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

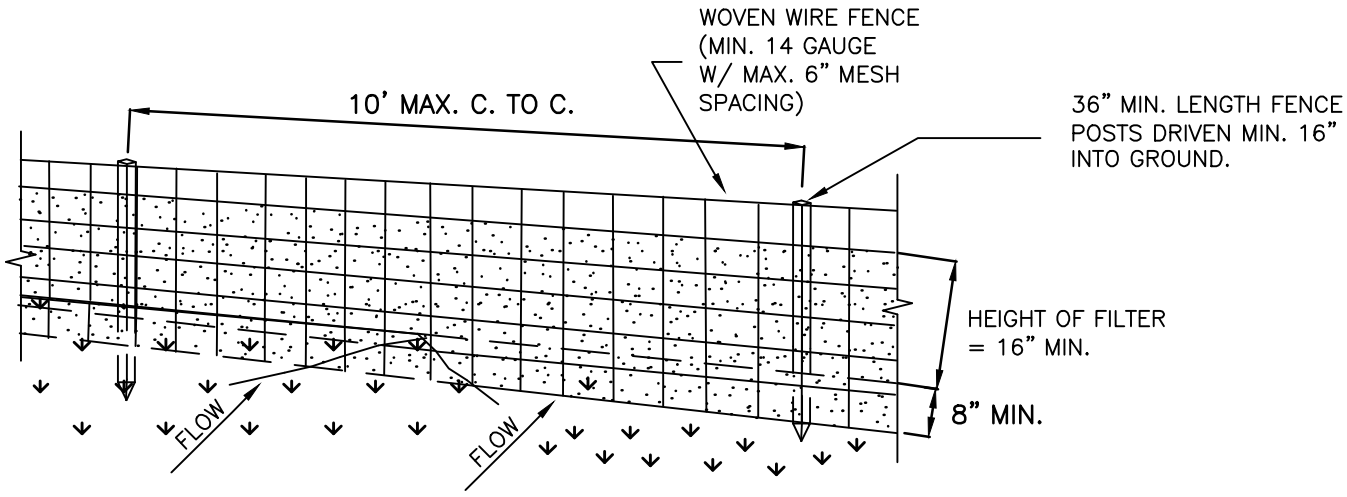
Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
STANDARD SILT FENCE

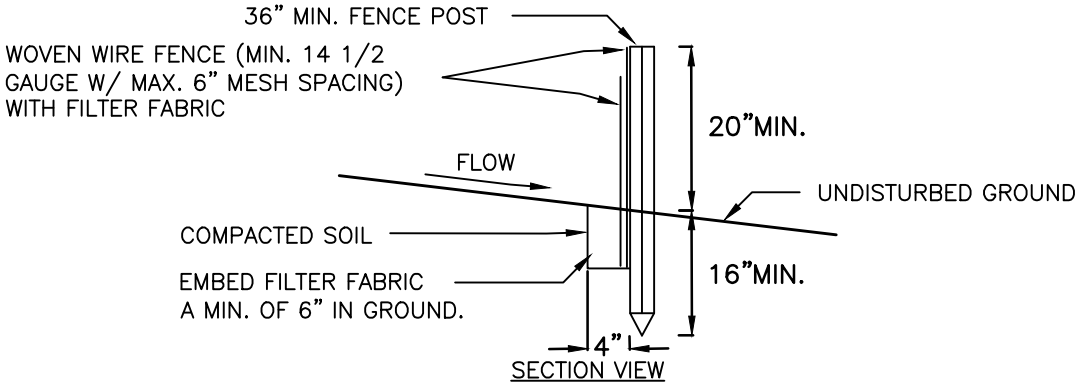
Tennessee Gas Pipeline Company, L.L.C.
a Kinder Morgan company

FIG. NO. 30

Sheet: 30 of 127
Type:



PERSPECTIVE VIEW



SECTION VIEW

CONSTRUCTION SPECIFICATIONS

1. WOVEN WIRE FENCE TO BE FASTENED SECURELY TO FENCE POSTS WITH WIRE TIES OR STAPLES. POSTS SHALL BE STEEL EITHER "T" OR "U" TYPE OR HARDWOOD.
2. FILTER CLOTH TO BE TO BE FASTENED SECURELY TO WOVEN WIRE FENCE WITH TIES SPACED EVERY 24" AT TOP AND MID SECTION. FENCE SHALL BE WOVEN WIRE, 14 GAUGE, 6" MAXIMUM MESH OPENING.
3. WHEN TWO SECTIONS OF FILTER FABRIC ADJOIN EACH OTHER THEY SHALL BE OVER–LAPPED BY SIX INCHES AND FOLDED. FILTER FABRIC SHALL BE EITHER FILTER X, MIRAFI 100X, STABILINKA T140N, OR APPROVED EQUIVALENT.
4. PREFABRICATED UNITS SHALL BE GEOFAB, ENVIROFENCE, OR APPROVED EQUIVALENT.
5. MAINTENANCE SHALL BE PERFORMED AS NEEDED AND MATERIAL REMOVED WHEN "BULGES" DEVELOP IN THE SILT FENCE.
6. MAXIMUM DRAINAGE AREA FOR OVERLAND FLOW TO A SILT FENCE SHALL NOT EXCEED 1/4 ACRE PER 100 FEET OF FENCE.
7. MAXIMUM ALLOWABLE SLOPE LENGTHS CONTRIBUTING RUNOFF TO SILT FENCE PLACED ON A SLOPE ARE AS FOLLOWS:

SLOPE STEEPNESS	MAXIMUM LENGTH (FT)
2:1	25
3:1	50
4:1	75
5:1 OR GREATER	100

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
REINFORCED SILT FENCE

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

FIG. NO. 31

Sheet: 31 of 127
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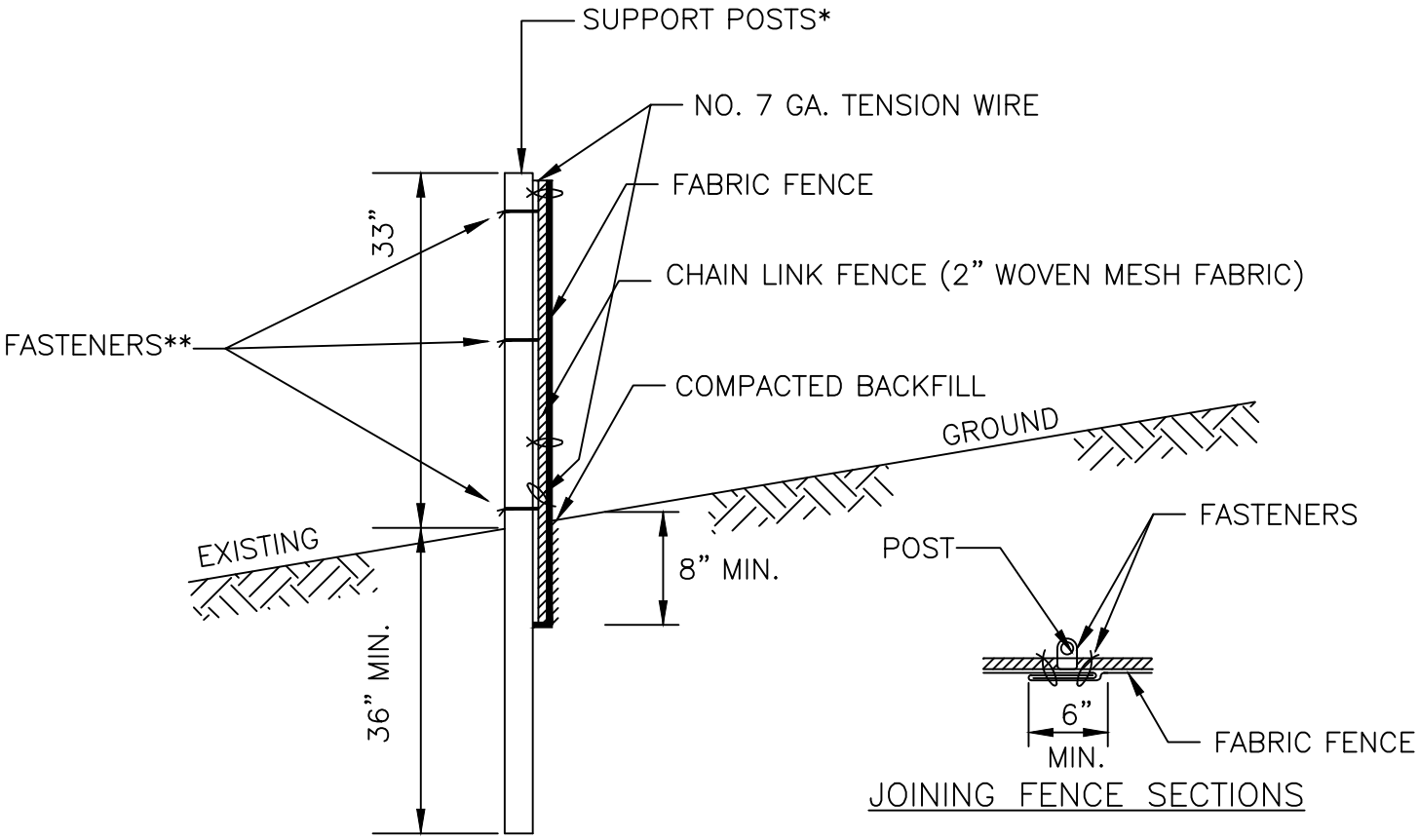
STANDARD CONSTRUCTION DETAIL #22
Super Filter Fabric Fence



* POSTS SPACED @ 10' MAX. USE 2 1/2" DIA. GALVANIZED OR ALUMINUM POSTS.

** CHAIN LINK TO POST FASTENERS SPACED @ 14" MAX. USE NO. 6 GA. ALUMINUM WIRE OR NO. 9 GALVANIZED STEEL PRE–FORMED CLIPS. CHAIN LINK TO TENSION WIRE FASTENERS SPACED @ 60" MAX. USE NO. 10 GA. GALVANIZED STEEL WIRE. FABRIC TO CHAIN FASTENERS SPACED @ 24" MAX. C TO C.

NO. 7 GA. TENSION WIRE INSTALLED HORIZONTALLY AT TOP AND BOTTOM OF CHAIN–LINK FENCE.

FILTER FABRIC FENCE MUST BE PLACED AT EXISTING LEVEL GRADE. BOTH ENDS OF THE BARRIER MUST BE EXTENDED AT LEAST 8 FEET UPSLOPE AT 45 DEGREES TO THE MAIN BARRIER ALIGNMENT.

SEDIMENT MUST BE REMOVED WHEN ACCUMULATIONS REACH 1/2 THE ABOVE GROUND HEIGHT OF THE FENCE.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
SUPER SILT FENCE (1)

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

FIG. NO. 32

Sheet: 32 of 127
Type:

NOTES:
1. SILT FENCE MUST BE LEFT IN PLACE UNTIL PERMANENT STABILIZATION.
2. FILTER FABRIC FENCE MUST BE INSTALLED AT EXISTING LEVEL GRADE.
3. SEDIMENT MUST BE REMOVED WHERE ACCUMULATIONS REACH 1/2 THE ABOVE GROUND HEIGHT OF THE FENCE.
4. AT A MINIMUM, THE FABRIC SHOULD HAVE THE FOLLOWING PROPERTIES:

FABRIC PROPERTY	MINIMUM ACCEPTABLE VALUE	TEST METHOD
GRAB TENSILE STRENGTH (lb)	120	ASTM D1682
ELONGATION AT FAILURE (%)	20% MAX.	ASTM D1682
MULLEN BURST STRENGTH (lb)	200	ASTM D3786
TRAPEZOIDAL TEAR STRENGTH (lb)	50	
PUNCTURE STRENGTH (lb)	40	ASTM D 751 (MODIFIED)
SLURRY FLOW RATE (gal/min/sf)	0.3	ASTM 5141
EQUIVALENT OPENING SIZE	30	US STD. SIEVE CW-02215
ULTRAVIOLET RADIATION STABILITY (%)	80	ASTM G-26

5. SILT FENCE MUST BE PLACED AT EXISTING LEVEL GRADE. BOTH ENDS OF THE BARRIER WILL BE EXTENDED 8 FEET UPSLOPE AT 45 DEGREES TO THE MAIN BARRIER ALIGNMENT.
6. POSTS SHALL BE INSTALLED USING A POST HOLE DRILL.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
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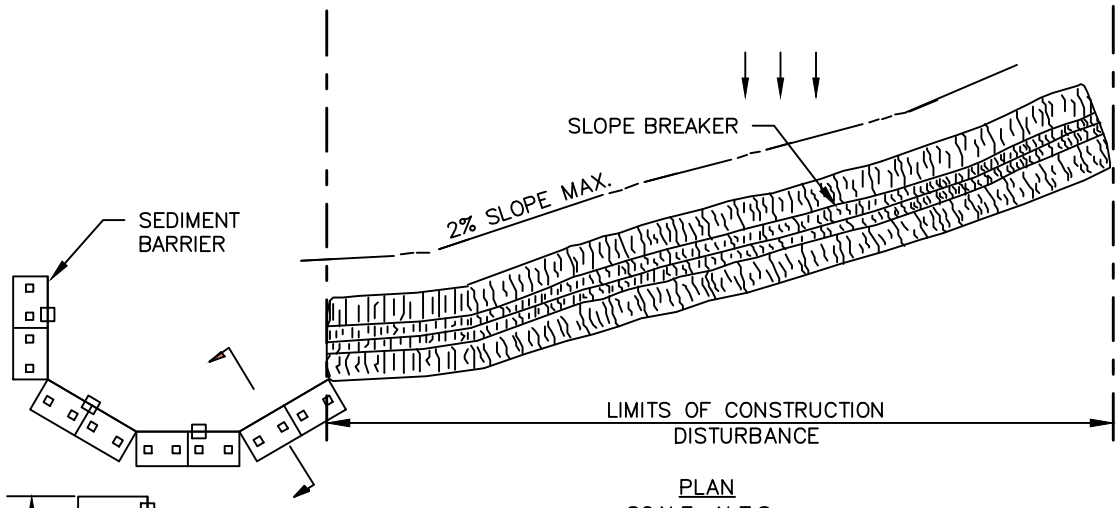
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
SUPER SILT FENCE (2)

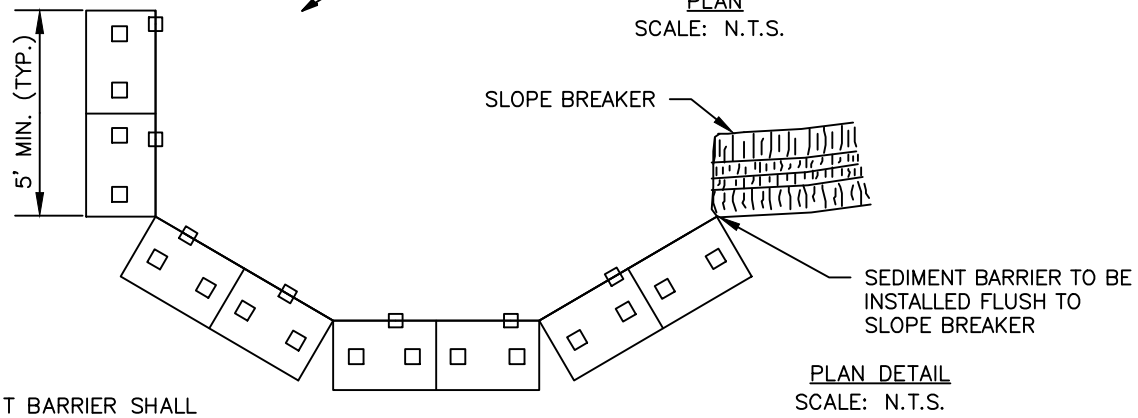
Tennessee Gas Pipeline Company, L.L.C.
a Kinder Morgan company

FIG. NO. 33

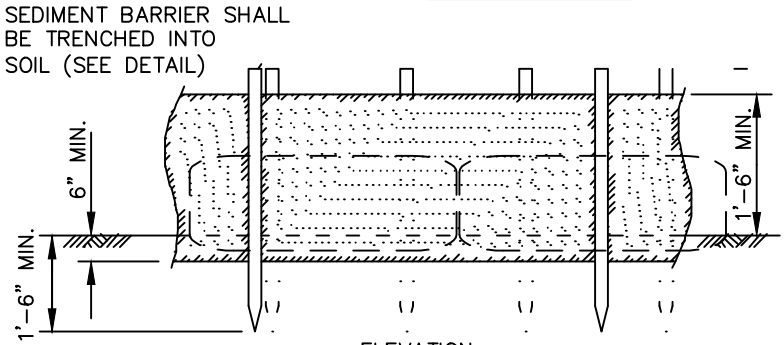
Sheet: 33 of 127
Type:



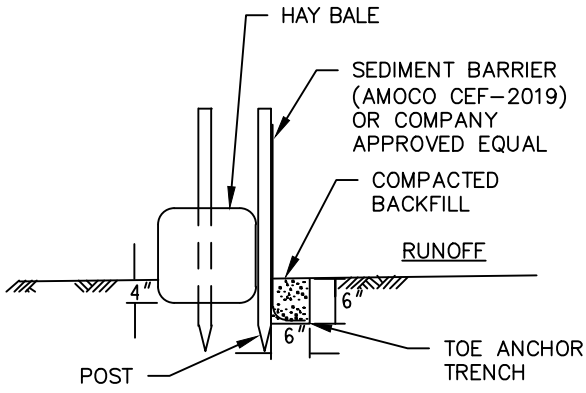
PLAN
SCALE: N.T.S.



PLAN DETAIL
SCALE: N.T.S.



ELEVATION
SCALE: N.T.S.



SEDIMENT BARRIER DETAIL
SCALE: N.T.S.

NOTES:

1. REINFORCED SEDIMENT BARRIER HOOKS SHALL BE PLACED AT THE OUTLET OF SLOPE BRAEAKERS AS SHOWN ON THE PLAN.
2. ONCE THE DISTURBED AREA IS STABILIZED, THE REINFORCED SEDIMENT BARRIER HOOK SHALL BE REMOVED AND ANY DISTURBED AREAS CAUSED BY REMOVAL SHALL BE RETURNED TO ORIGINAL CONDITION AND REVEGETATED.
3. SEDIMENT SHALL BE REMOVED WHEN IT REACHES HALF THE HEIGHT OF THE SEDIMENT BARRIER.
4. STAKES SHALL BE 2"X2"X48" HARDWOOD OR EQUIVALENT STEEL ("U" OR "T") STAKES.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

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Division:	Op. Area:	
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Chk:	Date:	Scale:
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TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
REINFORCED SEDIMENT BARRIER HOOK
OUTLET STRUCTURE

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

FIG. NO. 34

Sheet: 34 of 127
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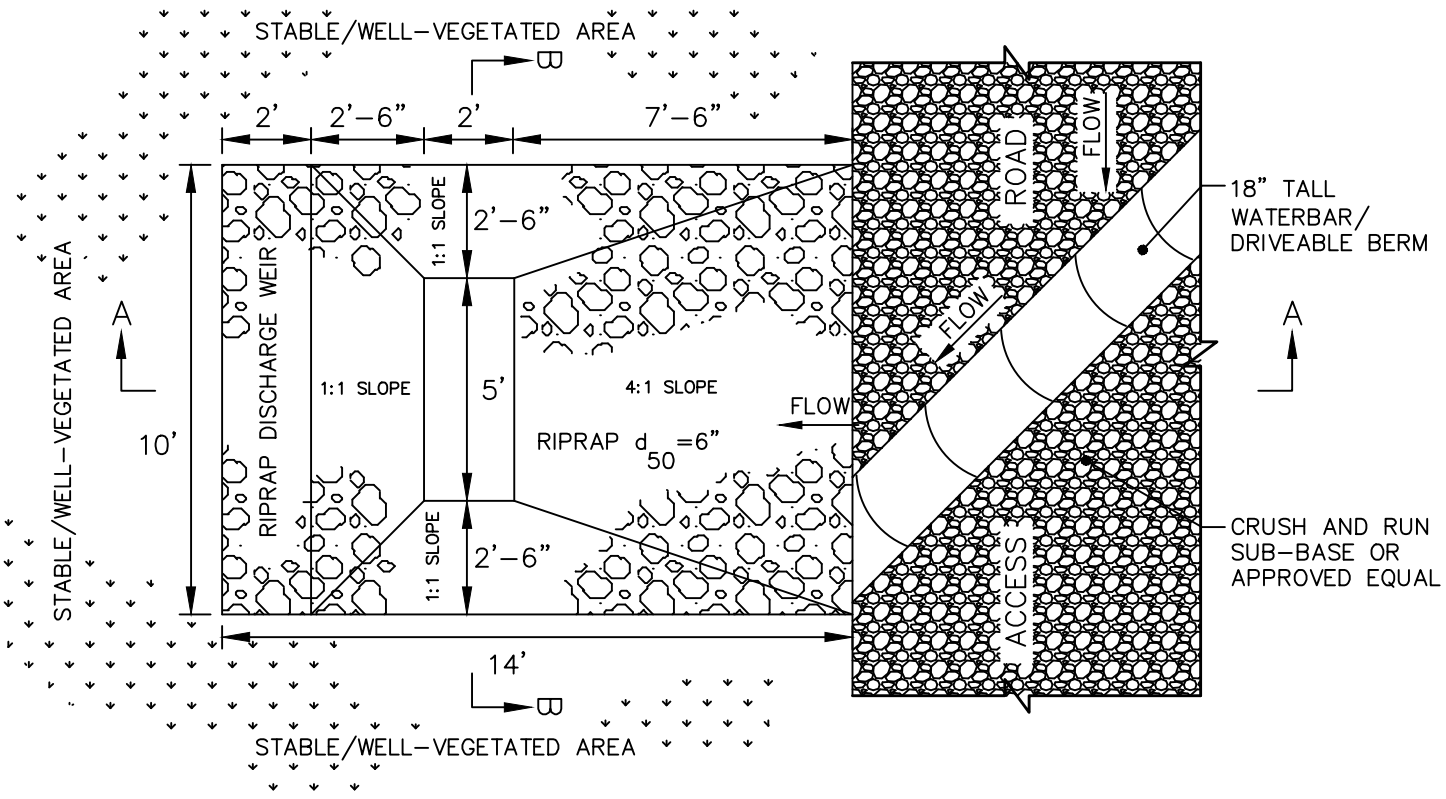
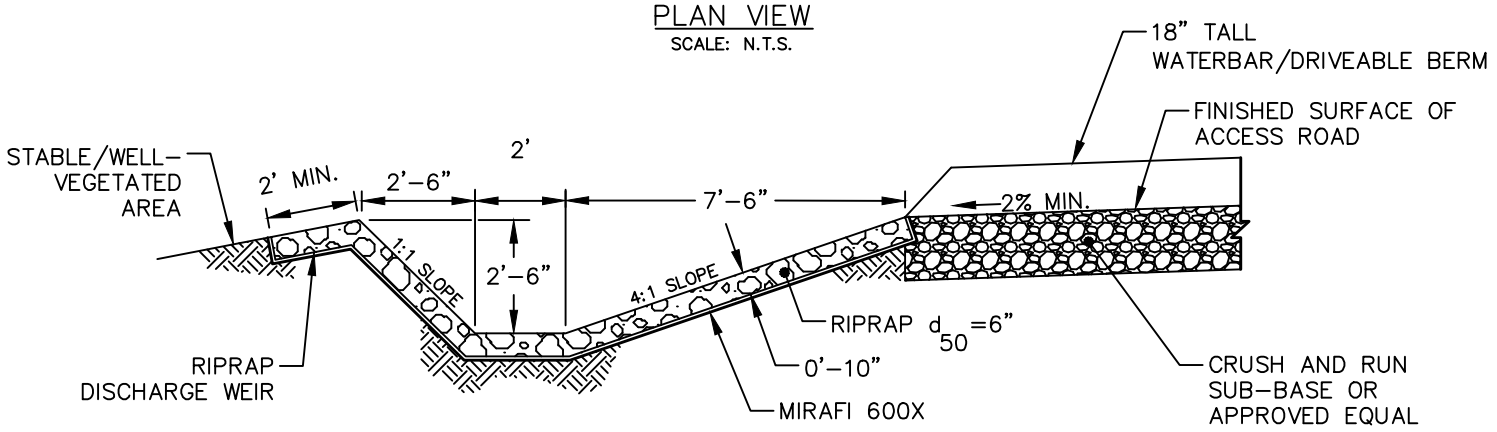


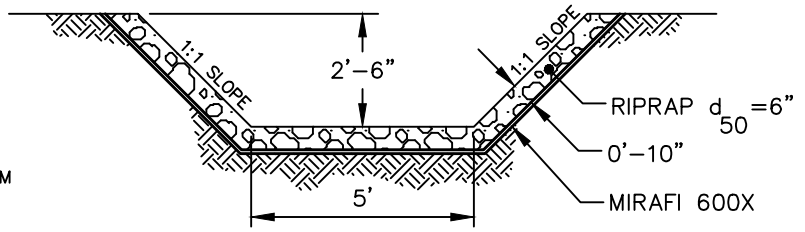
PLAN VIEW
SCALE: N.T.S.



SECTION A-A
SCALE: N.T.S.

NOTES:

1. RIPRAP SHALL CONFORM TO THE NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL PROTECTION'S STANDARDS AND SPECIFICATIONS FOR SEDIMENT AND EROSION CONTROL.
2. ADDITIONAL BEST MANAGEMENT PRACTICES (BMPS) MAY BE REQUIRED TO BE UTILIZED IN CONJUNCTION WITH THE WATERBAR OUTLET APRON TO ENSURE THAT EROSION AND SEDIMENTATION DOES NOT OCCUR DOWNSTREAM OF THE APRON. SOME ADDITIONAL BMPS MAY INCLUDE BUT ARE NOT LIMITED TO SILT FENCE, STRAWBALE BARRIER AND EROSION CONTROL MATTING. THE CONTRACTOR SHALL COORDINATE WITH THE ENVIRONMENTAL INSPECTOR TO ENSURE THAT INSTALLATION OF ADDITIONAL BMPS ARE NOT REQUIRED.



SECTION B-B
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NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

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Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
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TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
WATERBAR OUTLET APRON

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

FIG. NO. 35

Sheet: 35 of 127
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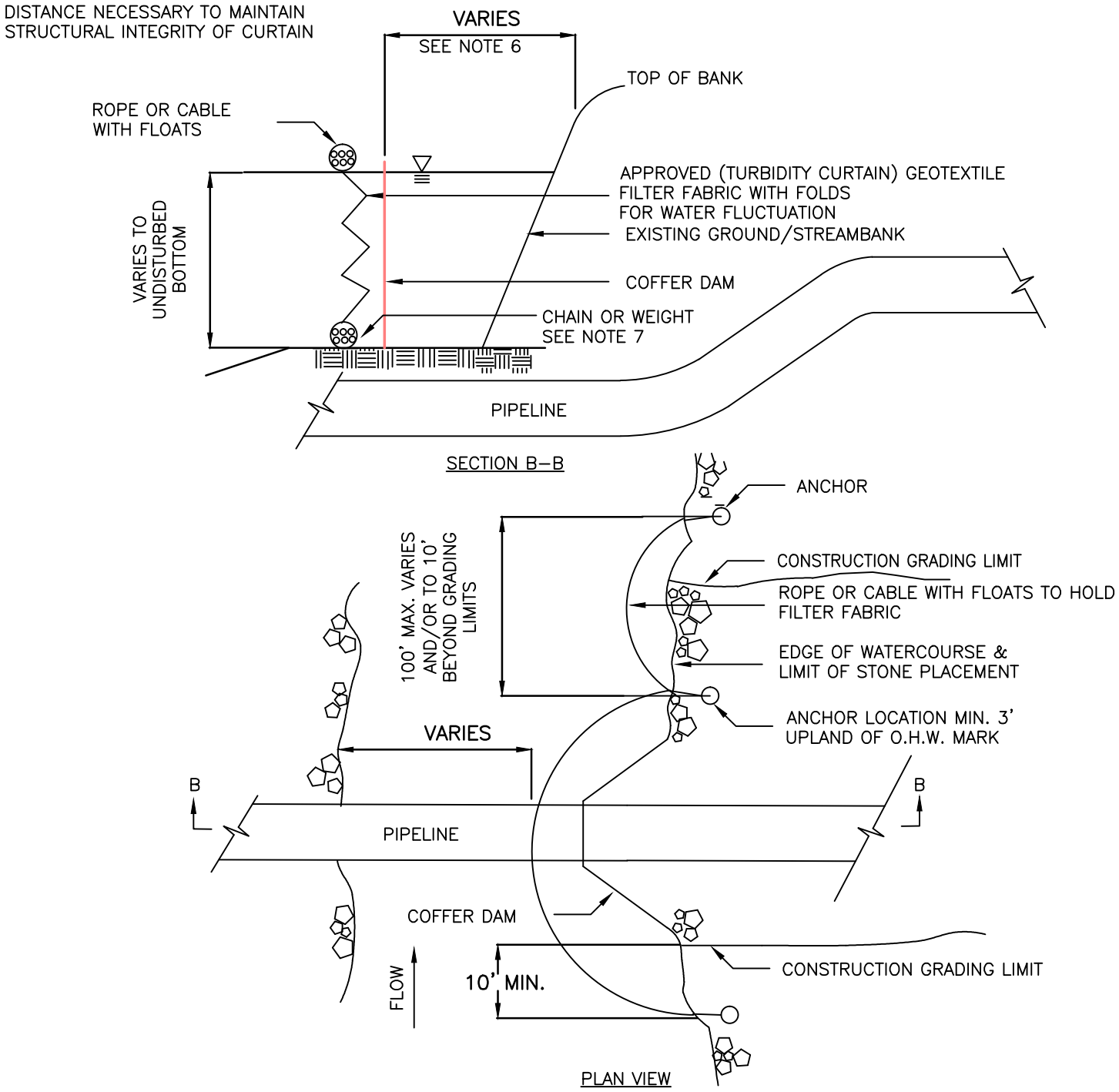

NOTES:
1. TO BE USED IN AREAS AS OUTLINED IN THE CONSTRUCTION DRAWINGS OR AS ORDERED BY THE ENVIRONMENTAL INSPECTOR.
2. HEIGHT OF THE CURTAIN SHALL BE 20% GREATER THAN THE DEPTH OF THE WATER.
3. NOT PERMITTED FOR USE ACROSS WATERCOURSES.
4. AREA SHALL NOT CONTAIN LARGE CURVERT/DRAINAGE AREAS.
5. TURBIDITY CURTAIN SHALL BE A MAX OF 100' LONG FOR EACH SECTION OF CURTAIN REQUIRED. END SECTIONS SHALL TERMINATE 10' BEYOND THE LIMIT OF DISTURBANCE.
6. THE TURBIDITY CURTAIN SHALL BE PLACED AS CLOSE TO THE WORK AS POSSIBLE WITHOUT INTERFERING WITH CONSTRUCTION OPERATIONS.
7. THE WEIGHTED ANCHOR SYSTEM SHALL BE A TYPE THAT ALLOWS THE CURTAIN TO CONFORM TO THE CONTOUR OF THE BOTTOM OF THE WATERBODY.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

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TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
TURBIDITY CURTAIN

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

FIG. NO. 36

Sheet: 36 of 127
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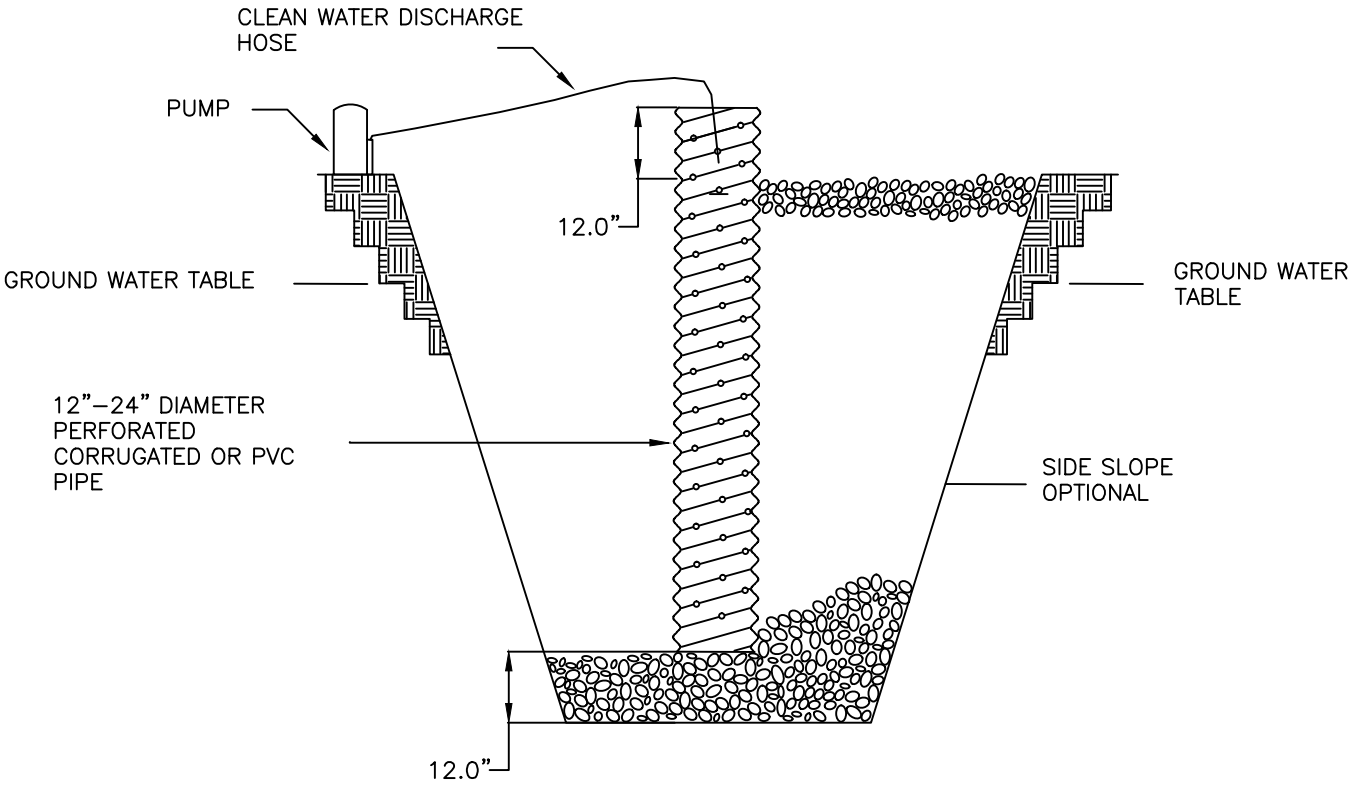

CONSTRUCTION SPECIFICATIONS

1. PIT DIMENSIONS ARE OPTIONAL.
2. THE STANDPIPE SHOULD BE CONSTRUCTED BY PERFORATING A 12–24" DIAMETER CORRUGATED OR PVC PIPE.
3. A BASE OF 2" AGGREGATE SHOULD BE PLACED IN THE PIT TO A DEPTH OF 12". AFTER INSTALLING THE STANDPIPE, THE PIT SURROUNDING THE STANDPIPE SHOULD BE BACKFILLED WITH 2" AGGREGATE.
4. THE STANDPIPE SHOULD EXTEND 12" ABOVE THE LIP OF THE PIT.
5. THE OUTLET SHALL BE FILTERED THROUGH AN APPROVED DEWATERING DEVICE TO PREVENT HEAVY SILT LADEN WATER FROM DIRECTLY ENTERING A WATERBODY OR WETLAND.
6. THE OUTLET SHOULD BE SITUATED IN A WELL VEGETATED AREA.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
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TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
WELL POINT / SUMP PIT

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

FIG. NO. 37

Sheet: 37 of 127
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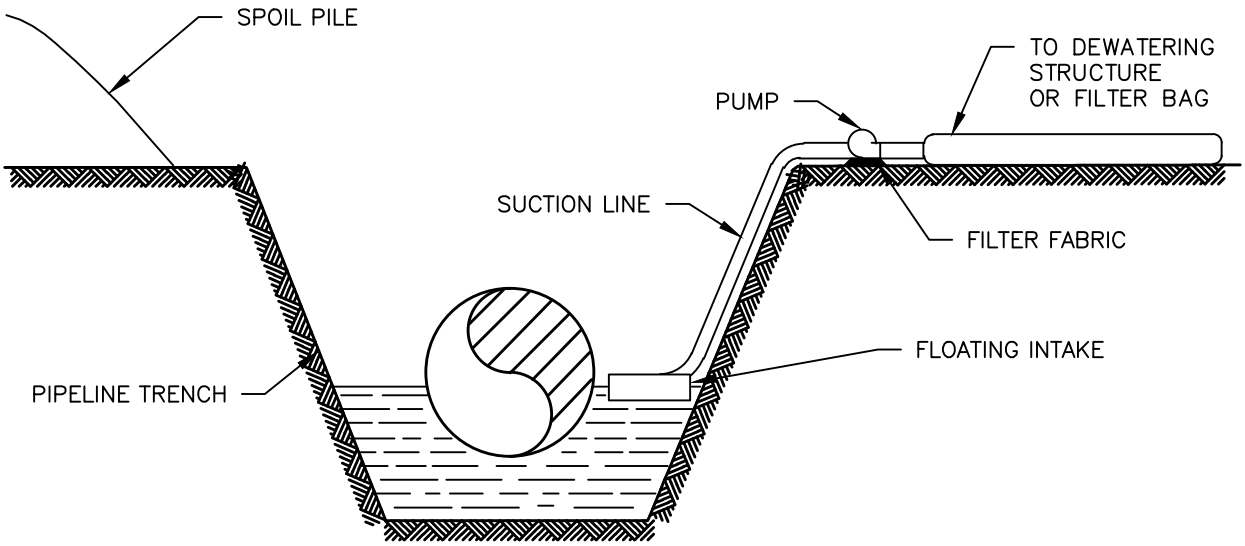

NOTES:

1. WATER PUMPED OUT OF TRENCH SHALL NOT BE DISCHARGED DIRECTLY INTO WATERBODIES. WATER SHALL BE DISCHARGED INTO A FILTER BAG OR DEWATERING STRUCTURE.
2. PUMP SHALL BE CONTROLLED SO THAT THE DISCHARGE DOES NOT OVERFLOW DEWATERING STRUCTURE. THE DEWATERING STRUCTURE SHALL BE RESIZED IF ADDITIONAL FLOW IS REQUIRED.
3. PUMP SUCTION HOSE MUST NOT BE ALLOWED TO COME IN CONTACT WITH TRENCH BOTTOM. PROVISIONS MUST BE MADE TO ELEVATE THE SUCTION HOSE TO AT LEAST ONE FOOT ABOVE THE BOTTOM OF THE PIPE TRENCH UNTIL BOTTOM DEWATERING IS NECESSARY.
4. DEWATERING SHALL NOT OCCUR DURING TIMES OF HEAVY RAINFALL EXCEPT AS REQUIRED TO PREVENT FLOODING OF CONSTRUCTION EQUIPMENT LOCATED IN BORE PITS AND TRENCHES.
5. PUMPS UTILIZED DURING DEWATERING SHALL BE PLACED WITHIN SECONDARY CONTAINMENT IF POSITIONED WITHIN 100 FEET OF A WETLAND OR WATERBODY.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
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Dft:	Date:	Project ID:
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TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
TRENCH DEWATERING

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

FIG. NO. 38

Sheet: 38 of 127
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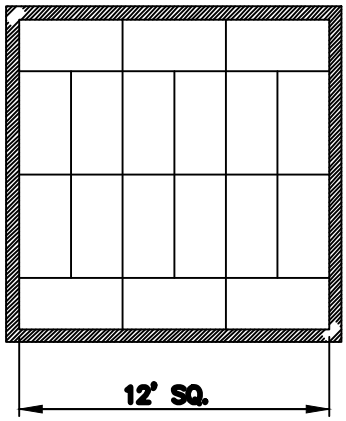
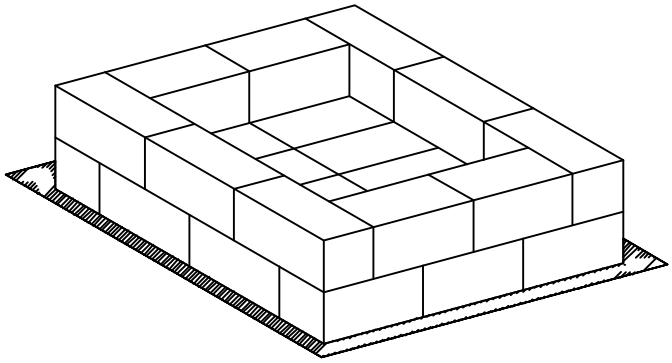
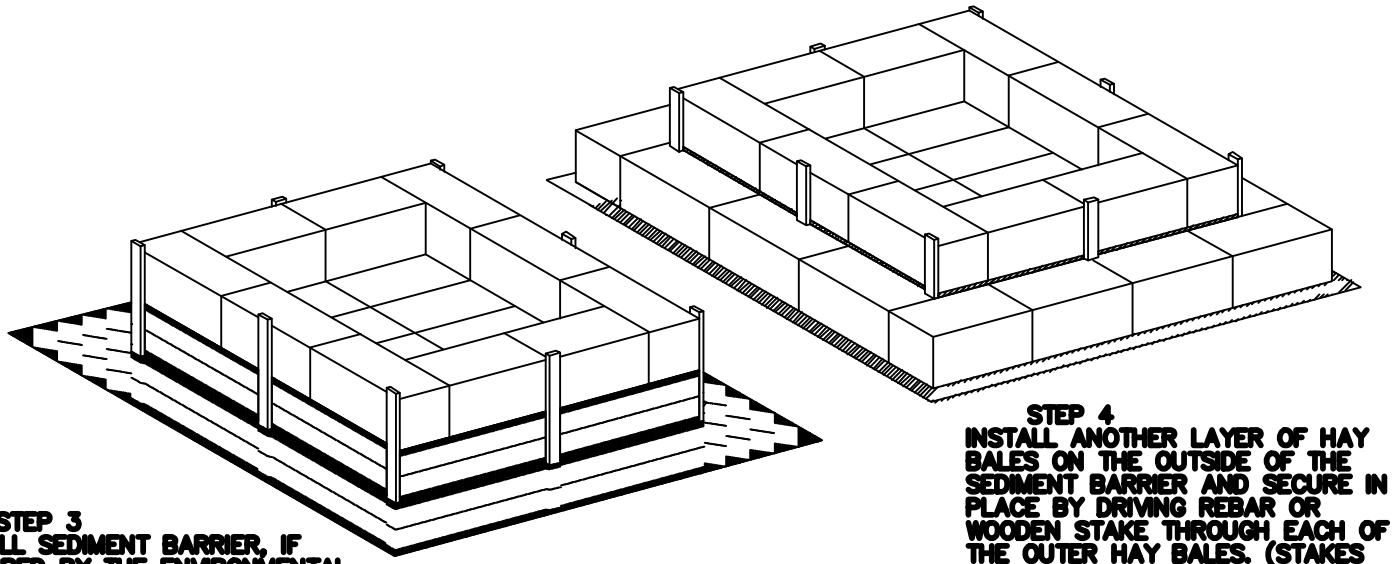


STEP 1
ARRANGE HAY BALES OVER GEOTEXTILE FABRIC OR STONE BASE ON LEVEL LAND TIGHTLY PACKED AS SHOWN TO COVER AN AREA APPROXIMATELY 12' x 12'

STEP 2
INSTALL ANOTHER LAYER OF HAY BALES ON THE OUTER EDGE AS SHOWN





STEP 3
INSTALL SEDIMENT BARRIER, IF REQUIRED BY THE ENVIRONMENTAL INSPECTOR, AROUND ENTIRE HAY BALE STRUCTURE AS SHOWN.

STEP 4
INSTALL ANOTHER LAYER OF HAY BALES ON THE OUTSIDE OF THE SEDIMENT BARRIER AND SECURE IN PLACE BY DRIVING REBAR OR WOODEN STAKE THROUGH EACH OF THE OUTER HAY BALES. (STAKES NOT SHOWN FOR CLARITY PURPOSES)

NOTES:

1. WHERE POSSIBLE, THE STRUCTURE SHALL BE PLACED ON A LEVEL, WELL VEGETATED UPLAND SITE SUCH THAT WATER WILL FLOW AWAY FROM STRUCTURE AND ANY WORK AREAS.
2. THE CONTRACTOR SHALL PROPERLY REMOVE AND PROPERLY DISPOSE OF THE DEWATERING STRUCTURE IMMEDIATELY UPON COMPLETION OF DEWATERING OPERATIONS. UNDER NO CIRCUMSTANCES SHALL USED DEWATERING STRUCTURES BE LEFT IN PLACE FOR A PERIOD OF TIME GREATER THAN 48 HOURS AFTER DEWATERING OPERATIONS ARE COMPLETE.
3. THE STRUCTURE SHOULD BE POSITIONED SUCH THAT WATER WILL NOT FLOW DIRECTLY INTO ANY WETLANDS OR WATERBODIES.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
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TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
DEWATERING STRUCTURE

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

FIG. NO. 39

Sheet: 39 of 127
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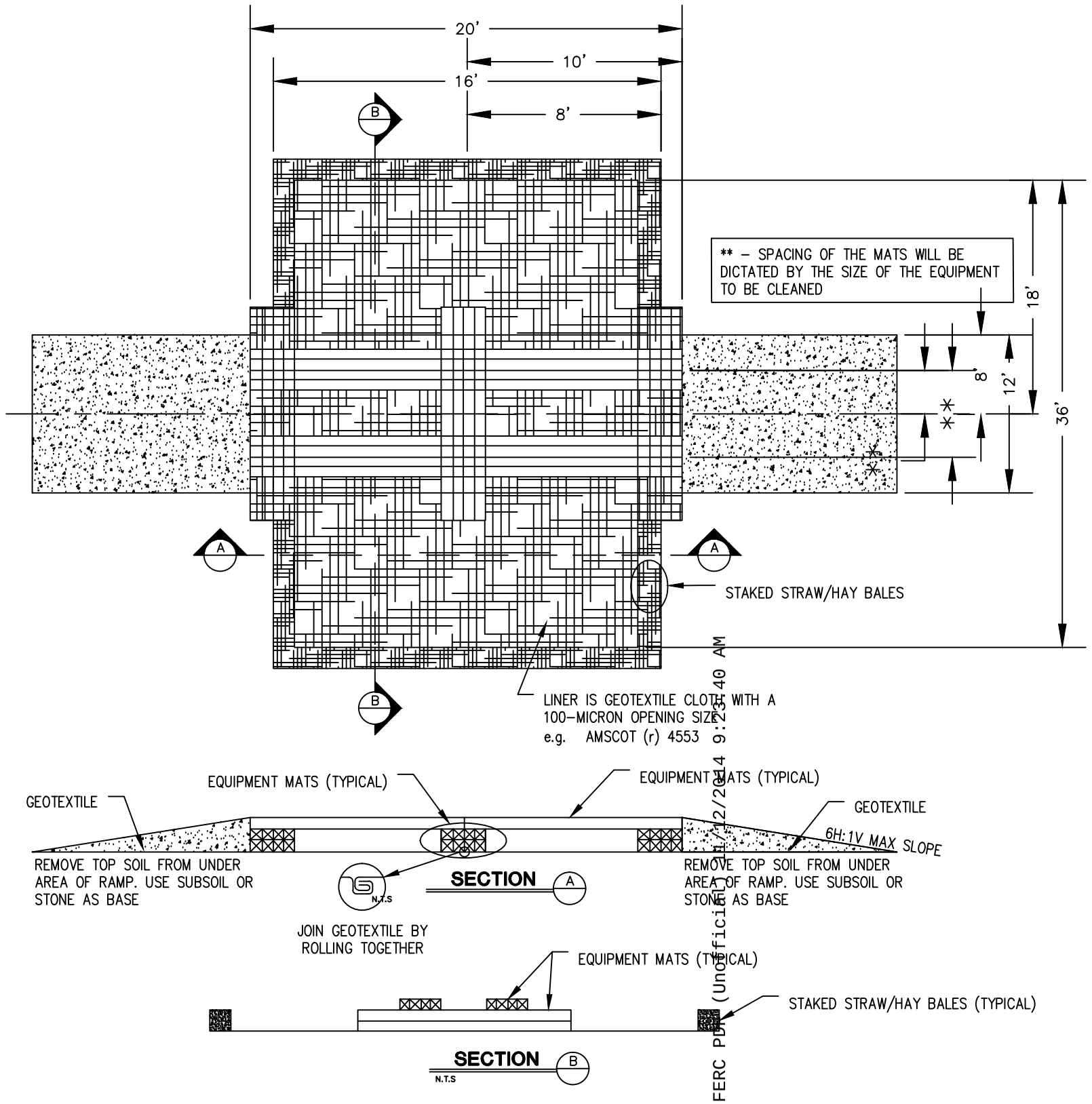

ELEVATED WASHRACK STATION LOCATIONS

	MILEPOST	LL	WETLAND ID	INVASIVE WETLANDS SPECIES IDENTIFIED	STATION POSITION COMMENTS

THIS TABLE WAS INTENTIONALLY LEFT BLANK AND SHOULD BE COMPLETED BY THE PLAN PREPARER

NOTES:

1. WASH STATION MUST BE WITHIN THE ENVIRONMENTALLY CLEARED RIGHT–OF–WAY AND OUTSIDE THE 100' WETLAND BUFFER ZONE.
2. IF WASH STATION IS IN AGRICULTURAL LANDS, REMOVE THE TOPSOIL AND STOCKPILE BEFORE THE TOPSOIL IS REPLACED. THE SUBSOIL MUST BE DECOMPACTED AND ROCKS REMOVED. THE TOPSOIL MOISTURE MUST PASS THE ATTERBERG TEST PRIOR TO SPREADING THE TOPSOIL.
3. THE LOCATION OF THE PUMPING EQUIPMENT, WATER SUPPLY AND SPRAY EQUIPMENT WILL BE DICTATED BY THE LOCATION OF THE WASH STATION.
4. AFTER THE EQUIPMENT WASHING IS COMPLETE, FOLD OR ROLL THE GEOTEXTILE (CAUTION WILL BE EXCERCISED NOT TO SPILL ANY OF THE CONTAINED MATERIAL) AND REMOVE TO AN APPROPRIATE DISPOSAL SITE. REMOVE THE CLEANING EQUIPMENT, RAMPS AND STRAW/HAY BALES AND COMPLETE THE CLEANUP.

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NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.
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Dft: | Date: | Scale:
Chk: | Date: | Filename:
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TENNESSE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
ELEVATED WASHRACK

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

FIG. NO. 40 | Sheet: 40 of 127 | Type:

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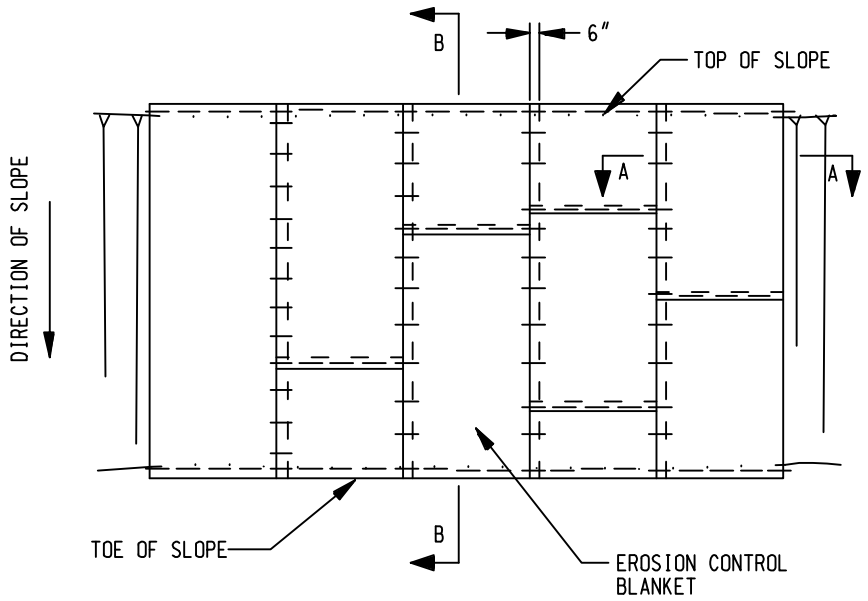

PLAN

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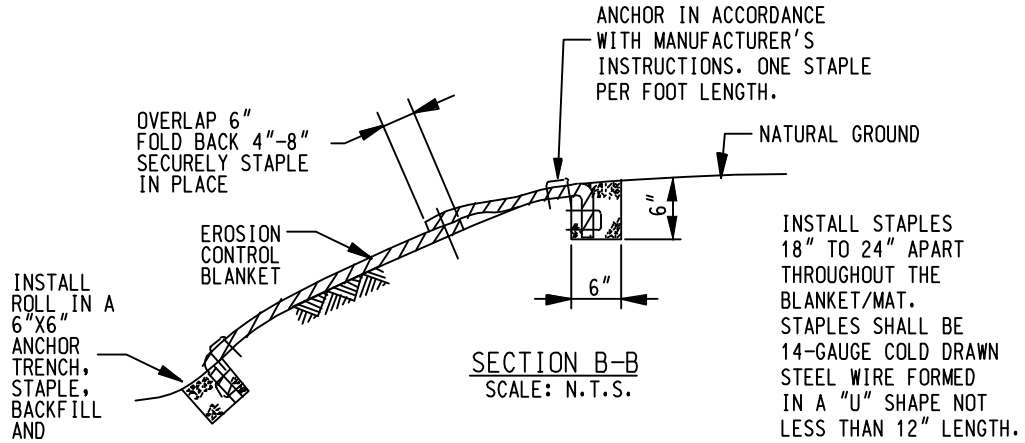
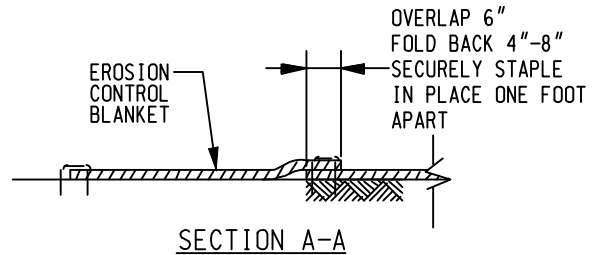


SECTION B-B

SCALE: N.T.S.

EMBANKMENT INSTALLATION



SECTION A-A

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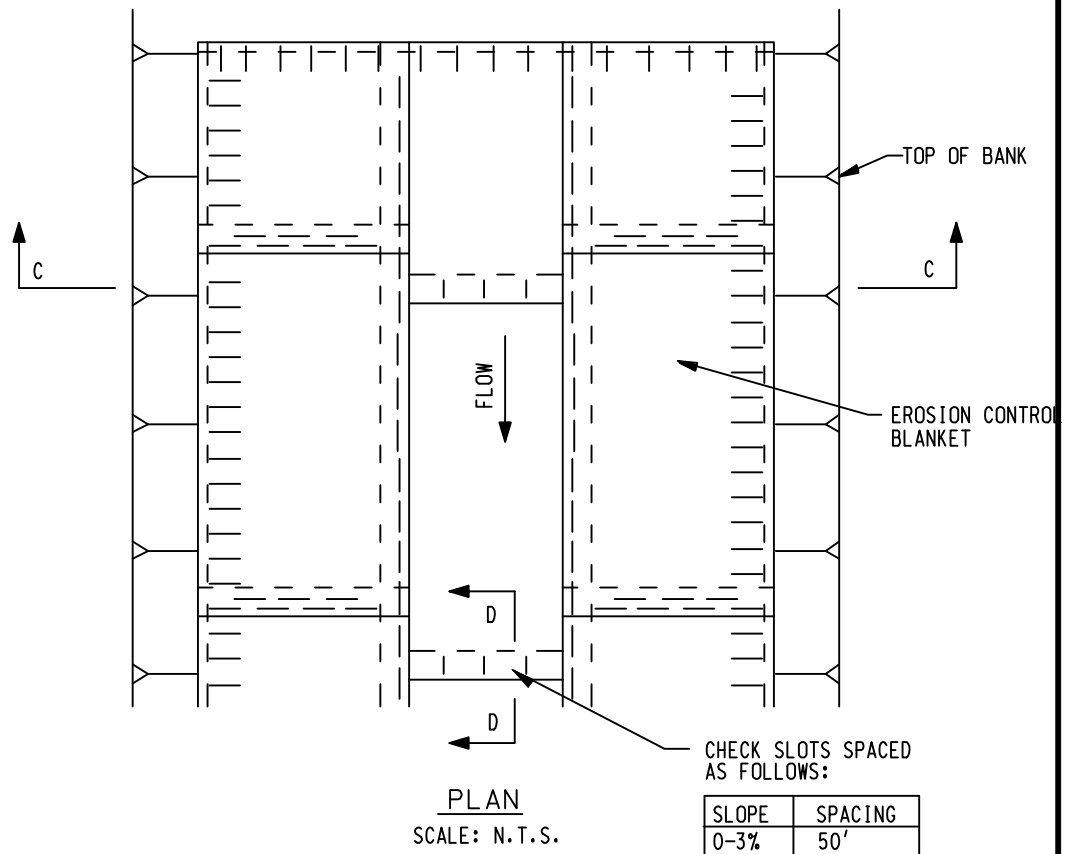

PLAN

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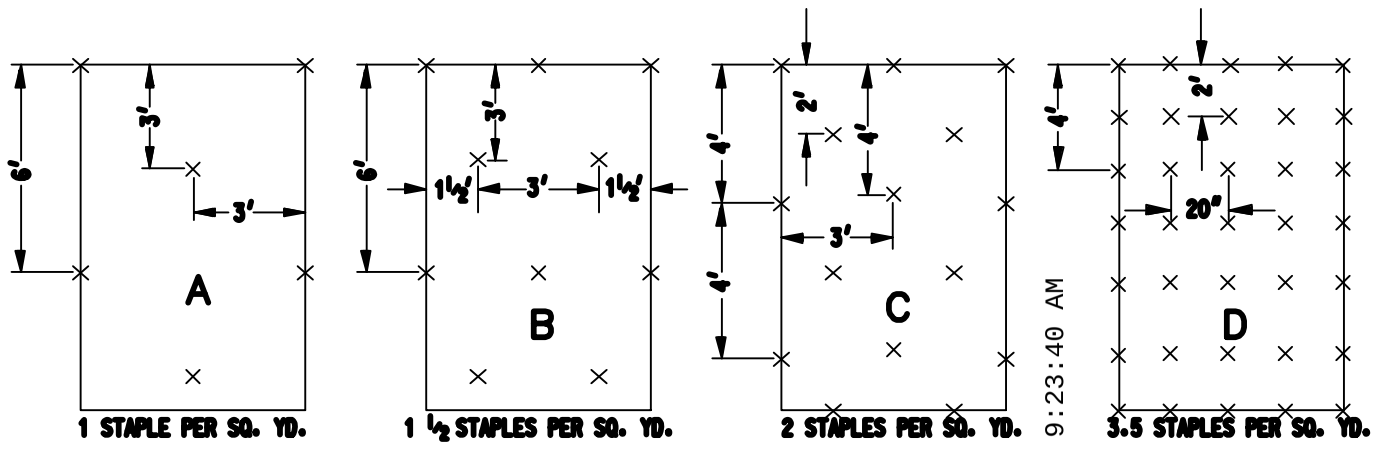
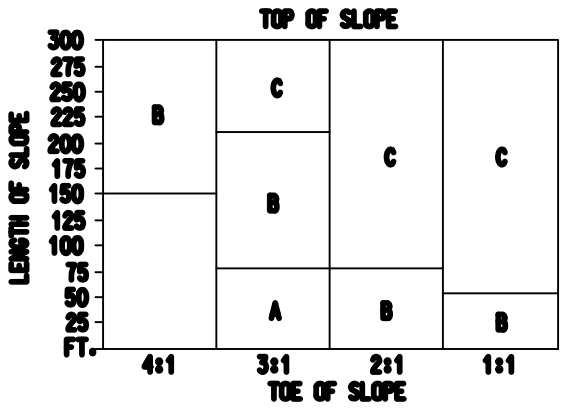
SLOPE	SPACING
0-3%	50′
> 3%	25′



STAPLE PATTERN GUIDE



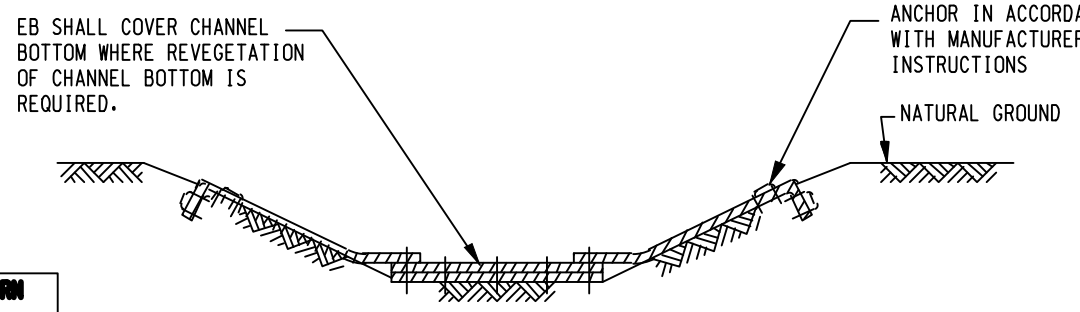
A EMBANKMENT INSTALLATION - STAPLE PATTERN TABLE (SEE STAPLE PATTERN GUIDE)

NOTES:

1. EROSION CONTROL BLANKETS SHALL EXTEND COMPLETELY ACROSS DISTURBED AREA TO PROTECT ERODIBLE SURFACES. THE SOIL SHALL BE PROPERLY PREPARED, SEEDED AND MULCHED PRIOR TO INSTALLATION.
2. INSTALL EROSION CONTROL BLANKETS ON FRESHLY GRADED EMBANKMENTS ON SLOPES IN EXCESS OF 3:1 (H:V) TO SUPPORT VEGETATION.
3. INSTALL BLANKETS IN ACCORDANCE WITH MANUFACTURER'S INSTRUCTIONS.
4. BLANKET SHALL BE LOOSELY INSTALLED AND TAMPED OR ROLLED IN PLACE AFTER INSTALLATION. STAPLES SHALL BE DRIVEN FLUSH WITH THE GROUND.

FLOW	STAPLE PATTERN TYPE
LOW VELOCITY	C
MED. TO HIGH VELOCITY	D

CHANNEL INSTALLATION - STAPLE PATTERN TABLE (SEE STAPLE PATTERN GUIDE)



SECTION C-C

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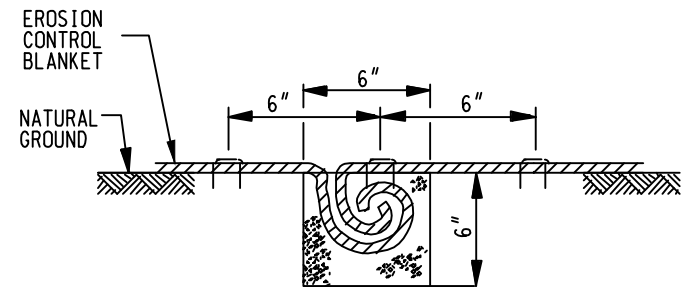
CHANNEL INSTALLATION



SECTION D-D

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TENNESSE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
EROSION CONTROL BLANKET

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

FIG. NO. 41

Sheet: 41 of 127
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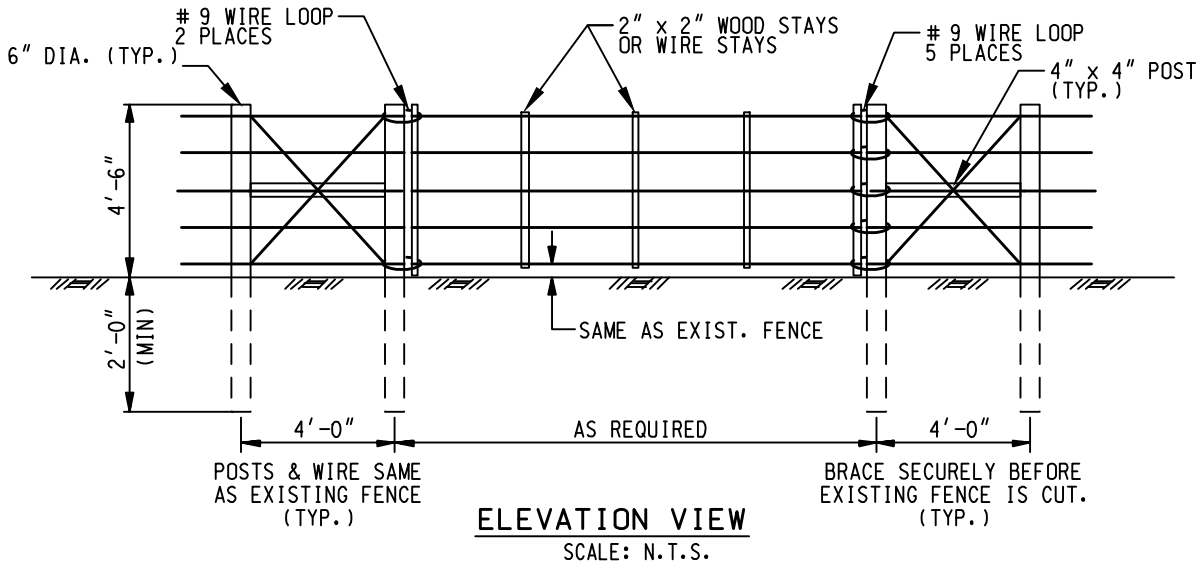

ELEVATION VIEW

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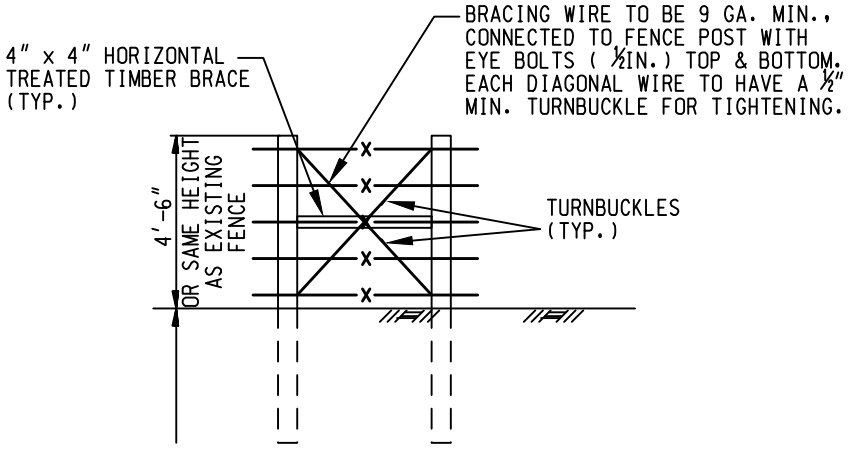

NOTES:

1. THE CONTRACTOR SHALL FURNISH ALL NECESSARY MATERIAL TO CONSTRUCT A TEMPORARY FENCE GATE TO MATCH EXISTING FENCE.
2. BRACE THE SPAN TO BE CONSTRUCTED ON EACH SIDE OF PIPELINE RIGHT-OF-WAY, PRIOR TO INITIAL DISMANTLING OF FENCE.
3. THE CONTRACTOR SHALL RESTORE THE FENCE TO IT'S ORIGINAL CONDITION AND REMOVE ALL TEMPORARY MATERIALS AFTER COMPLETION OF PIPELINE CONSTRUCTION.
4. ACTUAL EMBEDMENT DEPTH REQUIRED WILL BE DETERMINED BY WHAT IS REQUIRED TO ACHIEVE A STABLE SUPPORT POST.
5. UNDER NO CIRCUMSTANCES SHALL FENCE POSTS BE PLACED DIRECTLY OVER THE PIPELINE. CONSULT COMPANY AUTHORIZED REPRESENTATIVES FOR LOCATIONS OF FENCE POSTS ADJACENT TO THE PIPELINE.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
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TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
FENCE WITH TEMPORARY GATE

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

FIG. NO. 42

Sheet: 42 of 127

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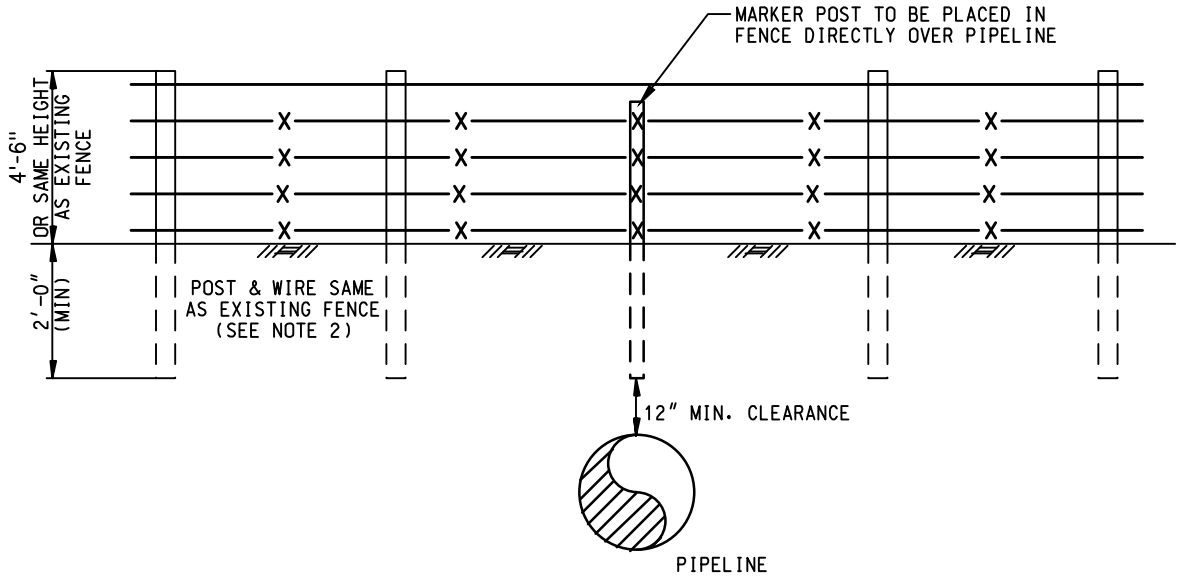

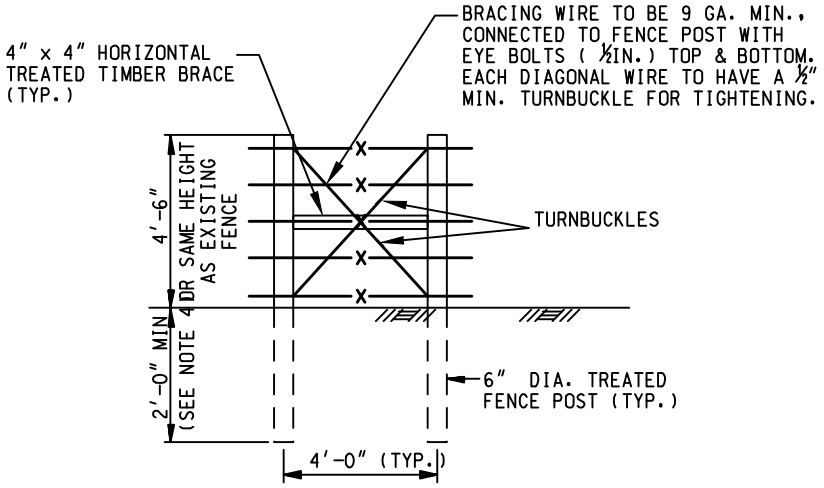

BRACE SPAN DETAIL (SEE NOTE 3)

NOTES:

1. THE CONTRACTOR SHALL FURNISH ALL NECESSARY MATERIAL TO RESTORE THE FENCE TO IT'S ORIGINAL CONDITION.
2. POSTS, WIRE AND OTHER MATERIAL SHALL BE THE SAME AS OR EQUIVALENT MATERIAL TO MATCH THE EXISTING FENCE.
3. BRACE SPAN TO BE CONSTRUCTED ON EACH SIDE OF PIPELINE RIGHT-OF-WAY, PRIOR TO INITIAL DISMANTLING OF FENCE.
4. ACTUAL EMBEDMENT DEPTH REQUIRED WILL BE DETERMINED BY WHAT IS REQUIRED TO ACHIEVE A STABLE SUPPORT POST.
5. UNDER NO CIRCUMSTANCES SHALL FENCE POSTS BE PLACED DIRECTLY OVER THE PIPELINE. CONSULT COMPANY AUTHORIZED REPRESENTATIVES FOR LOCATIONS OF FENCE POSTS ADJACENT TO THE PIPELINE.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

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Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
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TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
FENCE RESTORATION

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

FIG. NO. 43

Sheet: 43 of 127
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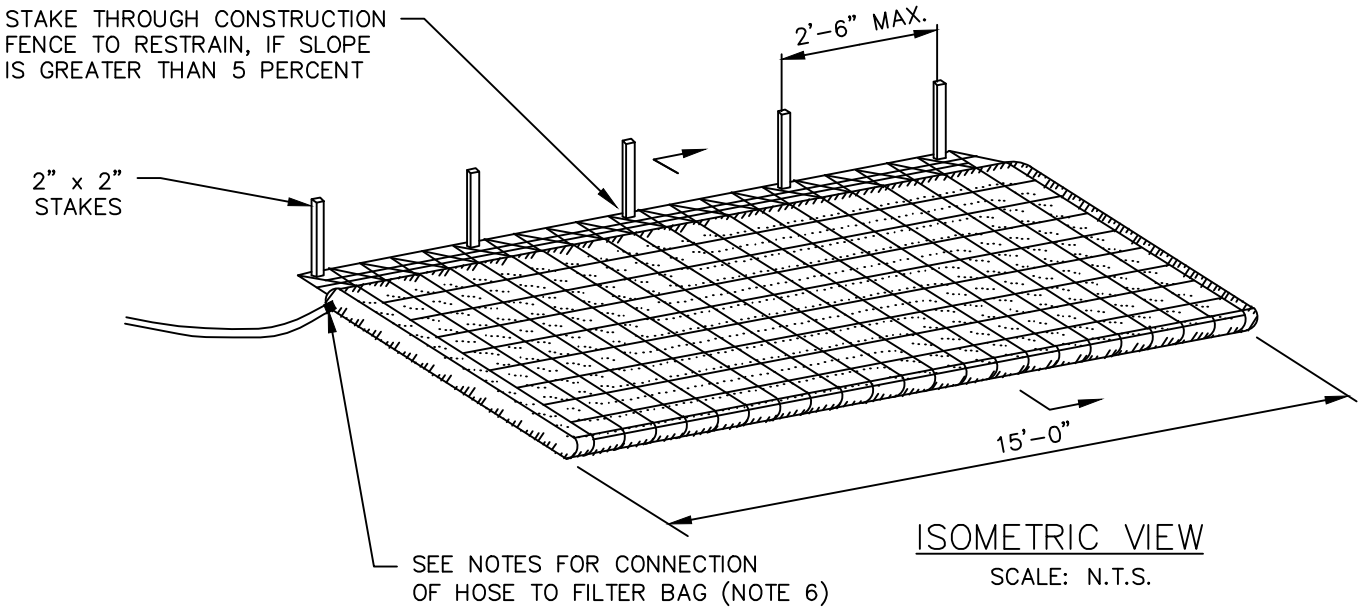
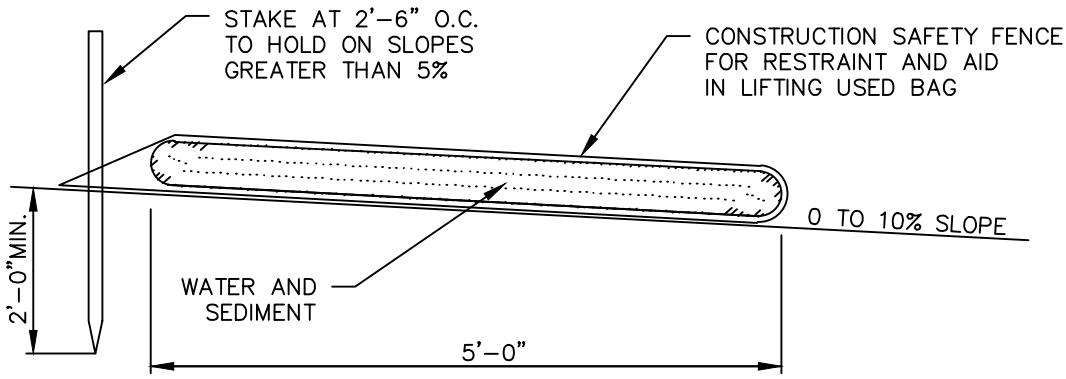


ISOMETRIC VIEW

SCALE: N.T.S.



SECTION

SCALE: N.T.S.

NOTES:

1. FILTER BAG SHALL BE PLACED ON A SLOPING OR LEVEL, WELL VEGETATED SITE SUCH THAT WATER WILL FLOW AWAY FROM THE DEVICE AND ANY WORK AREAS.
2. THE FILTER BAG MUST BE STAKED IN PLACE IF THE FILTER BAG IS PLACED ON A SLOPE GREATER THAN 5 PERCENT.
3. THE FILTER BAG SHALL NOT BE USED FOR DISCHARGE FLOWS GREATER THAN 300 GPM OR AS RECOMMENDED BY THE MANUFACTURER.
4. THE CONTRACTOR SHALL PROPERLY REMOVE AND PROPERLY DISPOSE OF USED FILTER BAGS IMMEDIATELY UPON COMPLETION OF DEWATERING OPERATIONS. UNDER NO CIRCUMSTANCES SHALL USED FILTER BAGS BE LEFT IN PLACE FOR A PERIOD OF TIME GREATER THAN 48 HOURS AFTER DEWATERING OPERATIONS ARE COMPLETE.
5. SEDIMENT FROM BAG, AT THE DISCRETION OF THE ENVIRONMENTAL INSPECTOR, MAY BE SPREAD IN UPLAND AREAS WITHIN THE CONSTRUCTION CORRIDOR AND THE AREA SHALL BE STABILIZED AND REVEGETATED.
6. TO ATTACH HOSE, CUT OPEN CORNER OF FILTER BAG, GATHER UP MATERIAL AND CLAMP TO A SHORT SECTION OF STEEL PIPE. CLAMP HOSE TO OTHER END OF PIPE. BOTH CONNECTIONS SHALL BE WATERTIGHT.
7. CONTRACTOR SHALL ONLY INSTALL ONE DEWATERING HOSE PER FILTER BAG.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

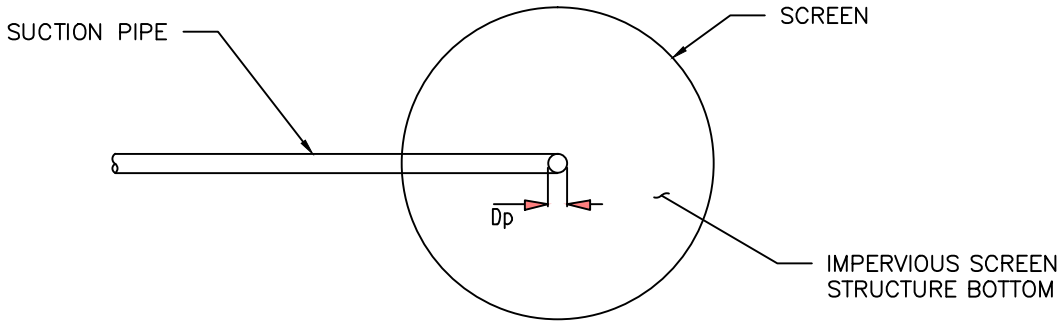
TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
FILTER BAG

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

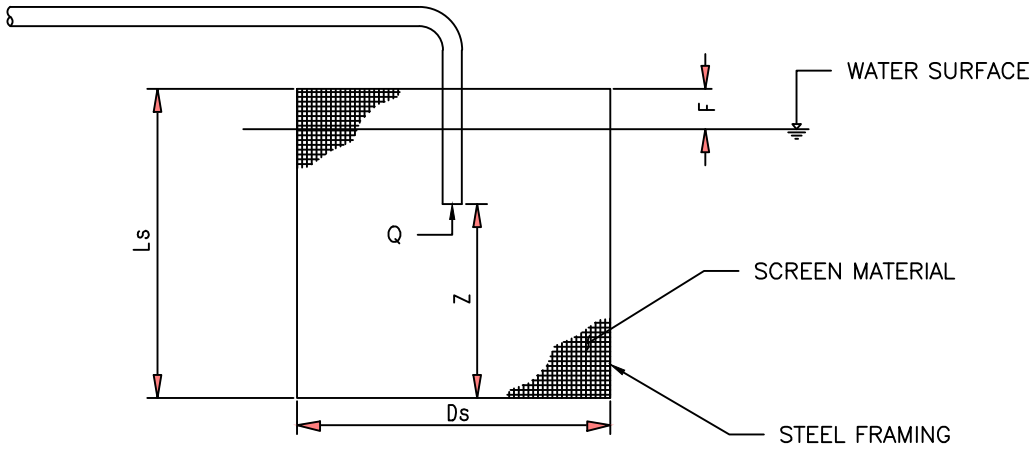
FIG. NO. 44

Sheet: 44 of 127

Type:



PLAN VIEW
N.T.S.



SIDE VIEW
N.T.S.

TO BE USED FOR HYDROSTATIC TESTING OF THE PIPELINE

NOTES:

1. CONTRACTOR SHALL NOT DEVIATE FROM THE SPECIFIED MATERIAL OR DIMENSIONS OF THE STRUCTURE WITHOUT WRITTEN APPROVAL FROM THE COMPANY.
2. THE FRAME OF THE SCREEN STRUCTURE SHALL BE OF STURDY CONSTRUCTION TO WITHSTAND ITS INTENDED USE.
3. SIDE AND TOP OF SCREEN STRUCTURE SHALL CONSIST OF 2MM X 2MM WIRE SCREEN.
4. THE SUCTION PIPE SHALL BE SECURED SO THAT THE INLET REMAINS WITHIN THE SCREEN STRUCTURE AND AT THE PROPER DEPTH ALL TIMES DURING PUMPING OPERATIONS. THE VERTICAL AXIS OF SUCTION PIPE SHALL BE ALIGNED WITH THE VERTICAL AXIS OF THE SCREEN STRUCURE.
5. SPECIFICATIONS:

Q =
Dp =
Ds =
Ls =
Z =
F =

DESIGN SPECIFICATIONS WILL VARY BASED ON SITE SPECIFIC APPLICATIONS. THE CONTRACTOR SHALL WORK WITH KINDER MORGAN INC. TO DEVELOP THE SITE SPECIFIC SPECIFICATIONS PRIOR TO TESTING.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
PUMP INLET SCREEN STRUCTURE

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

FIG. NO. 45

Sheet: 45 of 127
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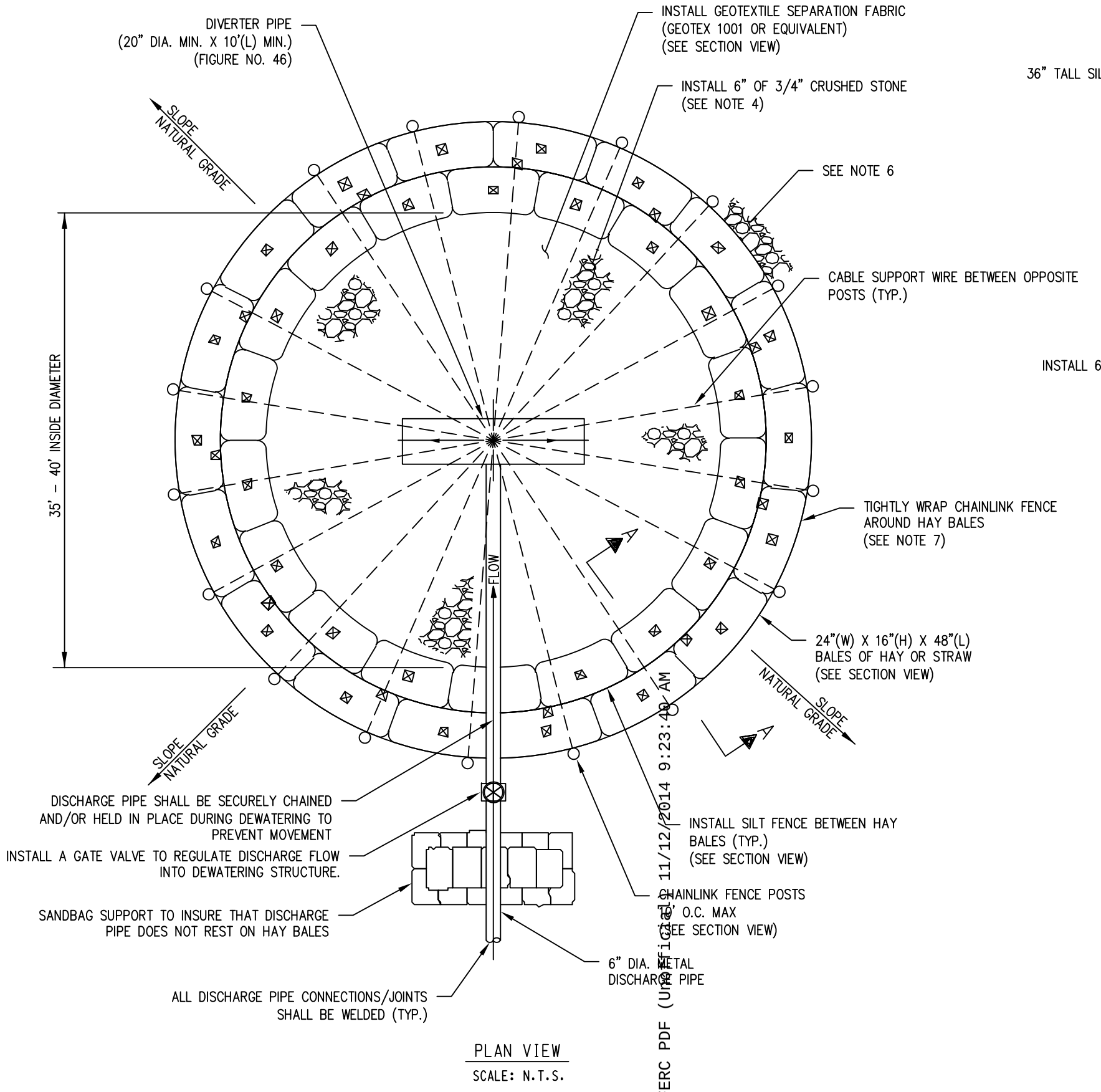
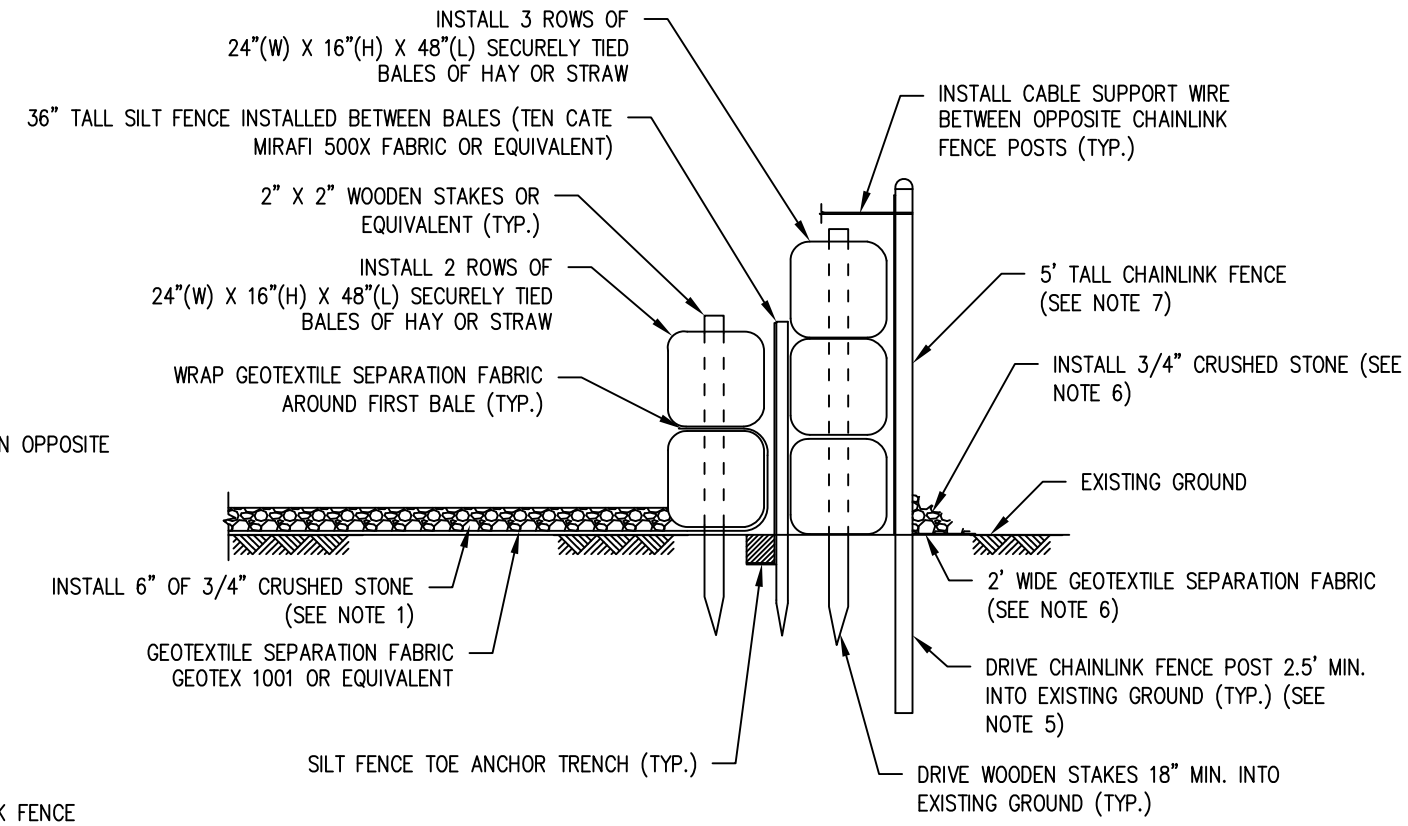


PLAN VIEW

SCALE: N.T.S.



SECTION "A-A" VIEW

SCALE: N.T.S.

NOTES:

1. STRUCTURE SHALL BE PLACED ON A LEVEL WELL VEGETATED SITE SUCH THAT WATER WILL FLOW AWAY FROM STRUCTURE AND ANY WORK AREAS AND MINIMIZE EROSION OF THE SURROUNDING AREA TO THE EXTENT PRACTICABLE.
2. AT THE DISCRETION OF THE ENVIRONMENTAL INSPECTOR, ADDITIONAL EROSION AND SEDIMENTATION CONTROL DEVICES (E.G. RIPRAP CHECK DAMS, COMPOST FILTER SOCKS, ETC.) MAY BE REQUIRED TO BE INSTALLED DOWNSTREAM OF THE STRUCTURE IF EROSION BECOMES APPARENT DURING DEWATERING.
3. FLOW RATES THROUGH DISCHARGE AND DIVERTER PIPES SHALL BE SUCH THAT STRUCTURE WILL NOT OVERFLOW. A MINIMUM FREEBOARD OF 3", MEASURED FROM THE TOP OF THE THIRD ROW OF HAYBALES TO THE WATER SURFACE ELEVATION, SHALL BE MAINTAINED AT ALL TIMES.
4. THE 3/4" CRUSHED STONE INSTALLED WITHIN THE BASIN SHALL BE WASHED TO REMOVE ALL DIRT/FINE PARTICLES PRIOR TO INSTALLATION.
5. THE CHAINLINK FENCE POSTS SHALL BE DRIVEN A MINIMUM OF 2.5 FT. INTO STABLE, EXISTING GROUND. THE CONTRACTOR MAY BE REQUIRED TO INSTALL THE POLES DEEPER IF STABLE SUBSOILS ARE NOT ACHIEVED WITHIN 2.5 FT.
6. AT THE DISCRETION OF THE ENVIRONMENTAL INSPECTOR, ADDITIONAL GEOTEXTILE SEPARATION FABRIC AND 3/4" CRUSHED STONE MAY BE REQUIRED TO BE INSTALLED AROUND THE OUTSIDE EDGE OF THE DEWATERING STRUCTURE.
7. CHAINLINK FENCE SHALL INSTALLED TIGHTLY AGAINST THE HAY BALES AND SECURELY FASTENED TOGETHER AT ALL JOINTS WITH CABLE TENSION WIRE AND STRETCHER BARS.
8. THE ENVIRONMENTAL INSPECTOR SHALL HAVE THE AUTHORITY TO MODIFY THE DESIGN AS REQUIRED TO PREVENT EROSION AND SEDIMENTATION DOWNSTREAM OF THE STRUCTURE.
9. HAY BALES SHALL BE STACKED SUCH THAT THE JOINTS ARE STAGGERED.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division: Op. Area.:
State: Co./Par.:
Section: Township: Range:
Dft: Date: Scale:
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TENNESSE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
HYDROSTATIC DEWATERING STRUCTURE

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

FIG. NO. 46

Sheet: 46 of 127
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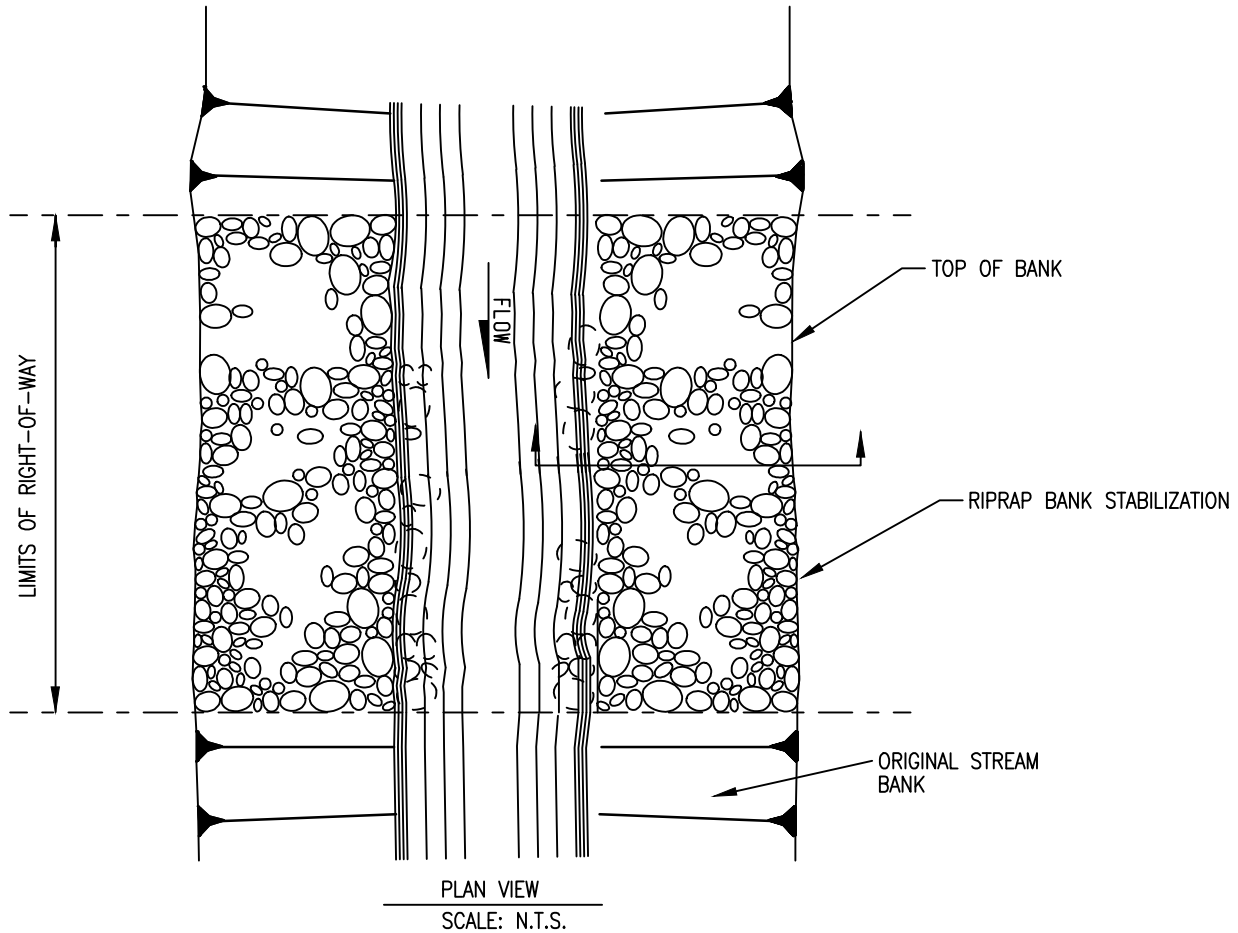
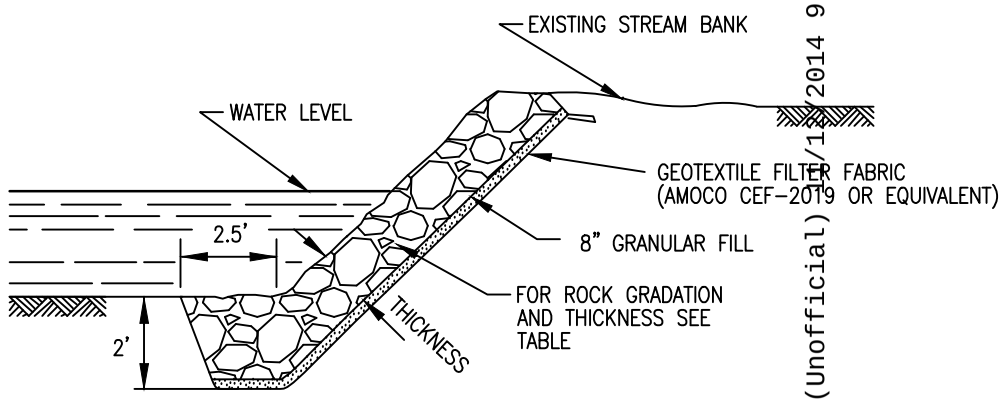
20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM



PLAN VIEW
SCALE: N.T.S.



SECTION
SCALE: N.T.S.

TABLE: RIPRAP GRADUATIONS

Class	Layer Thickness (in.)	Max Velocity (ft./s.)	Wave Height (ft.)		PERCENT FINER BY WEIGHT											
					D_{10}			D_{50}			D_{85}			D_{100}		
					Wt. (lbs.)	d_o (in.)	d□ (in.)	Wt. (lbs.)	d_o (in.)	d□ (in.)	Wt. (lbs.)	d_o (in.)	d□ (in.)	Wt. (lbs.)	d_o (in.)	d□ (in.)
I	18	8.5	-		5	5	4	50	10	8	100	13	10	150	15	12
II	18	10	-		17	7	6	170	15	12	340	19	15	500	22	18
III	24	12	2		46	10	8	460	21	17	920	26	21	1400	30	24
IV	36	14	3		150	15	12	1500	30	25	3000	39	32	4500	47	36
V	48	17	4.8		370	20	16	3700	42	34	7400	53	43	11,000	60	49

d_o = gravel material d□ = angular rock riprap
Wt = weight in pounds

NOTES:

1. ROCK UTILIZED FOR RIPRAP SHALL CONSIST OF SOUND, DURABLE ROCK, INSOLUBLE IN WATER, AND RESISTANT TO WEATHERING.
2. ALL MATERIAL SHALL BE FREE OF STRUCTURAL DEFECTS, SHALE SEAMS AND ORGANIC MATTER.
3. INDIVIDUAL PIECES SHOULD BE SHARPLY ANGULAR, BLOCK SHAPED AND HAVE A MINIMUM SPECIFIC GRAVITY OF 2.5.
4. NO PIECE SHALL HAVE A LENGTH EXCEEDING THREE (3) TIMES ITS WIDTH OR DEPTH.
5. EACH LOAD OF ROCK SHALL BE OF WELL-GRADED MIXTURE. A WELL-GRADED MIXTURE, AS USED HEREIN, IS DEFINED AS A MIXTURE COMPOSED PRIMARILY OF LARGER STONE, BUT WITH A SUFFICIENT MIXTURE OF SMALLER SIZES TO FILL THE VOIDS.
6. MATERIAL SHALL MEET SPECIFICATIONS AS NOTED IN ABOVE TABLE.
7. IF STREAM WIDTH IS EQUAL TO OR LESS THAN 2 TIMES THE TOE WIDTH, RIPRAP SHALL BE PLACED ACROSS THE ENTIRE STREAM WIDTH.
8. RIPRAP SHALL BE PLACED TO THE FULL COURSE THICKNESS IN ONE CONTINUOUS OPERATION. OPERATIONS WHICH CAUSE SEGREGATION OF THE MATERIALS SHALL NOT BE PERMITTED. INDIVIDUAL ROCKS MAY BE REARRANGED, AND THE VOIDS FILLED WITH HAND PLACED SMALLER ROCK IN ORDER TO ACHIEVE THE DESIRED UNIFORM ARMOR.
9. SLOPE SHALL BE GRADED TO 2:1 OR FLATTER PRIOR TO PLACING FILTER, FILTER FABRIC, OR RIPRAP.
10. ENDS OF THE RIPRAP SHALL BE KEYED INTO A STABLE BANK. WHEN TYING INTO OTHER STRUCTURES, LARGER RIPRAP CAN BE LAID IN STEPS OR STACKED AS NEEDED TO FIT. STONES LARGER THAN THOSE DESIGNED FOR FLOW SHALL BE USED FOR THIS PURPOSE.
11. REMAINING DISTURBED AREAS SHALL BE GRADED AND PERMANENTLY SEEDED AND MULCHED.

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NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

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Division: Op. Area.:
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Dft: Date: Scale:
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Appr: Date:

TENNESSE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
RIPRAP STREAM BANK STABILIZATION

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

FIG. NO. 47

Sheet: 47 of 127
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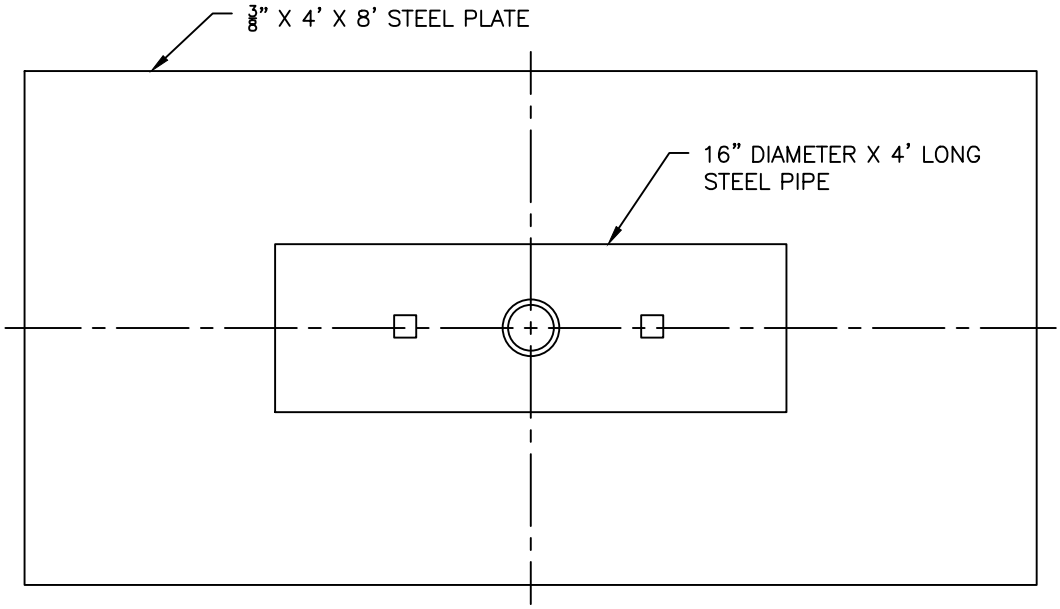
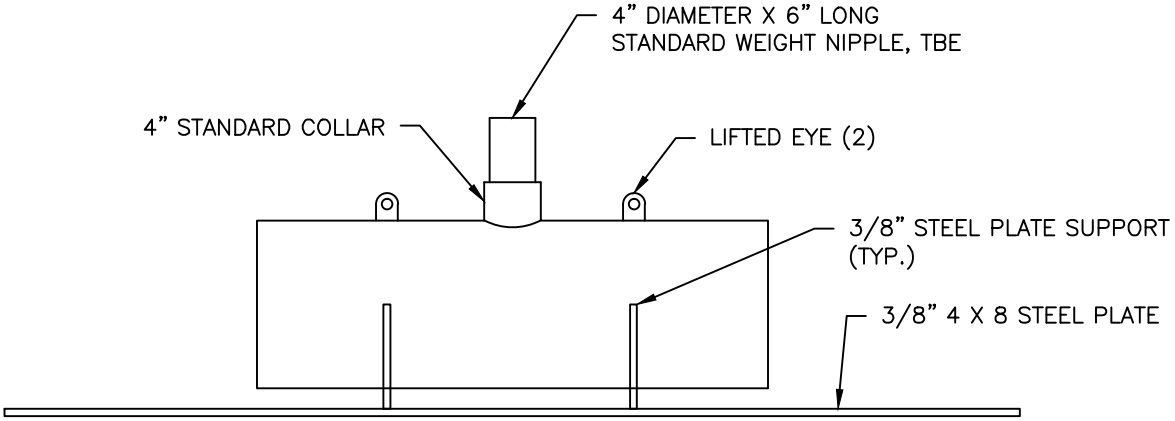


PLAN VIEW
N.T.S.



SECTION VIEW
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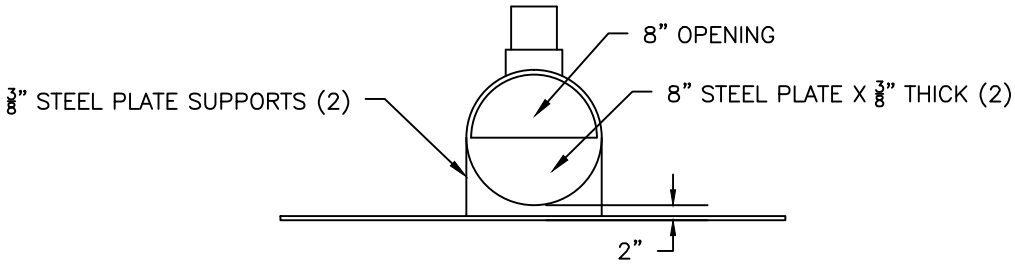

PROFILE VIEW
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NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

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Division:	Op. Area:	
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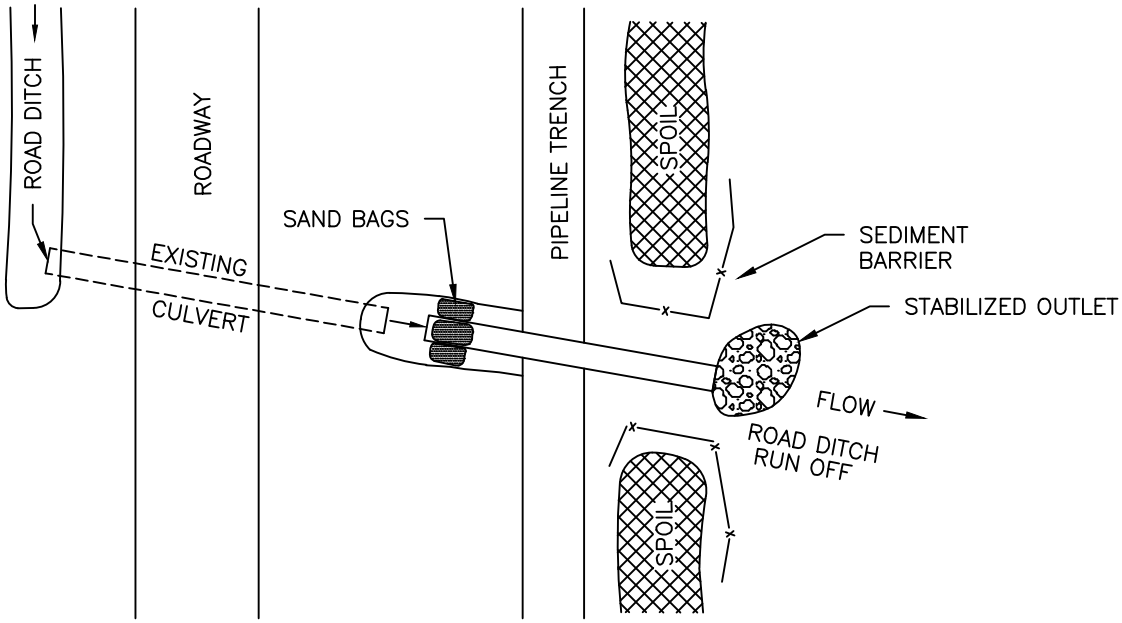
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
PIPE ENERGY DISSIPATER

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

FIG. NO. 48

Sheet: 48 of 127
Type:



PLAN VIEW

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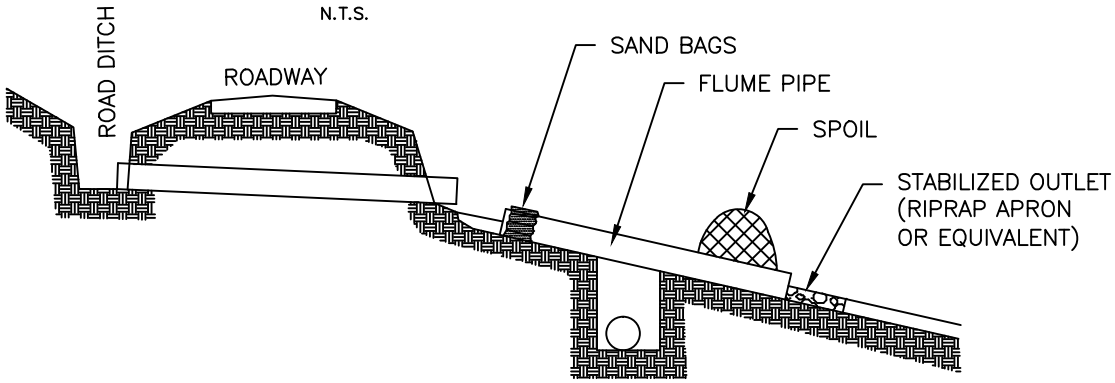


NOTES:

1. INSTALL THE TEMPORARY CULVERT ACROSS THE PIPELINE TRENCH AT ROAD CULVERT LOCATIONS WHERE THE PIPELINE TRENCH IS LOCATED BELOW THE ROAD SURFACE. AN 8" MINIMUM DIAMETER CULVERT IS TO BE INSTALLED, HOWEVER, THE TEMPORARY PIPE SHALL BE SIZED TO ADEQUATELY CONVEY THE MAXIMUM ANTICIPATED FLOW AT THE TIME OF CROSSING.

2. REMOVE CULVERT WHILE BACK FILLING AND RESTORE AND STABILIZE ROAD DITCH RUN OFF TO ORIGINAL CONDITION.

SECTION VIEW

N.T.S.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

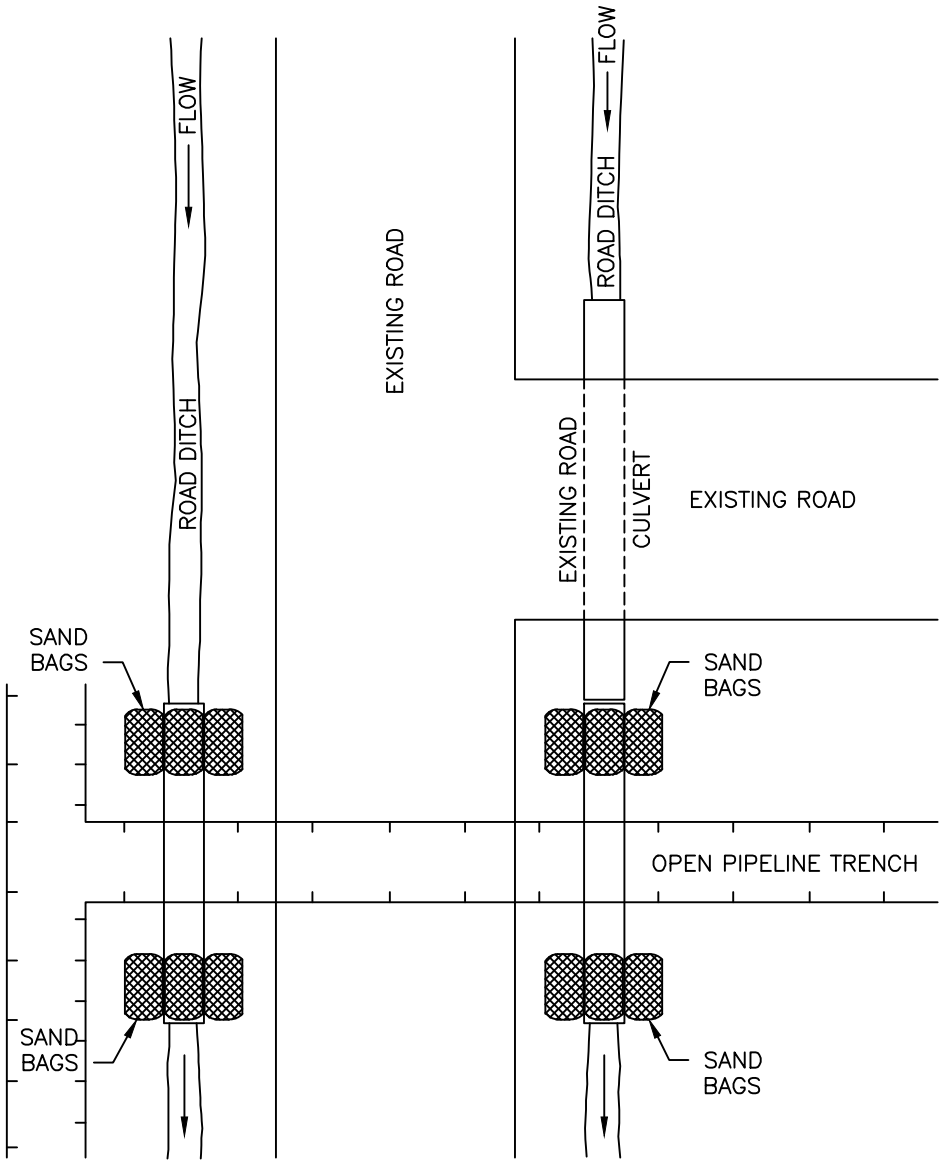
Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
ROAD CULVERT EXTENSION ACROSS
PIPELINE TRENCH

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

FIG. NO. 49

Sheet: 49 of 127
Type:



NOTES:

1. INSTALL TEMPORARY CULVERT IN ROAD DITCH, ACROSS OPEN PIPELINE TRENCH. AN 8" MINIMUM DIAMETER CULVERT IS TO BE INSTALLED. HOWEVER, THE TEMPORARY PIPE SHALL BE SIZED TO ADEQUATELY CONVEY THE MAXIMUM ANTICPATED FLOW AT THE TIME OF CROSSING.

2. REMOVE CULVERT WHEN BACK FILLING AND RESTORE AND STABILIZE ROAD DITCH TO ORIGINAL CONDITION.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
TEMPORARY CULVERT ACROSS
OPEN TRENCH

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

FIG. NO. 50

Sheet: 50 of 127
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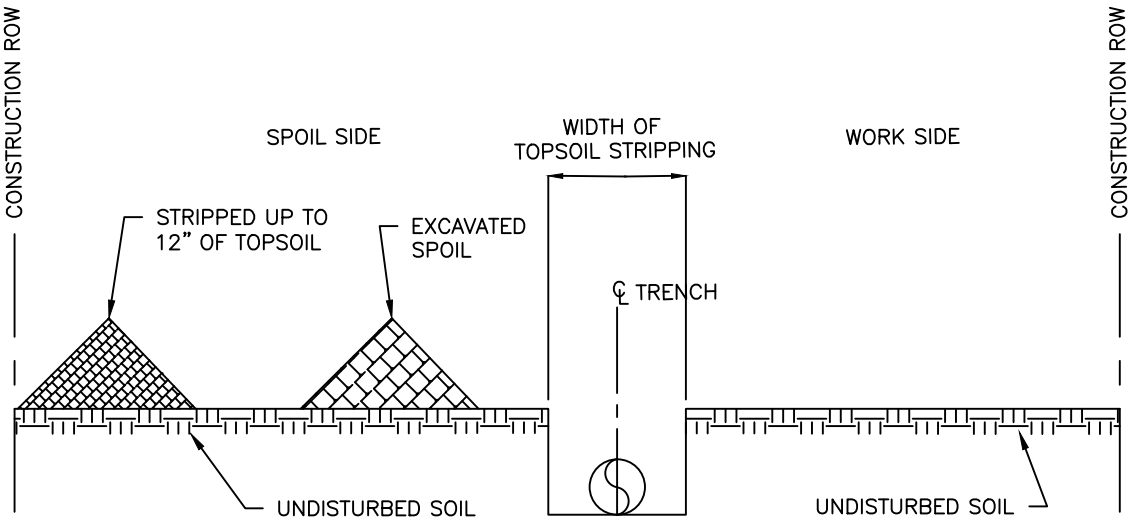
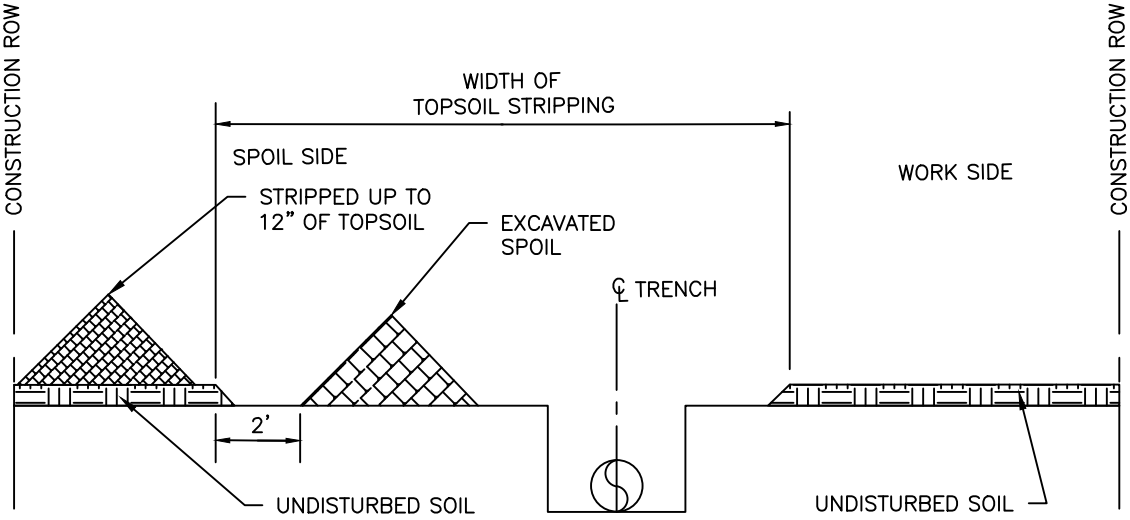


DITCH LINE TOPSOIL STRIPPING

N.T.S.

ALSO USED IN NON–SATURATED WETLANDS



DITCH PLUS SPOIL SIDE SEGREGATION

N.T.S.

NOTES:

1. ALLOW FOR A 3' SEPERATION BETWEEN THE TOPSOIL PILE AND THE TRENCH SPOIL.
2. RETURN TRENCH SPOIL TO TRENCH AND COMPACT. FEATHER OUT EXCESS SPOIL OVER STRIPPED AREA LEAVING A LOW CROWN CENTERED OVER THE TRENCH. ALLEVIATE COMPACTION OF SUBSOILS OVER THE STRIPPED AREA.
3. RETURN TOPSOIL EVENLY OVER THE STRIPPED AREA AFTER TRENCH HAS SUFFICIENTLY SETTLED OR HAS BEEN COMPACTED.
4. ALLEVIATE COMPACTION OF TOPSOIL OVER ENTIRE RIGHT–OF–WAY.
5. SEGREGATED TOPSOIL MAY NOT BE USED FOR PADDING THE PIPE.
6. INSTALL SEDIMENT BARRIER AS REQUIRED.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:		Op. Area:	
St.:		Co./Par.:	
Section:	Township:		Range:
Dft:	Date:	Project ID:	
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TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
TOPSOIL SEGREGATION (1)

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

FIG. NO. 51

Sheet: 51 of 127

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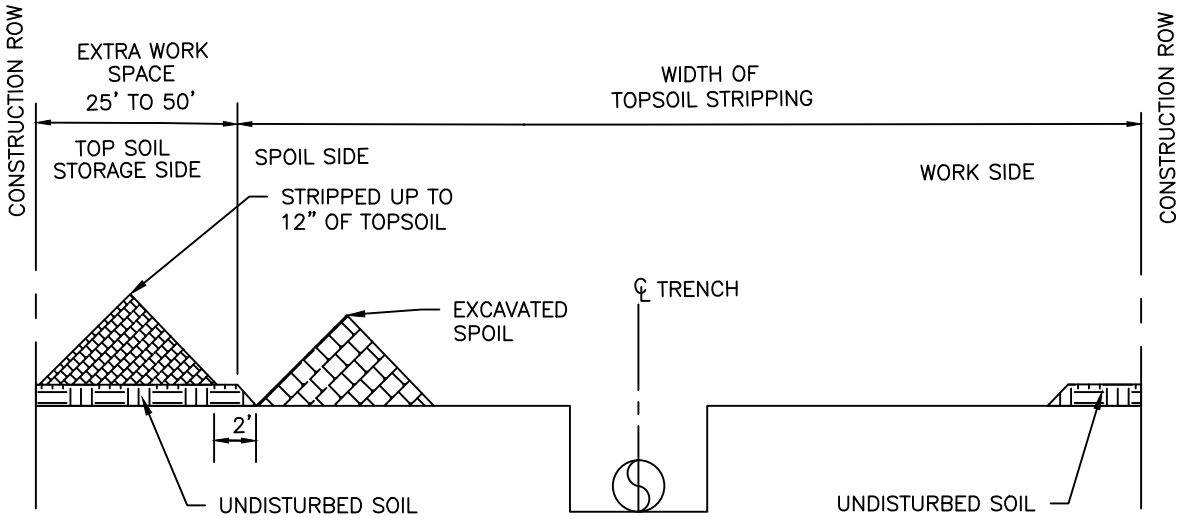
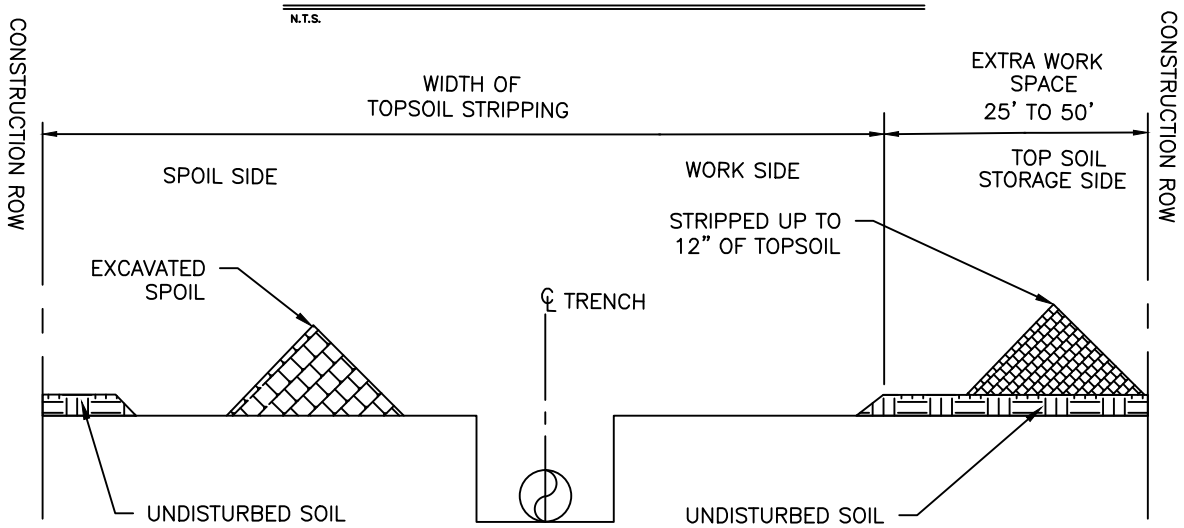


FULL RIGHT-OF-WAY TOPSOIL STRIPPING - A

N.T.S.



FULL RIGHT-OF-WAY TOPSOIL STRIPPING - B

N.T.S.

NOTES:

1. ALLOW FOR A 3' SEPERATION BETWEEN THE TOPSOIL PILE AND THE TRENCH SPOIL.
2. RETURN TRENCH SPOIL TO TRENCH AND COMPACT. FEATHER OUT EXCESS SPOIL OVER STRIPPED AREA LEAVING A LOW CROWN CENTERED OVER THE TRENCH. ALLEVIATE COMPACTION OF SUBSOILS OVER THE STRIPPED AREA.
3. RETURN TOPSOIL EVENLY OVER THE STRIPPED AREA AFTER TRENCH HAS SUFFICIENTLY SETTLED OR HAS BEEN COMPACTED
4. ALLEVIATE COMPACTION OF TOPSOIL OVER ENTIRE RIGHT–OF–WAY.
5. SEGREGATED TOPSOIL MAY NOT BE USED FOR PADDING THE PIPE
6. INSTALL SEDIMENT BARRIER AS REQUIRED

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
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TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
TOPSOIL SEGREGATION (2)

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

FIG. NO. 52

Sheet: 52 of 127
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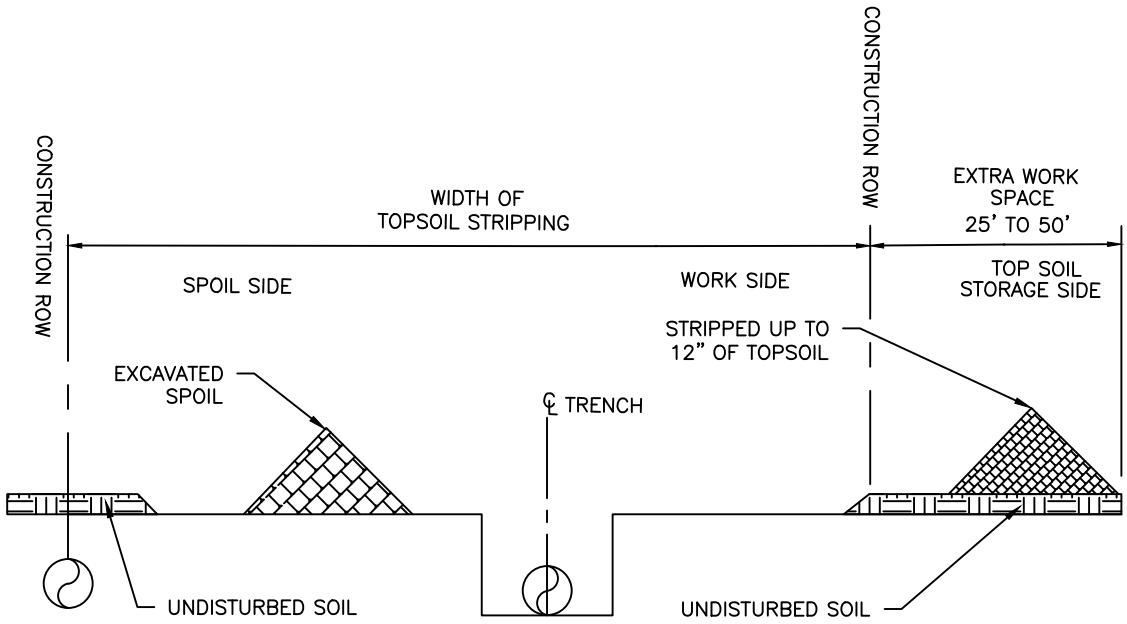
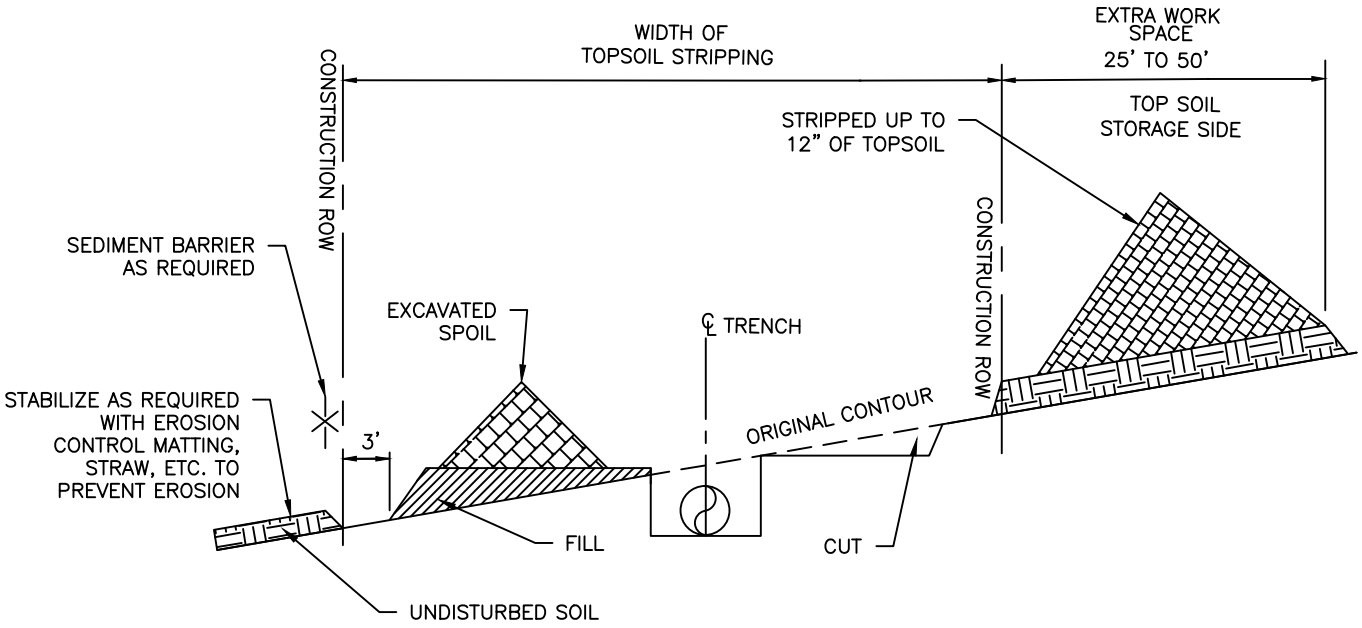


FULL RIGHT-OF-WAY TOPSOIL STRIPPING-PARALLELING PIPELINES

N.T.S.



FULL RIGHT-OF-WAY TOPSOIL STRIPPING-SIDE SLOPES

N.T.S.

NOTES:

1. ALLOW FOR A 3' SEPERATION BETWEEN THE TOPSOIL PILE AND THE TRENCH SPOIL.
2. RETURN TRENCH SPOIL TO TRENCH AND COMPACT. FEATHER OUT EXCESS SPOIL OVER STRIPPED AREA LEAVING A LOW CROWN CENTERED OVER THE TRENCH. ALLEVIATE COMPACTION OF SUBSOILS OVER THE STRIPPED AREA.
3. RETURN TOPSOIL EVENLY OVER THE STRIPPED AREA AFTER TRENCH HAS SUFFICIENTLY SETTLED OR HAS BEEN COMPACTED.
4. ALLEVIATE COMPACTION OF TOPSOIL OVER ENTIRE RIGHT–OF–WAY.
5. SEGREGATED TOPSOIL MAY NOT BE USED FOR PADDING THE PIPE.
6. INSTALL SEDIMENT BARRIER AS REQUIRED.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:		Op. Area:	
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Section:	Township:		Range:
Dft:	Date:	Project ID:	
Chk:	Date:	Scale:	
Appr:	Date:	Filename:	

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
TOP SOIL SEGREGATION (3)

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

FIG. NO. 53

Sheet: 53 of 127
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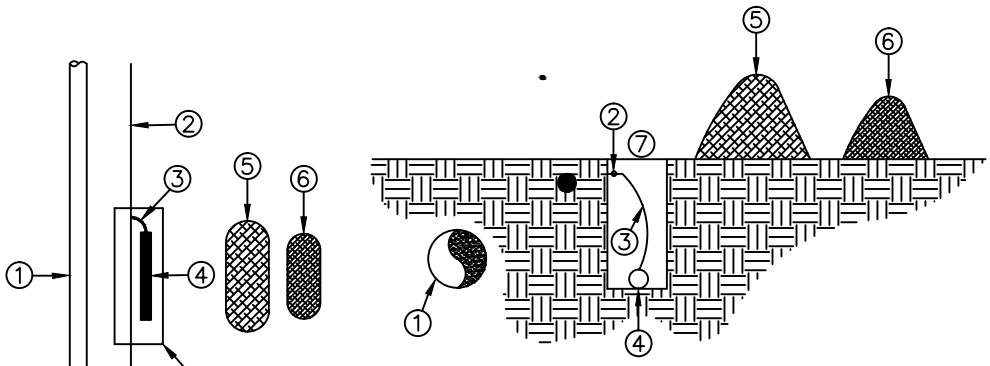
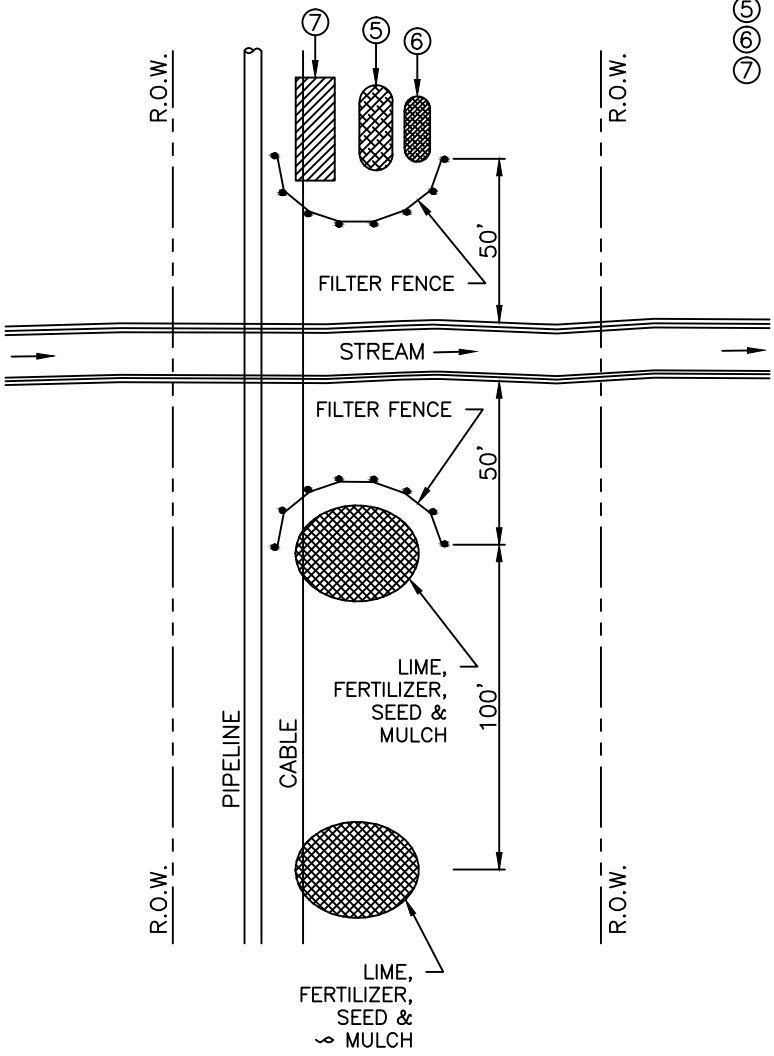
TYPICAL ANODE INSTALLATION



① PIPELINE
② CABLE
③ WIRE FROM ANODE TO CABLE
④ ANODE (8" X 7")
⑤ SUBSOIL
⑥ TOPSOIL
⑦ OPENING (4'W X 10'L X 5'D)



NOTES:

1. ANODES INSTALLED A MINIMUM OF 50' FROM EDGE OF WATER

2. INSTALL FILTER FENCE ACROSS THE DISTURBED AREAS AT ANODE INSTALLATIONS ADJACENT TO STREAMS.

3. LIME, FERTILIZER, SEED AND MULCH IMMEDIATELY AFTER BACKFILLING AS APPROVED BY THE EI OR LOCAL PERMITTING AGENCY. ALL DISTURBED AREAS WITHIN 50' OF THE TOP OF BANK WILL BE STABILIZED. LIME AND FERTILIZER SHALL NOT BE USED WITHIN WETLANDS OR WATERBODIES UNLESS APPROVED AS ABOVE.

4. PLACEMENT OF EROSION CONTROLS WILL BE ADJUSTED AS NECESSARY TO PREVENT THE TRANSPORTATION OF SEDIMENT INTO WETLANDS AND/OR WATERBOSIES

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

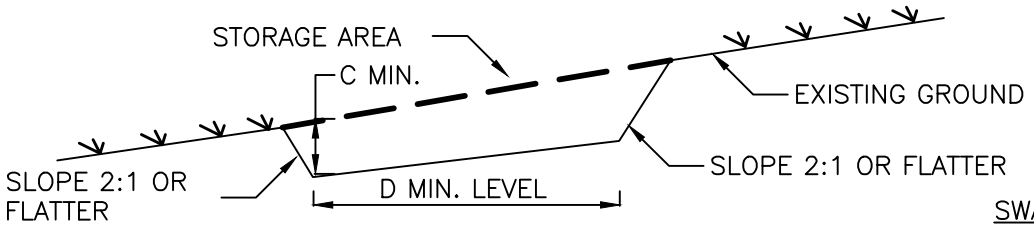
Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
CATHODIC PROTECTION
ANODE INSTALLATION

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

FIG. NO. 54

Sheet: 54 of 127
Type:

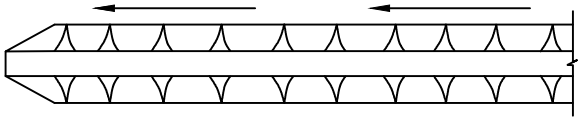


CROSS SECTION

	SWALE A	SWALE B
C	1'	1'
D	4'	6'

POSITIVE DRAINAGE: 0.5% OR STEEPER DEPENDENT ON TOPOGRAPHY

OUTLET AS REQUIRED SEE ITEM 8 BELOW.



PLAN VIEW

CONSTRUCTION SPECIFICATIONS

1. ALL TEMPORARY SWALES SHALL HAVE UNINTERUPTED POSITIVE GRADE TO AN OUTLET.
2. DIVERTED RUNOFF FROM A DISTURBED AREA SHALL BE CONVEYED TO A SEDIMENT TRAPPING DEVICE.
3. DIVERTED RUNOFF FROM AN UNDISTURBED AREA SHALL OUTLET DIRECTLY INTO AN UNDISTURBED STABILIZED AREA AT NON–EROSIVE VELOCITY.
4. ALL TREES, BRUSH, STUMPS, OBSTRUCTIONS, AND OTHER OBJECTIONABLE MATERIAL SHALL BE REMOVED AND DISPOSED OF SO AS NOT TO INTERFERE WITH THE PROPER FUNCTIONING OF THE SWALE.
5. THE SWALE SHALL BE EXCAVATED OR SHAPED TO LINE, GRADE, AND CROSS SECTION AS REQUIRED TO MEET THE CRITERIA SPECIFIED HEREIN AND BE FREE OF BANK PROJECTIONS OR OTHER IRREGULARITIES WHICH WILL IMPEDE NORMAL FLOW.
6. FILLS SHALL BE COMPACTED BY EARTH MOVING EQUIPMENT.
7. ALL EARTH REMOVED AND NOT NEEDED FOR CONSTRUCTION SHALL BE PLACED SO THAT IT WILL NOT INTERFERE WITH THE FUNCTIONING OF THE SWALE.
8. STABILIZATION SHALL BE AS PER THE FLOW CHANNEL STABILIZATION CHART BELOW:

TYPE OF TREATMENT	CHANNEL GRADE	A(5 AC. OR LESS)	B(5 AC –10AC)
1	0.5–3.0%	SEED AND STRAW MULCH	SEED AND STRAW MULCH
2	3.1–5.0%	SEED AND STRAW MULCH	SEED USING JUTE OR EXCELSIOR
3	5.1–8.0%	SEED WITH JUTE OR EXCELSIOR, SOD	LINED WITH 4–8" RIP–RAP OR RECYCLED CONCRETE EQUIVALENT
4	8.1–20.%	LINED WITH 4–8" RIP–RAP	ENGINEERED DESIGN

9. PERIODIC INSPECTION AND REQUIRED MAINTENANCE MUST BE PROVIDED AFTER EACH RAIN EVENT.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

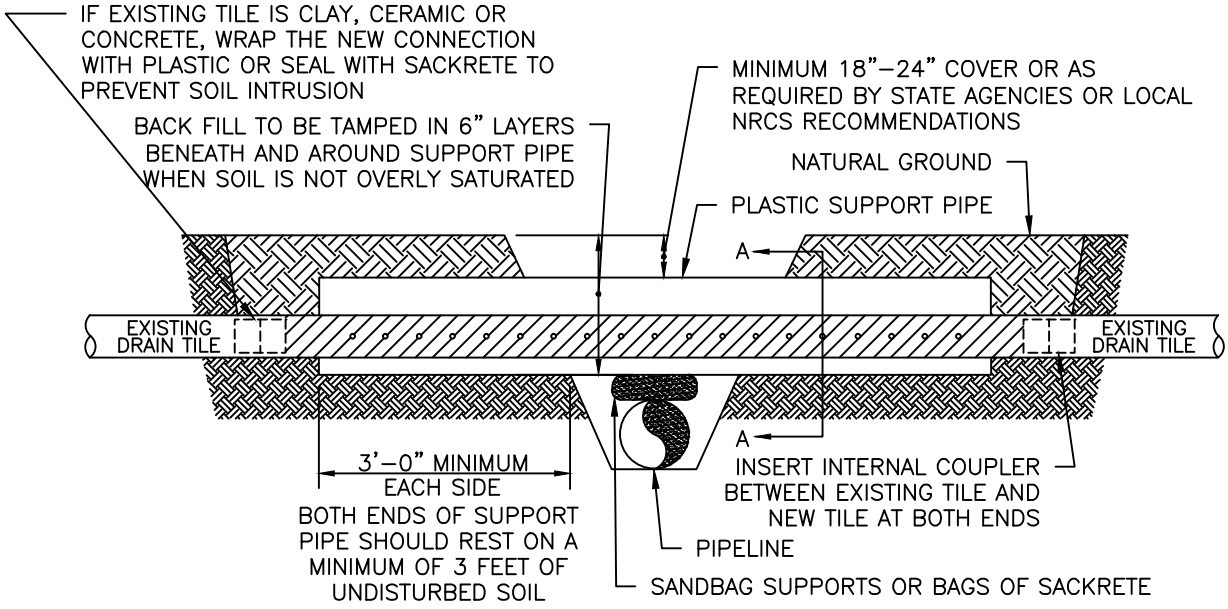
Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
TEMPORARY SWALE

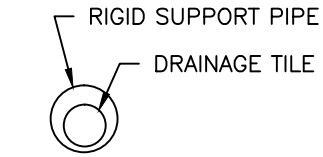
Tennessee Gas Pipeline Company, L.L.C.
a Kinder Morgan company

FIG. NO. 55

Sheet: 55 of 127
Type:

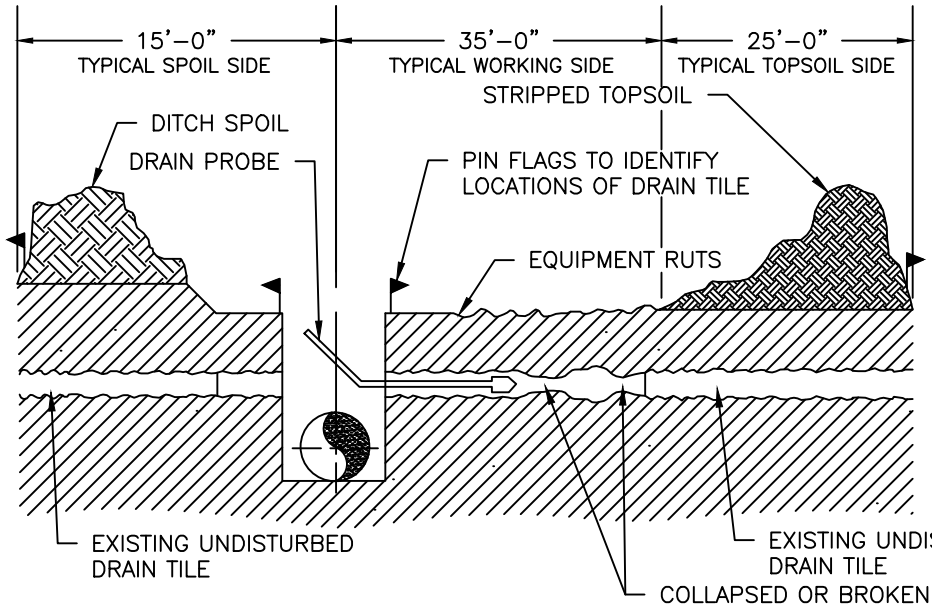


DRAINAGE TILE	SUPPORT SIZE
3" TO 5"	6" PIPE
6"	8" PIPE
7" TO 8"	10" PIPE
9" TO 10"	12" PIPE
12"	W12 X 14
15" TO 18"	W16 X 26
OVER 18"	W18 X 46



SECTION A–A
FOR UP TO 10" DRAIN TILE

NOTES:
1. SUPPORT PIPE TO BE OF 0.250" WALL THICKNESS OR HEAVIER. WHERE THE SUPPORT PIPE IS OVER 30" IN LENGTH OR IN SATURATED AREAS. PERFORATIONS TO THE SUPPORT PIPE MAY BE REQUESTED.
2. REPLACEMENT TILE TO BE HEAVY DUTY HIGHWAY GRADE PERFORATED PLASTIC DRAIN TUBING (ADS TYPE N–12) CONFORMING TO THE AASHTO M.252 SPECIFICATION.
3. IF THE TRENCH WIDTH EXCEEDS 10 FEET, SUFFICIENT STABILITY SHALL BE PROVIDED TO THE SUPPORT PIPE TO PREVENT SAGGING.



NOTES:
1. CLEAN OUT DRAIN TILES TO THE PERMANENT R.O.W. LIMITS ON THE BACKFILL SIDE AND TO THE TEMPORARY R.O.W. LIMIT ON THE WORKING SIDE.

2. REPLACE DAMAGED TILES AND REPAIR TILES AND JOINTS THAT REQUIRE WORK AND ARE WITHIN THE AREAS OF CONSTRUCTION ACTIVITIES.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

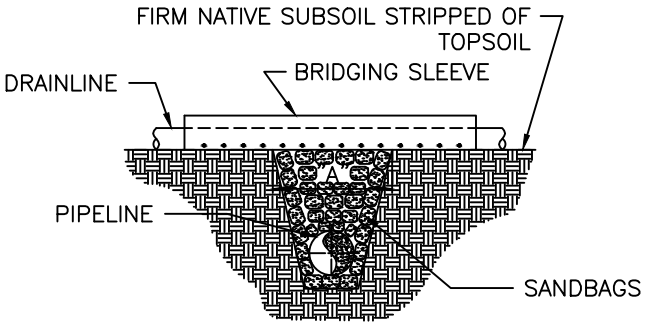
Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
TYPICAL DRAIN TILE REPAIR ACROSS TRENCH (1)

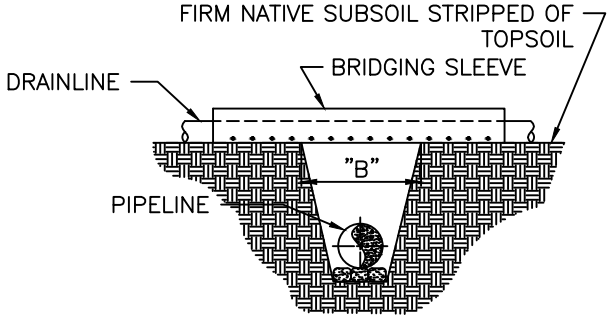
Tennessee Gas Pipeline Company, L.L.C.
a Kinder Morgan company

FIG. NO. 56

Sheet: 56 of 127
Type:

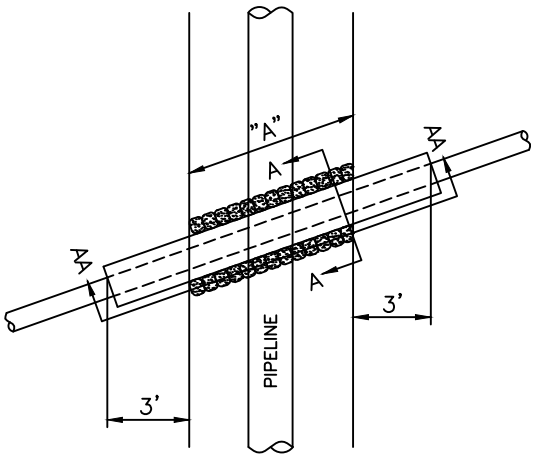


IF DISTANCE "A" EXCEEDS 10 FEET, THE SCHEDULE 80 PERFORATED BRIDGING–SLEEVE REQUIRES A MODIFIED SANDBAG TRENCH BREAKER UNDER THE BRIDGING SLEEVE.



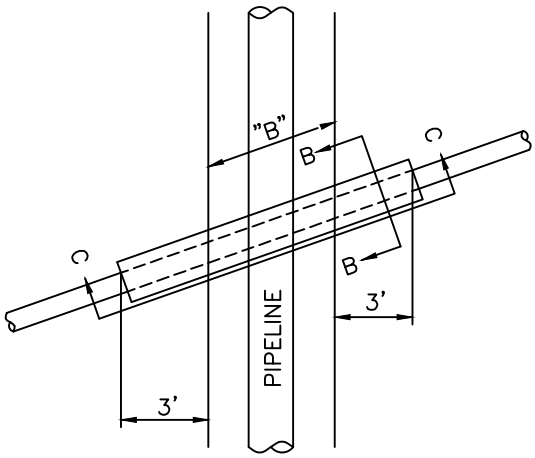
IF DISTANCE "B" DOES NOT EXCEED 10 FEET, THE SCHEDULE 80 PERFORATED BRIDGING–SLEEVE DOES NOT REQUIRE SUPPORT UNDER THE BRIDGING–SLEEVE.

SECTION AA-AA

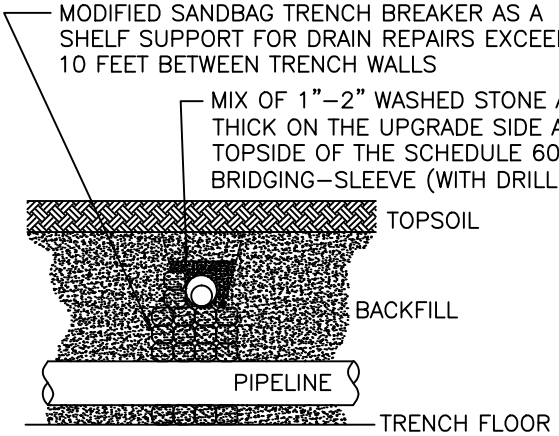


PLAN VIEW

SECTION C-C



PLAN VIEW



CROSS SECTION "B–B" IS THE SAME AS CROSS SECTION "A–A", MINUS THE SAND BAG TRENCH BREAKER. MINIMUM OF 1"–2" WASHED STONE, 4"–6" THICK UNDERNEATH,TO BE PLACED AROUND THE SIDES AND OVER TOP OF THE BRIDGING SLEEVE.

THE BRIDGING–SLEEVE DRAIN REPAIR RESTS ON THE UPGRADIENT SIDE OF THE MODIFIED SANDBAG TRENCH BREAKER. THE HIGHER PORTION OF THE TRENCH BREAKER IS ON THE DOWN GRADIENT SIDE OF THE REPAIR.

NOTE:

1.IF THE REPAIR OF THE SEVERED DRAINLINE CROSSES THE PIPELINE TRENCH AT AN ANGLE REQUIRING MORE THAN 20' OF BRIDGING–SLEEVE BETWEEN THE FARTHEST ENDS OF THE FIRM SHELVES, MODIFY THE CROSSING ANGLE TO SHORTEN THE TOTAL LENGTH OF THE CROSSING AND THEN TIE TO THE EXISTING DRAIN TILE.

2. ALL DRAIN TILE REPAIRS CONSISTING OF PLASTIC PIPE SHALL CONFORM TO THE AASHTO M.252 SPECIFICATION.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

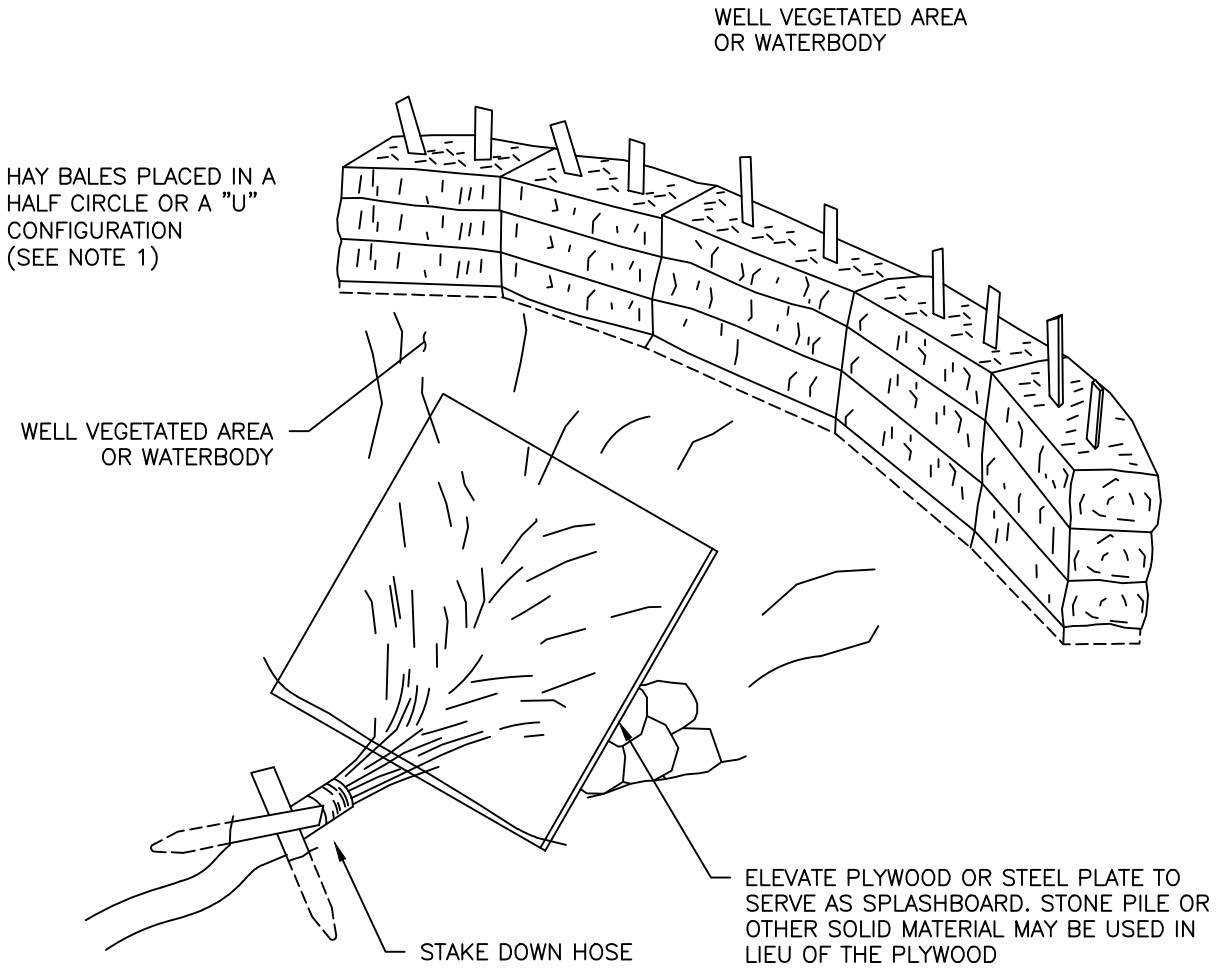
TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
TYPICAL DRAIN TILE REPAIR ACROSS TRENCH (2)

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

FIG. NO. 57

Sheet: 57 of 127

Type:



USED FOR TRENCH DE–WATERING AND DAM AND PUMP
WATERBODY CROSSINGS

NOTE:

1. THIS DISSIPATER MAY BE USED WITHIN A WATERBODY DURING A DAM AND PUMP DEWATERING OPERATION. THE HAYBALES WILL NOT BE INSTALLED IF UTILIZED IN A WATERBODY.
2. THIS SHALL NOT BE USED WHEN TRENCH DEWATERING IS REQUIRED AND THERE IS SILT LADEN WATER THAT WILL DISCHARGE DIRECTLY INTO A WETLAND OR WATERBODY.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

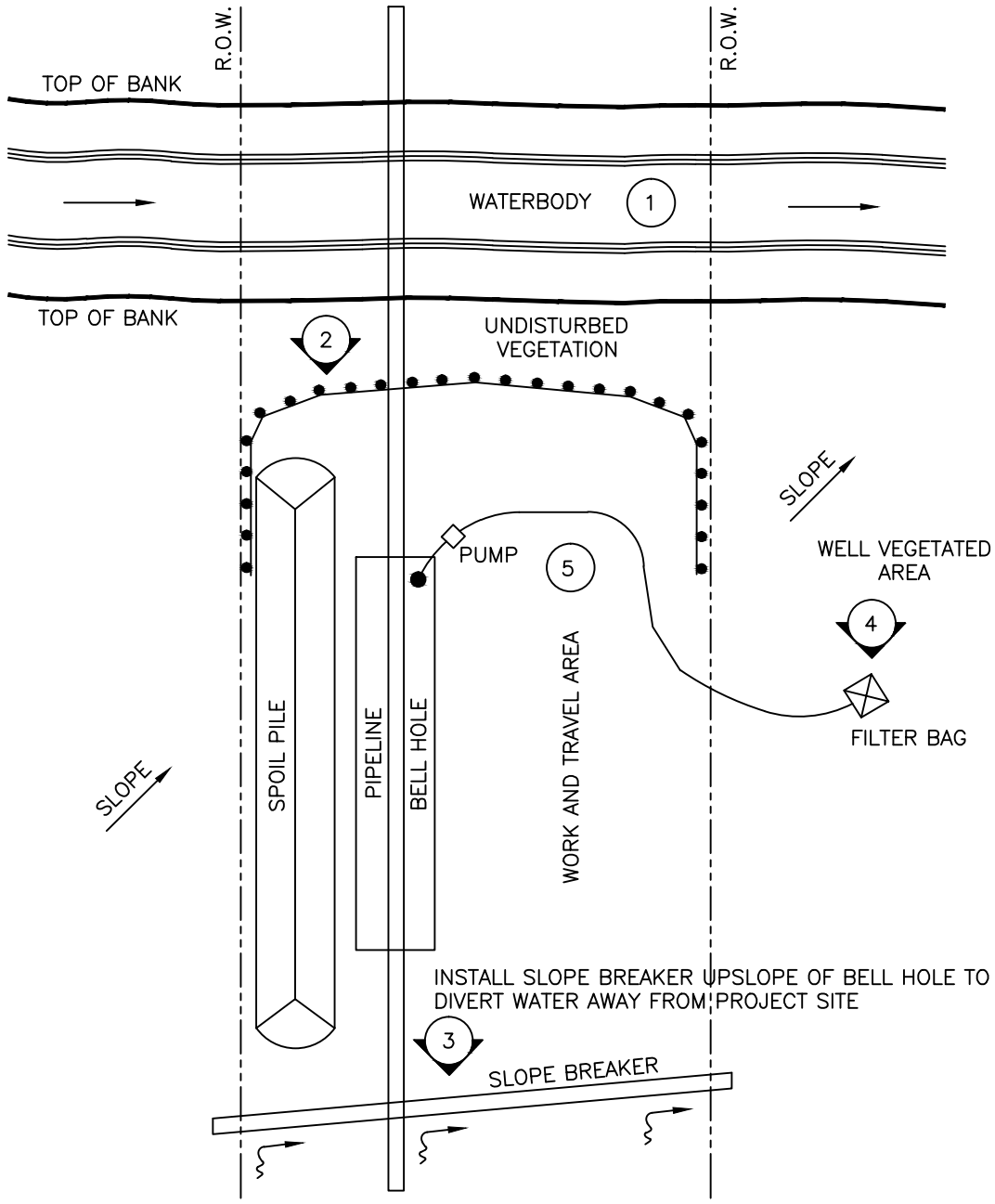
Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
ENERGY DISSIPATER

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

FIG. NO. 58

Sheet: 58 of 127
Type:



1. (IF NEEDED) EQUIPMENT CROSSING, SEE CROSSING DETAILS FOR PROPER INSTALLATION
2. SEDIMENT BARRIER
3. SLOPE BREAKER
4. BELL HOLE DEWATERING OUTLET, SEE TRENCH DEWATERING DETAILS FOR PROPER METHODOLOGY
5. LIME, FERTILIZE, SEE AND MULCH ALL DISTURBED AREAS IMMEDIATELY AFTER BACKFILLING AS APPROVED BY THE EI OR LOCAL PERMITTING AGENCY. LIME AND FERTILIZER SHALL NOT BE USED WITHIN WETLANDS OR WATERBODIES UNLESS APPROVED AS NOTED ABOVE.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

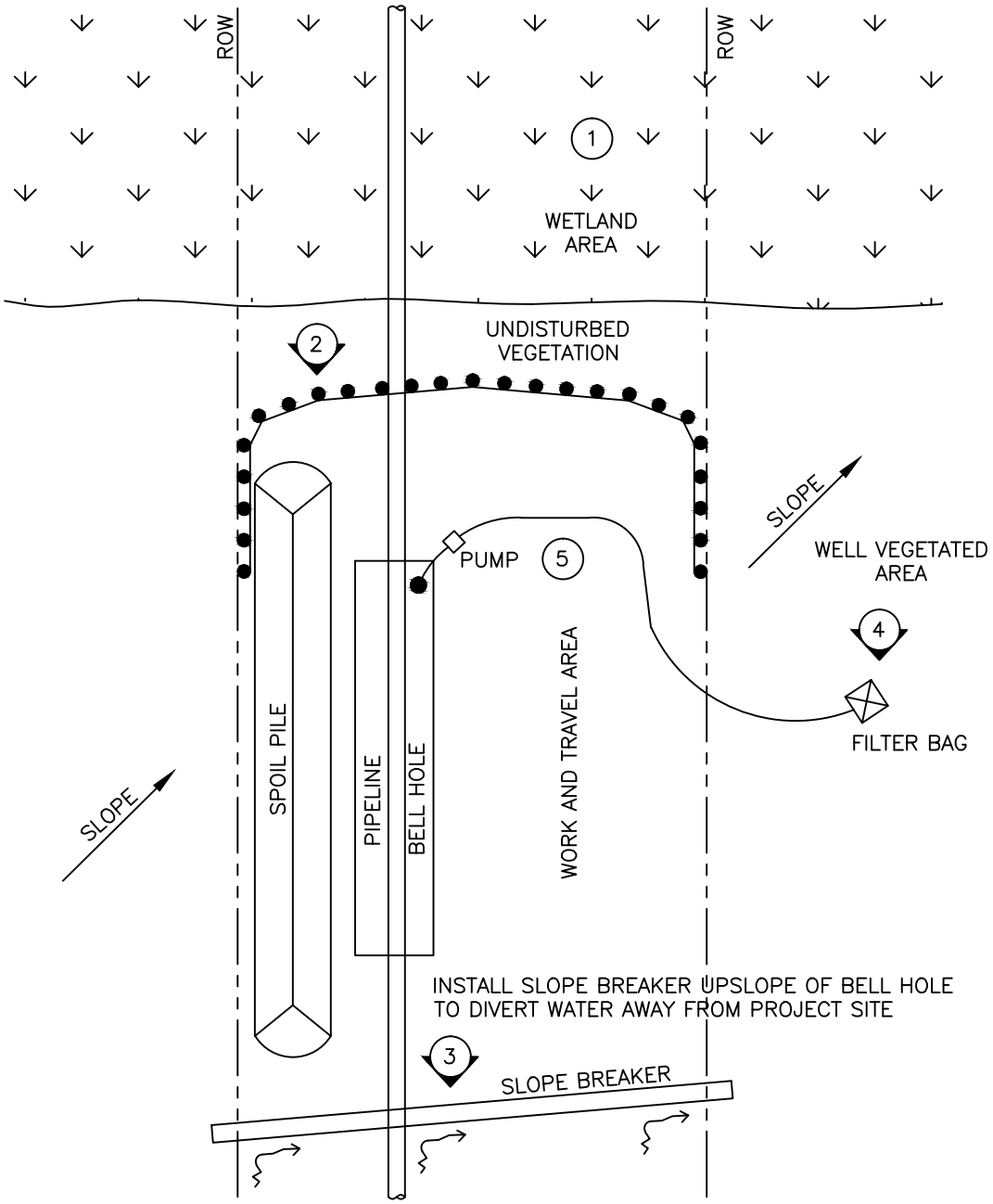
Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
BELL HOLE NEXT TO WATERBODY

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

FIG. NO. 59

Sheet: 59 of 127
Type:



1. (IF NEEDED) EQUIPMENT CROSSING, SEE CROSSING DETAILS FOR PROPER INSTALLATION
2. SEDIMENT BARRIER
3. SLOPE BREAKER
4. BELL HOLE DEWATERING OUTLET, SEE TRENCH DEWATERING DETAILS FOR PROPER METHODOLOGY
5. LIME, FERTILIZE, SEED AND MULCH ALL DISTURBED AREAS IMMEDIATELY AFTER BACKFILLING AS APPROVED BY RGE EI OR LOCAL PERMITTING AGENCY. LIME AND FERTILIZER SHALL NOT BE USED WITHIN WETLANDS OR WATERBODIES UNLESS APPROVED AS NOTED ABOVE.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

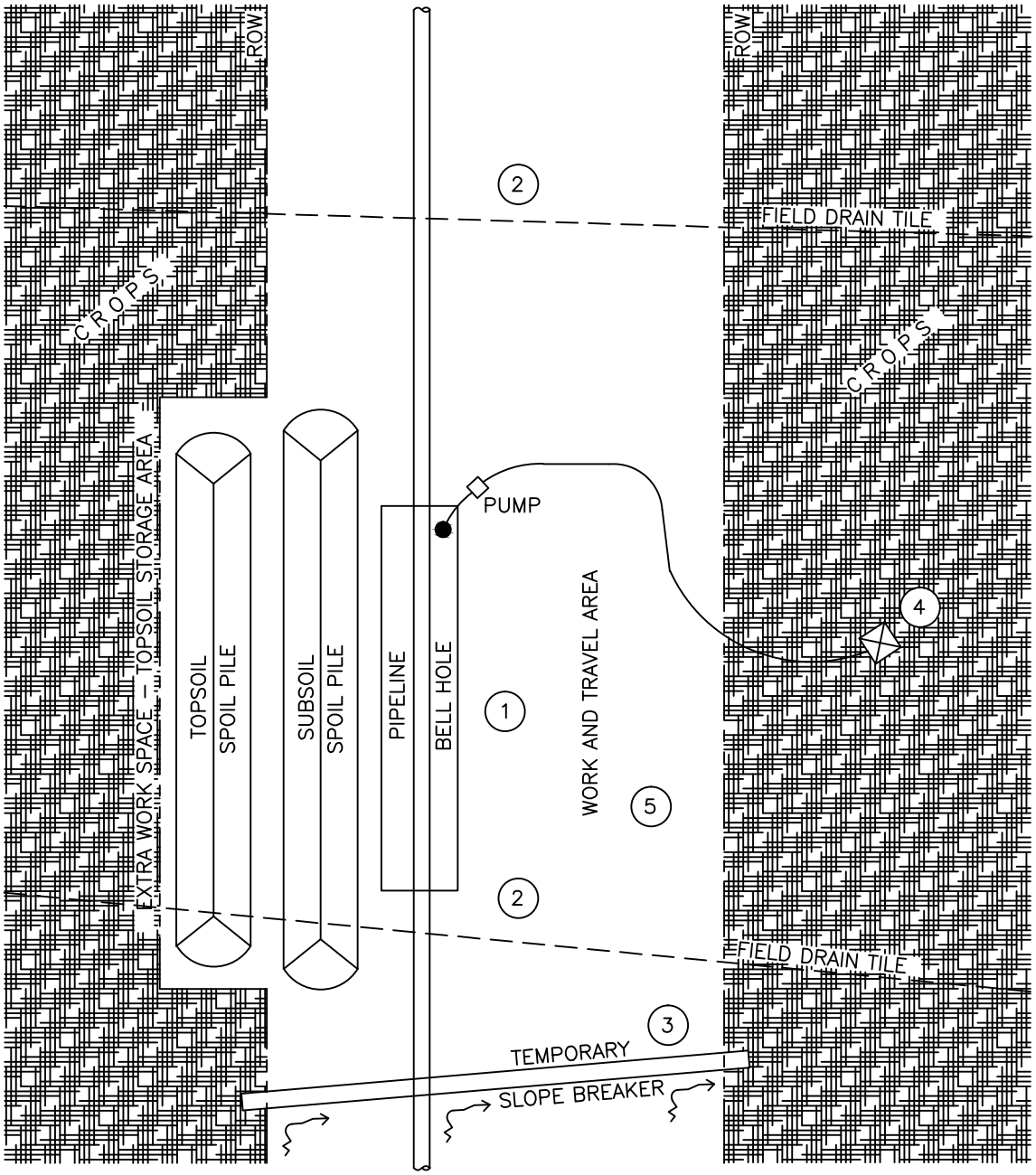
Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
BELL HOLE NEXT TO WETLAND

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

FIG. NO. 60

Sheet: 60 of 127
Type:



(1) FULL RIGHT OF WAY TOPSOIL SEGREGATION

(2) DRAIN TILE, REPAIR AS REQUIRED.

(3) (IF NEEDED) TEMPORARY SLOPE BREAKER

(4) BELL HOLE DEWATERING OUTLET, SEE TRENCH DEWATERING DETAILS FOR PROPER METHODOLOGY

(5) SOIL COMPACTION MITIGATION, SEE DECOMPACTION PLAN FOR PROPER PROCEDURE

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

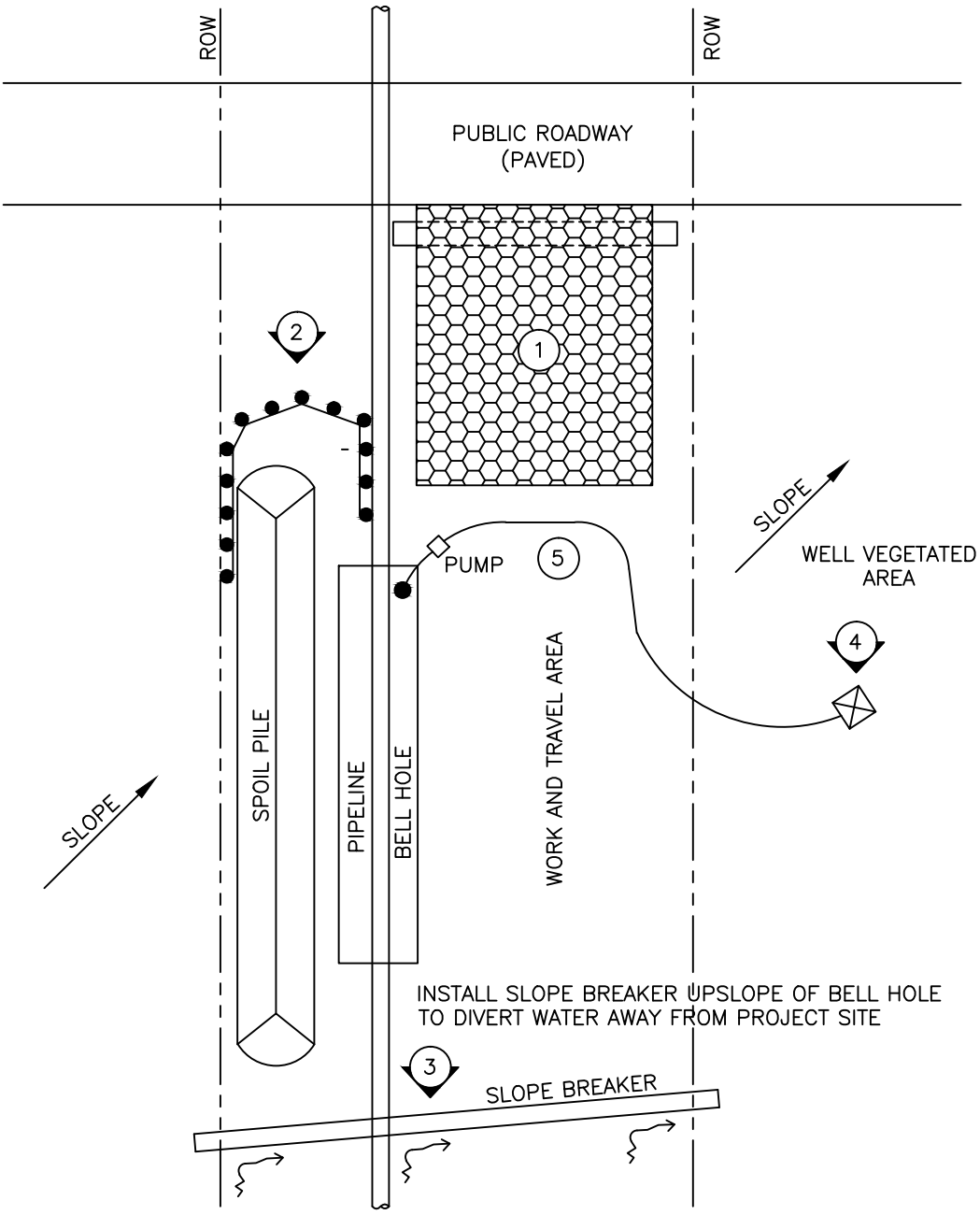
TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
BELL HOLE NEXT TO
AGRICULTURAL FIELD

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

FIG. NO. 61

Sheet: 61 of 127

Type:



1. CONSTRUCTION ENTRANCE
2. SEDIMENT BARRIER
3. SLOPE BREAKER
4. BELL HOLE DEWATERING OUTLET, SEE TRENCH DEWATERING DETAILS FOR PROPER METHODOLOGY
5. LIME, FERTILIZE, SEED AND MULCH ALL DISTURBED AREAS IMMEDIATELY AFTER BACKFILLING

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

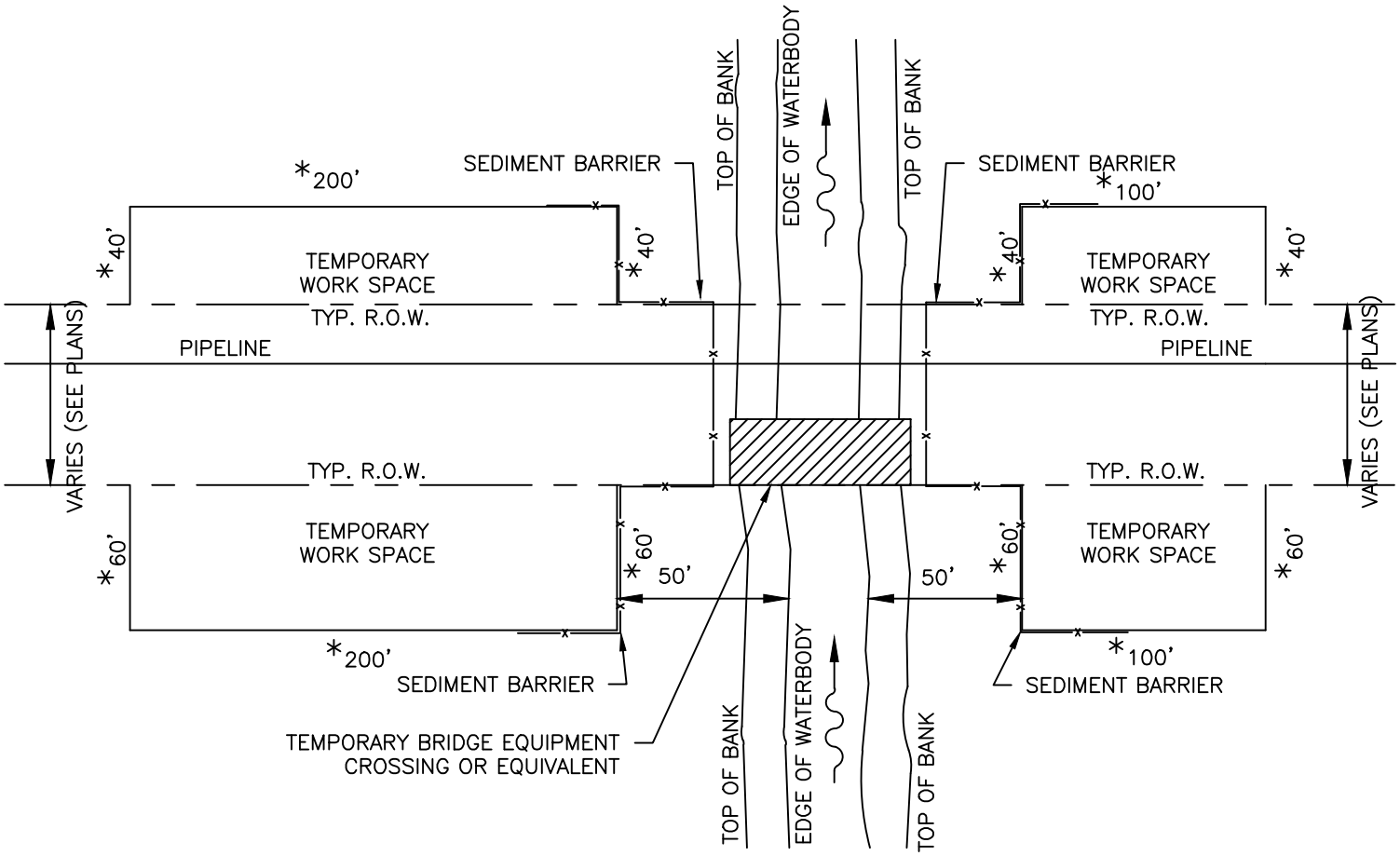
Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
BELL HOLE NEXT TO
PUBLIC ROADWAY

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

FIG. NO. 62

Sheet: 62 of 127
Type:



* FOOTAGES SHOWN ARE FOR EXAMPLE PURPOSES ONLY. ACTUAL EXTRA WORK SPACE AREAS WILL VARY DEPENDING ON INDIVIDUAL PROJECTS.

NOTES:

1) ALL EXTRA WORK SPACES SHALL BE LOCATED AT LEAST 50 FEET FROM THE WATERS EDGE, EXCEPT WHERE THE ADJACENT UPLAND CONSISTS OF ACTIVELY CULTIVATED OR ROTATED CROPLAND OR OTHER DISTURBED LAND.
2) THE CONSTRUCTION ROW SHALL BE LIMITED TO 75 FT WIDE WITHIN 50 FT FROM THE WATERS EDGE UNLESS APPROVED OTHERWISE ON THE CERTIFICATE.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
TYPICAL EXTRA WORK SPACES AT WATERBODY CROSSINGS

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

FIG. NO. 63

Sheet: 63 of 127
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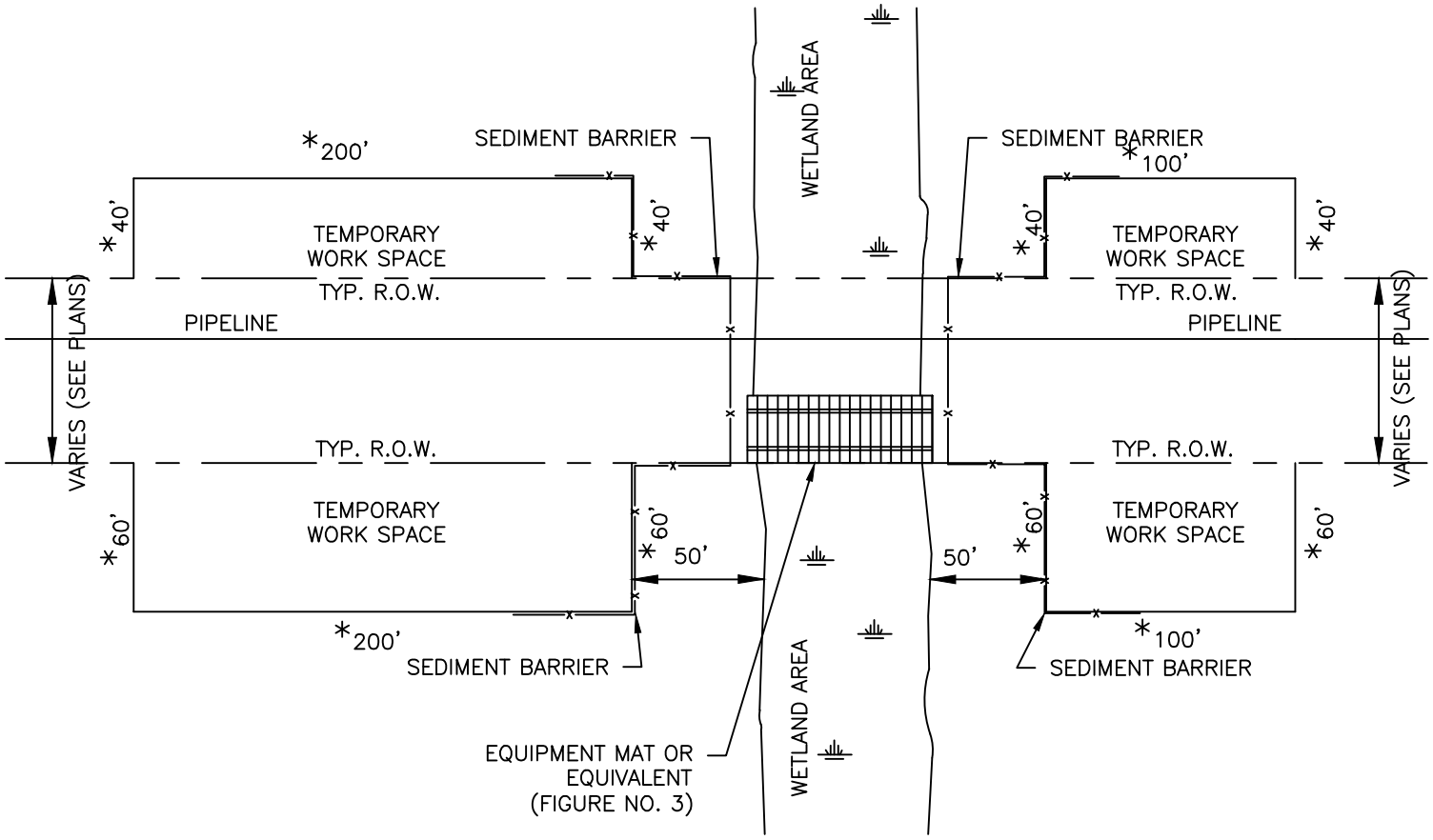

* FOOTAGES SHOWN ARE FOR EXAMPLE PURPOSES ONLY. ACTUAL EXTRA WORK SPACE AREAS WILL VARY DEPENDING ON INDIVIDUAL PROJECTS.

NOTES:
1) ALL EXTRA WORK SPACES SHALL BE LOCATED AT LEAST 50 FEET FROM THE EDGE OF WETLAND, EXCEPT WHERE THE ADJACENT UPLAND CONSISTS OF ACTIVELY CULTIVATED OR ROTATED CROPLAND OR OTHER DISTURBED LAND.
2) THE CONSTRUCTION ROW SHALL BE LIMITED TO 75 FT WIDE WITHIN 50 FT FROM THE EDGE OF WETLANDS UNLESS APPROVED OTHERWISE ON THE CERTIFICATE.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
TYPICAL EXTRA WORK SPACES AT WETLAND CROSSINGS

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

FIG. NO. 64

Sheet: 64 of 127
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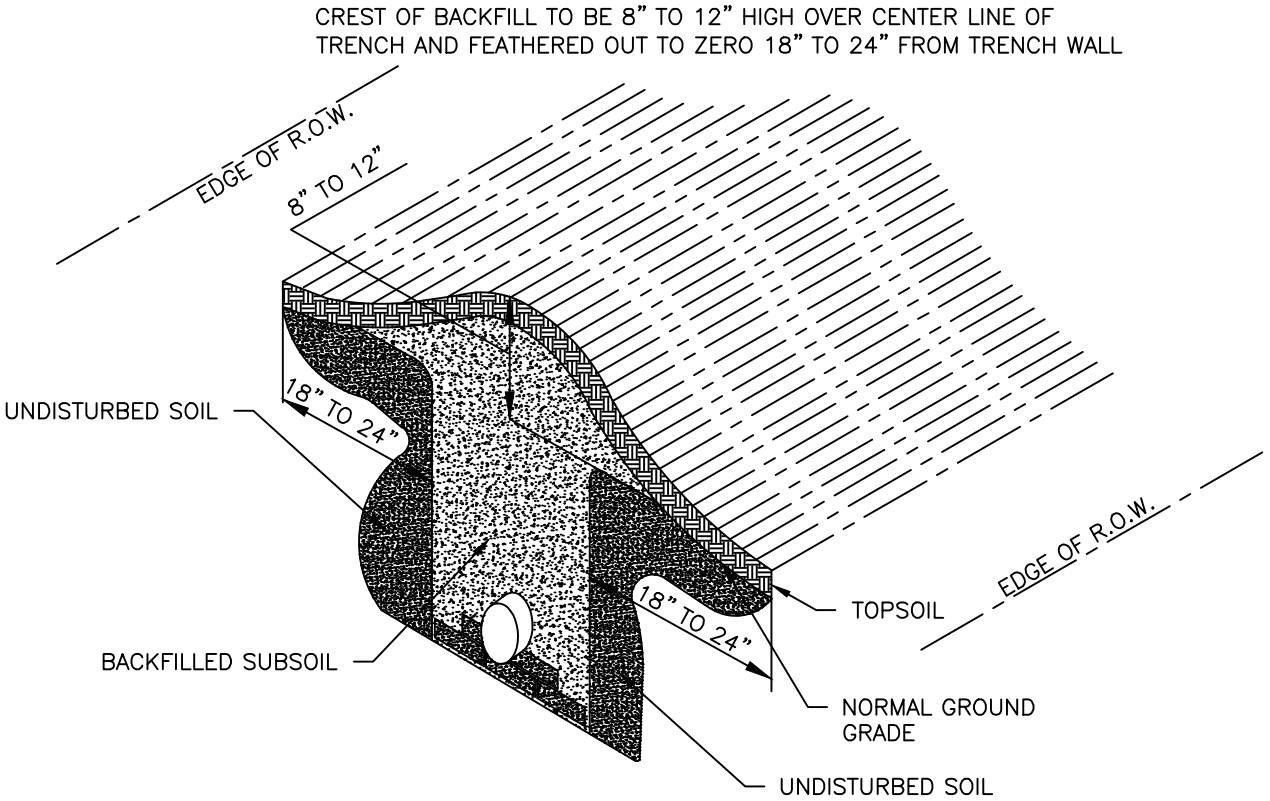
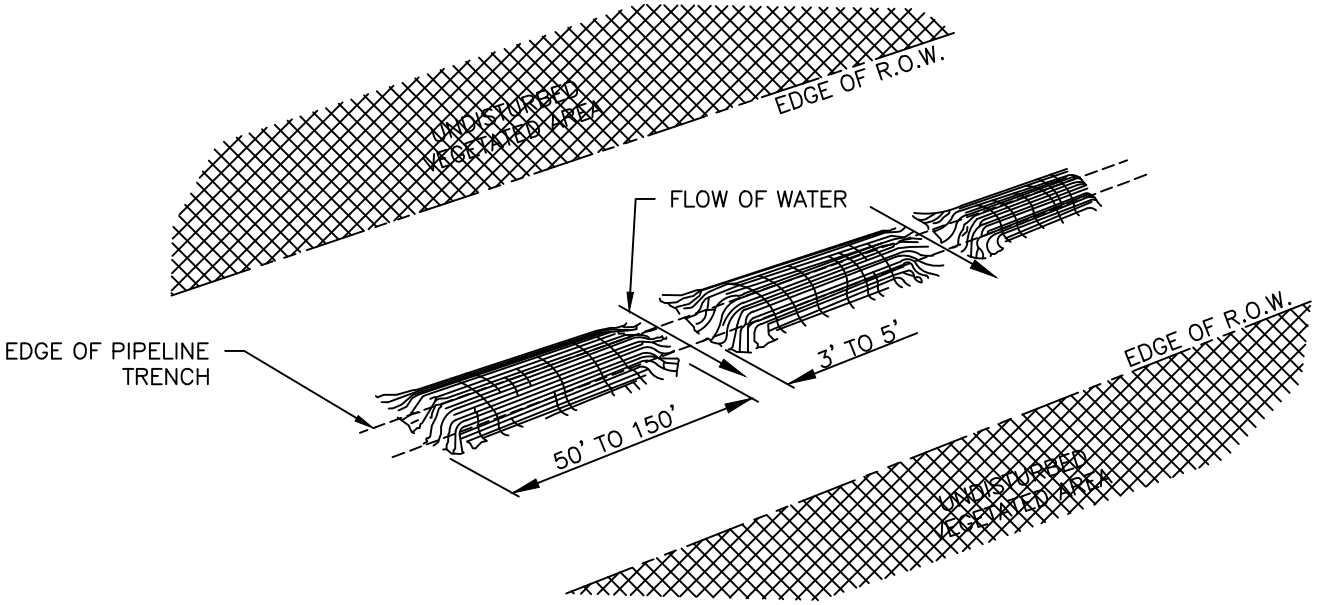


ISOMETRIC SECTION

N.T.S.



ISOMETRIC VIEW

N.T.S.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:		Op. Area:	
St.:		Co./Par.:	
Section:	Township:	Range:	
Dft:	Date:	Project ID:	
Chk:	Date:	Scale:	
Appr:	Date:	Filename:	

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
RIGHT–OF–WAY CROWNING

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

FIG. NO. 65

Sheet: 65 of 127
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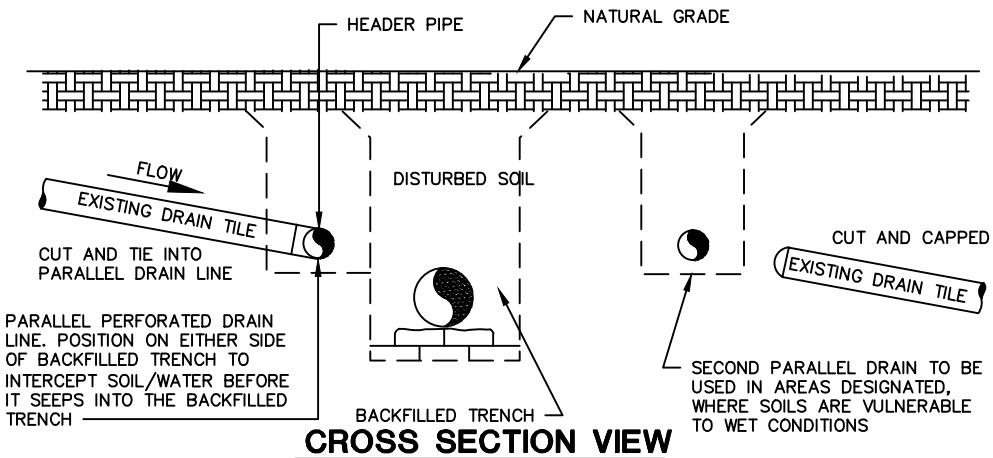
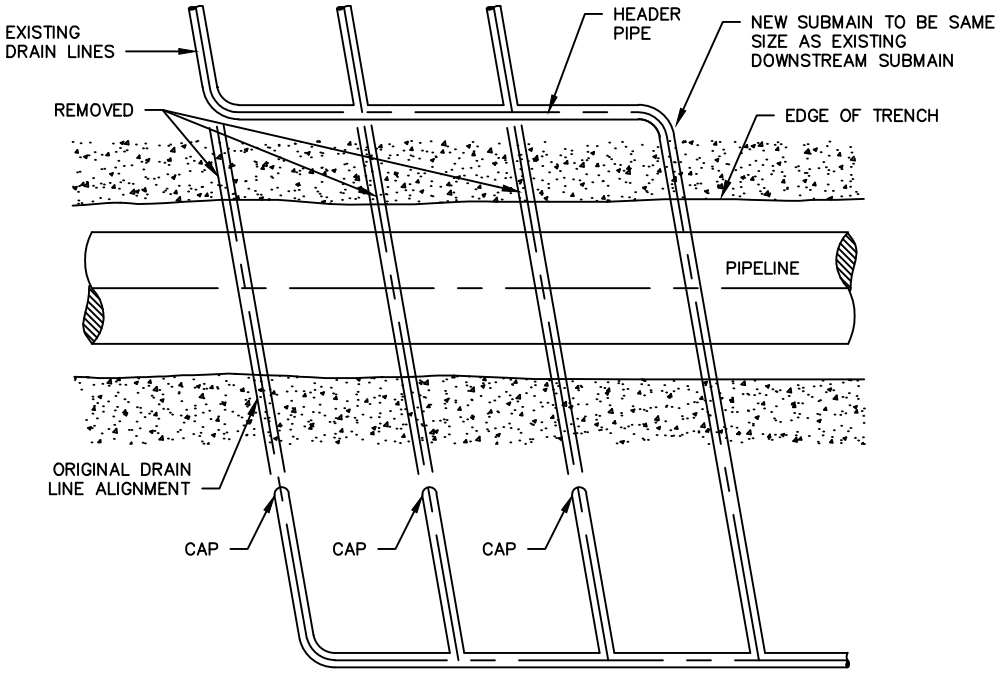


CROSS SECTION VIEW

N.T.S.

NOTE:
1. PARALLEL DRAINAGE TILE INSTALLATION TO BE APPROVED FOR SITE SPECIFIC AGRICULTURAL SOILS WHERE REPAIR OF EXISTING CROSS TILES WOULD BE LESS EFFECTIVE FOR EXAMPLE:
   A. SHALLOW BEDROCK.
   B. INTERFERENCE BY OTHER UTILITY LINES.
   C. HEADER TO CLOSELY SPACED, SHALLOW TILES AND FRENCH DRAINS.



PLAN VIEW TILE SYSTEM WITH NEW SUBMAIN

N.T.S.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
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Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
PARALLEL / NEW SUBMAIN
TILE INSTALLATION

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

FIG. NO. 66

Sheet: 66 of 127
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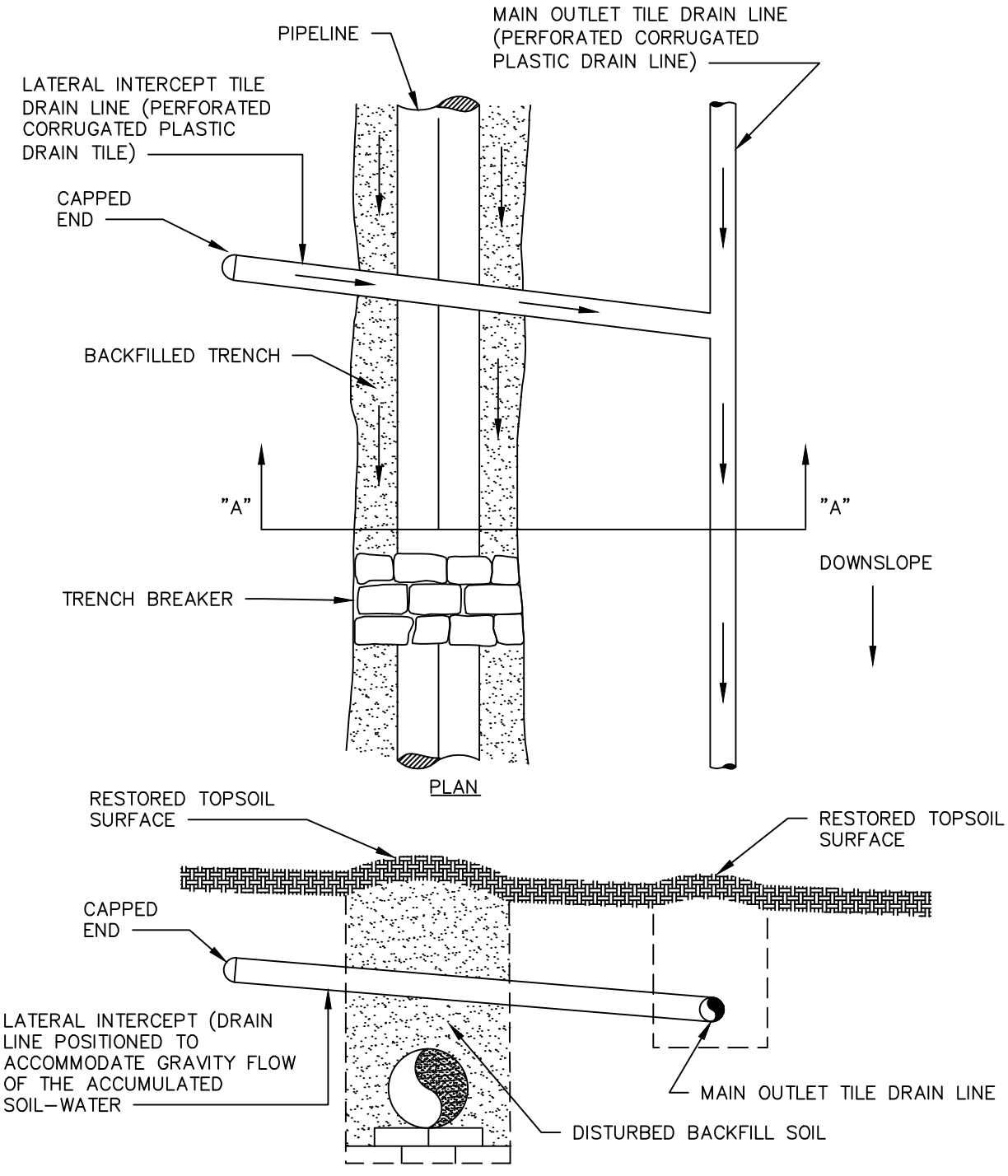

NOTES:
1. TRENCH BREAKERS PREVENT GULLY EROSION WHILE THE TRENCH IS OPEN AND HELP INHIBIT WATER PIPING AND WATER BLOWOUTS DOWN THE COURSE OF THE PIPELINE AFTER BACKFILLING.
2. INTERCEPT DRAIN LINES ABSORB THE WATER WHICH DRAIN NATURALLY FROM THE UNDISTURBED SOIL PROFILE INTO THE DISTURBED BACKFILL SOIL MATERIAL OF THE TRENCH. THE INTERCEPT DRAIN LINES HELP PREVENT SATURATED SOIL CONDITIONS.
3. AGRICULTUTRAL CROPLAND MAY REQUIRE CROSS TRENCH DRAINAGE OR PARALLEL DRAINAGE.
4. ALL DRAIN TILE REPAIRS CONSISTING OF PLASTIC PIPE SHALL CONFORM TO THE AASHTO M.252 SPECIFICATION.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
LATERAL INTERCEPT DRAIN

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

FIG. NO. 67

Sheet: 67 of 127
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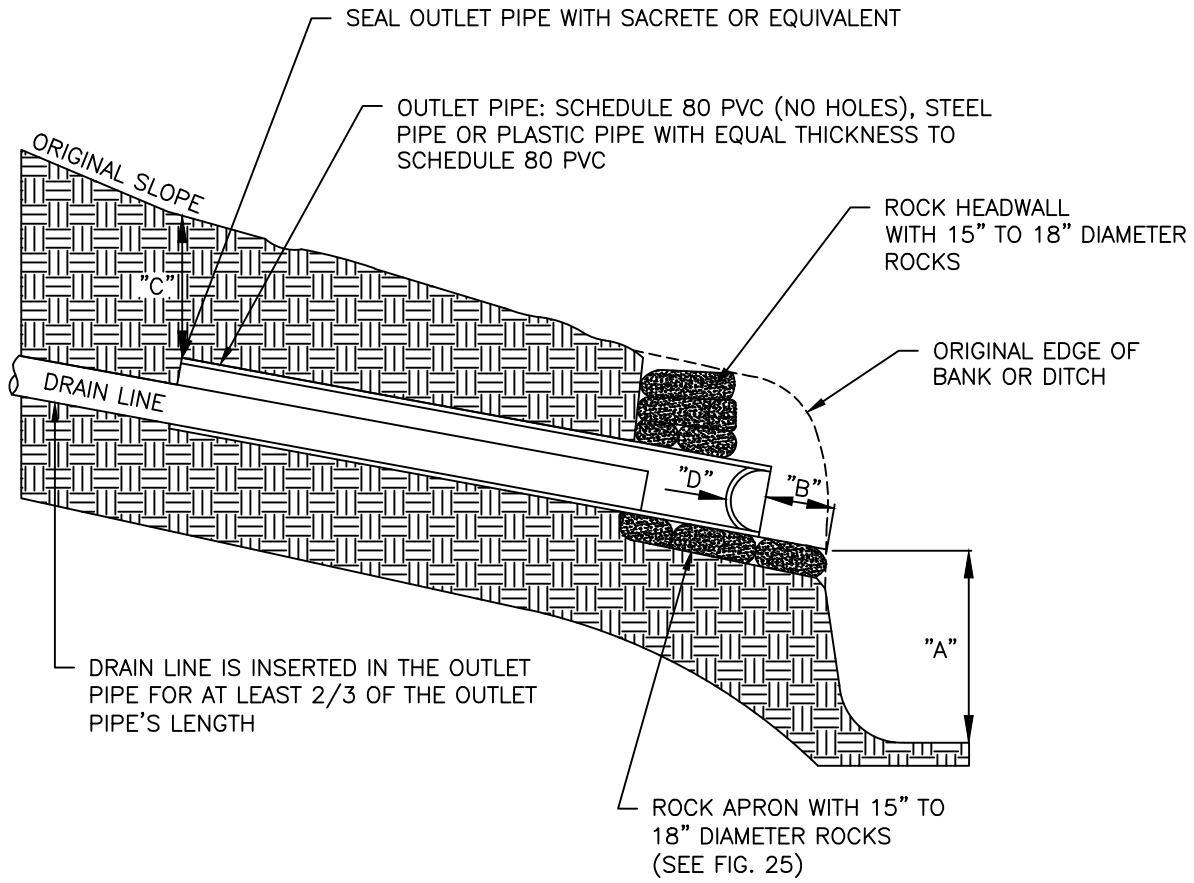

"A" – THE FREE DROP OR OUTFALL DISTANCE OF THE DRAINAGE WATER TO ITS UNRESTRICTED (FREE) DAYLIGHT OUTLET. GUIDELINE IS 2 FEET BUT NOT LESS THAN 1 FOOT WITHOUT SPECIAL DESIGN APPROVAL.

"B" – THE RECESS BACK FROM THE EDGE OF THE BANK OR DITCH OR OTHER POINT OF DAYLIGHT. GUIDELINE IS 2 FEET RECESSED BACK TO AVOID FUTURE DAMAGE.

"C" – THE MINIMUM DEPTH OF COVER OVER THE DRAIN LINE AT WHICH THE OUTLET PIPE MUST BEGIN. THE MINIMUM IS 2 FEET.

"D" – AN INTERNALLY HINGED ANIMAL (RODENT) GUARD. BOLTED FROM THE OUTSIDE. MOUNT THE GUARD 4"–6" BACK INSIDE THE OUTLET PIPE.

NOTE:
ALL DRAIN TILE REPAIRS CONSISTING OF PLASTIC PIPE SHALL CONFORM TO THE AASHTO M.252 SPECIFICATION.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
TYPICAL DRAIN TILE OUTLET

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

FIG. NO. 68

Sheet: 68 of 127
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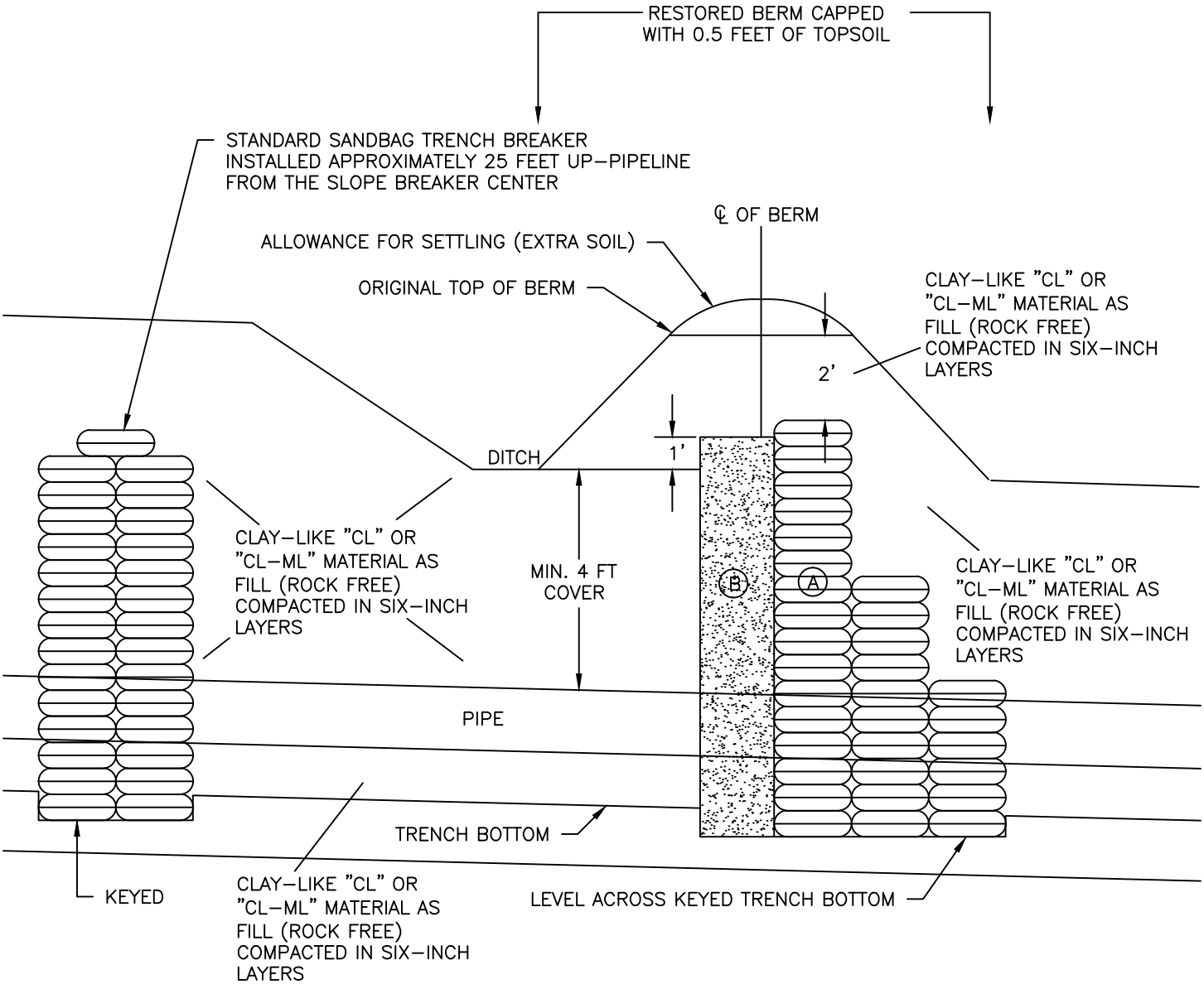

NOTES:

1. ALL CLAY–LIKE "CL" OR "CL–ML" MATERIAL USED FOR SLOPE BREAKER RE–ENGINEERED REPAIR / RECONSTRUCTION WILL BE VERIFIED BY THE INSPECTOR TO ENSURE THE MATERIAL IS ROCK–FREE (NO STONES / ROCKS LARGER THAN 3–4 INCHES IN DIAMETER), AND DOES NOT CONTAIN ANY TOPSOIL NOR OTHER ORGANIC MATERIALS (E.G. CLUMPS OF SOD, TREE AND BRUSH ROOTS). THE CLAY–LIKE "CL" OR "CL–ML" MATERIAL SHALL BE COMPACTED AT ALL AREAS IN SIX–INCH LIFTS WHEN THE MATERIAL IS MOIST, NOT WET NOR DRY. THE MAJORITY OF COMPACTION SHALL BE ACHIEVED INSIDE THE TRENCH ZONE WITH A VIBRATORY JUMPER COMPACTION, AND MAY INCLUDE FINAL SURFACE COMPACTION OF BERM WITH A SHEEPSFOOT ROLLER.

A. THE SANDBAG TRENCH BREAKER SHALL BE SNUGLY EMPLACED WITH 3 BAGS ACROSS THE BOTTOM WIDTH AS WELL AS AROUND THE PIPE AND OTHER LOWER LAYERS TO MID–LEVEL, 2 BAGS WIDTH ABOVE MID–LEVEL, AND 1 BAG WIDTH ACROSS UPPER SECTION.

B. CONCRETE–GRADE SAND APPLIED IN SIX–INCH LIFTS, EACH LIFT COMPACTED WITH A VIBRATORY JUMPER–COMPACTION (E.G. WACKER WITH AN 8" X 10" COMPACTOR PAD). MINIMUM WIDTH OF THE SAND COLUMN IS TWO (2) FEET ACROSS FOR ENTIRE HEIGHT (BOTTOM TO TOP). THE SAND MATERIAL SHOULD BE COMPACTED WHEN MOIST BUT NOT WHEN DRY NOR WET.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
SLOPE BREAKER (WATERBAR)
REPAIR (1)

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

FIG. NO. 69

Sheet: 69 of 127
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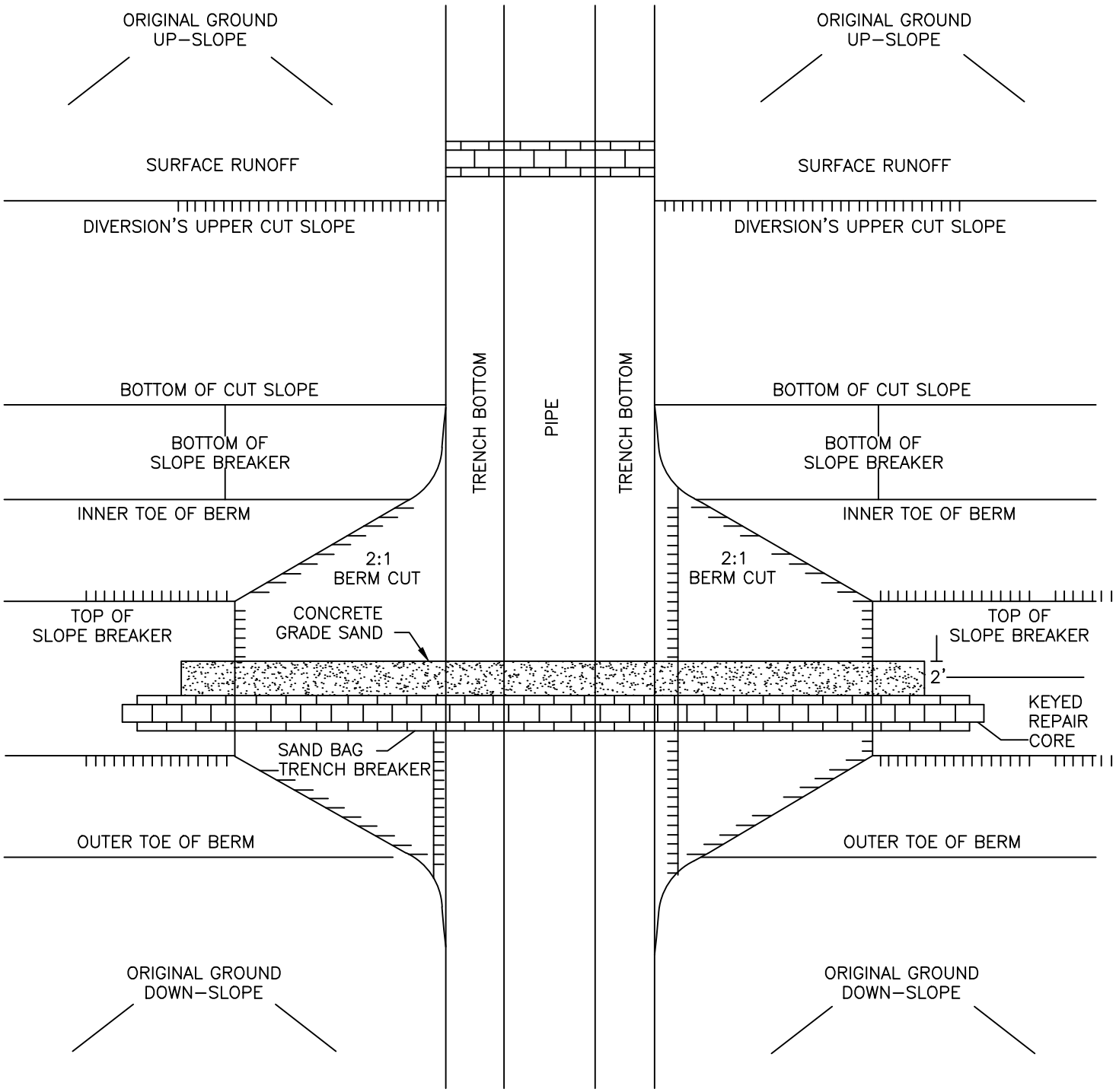

NOTES:

1. KEYED–BACK CORE REPAIR ORIGINAL BERM TEN FEET NOMINAL BEYOND THE 2:1 BERM CUT

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
SLOPE BREAKER (WATERBAR)
REPAIR (2)

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

FIG. NO. 70

Sheet: 70 of 127
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Sep 17, 2014 – 11:30AM

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

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TENNESSE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
SLOPE BREAKER
(WATERBAR) PROTECTION

FIG. NO. 71

Sheet: 71 of 127
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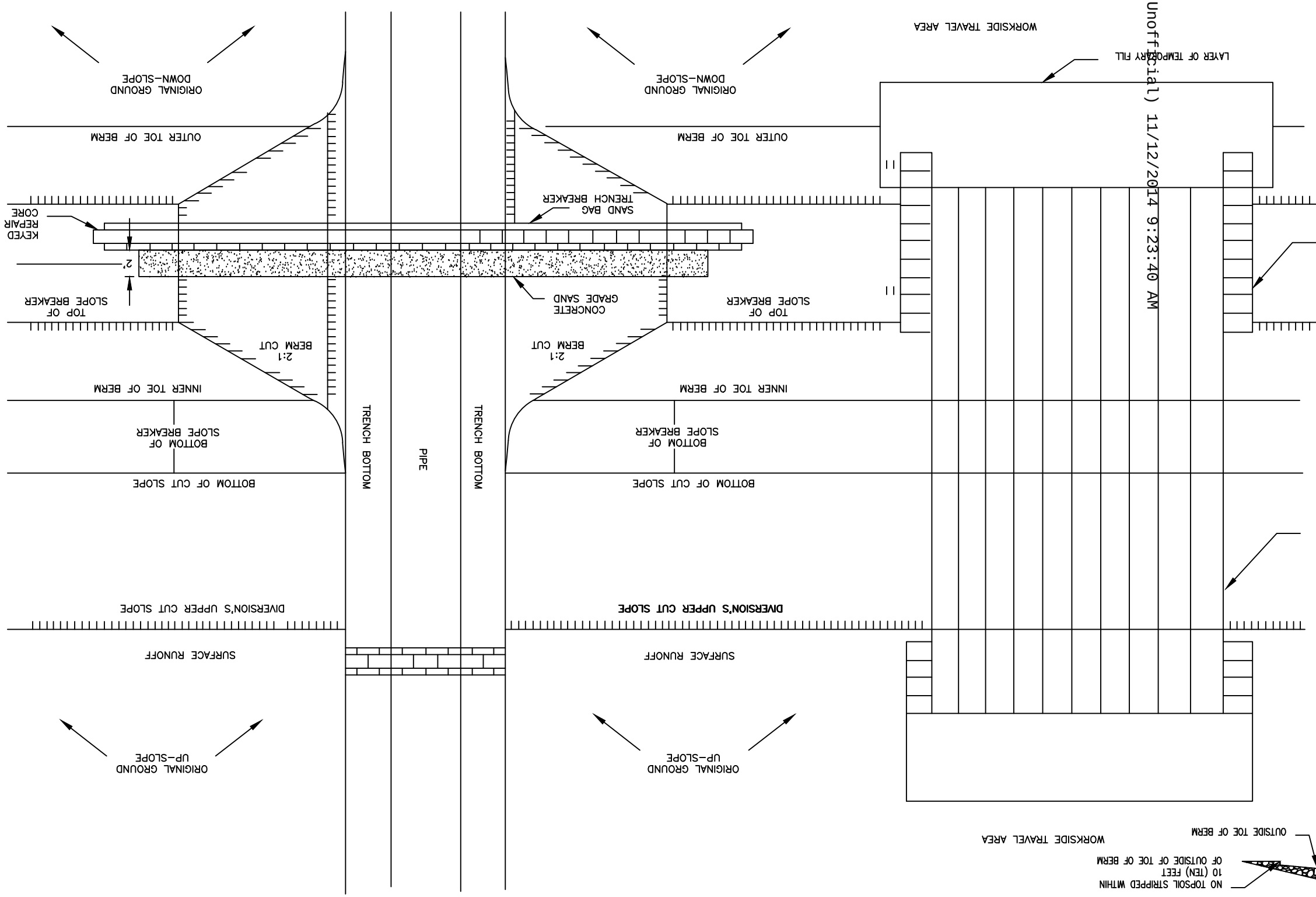
Tennessee Gas Pipeline Company, L.L.C.
a Kinder Morgan company

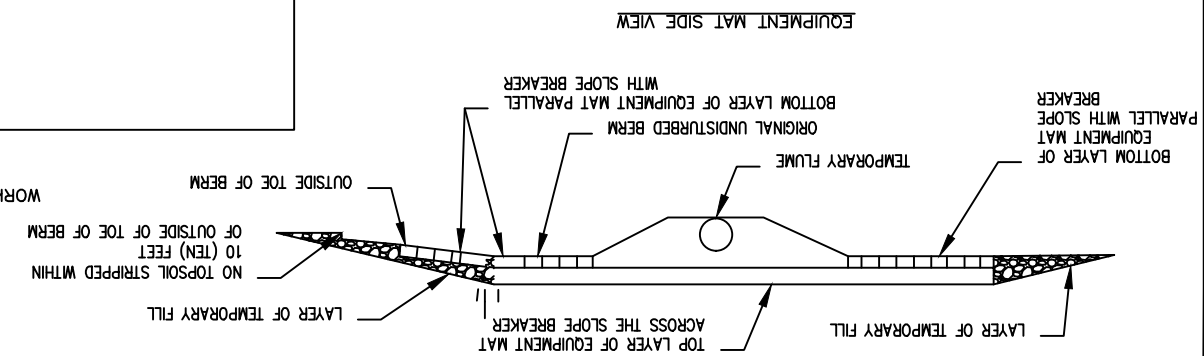
NOTES:

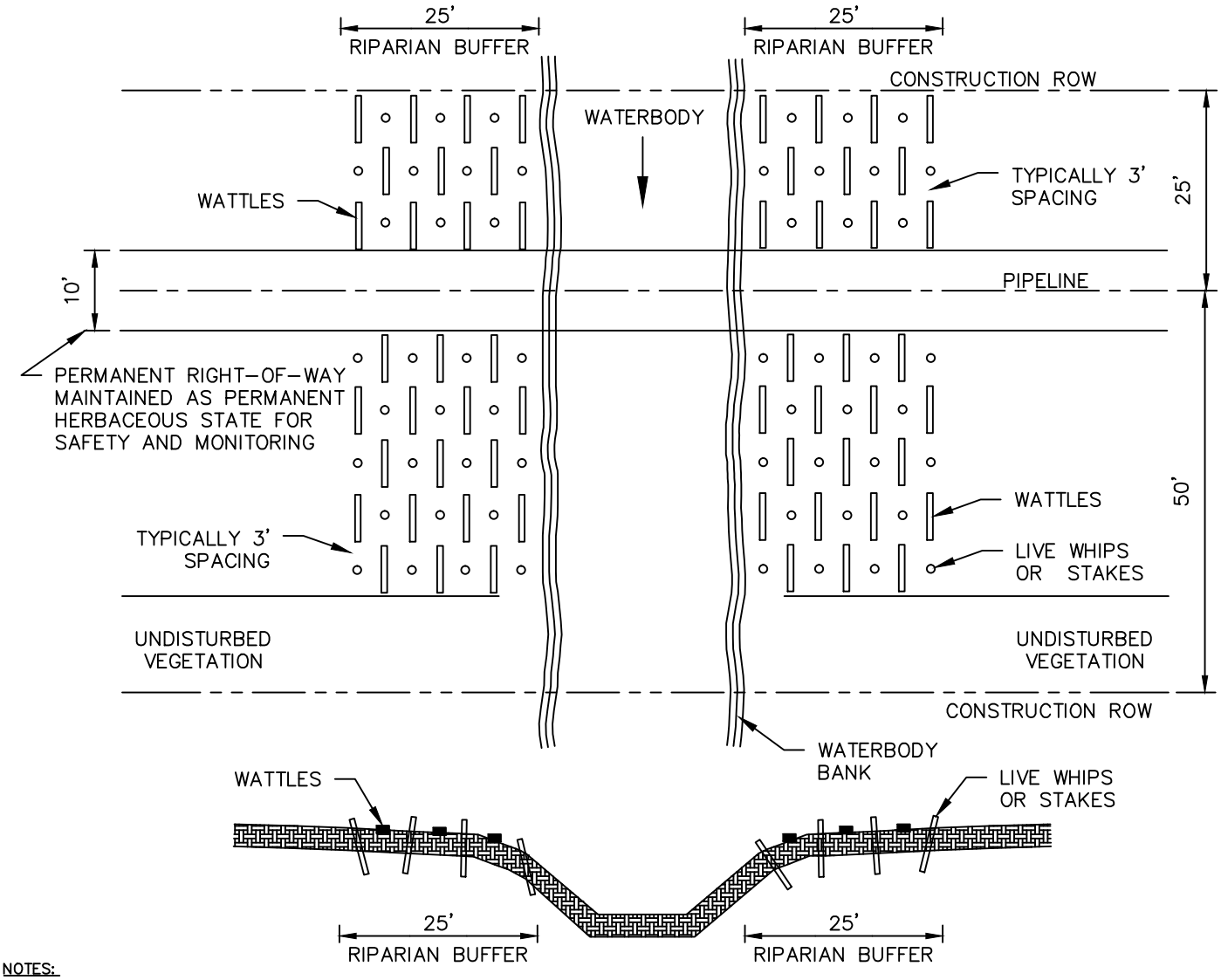
1. THE ONLY PORTION OF DIVERSION TO BE DISTURBED IS THE PIPELINE TRENCH AND THE 2:1 BERM CUT, DURING CONSTRUCTION; AND THE BERM'S KEYED-IN REPAIR CORE DURING THE RECONSTRUCTION OF THE SLOPE BREAKER.
2. ALL OTHER ORIGINAL FEATURES OF THE DIVERSION TERRACE ARE PROTECTED THROUGHOUT THE RIGHT OF WAYS CONSTRUCTION AND RESTORATION STAGES OF WORK AND ACCESS BY TEMPORARY FILL LAYERS AND TIMBER BRIDGING.
3. A TEMPORARY FLUME WILL BE MAINTAINED UNTIL THE SLOPE BREAKER IS FULLY RECONSTRUCTED.
4. FILTER FENCE WILL BE INSTALLED AT THE UPSLOPE AND DOWNSLOPE SIDES OF THE SLOPE BREAKERS (AT THE LIMITS OF THE TOPSOIL STRIPPING) TO LIMIT ACCESS AND DISTURBANCE.

EQUIPMENT MAT TOP VIEW



EQUIPMENT MAT SIDE VIEW





NOTES:

1. RESTORATION OF THE ROW SHALL INCLUDE PLANTING 25-FOOT RIPARIAN BUFFERS ALONG WATERBODIES WITH NATIVE PLANT SPECIES. RESTORATION OF CROSSINGS OF STATE DESIGNATED FISHERY WATERBODIES SHALL INCLUDE PLANTINGS OF NATIVE WOODY SPECIES TO RESTORE THE STREAM-SHADING CONDITIONS WITHIN A 25-FOOT RIPARIAN BUFFER.

2. SPACING OF WATTLE AND LIVE WHIP PLANTINGS ASSUMED TO BE APPROXIMATELY 3' IN A TRIANGLE PATTERN BASED ON NURSERY GUIDANCE AND VENDOR RECOMMENDATIONS. SPACING TO BE MODIFIED AS NEEDED BASED ON EACH SPECIFIC LOCATION CONDITION.

3. PLANTINGS SHALL BE PLACED WITHIN THE 25-FOOT RIPARIAN BUFFER AND OUTSIDE OF THE 10-FOOT MAINTAINED PERMANENT RIGHT-OF-WAY AS NEEDED. RIPARIAN BUFFER RESTORATION PLANTINGS SHALL NOT CONFLICT WITH EXISTING LAND USE OUTSIDE OF THE RIGHT-OF-WAY (E.G., AGRICULTURAL FIELDS).

4. PLANTINGS TO RESTORE THE STREAM-SHADING CONDITIONS SHALL INCLUDE NATIVE WOODY SPECIES, SUCH AS WILLOW (SALIX SPECIES) AND DOGWOOD (CORNUS SPECIES).

5. LIVE WHIPS ARE SLENDER, LIVE WOODY MATERIAL. THEY ARE GENERALLY 3/8"-1" DIAMETER. THEY ARE PUSHED INTO THE GROUND AS FAR AS THEY WILL GO, WITH AT LEAST TWO-THIRDS OF THE WHIP COVERED WITH SOIL. THEY CAN BE INSTALLED EITHER LAYING ON AN ANGLE OR ERECT IN THE SOIL. LIVE STAKES SHALL BE 1"-2" IN DIAMETER AND 2'-6' LONG DEPENDING ON THE APPLICATION. A MINIMUM OF 2"-4" OF LIVE STAKE SHALL BE EXPOSED AND SHALL INCLUDE TWO LIVE BUDS.

6. WATTLES ARE LIVING BRANCHES BOUND TOGETHER IN LONG, TUBULAR BUNDLES. THEY ARE PLACED IN SHALLOW TRENCHES ACROSS THE SLOPE AND SECURED WITH LIVE OR DEAD STAKES AT 2' OR 3' INTERVALS.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
STREAM PLANTINGS

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

FIG. NO. 72

Sheet: 72 of 127
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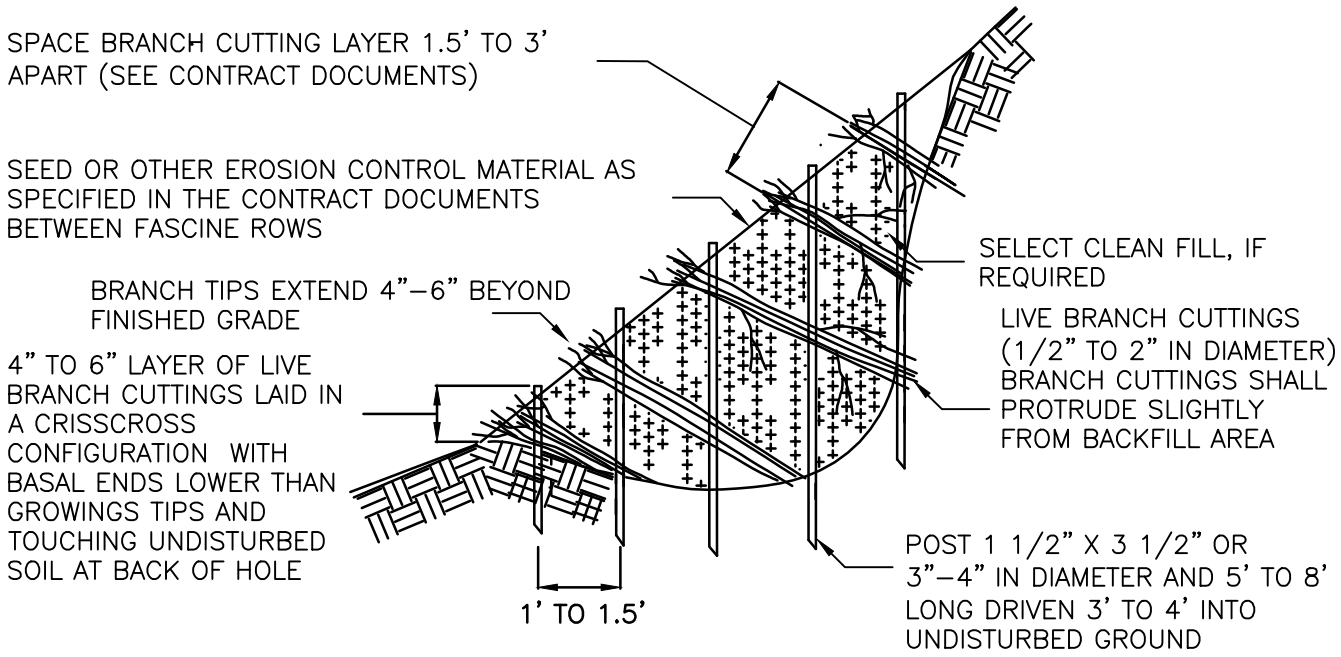

CROSS SECTION – NOT TO SCALE

CONSTRUCTION SPECIFICATIONS

1. STARTING AT THE LOWEST POINT DRIVE THE WOODEN POSTS VERTICALLY 3' TO 4' INTO THE GROUND. SET THEM 1' TO 1.5' APART.
2. A LAYER OF LIVING BRANCHES 4" TO 6" THICK IS PLACED IN THE BOTTOM OF THE HOLE, BETWEEN THE VERTICAL POSTS. THEY SHALL BE PLACED IN A CRISSCROSS CONFIGURATION WITH THE GROWING TIPS GENERALLY ORIENTED TOWARD THE SLOPE FACE. SOME OF THE BASAL ENDS OF THE BRANCHES FROM EACH LAYER SHALL TOUCH THE BACK OF THE HOLE OR SLOPE.
3. EACH LAYER OF BRANCHES SHALL BE INSTALLED WITH THE BASAL ENDS LOWER THAN THE GROWING TIPS OF THE BRANCHES.
4. THE FINAL INSTALLATION SHALL MATCH THE EXISTING SLOPE. BRANCHES SHOULD PROTRUDE ONLY SLIGHTLY FROM THE FILLED FACE.
5. EACH LAYER OF BRANCHES SHALL BE FOLLOWED BY A 1' LAYER OF SOIL HAND TAMPED TO ENSURE CONTACT WITH THE BRANCH CUTTINGS.
6. THE SOIL SHALL BE MOIST OR MOISTENED TO ENSURE THAT LIVE BRANCHES DO NOT DRY OUT.
7. WHERE SPECIFIED, LIVE STAKES SHALL BE USED IN PLACE OF POSTS.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
BRANCH PACKING

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

FIG. NO. 73

Sheet: 73 of 127
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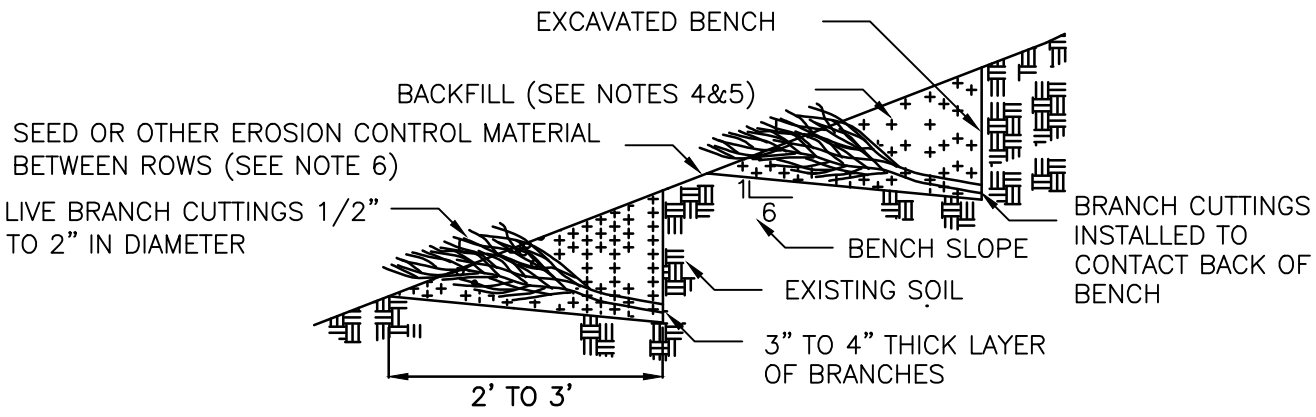
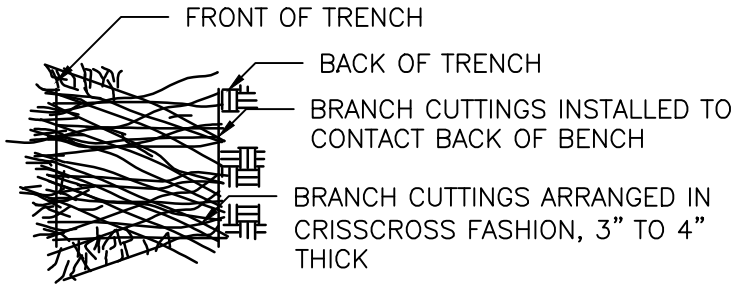


CROSS SECTION OF BRUSHLAYER ON CUT SLOPE
NOT TO SCALE



PLAN VIEW
NOT TO SCALE

CONSTRUCTION SPECIFICATIONS

1. BENCH SHALL BE ANGLED SO OUTSIDE EDGE IS HIGHER THAN BACK OF BENCH.
2. LIVE BRANCH CUTTINGS SHALL BE PLACED ON THE BENCH IN A CRISSCROSS OR OVERLAP CONFIGURATION, 3" TO 4" THICK.
3. GROWING TIPS SHALL BE ALIGNED OUT OF THE SLOPE FACE AND SHALL EXTEND SLIGHTLY BEYOND THE FILL AREA.
4. FILL EACH LOWER BENCH WITH SOIL EXCAVATED FROM THE BENCH ABOVE. TOP BENCH TO BE BACKFILLED WITH INITIAL EXCAVATION.
5. PLACE BACKFILL ON TOP OF BRANCHES AND HAND TAMP IN 6" LIFTS TO REDUCE AIR POCKETS.
6. SEED OR OTHER EROSION CONTROL MATERIAL SHALL BE USED BETWEEN THE ROWS AS STATED IN THE CONTRACT DOCUMENTS.
7. BRUSHLAYER BENCHES SHALL BE FROM 3' TO 5' VERTICAL APART, DEPENDING ON SLOPE, AS SHOWN ON THE PLANS MEASURED BETWEEN FRONT EDGE OF BENCHES.
7. RECOMMENDED ON SLOPES IUP TO 2:1 IN STEEPNESS AND TWENTY FEET IN HEIGHT.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
BRUSH LAYER

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

FIG. NO. 74

Sheet: 74 of 127
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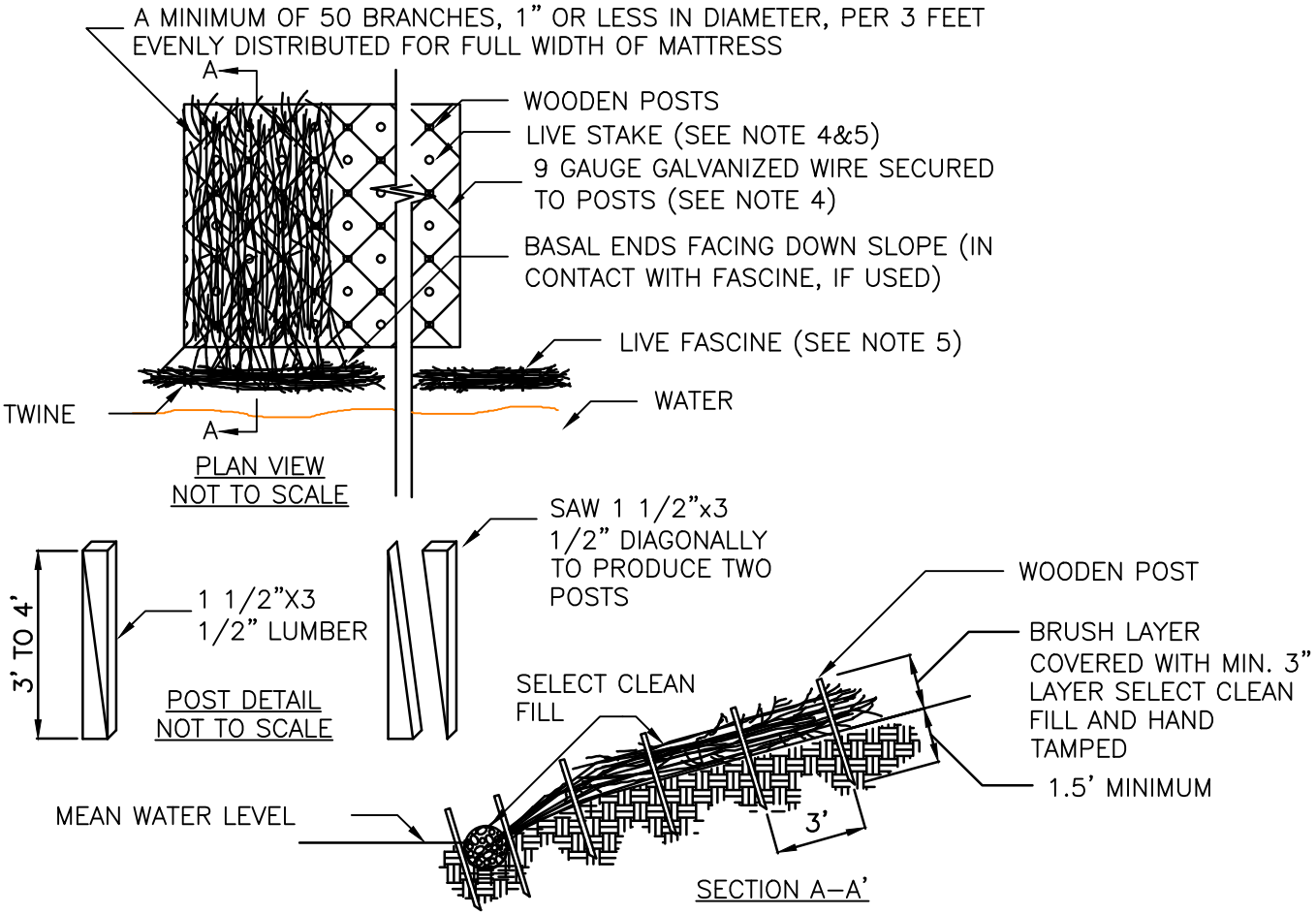

CONSTRUCTION SPECIFICATIONS

1. LAYERS SHALL BE COMPRISED OF LIVE QUICK–ROOTING SPECIES. SEE CONTRACT DOCUMENTS.
2. FILL MATTRESS WITH SOIL AND EVENLY DISTRIBUTE TO APPROXIMATELY 4" IN DEPTH AND HAND TAMP.
3. PLACE POSTS EVENLY OVER THE GRADED FACE USING 3' SQUARE SPACING. IF LIVE STAKES ARE SPECIFIED, ALTERNATE EVERY OTHER ON WITH THE POSTS.
4. STRETCH 9 GAUGE GALVANIZED WIRE DIAGONALLY FROM ONE POST TO ANOTHER BY TIGHTLY WRAPPING WIRE AROUND POSTS, NO CLOSER THAN 6" FROM THE TOP OF POST. WIRE SHALL NOT BE ATTACHED TO LIVE STAKES, IF THEY ARE SPECIFIED. POUND STAKES TO COMPRESS MATTRESS.
5. LIVE FASCINES AND LIVE STAKES ARE INSTALLED WHEN AND WHERE DIRECTED ON THE PLAN SHEET.
6. RECOMMENDED FOR STREAMBANKS WHERE VELOCITY IS <6 FT/SEC MAX SLOPE 1.5:1

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
BRUSH MATTRESS

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

FIG. NO. 75

Sheet: 75 of 127
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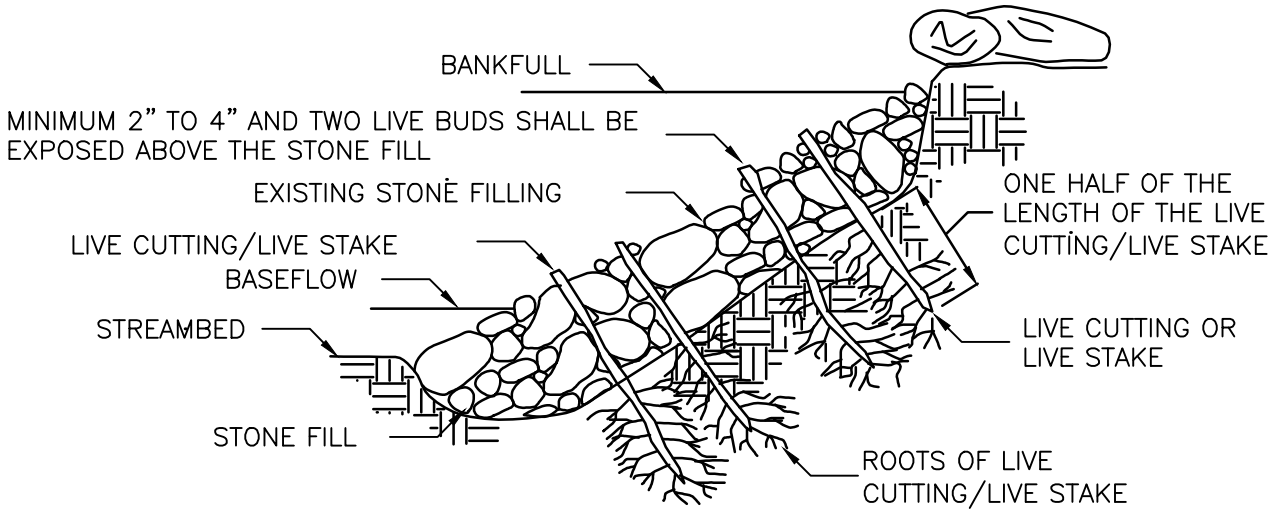
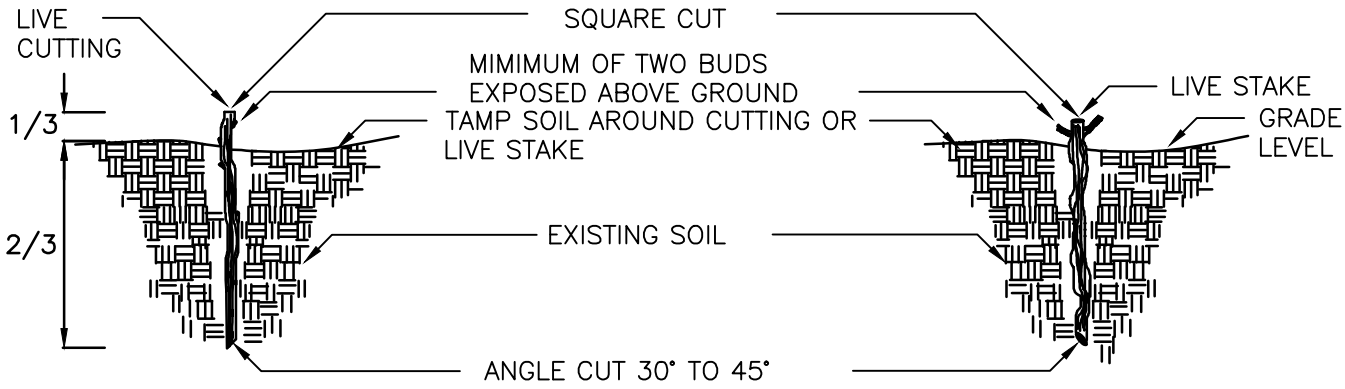


LIVE CUTTING/LIVE STAKE JOINT PLANTING CROSS SECTION



LIVE CUTTING CROSS SECTION
NOT TO SCALE

LIVE STAKE CROSS SECTION
NOT TO SCALE

NOTE:
1. NOT INTENDED FOR STRUCTURAL INTEGRITY NOR TO RESIST LARGE LATERAL EARTH PRESSURES.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
LIVE CUTTINGS LIVE STAKINGS
PLANTINGS

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

FIG. NO. 76

Sheet: 76 of 127
Type:

LIVE STAKES SPECIFICATIONS

1. CARE SHALL BE TAKEN NOT TO DAMAGE THE LIVE CUTTINGS/LIVE STAKES DURING INSTALLATION. THOSE DAMAGED SHALL BE LEFT IN PLACE AND SUPPLEMENTED WITH AN INTACT LIVE CUTTING/LIVE STAKE.
2. THE LENGTHS OF LIVE CUTTINGS/LIVE STAKES DEPENDS UPON THE APPLICATION. THE LENGTH SHALL EXTEND THROUGH THE SURFACE OF THE STONE FILL. AT LEAST HALF THE LENGTH SHALL BE INSERTED IN TO THE SOIL, BELOW THE STONE FILL.
3. A PILOT HOLE IS REQUIRED TO ENSURE THAT THE LIVE CUTTING/LIVE STAKE IS NOT DAMAGED WHEN DRIVEN THROUGH THE STONE FILLING. ACCESS SHALL BE MADE THROUGH THE USE OF A DIBBLE BAR, OR SIMILAR TOOL TO WORK AN OPENING THROUGH THE ROCK LAYER.
4. MINIMUM 2" TO 4" AND TWO LIVE BUDS OF THE LIVE CUTTING/LIVE STAKE SHALL BE EXPOSED ABOVE THE STONE FILLING.

LIVE CUTTINGS SPECIFICATIONS

1. LIVE CUTTINGS SHALL RANGE FROM 1/2" TO 1" IN DIAMETER AND BE FROM 1' TO 4' IN LENGTH.
2. LIVE STAKES SHALL RANGE FROM 1" TO 4" IN DIAMETER AND BE FROM 5' TO 6' IN LENGTH.
3. SEE CONTRACT DOCUMENTS FOR SPECIES, SIZE, SPACING, LOCATION, AND FINAL DETERMINATION ON USE OF CUTTINGS OR STAKES.
4. LIVE CUTTINGS/LIVE STAKES SHALL BE CUT TO A POINT ON THE BASAL END FOR INSERTION IN THE GROUND.
5. USE A DEAD BLOW HAMMER TO DRIVE STAKES INTO THE GROUND. (HAMMER HEAD FILLED WITH SHOT OR SAND.) A DIBBLE, IRON BAR, OR SIMILAR TOOL SHALL BE USED TO MAKE A PILOT HOLE TO PREVENT DAMAGING THE MATERIAL DURING INSTALLATION.
6. LIVE CUTTINGS SHALL BE INSERTED BY HAND INTO PILOT HOLES.
7. WHEN POSSIBLE, TAMP SOIL AROUND LIVE CUTTING/LIVE STAKES.
8. ANY LIVE CUTTING/LIVE STAKE THAT IS DAMAGED SHALL BE LEFT IN PLACE AND SUPPLEMENTED WITH AN INTACT LIVE CUTTING/LIVE STAKE.
9. NO LEAF BUDS SHALL HAVE INITIATED GROWTH BEYOND ¼" AND CAMBIUM LAYER SHALL BE MOIST, GREEN AND HEALTHY.

GENERAL SPECIFICATION

1. FREQUENT INSPECTION IS RECOMMENDED DURING FIRST 1–2 YEARS DUE TO PHYSICAL CONSTRAINTS, CLIMATE CONDITIONS AND ANIMAL POPULATION.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
LIVE CUTTINGS LIVE STAKINGS
PLANTINGS SPECFICACTIONS

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

FIG. NO. 77

Sheet: 77 of 127
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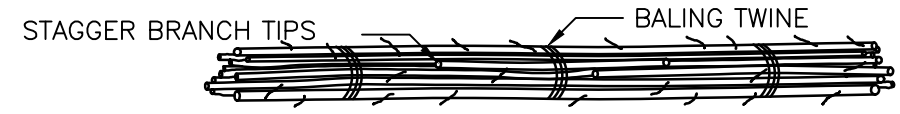
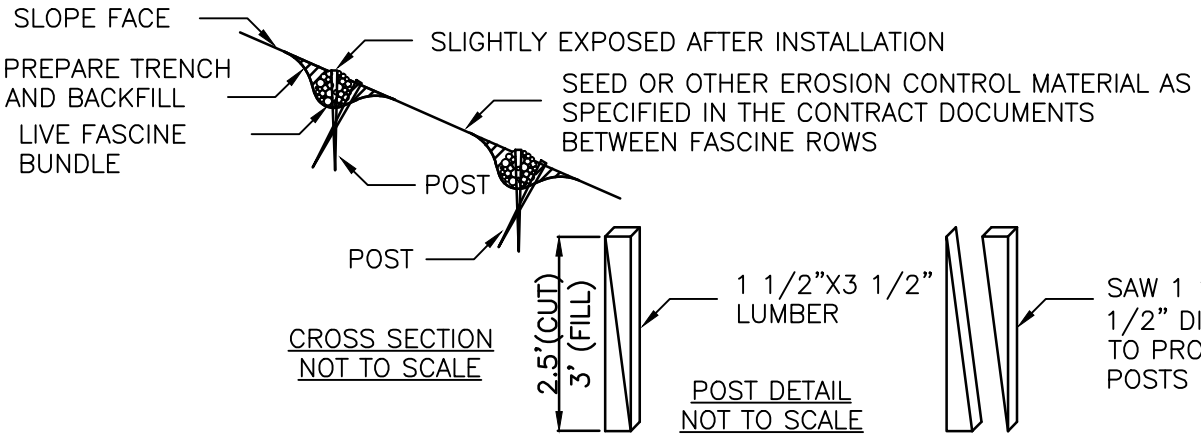


4" TO 8" DIAMETER AND MINIMUM LENGTH OF 8' REQUIRED

FASCINE BUNDLE DETAIL
NOT TO SCALE



CROSS SECTION
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POST DETAIL
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LIVE FACINE SPECIFICATIONS

1. LIVE FASCINES SHALL BE PREPARED FROM FRESHLY CUT DORMANT PLANTS AND INSTALLED WITHIN 8 HOURS OF THE TIME THE MATERIAL IS HARVESTED, UNLESS PROPERLY STORED.
2. LIVE FASCINE SHALL BE OBTAINED FROM SOURCES APPROVED BY THE ENGINEER.
3. LIVE FASCINES SHALL BE 4" TO 8" IN DIAMETER. LENGTHS MAY VARY TO SUIT CONDITIONS. A MINIMUM LENGTH OF 8' IS REQUIRED.
4. THE TIPS OF THE BRANCHES WITHIN THE LIVE FASCINE SHALL BE STAGGERED.
5. LIVE FASCINES SHALL BE PLACED AS INDICATED IN THE CONTRACT DOCUMENTS.
6. BEGINNING AT THE BASE OF THE SLOPE, A TRENCH SHALL BE DUG LARGE ENOUGH TO CONTAIN THE LIVE FASCINES. THE LIVE FASCINES SHALL BE PLACED IN THE TRENCH. WHERE ENDS MEET IN THE TRENCH, THE FASCINES SHALL OVERLAP BY 18".
7. WOOD POSTS SHALL BE INSTALLED FLUSH TO THE TOP OF THE FASCINE EVERY 18" ALONG THE LENGTH OF THE BUNDLES AS SHOWN ON THE CROSS SECTION. WHERE SPECIFIED LIVE STAKES MAY BE USED IN PLACE OF POSTS.
8. THE TRENCH SHALL BE BACKFILLED WITH MOIST SOIL AND HAND TAMPED. THE TOP OF THE FASCINE SHALL BE SLIGHTLY EXPOSED WHEN THE INSTALLATION IS COMPLETE AS SHOWN ON THE CROSS SECTION.
9. SEED OR OTHER EROSION CONTROL MATERIAL SHALL BE USED BETWEEN THE FASCINE ROWS, AS SPECIFIED IN THE CONTRACT DOCUMENTS.
10. LIVE FASCINE TRENCHES SHALL BE FROM 3' TO 8' APART, ACCORDING TO SLOPE AND/OR THE CONTRACT DOCUMENTS.
11. SLOPES MUST BE 1:1 OR FLATTER.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
LIVE FASCINE

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

FIG. NO. 78

Sheet: 78 of 127
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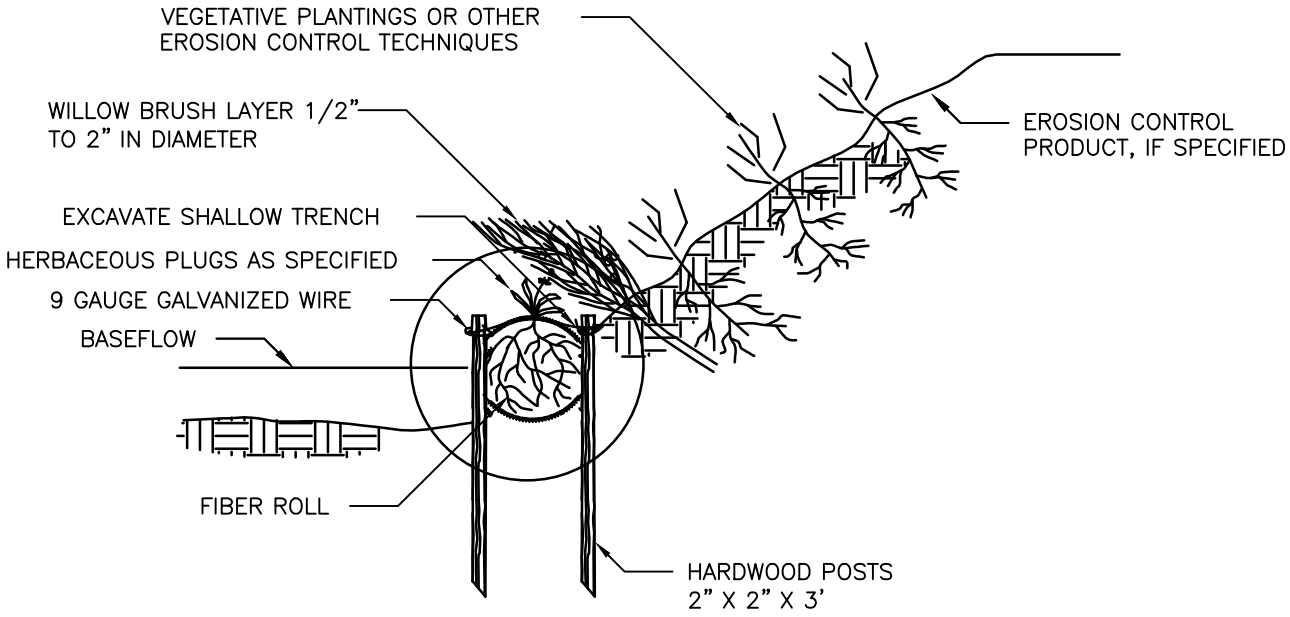

CROSS SECTION
NOT TO SCALE

CONSTRUCTION SPECIFICATIONS

1. EXCAVATE A SHALLOW TRENCH AT THE TOE OF SLOPE TO SLIGHTLY BELOW BASEFLOW.

2. PLACE THE ROLL IN THE TRENCH AND ANCHOR WITH 2" x 2" x 3' POSTS PLACED ON BOTH SIDES OF THE ROLL AND SPACED LATERALLY ON 2' TO 4' CENTERS. TRIM THE TOP OF THE POSTS EVEN WITH THE EDGE OF THE ROLL, IF NECESSARY.

3. NOTCH THE POSTS AND TIE TOGETHER, ACROSS THE ROLL, WITH 9 GAUGE GALVANIZED WIRE OR 1/8" DIAMETER BRAIDED NYLON ROPE.

4. PLACE SOIL EXCAVATED FROM THE TRENCH BEHIND THE ROLL AND HAND TAMP. PLANT WITH SUITABLE HERBACEOUS OR WOODY VEGETATION AS SPECIFIED ELSEWHERE IN THE CONTRACT DOCUMENTS. VEGETATION SHALL BE PLACED IMMEDIATELY ADJACENT TO THE ROLL TO PROMOTE ROOT GROWTH INTO THE FIBER. HERBACEOUS VEGETATION, IF SPECIFIED, SHALL BE PLANTED INTO THE FIBER ROLL.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
FIBER ROLL

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

FIG. NO. 79

Sheet: 79 of 127
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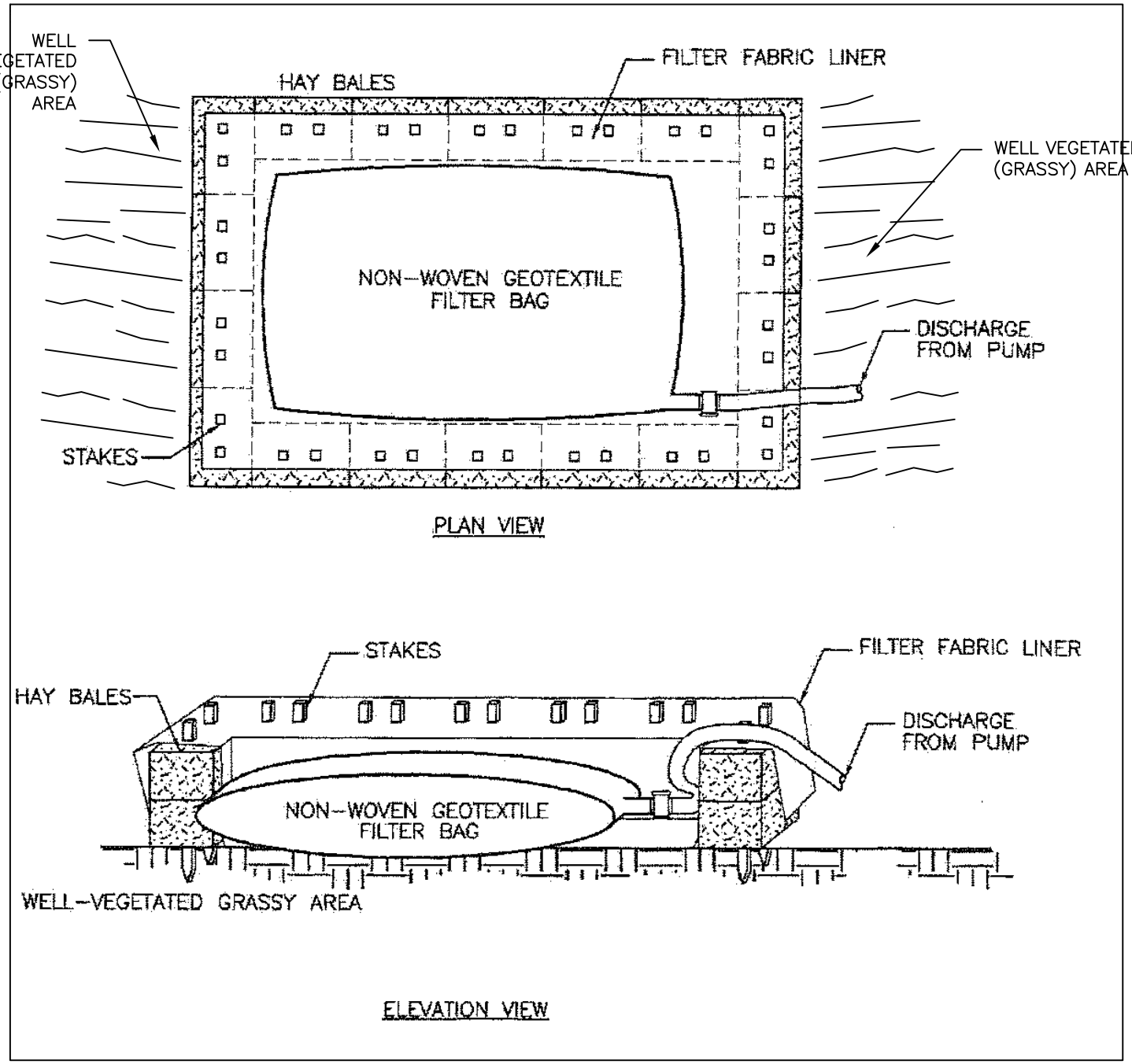

NOTES:

1. RECTANGULAR DEWATERING DISCHARGE AREA CONSTRUCTED OUT OF HAY BALES STACKED ONE OR TWO ROWS HIGH AND SECURED WITH WOODEN STAKES.
2. FILTER FABRIC LINER INSTALLED COVERING ENTIRE INTERIOR OF STRUCTURE AND SECURED ON TOP OF THE HAY BALES WITH WOODEN STAKES.
3. THE DEWATERING DEVICE SHALL BE LOCATED IN A WELL-VEGETATED (GRASSY) AREA AND DISCHARGE ONTO STABLE, EROSION RESISTANT AREAS. WHERE THIS IS NOT POSSIBLE, A GEOTEXTILE FLOW PATH SHALL BE PROVIDED. A DISCHARGE DEVICE SHALL NOT BE PLACED ON SLOPES GREATER THAN 5%.
4. FOR LESS TURBID WATER DISCHARGE, THE GEOTEXTILE FILTER BAG IS OPTIONAL AND THE STRUCTURE MAY UTILIZE JUST FILTER FABRIC LINER WITH NO FILTER BAG.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
TRENCH DEWATERING SEDIMENT CORRAL

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

FIG. NO. 80

Sheet: 80 of 127
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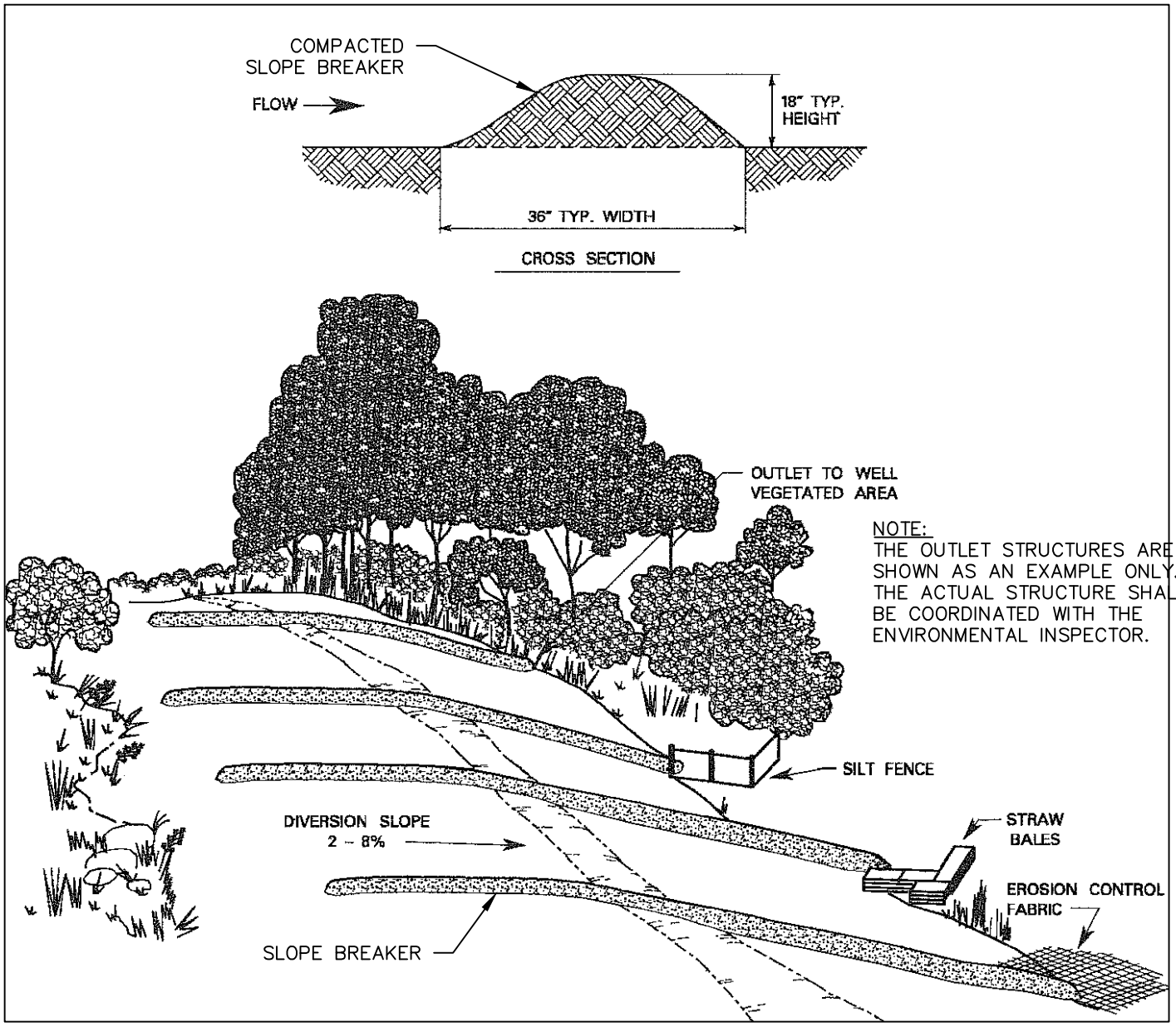

INSTALLATION REQUIREMENTS:

- INSTALL PERMANENT SLOPE BREAKERS IN ALL AREAS EXCEPT RESIDENTIAL OR AGRICULTURAL AS NECESSARY TO AVOID EXCESSIVE EROSION (UNLESS AUTHORIZED BY LANDOWNER OR LAND MANAGING AGENCY IN AGRICULTURAL OR RESIDENTIAL AREA).
- MUST BE INSTALLED WHERE THE BASE OF THE SLOPE IS LESS THAN 50 FEET FROM A WATERBODY, WETLAND OR ROAD CROSSING AND AT THE FOLLOWING MINIMUM SPACING:

SLOPE (%)	SPACING (FT.)
< 50	125
5–10	100
10–20	75
20–35	50
< 35	25

- CONSTRUCT USING COMPACTED EARTH AND ROCK FOR PERMANENT BREAKERS.
- INSTALL WITH A 2–8% OUTFALL ANGLE
- POSITION OUTFALL TO PREVENT SEDIMENT DISCHARGE INTO WETLANDS, WATERBODIES, OR OTHER SENSITIVE RESOURCES.
- FILTER RUN–OFF WATER BY CONSTRUCTING THE OUTLET IN A WELL VEGETATED STABLE AREA OR BY USING AN ENERGY DISSIPATING DEVICE (SILT FENCE, STRAW BALES, EROSION CONTROL FABRIC), AS DIRECTED BY THE ENVIRONMENTAL INSPECTOR.

MAINTENANCE REQUIREMENTS:

- INSPECT DURING AND FOLLOWING CONSTRUCTION AND MAKE REPAIRS AS NEEDED.
- KEEP THE CHANNEL FREE OF DEBRIS AND OBSTRUCTIONS.
- SEED AND MULCH PERMANENT SLOPE BREAKERS FOLLOWING CONSTRUCTION.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
INTERCEPTOR SLOPE BREAKER
INSTALLATION

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

FIG. NO. 81

Sheet: 81 of 127
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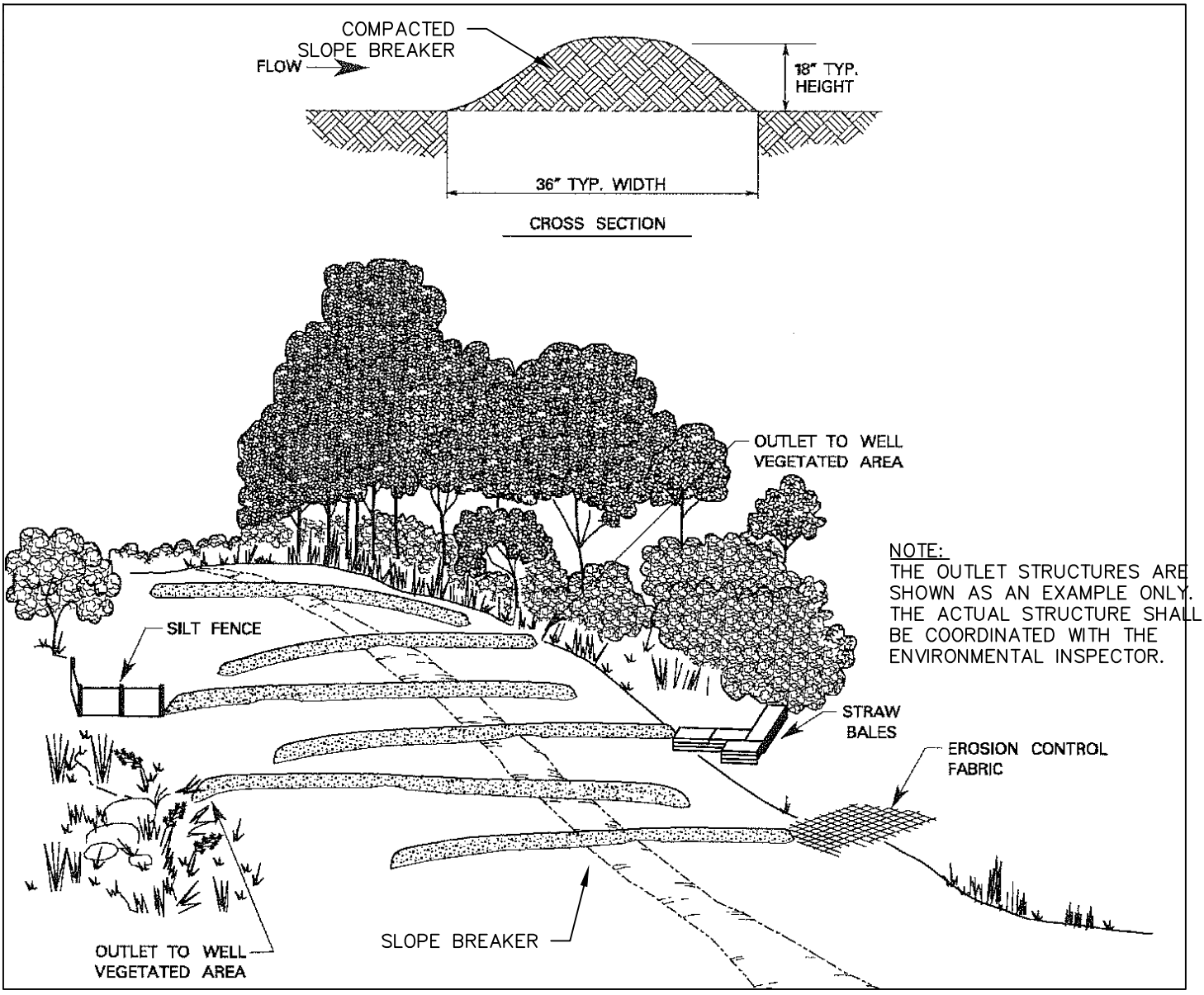

NOTE:
THE OUTLET STRUCTURES ARE SHOWN AS AN EXAMPLE ONLY. THE ACTUAL STRUCTURE SHALL BE COORDINATED WITH THE ENVIRONMENTAL INSPECTOR.

INSTALLATION REQUIREMENTS:

- INSTALL IN ALL AREAS EXCEPT RESIDENTIAL OR AGRICULTURAL (UNLESS AUTHOIRZED BY LANDOWNER OR LAND MANAGING AGENCY).
- CONSTRUCT USING COMPACTED EARTH AND ROCK FOR PERMANENT BREAKERS.
- INSTALL WITH A 2 – 8% OUTFALL ANGLE.
- FOR TEMPORARY CHEVRON SLOPE BREAKERS, POSITION OUTFALL TO PREVENT SEDIMENT DISCHARGE INTO WETLANDS, WATERBODIES, OR OTHER SENSITIVE RESOURCES.
- FILTER RUN–OFF WATER BY CONSTRUCTING AN OUTLET USING AN ENERGY DISSIPATING DEVICE (SILT FENCE, STRAW BALES, EROSIONS CONTROL FABRIC), AS DIRECTED BY THE ENVIRONMENTAL INSPECTOR.
- ALTHOUGH ALTERNATING, ALL SLOPE BREAKERS MUST BE INSTALLED WHERE THE BASE OF THE SLOPE IS LESS THAN 50 FEET FROM A WATERBODY, WETLAND OR ROAD CROSSING AND AT THE FOLLOWING MINIMUM SPACING:

SLOPE (%)	SPACING (FT.)
< 50	125
5–10	100
10–20	75
20–35	50
> 35	25

MAINTENANCE REQUIREMENTS:

- INSPECT DURING AND FOLLOWING CONSTRUCTION AND MAKE REPAIRS AS NEEDED.
- KEEP THE CHANNEL FREE OF DEBRIS AND OBSTRUCTIONS.
- SEED AND MULCH PERMANENT SLOPE BREAKERS FOLLOWING CONSTRUCTION.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
CHEVRON INTERCEPTOR SLOPE
BREAKER INSTALLATION & MAINTENANCE

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

FIG. NO. 82

Sheet: 82 of 127
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NOTES:

1. THE CONTRACTOR IS RESPONSIBLE FOR DUST CONTROL ALONG THE SITE. THE CONTRACTOR SHALL COORDINATE WITH THE ENVIRONMENTAL INSPECTOR TO DETERMINE WHICH PRACTICES ACCOMMODATE THEIR NEEDS BASED ON SPECIFIC SITE AND WEATHER CONDITIONS. SOME OF THE TYPICAL PRACTICES INCLUDE THE FOLLOWING:

   - SPRINKLING/IRRIGATION. SPRINKLING THE GROUND SURFACE WITH WATER UNTIL IT IS MOIST IS AN EFFECTIVE DUST CONTROL METHOD FOR HAUL ROADS AND OTHER TRAFFIC ROUTES (SMOLEN ET AL., 1988). THIS PRACTICE CAN BE APPLIED TO ALMOST ANY SITE.
   - VEGETATIVE COVER. IN AREAS NOT EXPECTED TO HANDLE VEHICLE TRAFFIC, VEGETATIVE STABILIZATION OF DISTURBED SOIL IS OFTEN DESIRABLE. VEGETATIVE COVER PROVIDES COVERAGE TO SURFACE SOILS AND SLOWS WIND VELOCITY AT THE GROUND SURFACE, THUS REDUCING THE POTENTIAL FOR DUST TO BECOME AIRBORNE.
   - MULCH. MULCHING CAN BE A QUICK AND EFFECTIVE MEANS OF DUST CONTROL FOR A RECENTLY DISTURBED AREA (SMOLEN ET AL., 1988).
   - WIND BREAKS. WIND BREAKS ARE BARRIERS (EITHER NATURAL OR CONSTRUCTED) THAT REDUCE WIND VELOCITY THROUGH A SITE AND THEREFORE REDUCE THE POSSIBILITY OF SUSPENDED PARTICLES. WIND BREAKS CAN BE TREES OR SHRUBS LEFT IN PLACE DURING SITE CLEARING OR CONSTRUCTED BARRIERS SUCH AS A WIND FENCE, SNOW FENCE, TARP CURTAIN, HAY BALE, CRATE WALL, OR SEDIMENT WALL (USEPA, 1992).
   - TILLAGE. DEEP TILLAGE IN LARGE OPEN AREAS BRINGS SOIL CLODS TO THE SURFACE WHERE THEY REST ON TOP OF DUST, PREVENTING IT FROM BECOMING AIRBORNE.
   - STONE. STONE MAY BE AN EFFECTIVE DUST DETERRENT FOR CONSTRUCTION ROADS AND ENTRANCES OR AS A MULCH IN AREAS WHERE VEGETATION CANNOT BE ESTABLISHED.
   - SPRAY–ON CHEMICAL SOIL TREATMENTS. THE PENNSYLVANIA DIRT AND GRAVEL ROAD PROGRAM HAS PLACED STRICT LIMITATIONS ON THE USE OF PRODUCTS THAT MAY CAUSE DAMAGE TO THE ENVIRONMENT. WITH THIS IN MIND, IT HAS APPROVED A NUMBER OF CHEMICAL DUST SUPPRESSANTS. WHEN CONSIDERING CHEMICAL APPLICATION TO SUPPRESS DUST, CONSIDERATION SHOULD BE TAKEN AS TO WHETHER THE CHEMICAL IS BIODEGRADABLE OR WATER–SOLUBLE AND WHAT EFFECT ITS APPLICATION COULD HAVE ON THE SURROUNDING ENVIRONMENT, INCLUDING WATERBODIES AND WILDLIFE.

2. TABLE H.1 SHOWS APPLICATION RATES FOR SOME COMMON DUST SUPPRESSANTS, AS RECOMMENDED BY THE PENNSYLVANIA DIRT AND GRAVEL ROAD PROGRAM.

TABLE H.1. APPLICATION RATES FOR DUST SUPPRESSANTS

PRODUCT	WATER DILUTION	TYPE
PENN SUPPRESS "D"	1:4 EMULSION TO WATER (MINIMUM)	PETROLEUM EMULSION
ULTRABOND 2000	1:4 EMULSION TO WATER (MINIMUM)	PETROLEUM EMULSION
COHEREX	1:10 EMULSION TO WATER (MINIMUM)	PETROLEUM EMULSION
DUST BOND	1:10 EMULSION TO WATER (MINIMUM)	PETROLEUM EMULSION
EK 35	100% ACTIVE, NOT WATER REQUIRED FOR APPLICATION	SYNTHETIC FLUID
ENVIROKLEEN	100% ACTIVE, NOT WATER REQUIRED FOR APPLICATION	SYNTHETIC FLUID
PAVE–CYRL SUPPRESS	AS RECEIVED (51% SOLIDS)	ACRYLIC POLYMER (PVA)
PAVE–CYRL SUPPRESS PLUS	AS RECEIVED (51% SOLIDS)	ACRYLIC POLYMER (PVA)
DIRT GLUE	AS RECEIVED (51% SOLIDS)	ACRYLIC POLYMER (PVA)

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
DUST CONTROL

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

FIG. NO. 83

Sheet: 83 of 127
Type:

NOTES:

1. WATER–SOLUBLE ANIONIC POLYACRYLAMIDE (PAM) MAY BE APPLIED TO A DISTURBED AREA AS A TEMPORARY SOIL–BINDING AGENT TO REDUCE EROSION DUE TO WIND AND WATER. THIS PRACTICE IS RECOMMENDED FOR AREAS WHERE TIMELY ESTABLISHMENT OF A VEGETATIVE COVER IS NOT FEASIBLE (E.G. NON–GERMINATING SEASON), WHEREVER SOILS HAVE HIGH CLAY CONTENT, OR WHERE THE VEGETATIVE COVER IS INADEQUATE TO PROVIDE PROTECTION FROM EROSION. WHEREVER USED, THE APPLICATION MUST COMPLY WITH ALL FEDERAL, STATE AND LOCAL LAWS AND REGULATIONS GOVERNING ANIONIC PAM.

2. PAM SPECIFICATIONS
   - ANIONIC PAM MIXTURES MUST BE ENVIRONMENTALLY SAFE AND NON–TOXIC TO FISH AND OTHER AQUATIC SPECIES, WILDLIFE, AND PLANTS. IT SHOULD ALSO BE NON–COMBUSTIBLE.
   - CATIONIC PAM MAY NOT BE USED DUE TO ITS TOXICITY TO AQUATIC SPECIES.
   - ANIONIC PAM MIXTURES MUST HAVE < 0.05% FREE ACRYLAMIDE MONOMER BY WEIGHT AS ESTABLISHED BY THE FOOD AND DRUG ADMINISTRATION (FDA) AND THE ENVIRONMENTAL PROTECTION AGENCY (EPA).
   - ACUTE TOXICITY TEST DATA SHOULD BE PROVIDED FROM EACH MANUFACTURER OR SUPPLIER.
   - THE MANUFACTURER SHOULD PROVIDE A PRODUCT EXPIRATION DATE FOR ANIONIC PAM BASED UPON EXPIRATION OF PAM IN THE PURE FORM.

3. APPLICATION
   - ANIONIC PAM SHOULD BE APPLIED IN ACCORDANCE WITH THE RECOMMENDED METHODS PROVIDED BY THE MANUFACTURER OR SUPPLIER FOR THE SPECIFIC SITE CONDITIONS (E.G. SLOPE AND SOIL TYPE). A RECORD OF THE APPLICATION, INCLUDING THE DATE OF APPLICATION, PRODUCT TYPE, WEATHER CONDITIONS, METHOD OF APPLICATION, AND THE NAME OF THE APPLICATOR, SHOULD BE KEPT ON SITE.
   - APPLICATION RATES SHOULD NOT EXCEED THE MANUFACTURER'S RECOMMENDATIONS. REPEATED APPLICATIONS MAY BE MADE IF NECESSARY TO ENSURE ADEQUATE COVERAGE.
   - THE APPLICATION METHOD USED SHOULD PROVIDE UNIFORM COVERAGE TO THE TARGET AREA WHILE AVOIDING DRIFT TO NON–TARGET AREAS, ESPECIALLY PAVED AREAS.
   - MANUFACTURER'S RECOMMENDATIONS FOR SAFE STORAGE, MIXING, AND USE OF THE PRODUCT SHOULD BE FOLLOWED.
   - USE OF ANIONIC PAM SHOULD BE IN CONJUNCTION WITH THE OTHER BMPS SPECIFIED IN THE APPROVED E&S PLAN.
   - ANIONIC PAM MAY NOT BE USED INSTEAD OF A PROTECTIVE LINER IN A CHANNEL OR IN PLACE OF MULCH ON A SEEDED AREA. HOWEVER, SEED MAY BE ADDED TO THE MIXTURE AT THE TIME OF APPLICATION.
   - DISPOSAL OF EXCESS MATERIAL MUST BE IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS AS WELL AS FEDERAL, STATE, AND LOCAL LAWS AND REGULATIONS.
   - ANIONIC PAM MAY NOT BE APPLIED WITHIN THE FLOODWAY OF A RECEIVING STREAM CHANNEL OR WITHIN 25 FEET OF OTHER WATER BODIES.
   - ANIONIC PAM MAY BE USED TO TEMPORARILY STABILIZE TOPSOIL STOCKPILES. HOWEVER, ANIONIC PAM MAY LOSE ITS EFFECTIVENESS IN AS LITTLE AS TWO MONTHS. THEREFORE, IT MIGHT BECOME NECESSARY TO REAPPLY THE MIXTURE.
   - ANIONIC PAM IS NOT RECOMMENDED FOR APPLICATION ON SURFACES OF PURE SAND OR GRAVELS WITH NO FINES OR ON SNOW–COVERED SURFACES.
   - A VISIBLE TRACER OR COLORANT MAY BE ADDED TO THE MIXTURE TO VISUALLY TRACK ITS APPLICATION.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
POLYACRYLAMIDE (PAM) SOIL BINDER

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

FIG. NO. 84

Sheet: 84 of 127
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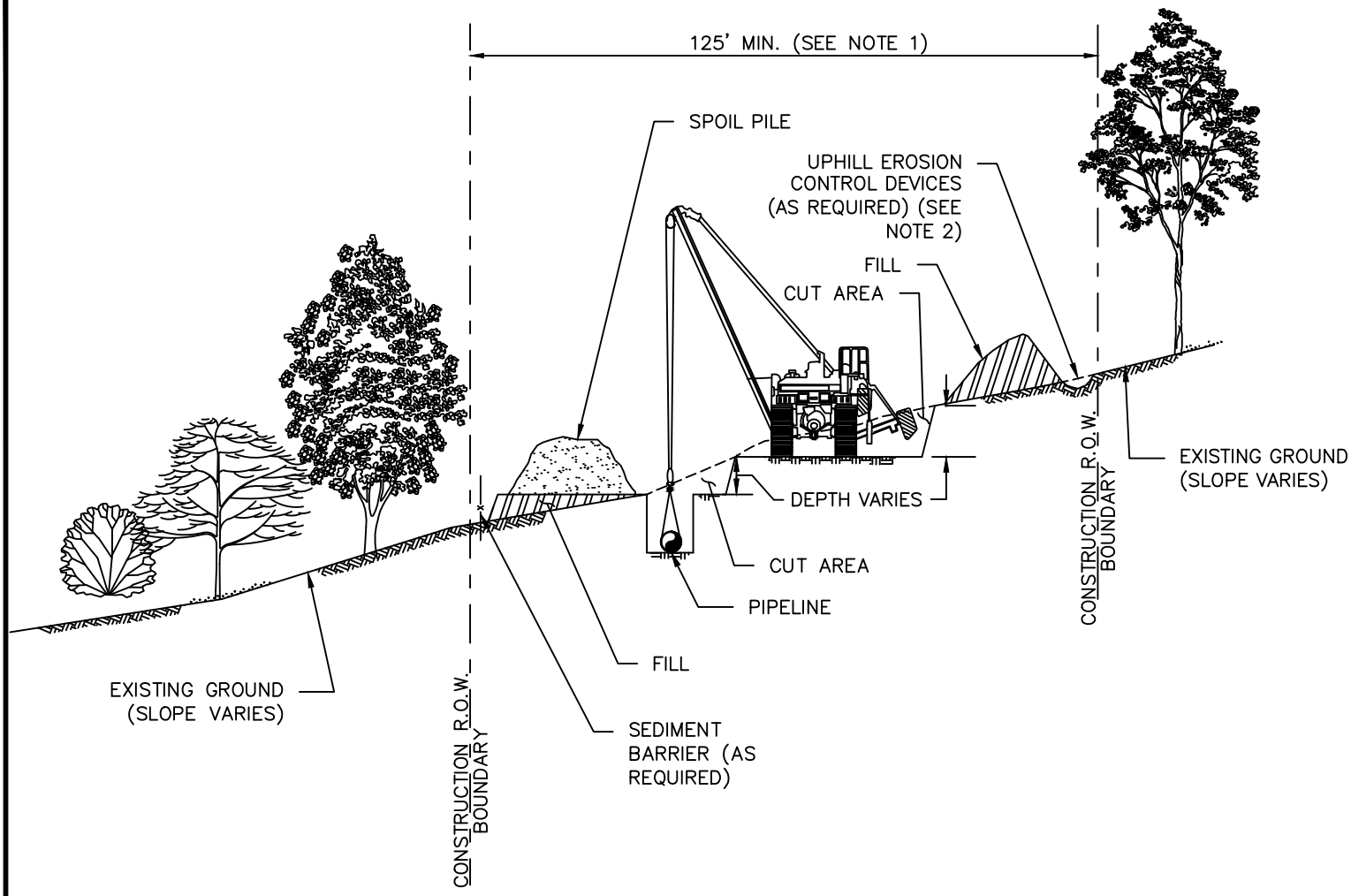

CROSS SECTION

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CONSTRUCTION PROCEDURE NOTES:

1. TWO–TONE THE RIGHT–OF–WAY TO LIMIT THE NEED FOR DEEP CUTS AND ADDITIONAL RIGHT–OF–WAY ON STEEP SLOPES. THE MINIMUM WORKSPACE WIDTH ALONG STEEP SIDE SLOPES SHALL BE 125'. ADDITIONAL TEMPORARY WORKSPACE MAY BE REQUIRED FOR WORKER SAFETY DEPENDING ON THE SEVERITY OF THE GRADE.
2. EMPLOY EROSION CONTROL MEASURES SUCH AS BREAKERS, CROSS DITCHES AND BERMS, TEMPORARY DRAINAGE PIPES, TEMPORARY SWALES, TEMPORARY OUTLET PROTECTION, ETC. AS REQUIRED TO PREVENT EROSION AND SEDIMENTATION OUTSIDE OF THE CONSTRUCTION RIGHT–OF–WAY. CLEAR AND STAKE ADDITIONAL RIGHT–OF–WAY TO ALLOW FOR EXTRA SPOIL.
3. ENSURE SIDE BOOM TRACTORS ARE EQUIPPED WITH BOOM EXTENDERS AND COUNTERWEIGHTS IF REQUIRED.
4. USE BACKHOE TO ASSIST BULLDOZERS WITH REPLACING CUTS.
5. RESTORE GRADE TO NEAR PRE–CONSTRUCTION TOPOGRAPHY, REPLACE TOPSOIL AND INSTALL PERMANENT EROSION CONTROL MEASURES AS REQUIRED.
6. REVEGETATE / SEED DISTURBED AREAS AS NOTED IN THE CONSTRUCTION DOCUMENTS OR AS DETERMINED BY THE ENVIRONMENTAL INSPECTOR.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
SIDE SLOPE (TWO–TONE)
CONSTRUCTION PROCEDURE

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

FIG. NO. 85

Sheet: 85 of 127
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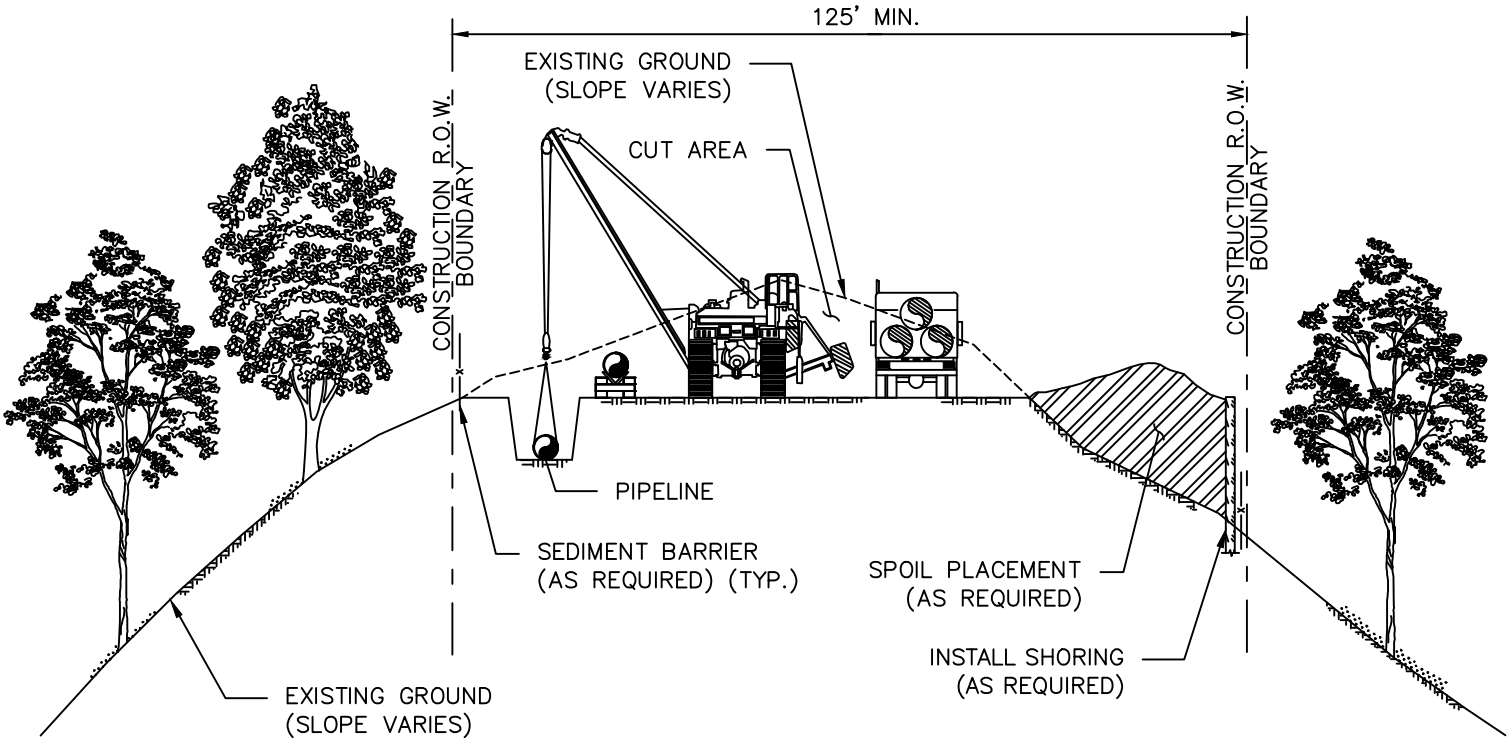

CROSS SECTION

SCALE: N.T.S.

CONSTRUCTION PROCEDURE NOTES:

1. EMPLOY EROSION CONTROL MEASURES SUCH AS BREAKERS, CROSS DITCHES AND BERMS, TEMPORARY DRAINAGE PIPES, TEMPORARY SWALES, TEMPORARY OUTLET PROTECTION, ETC. AS REQUIRED TO PREVENT EROSION AND SEDIMENTATION OUTSIDE OF THE CONSTRUCTION RIGHT–OF–WAY. CLEAR AND STAKE ADDITIONAL RIGHT–OF–WAY TO ALLOW FOR EXTRA SPOIL.
2. ENSURE SIDE BOOM TRACTORS ARE EQUIPPED WITH BOOM EXTENDERS AND COUNTERWEIGHTS IF REQUIRED.
3. USE BACKHOE TO ASSIST BULLDOZERS WITH REPLACING CUTS.
4. RESTORE GRADE TO NEAR PRE–CONSTRUCTION TOPOGRAPHY, REPLACE TOPSOIL AND INSTALL PERMANENT EROSION CONTROL MEASURES AS REQUIRED.
5. REVEGETATE / SEED DISTURBED AREAS AS NOTED IN THE CONSTRUCTION DOCUMENTS OR AS DETERMINED BY THE ENVIRONMENTAL INSPECTOR.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
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TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
RIDGE–TOP CONSTRUCTION PROCEDURE

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

FIG. NO. 86

Sheet: 86 of 127
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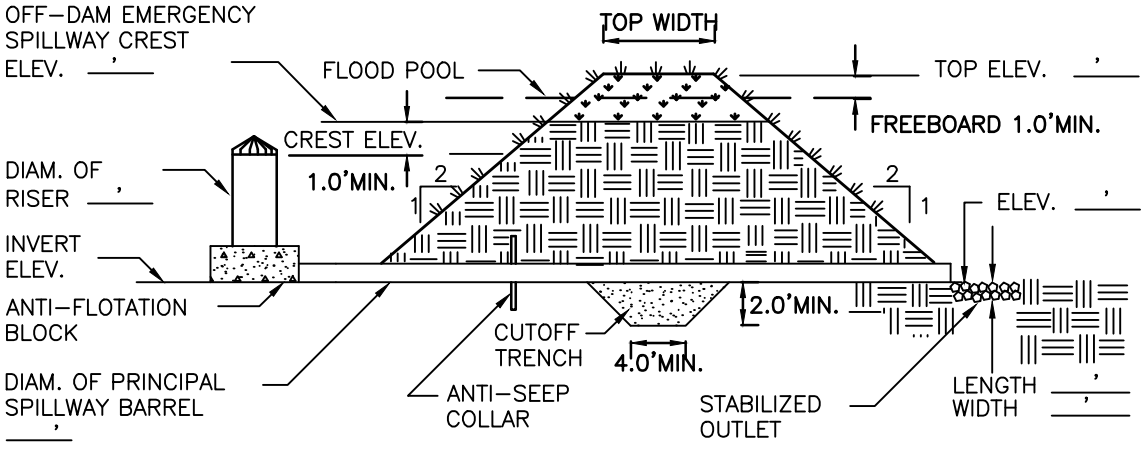
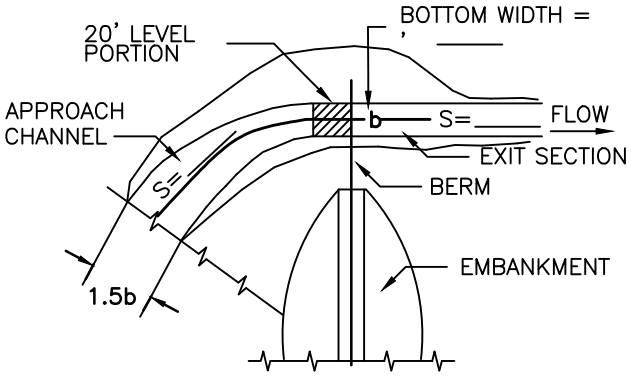
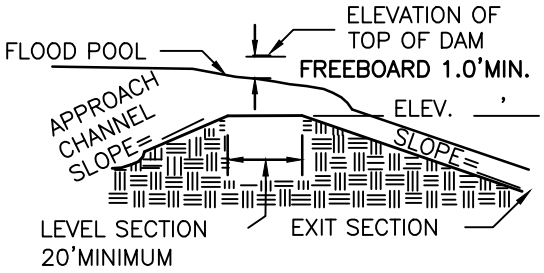


PRINCIPAL SPILLWAY PROFILE
NOT TO SCALE

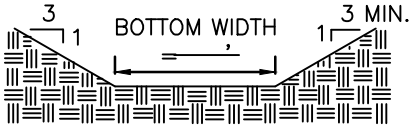
MAXIMUM DRAINAGE AREA = 100 ACRES



EMERGENCY SPILLWAY PLAN VIEW
NOT TO SCALE



PROFILE ALONG ℄ OF SPILLWAY
NOT TO SCALE



CROSS SECTION AT CONTROL SECTION
NOT TO SCALE

NOTE: THE ELEVATIONS AND DIMENSIONS WILL BE COMPLETED AS REQUIRED FOR THE FINAL SUBMISSION.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

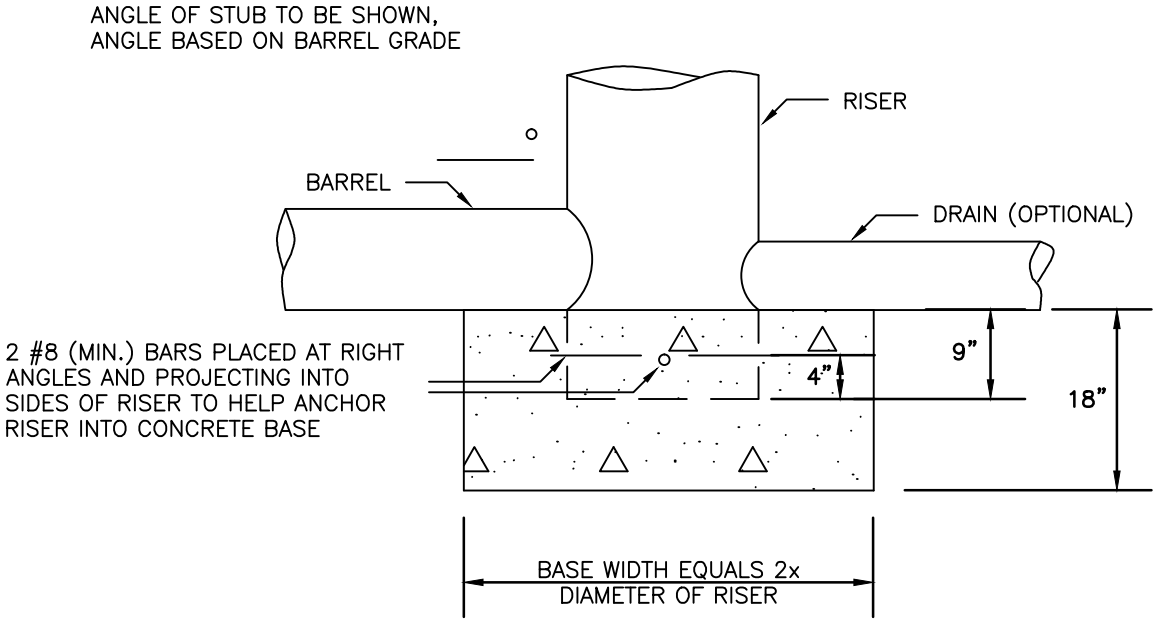
Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
SEDIMENT BASIN DETAILS

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

FIG. NO. 87

Sheet: 87 of 127
Type:



CONSTRUCTION SPECIFICATIONS

NOTES:

1. THE CONCRETE BASE SHALL BE POURED IN SUCH A MANNER TO INSURE THAT THE CONCRETE FILLS THE BOTTOM OF THE RISER TO THE INVERT OF THE OUTLET PIPE TO PREVENT THE RISER FROM BREAKING AWAY FROM THE BASE.
2. WITH ALUMINUM OR ALUMINIZED PIPE, THE EMBEDDED SECTION MUST BE PAINTED WITH CHROMATE OR EQUIVALENT.
3. RISER BASE MAY BE SIZED AS COMPUTED USING FLOATATION WITH A FACTOR OF SAFETY OF 1.2.

NOTE: THE ELEVATIONS AND DIMENSIONS WILL BE COMPLETED AS REQUIRED FOR THE FINAL SUBMISSION.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
SEDIMENT BASIN RISER BASE DETAIL

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

FIG. NO. 88

Sheet: 88 of 127
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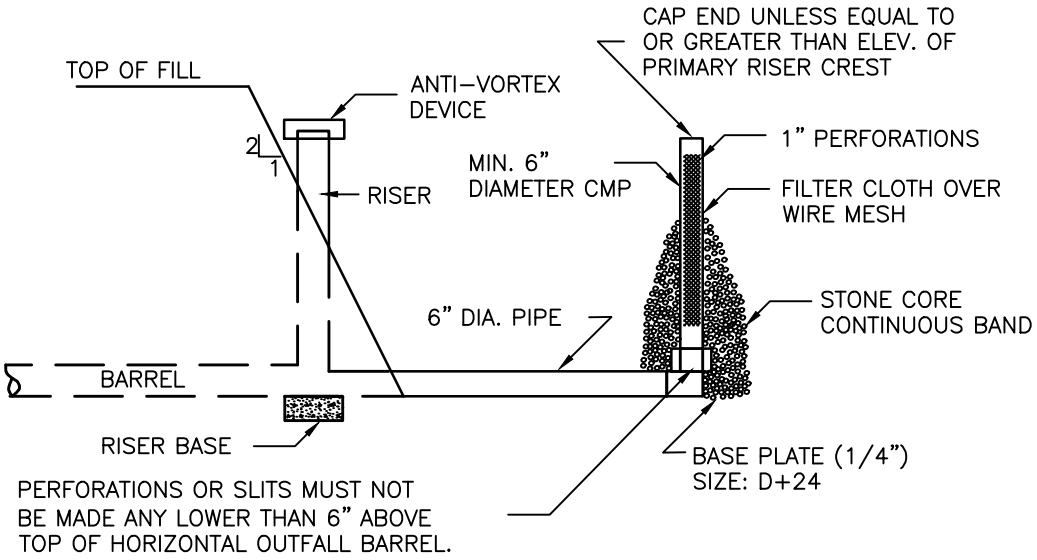
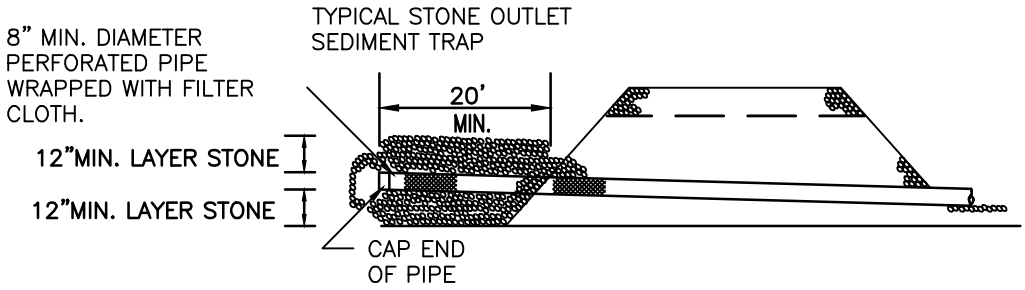


PERFORATIONS – 6" SPACING HORIZONTAL &
VERTICAL LOCATED IN CONCAVE.

OPTIONAL SEDIMENT TRAP DEWATERING DEVICE – 1 WITH 6" PERFORATED RISER



OPTIONAL SEDIMENT TRAP DEWATERING DEVICE – II

NOTE: THE ELEVATIONS AND DIMENSIONS WILL BE
COMPLETED AS REQUIRED FOR THE FINAL SUBMISSION.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
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Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
OPTIONAL SEDIMENT TRAP
DEWATERING DEVICES

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

FIG. NO. 89

Sheet: 89 of 127
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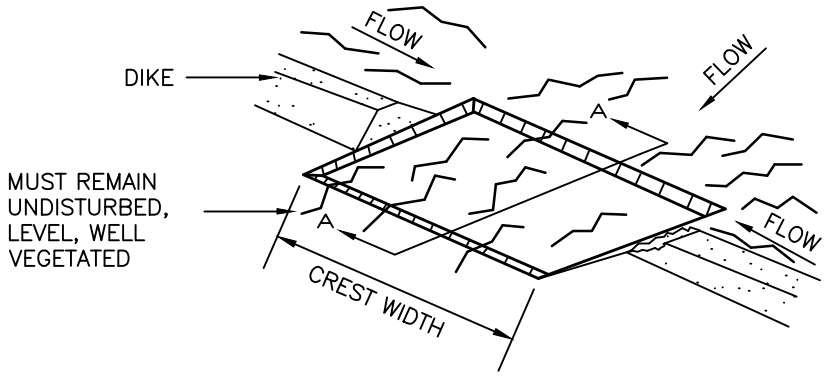

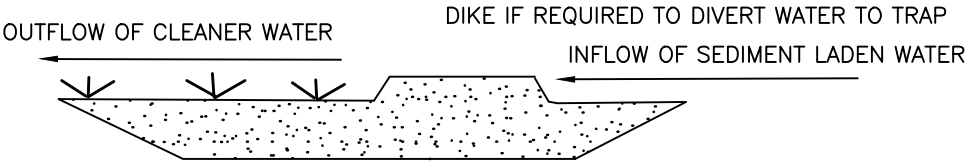

CREST WIDTH (FT)=4xDRAINAGE AREA (ACRES)

SECTION A – A
EXCAVATED GRASS OUTLET SEDIMENT TRAP

CONSTRUCTION SPECIFICATIONS

1. VOLUME OF SEDIMENT STORAGE SHALL BE 1800 CUBIC FEET PER ACRE OF CONTRIBUTORY DRAINAGE AREA.
2. MINIMUM CREST WIDTH SHALL BE 4 x DRAINAGE AREA
3. SEDIMENT SHALL BE REMOVED AND TRAP RESTORED TO ITS ORIGINAL DIMENSIONS WHEN THE SEDIMENT HAS ACCUMULATED TO 1/2 THE DESIGN DEPTH OF THE TRAP. REMOVED SEDIMENT SHALL BE DEPOSITED IN A SUITABLE AREA AND IN SUCH A MANNER THAT IT WILL NOT ERODE.
4. THE STRUCTURE SHALL BE INSPECTED AFTER EACH RAIN AND REPAIRS MADE AS NEEDED.
5. CONSTRUCTION OPERATIONS SHALL BE CARRIED OUT IN SUCH A MANNER THAT EROSION AND WATER POLLUTION SHALL BE MINIMIZED.
6. THE SEDIMENT TRAP SHALL BE REMOVED AND AREA STABILIZED WHEN THE REMAINING DRAINAGE AREA HAS BEEN PROPERLY STABILIZED.
7. ALL CUT SLOPES SHALL BE 1:1 OR FLATTER.

MAXIMUM DRAINAGE AREA: 5 ACRES

NOTE: THE ELEVATIONS AND DIMENSIONS WILL BE COMPLETED AS REQUIRED FOR THE FINAL SUBMISSION.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
GRASS OUTLET SEDIMENT TRAP

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

FIG. NO. 90

Sheet: 90 of 127
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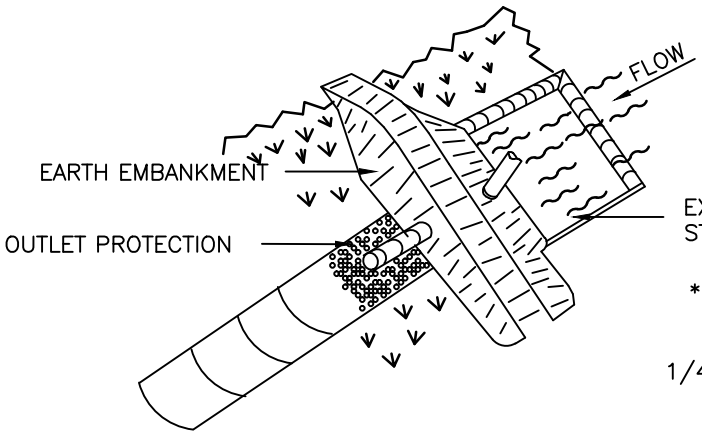
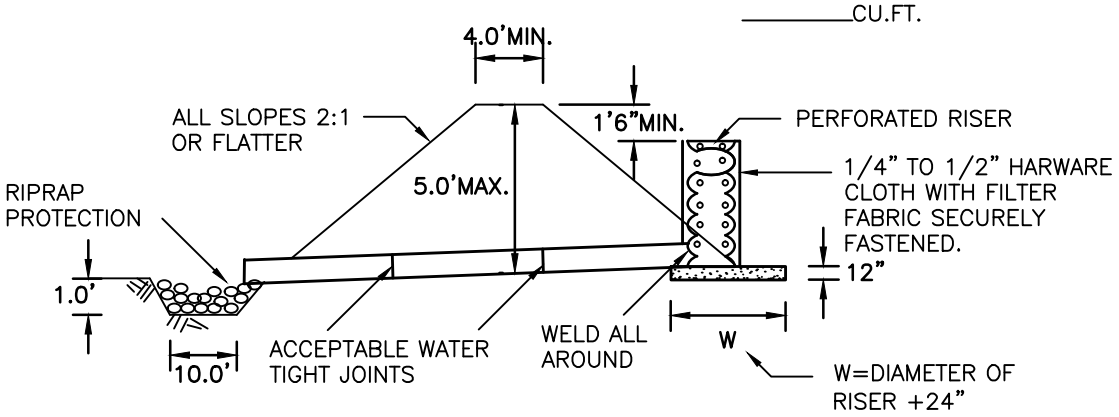




EMBANKMENT SECTION THRU RISER

SIZES OF PIPE NEEDED:

BARREL DIAMETER: _____
RISER DIAMETER: _____

NOTE:
CONSTRUCTION SPECIFICATION SHOULD BE ATTACHED TO THIS DETAIL TO COMPLETE DESIGN.

MAXIMUM DRAINAGE AREA: 5 ACRES

NOTE: THE ELEVATIONS AND DIMENSIONS WILL BE COMPLETED AS REQUIRED FOR THE FINAL SUBMISSION.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
SEDIMENT TRAP PIPE OUTLET

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

FIG. NO. 91

Sheet: 91 of 127
Type:

CONSTRUCTION SPECIFICATIONS

1. AREA UNDER EMBANKMENT SHALL BE CLEARED, GRUBBED AND STRIPPED OF ANY VEGETATION AND ROOT MAT. THE POOL AREA SHALL BE CLEARED.
2. THE FILL MATERIAL FOR THE EMBANKMENT SHALL BE FREE OF ROOTS OR OTHER WOODY VEGETATION AS WELL AS OVER–SIZED STONES, ROCKS, ORGANIC MATERIAL, OR OTHER OBJECTIONABLE MATERIAL. THE EMBANKMENT SHALL BE COMPACTED BY TRAVERSING WITH EQUIPMENT WHILE IT IS BEING CONSTRUCTED.
3. VOLUME OF SEDIMENT STORAGE SHALL BE 1800 CUBIC FEET PER ACRE OF CONTRIBUTORY DRAINAGE.
4. SEDIMENT SHALL BE REMOVED AND TRAP RESTORED TO ITS ORIGINAL DIMENSIONS WHEN THE SEDIMENT HAS ACCUMULATED TO 1/2 THE DESIGN DEPTH OF THE TRAP. REMOVED SEDIMENT SHALL BE DEPOSITED IN A SUITABLE AREA AND IN SUCH A MANNER THAT IT WILL NOT ERODE.
5. THE STRUCTURE SHALL BE INSPECTED AFTER EACH RAIN AND REPAIRS MADE AS NEEDED.
6. CONSTRUCTION OPERATIONS SHALL BE CARRIED OUT IN SUCH A MANNER THAT EROSION AND WATER POLLUTION ARE MINIMIZED.
7. THE STRUCTURE SHALL BE REMOVED AND AREA STABILIZED WHEN THE DRAINAGE AREA HAS BEEN PROPERLY STABILIZED.
8. ALL FILL SLOPES SHALL BE 2:1 OR FLATTER; CUT SLOPES 1:1 OR FLATTER.
9. ALL PIPE CONNECTIONS SHALL BE WATERTIGHT.
10. THE TOP 2/3 OF THE RISER SHALL BE PERFORATED WITH ONE (1) INCH DIAMETER HOLES OR SLITS SPACED SIX (6) INCHES VERTICALLY AND HORIZONTALLY AND PLACED IN THE CONCAVE PORTION OF PIPE. NO HOLES WILL BE ALLOWED WITHIN SIX (6) INCHES OF THE HORIZONTAL BARREL.
11. THE RISER SHALL BE WRAPPED WITH 1/4 TO 1/2 INCH HARDWARE CLOTH WIRE THEN WRAPPED WITH FILTER CLOTH (HAVING AN EQUIVALENT SIEVE SIZE OF 40–80). THE FILTER CLOTH SHALL EXTEND SIX (6) INCHES ABOVE THE HIGHEST HOLE AND SIX (6) INCHES BELOW THE LOWEST HOLE. WHERE ENDS OF THE FILTER CLOTH COME TOGETHER, THEY SHALL BE OVER–LAPPED, FOLDED AND STAPLED TO PREVENT BYPASS.
12. STRAPS OR CONNECTING BANDS SHALL BE USED TO HOLD THE FILTER CLOTH AND WIRE FABRIC IN PLACE. THEY SHALL BE PLACED AT THE TOP AND BOTTOM OF THE CLOTH.
13. FILL MATERIAL AROUND THE PIPE SPILLWAY SHALL BE HAND COMPACTED IN FOUR (4) INCH LAYERS. A MINIMUM OF TWO (2) FEET OF HAND COMPACTED BACKFILL SHALL BE PLACED OVER THE PIPE SPILLWAY BEFORE CROSSING IT WITH CONSTRUCTION
14. THE RISER SHALL BE ANCHORED WITH EITHER A CONCRETE BASE OR STEEL PLATE BASE TO PREVENT FLOTATION. FOR CONCRETE BASED THE DEPTH SHALL BE TWELVE (12) INCHES WITH THE RISER EMBEDDED NINE (9) INCHES. A 1/4 INCH MINIMUM THICKNESS STEEL PLATE SHALL BE ATTACHED TO THE RISER BY A CONTINUOUS WELD AROUND THE BOTTOM TO FORM A WATERTIGHT CONNECTION AND THEN PLACE TWO (2) FEET OF STONE, GRAVEL, OR TAMPED EARTH ON THE PLATE.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

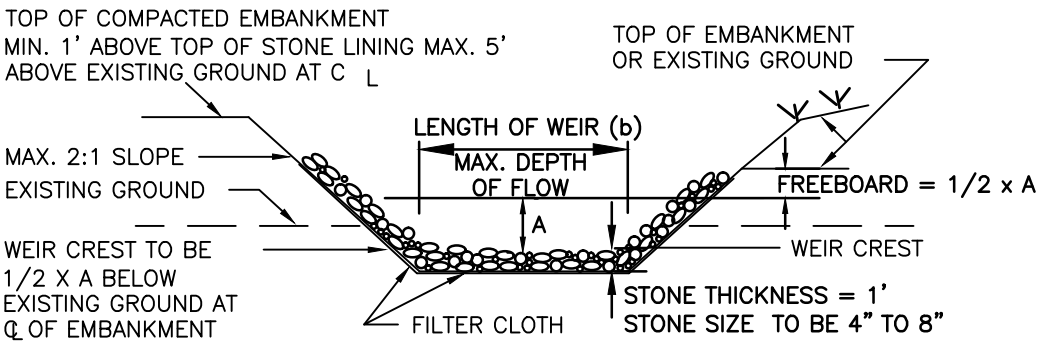
Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
SEDIMENT TRAP PIPE OUTLET
SPECIFICATIONS

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

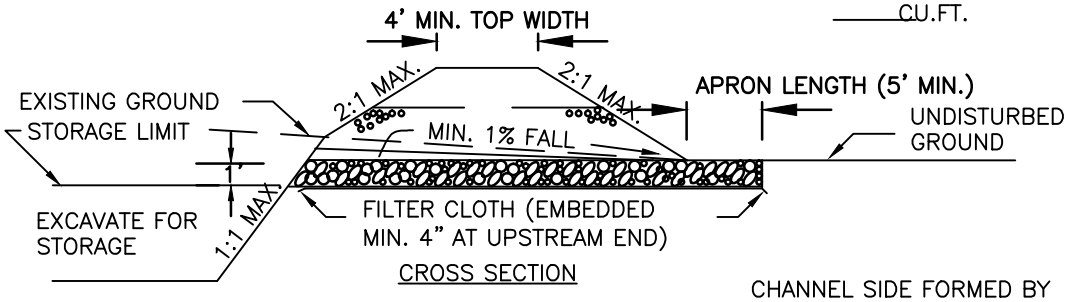
FIG. NO. 92

Sheet: 92 of 127
Type:

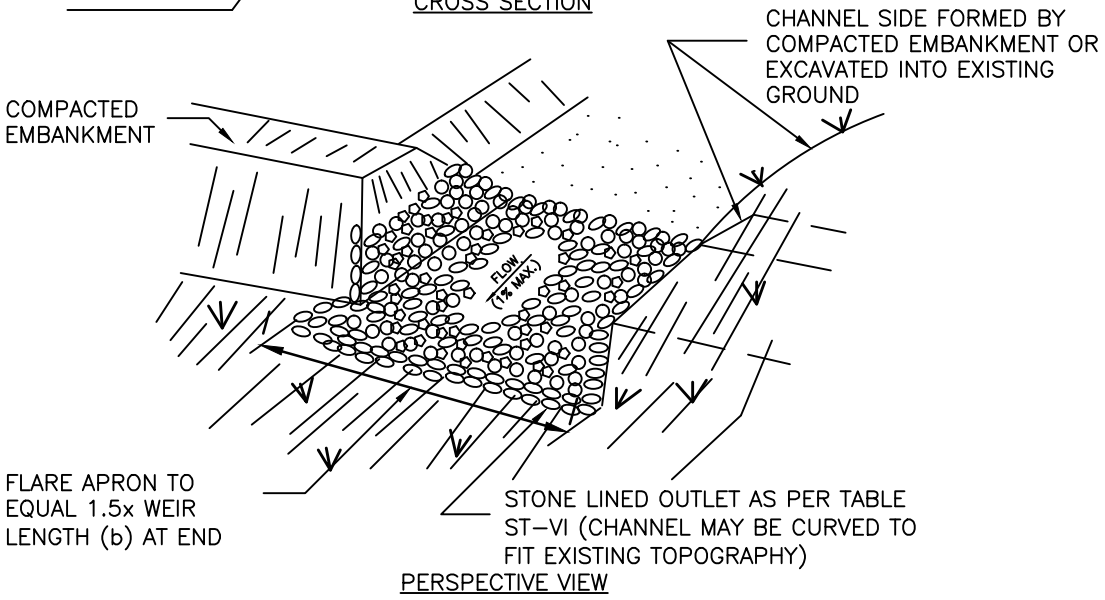


PROFILE

DESIGN VOLUME IS _____ CU.FT.



CROSS SECTION



PERSPECTIVE VIEW

MAXIMUM DRAINAGE AREA = 15 ACRES

NOTE: THE ELEVATIONS AND DIMENSIONS WILL BE COMPLETED AS REQUIRED FOR THE FINAL SUBMISSION.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
SEDIMENT TRAP RIPRAP OUTLET

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

FIG. NO. 93

Sheet: 93 of 127
Type:

CONSTRUCTION SPECIFICATIONS

1. THE AREA UNDER EMBANKMENT SHALL BE CLEARED, GRUBBED AND STRIPPED OF ANY VEGETATION AND ROOT MAT. THE POOL AREA SHALL BE CLEARED.
2. THE FILL MATERIAL FOR THE EMBANKMENT SHALL BE FREE OF ROOTS OR OTHER WOODY VEGETATION AS WELL AS OVER–SIZED STONES, ROCKS, ORGANIC MATERIAL OR OTHER OBJECTIONABLE MATERIAL. THE EMBANKMENT SHALL BE COMPACTED BY TRAVERSING WITH EQUIPMENT WHILE IT IS BEING CONSTRUCTED. MAXIMUM HEIGHT OF OF EMBANKMENT SHALL BE FIVE (5) FEET, MEASURED AT CENTERLINE OF EMBANKMENT.
3. ALL FILL SLOPES SHALL BE 2:1 OR FLATTER, CUT SLOPES 1:1 OR FLATTER.
4. ELEVATION OF THE TOP OF ANY DIKE DIRECTING WATER INTO TRAP MUST EQUAL OR EXCEED THE HEIGHT OF EMBANKMENT.
5. STORAGE AREA PROVIDED SHALL BE FIGURED BY COMPUTING THE VOLUME AVAILABLE BEHIND THE OUTLET CHANNEL UP TO AN ELEVATION OF ONE (1) FOOT BELOW THE LEVEL WEIR CREST.
6. FILTER CLOTH SHALL BE PLACED OVER THE BOTTOM AND SIDES OF THE OUTLET CHANNEL PRIOR TO PLACEMENT OF STONE. SECTIONS OF FABRIC MUST OVERLAP AT LEAST ONE (1) FOOT WITH SECTION NEAREST THE ENTRANCE PLACED ON TOP. FABRIC SHALL BE EMBEDDED AT LEAST SIX (6) INCHES INTO EXISTING GROUND AT ENTRANCE OUTLET CHANNEL.
7. STONE USED IN THE OUTLET CHANNEL SHALL BE FOUR (4) TO EIGHT (8) INCH RIPRAP. TO PROVIDE A FILTERING EFFECT, A LAYER OF FILTER CLOTH SHALL BE EMBEDDED ONE (1) FOOT WITH SECTION NEAREST ENTRANCE PLACED ON TOP. FABRIC SHALL BE EMBEDDED AT LEAST SIX (6) INCHES INTO EXISTING GROUND AT ENTRANCE OF OUTLET
8. SEDIMENT SHALL BE REMOVED AND TRAP RESTORED TO ITS ORIGINAL DIMENSIONS WHEN SEDIMENT HAS ACCUMULATED TO 1/2 THE DESIGN DEPTH OF THE TRAP. REMOVED SEDIMENT SHALL BE DEPOSITED IN A SUITABLE AREA AND IN SUCH A MANNER THAT IT WILL NOT ERODE.
9. THE STRUCTURE SHALL BE INSPECTED AFTER EACH RAIN AND REPAIRED AS NEEDED.
10. CONSTRUCTION OPERATIONS SHALL BE CARRIED OUT IN SUCH A MANNER THAT EROSION AND WATER POLLUTION ARE MINIMIZED.
11. THE STRUCTURE SHALL BE REMOVED AND THE AREA STABILIZED WHEN DRAINAGE AREA HAS BEEN PROPERLY STABILIZED.
12. DRAINAGE AREA FOR THIS PRACTICE IS LIMITED TO 15 ACRES OR LESS.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
SEDIMENT TRAP RIPRAP OUTLET
SPECIFICATIONS

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

FIG. NO. 94

Sheet: 94 of 127
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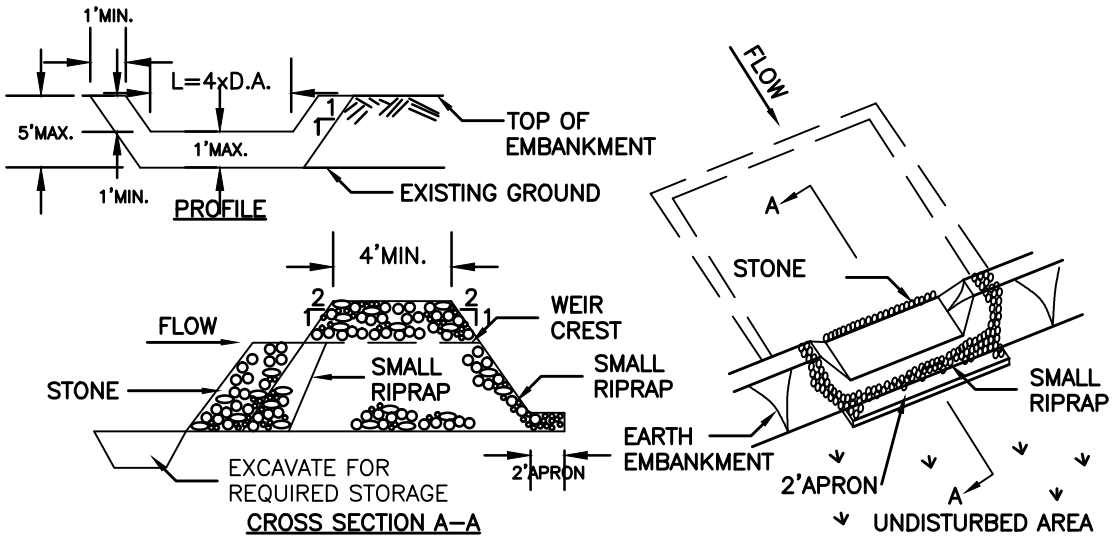

CONSTRUCTION SPECIFICATIONS

1. AREA UNDER EMBANKMENT SHALL BE CLEARED, GRUBBED AND STRIPPED OF ANY VEGETATION AND ROOT MAT. THE POOL AREA SHALL BE CLEARED.
2. THE FILL MATERIAL FOR THE EMBANKMENT SHALL BE FREE OF ROOTS AND OTHER WOODY VEGETATION AS WELL AS OVER–SIZED STONES, ROCKS, ORGANIC MATERIAL OR OTHER OBJECTIONABLE MATERIAL. THE EMBANKMENT SHALL BE COMPACTED BY TRAVERSING WITH EQUIPMENT WHILE IT IS BEING CONSTRUCTED.
3. ALL CUT AND FILL SLOPES SHALL BE 2:1 OR FLATTER.
4. THE STONE USED IN THE OUTLET SHALL BE SMALL RIPRAP 4"–8" ALONG WITH A 1' THICKNESS OF 2" AGGREGATE PLACED ON THE UP–GRADE SIDE ON THE SMALL RIPRAP OR EMBEDDED FILTER CLOTH IN THE RIPRAP.
5. SEDIMENT SHALL BE REMOVED AND TRAP RESTORED TO ITS ORIGINAL DIMEN–SIONS WHEN THE SEDIMENT HAS ACCUMULATED TO 1/2 THE DESIGN DEPTH OF THE TRAP.
6. THE STRUCTURE SHALL BE INSPECTED AFTER EACH RAIN AND REPAIRS MADE AS NEEDED.
7. CONSTRUCTION OPERATIONS SHALL BE CARRIED OUT IN SUCH A MANNER THAT EROSION AND WATER POLLUTION IS MINIMIZED.
8. THE STRUCTURE SHALL BE REMOVED AND THE AREA STABILIZED WHEN THE DRAINAGE AREA HAS BEEN PROPERLY STABILIZED.

MAXIMUM DRAINAGE AREA 5 ACRES

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
SEDIMENT TRAP STONE OUTLET

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

FIG. NO. 95

Sheet: 95 of 127
Type:

FILTER STRIPS

FILTER STRIPS ARE VEGETATED AREAS ALONG WATER BODIES, DESIGNED TO SLOW THE MOVEMENT OF OVERLAND FLOW OF WATER SO THAT SEDIMENT WILL BE LEFT BEHIND, PROVIDE AN OPPORTUNITY FOR VEGETATION TO REMOVE NUTRIENTS FROM SUBSURFACE FLOW, PROVIDE SHADE TO THE ADJACENT WATER BODY TO MAINTAIN COOL WATER TEMPERATURE, AND PROTECT BANK STABILITY AND PREVENT EROSION.

REQUIRED BMPS

FILTER STRIPS ARE REQUIRED ALONG ALL PONDS, LAKES, REGULATED STREAMS, AND CERTIFIED VERNAL POOLS.

FILTER STRIPS WILL EXTEND 50 FEET BACK FROM THE BANK, MEASURED ALONG THE SLOPE. EXCEPTIONS TO THIS FILTER STRIP WIDTH ARE:

1. SLOPES GREATER THAN 30%: FILTER STRIPS SHALL BE 100 FEET IN WIDTH, OR TO THE POINT BETWEEN 50 AND 100 FEET FROM THE BANK, WHERE A BREAK IN THE TOPOGRAPHY REDUCES THE SLOPE TO LESS THAN 30%.

2. STREAMS GREATER IN WIDTH THAN 25 FEET BANK TO BANK, PONDS 10 ACRES OR LARGER IN AREA, AND ALONG OUTSTANDING RESOURCE WATERS AND THEIR TRIBUTARIES: IN THESE CIRCUMSTANCES, VARIABLE–WIDTH FILTER STRIPS MUST BE USED IN ACCORDANCE WITH TABLE 4.

SLOPE (%)	FILTER STRIP WIDTH (FT)
0	50
10	90
20	130
30	170
40	210
50	250
60	290
70	330
80	370
90	410
100	450

NO LOGGING EQUIPMENT MAY OPERATE IN A FILTER STRIP UNLESS IT IS INCLUDED IN AN APPROVED FOREST CUTTING PLAN, AND IT:

- WILL REDUCE ENVIRONMENTAL DAMAGE;
- IS AT AN APPROVED STREAM CROSSING;
- IS ON A PRE–EXISTING LOGGING ROAD, OR;
- IS IN FILTER STRIPS GREATER THAN 50 FEET IN WIDTH, EQUIPMENT CAN OPERATE BEYOND 50 FEET OF THE WATERBODY. HOWEVER, NO PRINCIPAL SKID TRAILS MAY BE LOCATED IN THIS AREA, THE DISTURBANCE OF THE FORREST FLOOR MUS T BE MINIMIZED, AND ANY DISTRIBUTED SOIL MUST BE PROMPTLY STABILIZED.

NO MORE THAN 50% OF THE BASAL AREA MAY BE CUT AT ANY ONE TIME, AND A WAITING PERIOD OF FIVE YEARS MUST ELAPSE BEFORE ANOTHER CUT IS MADE. THE RESIDUAL STAND WILL BE COMPOSED OF HEALTHY GROWING TREES WELL DISTRIBUTED OVER THE AREA. EXCEPTIONS TO THIS STANDARD MAY BE MADE BY THE SERVICE FORESTER IF IT IS SHOWN IN THE FOREST CUTTING PLAN THAT A HEAVIER CUT IS NECESSARY TO PROTECT THE STREAM, BANK, OR WATER QUALITY.

CUT TREES WILL BE PULLED OUT OF THE FILTER STRIP AND SLASH WILL BE DISPOSED OF ACCORDING TO THE SLASH LAW OF MASSACHUSETTS.

THE FOLLOWING GUIDELINES MAY BE USED TO PROVIDE ADDITIONAL PROTECTION TO SENSITIVE STREAMS (E.G., TRIBUTARIES TO WATER SUPPLY RESERVOIRS, COLDWATER FISH RESOURCES, AND WILDLIFE HABITAT IN RIPARIAN CORRIDORS):

- LEAVE A 15 FOOT NO CUT BUFFER.
- AVOID SOIL COMPACTION AND RUTTING WITHIN 200 FEET OF A STREAM.
- MAINTAIN AREAS WITHIN 200 FEET OF A STREAM IN A FORRESTED CONDITION.
- PRESERVE IMPORTANT HABITAT CHARACTERISTICS WITHIN 200 FEET OF A STREAM, SUCH AS TREES WITH CAVITIES, DOWNED LOGS, STONE WALLS, AND ROCK JUMBLES.
- USE VARIABLE–WIDTH FILTER STRIP GUIDELINES ABOVE.
- MINIMIZE THE CUTTING OF TREES DIRECTLY ON THE STREAM BANK.

*MASSACHUSETTS LOOP ONLY

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:		Op. Area:	
St.:		Co./Par.:	
Section:	Township:		Range:
Dft:	Date:	Project ID:	
Chk:	Date:	Scale:	
Appr:	Date:	Filename:	

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
FILTER STRIPS

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

FIG. NO. 96

Sheet: 96 of 127

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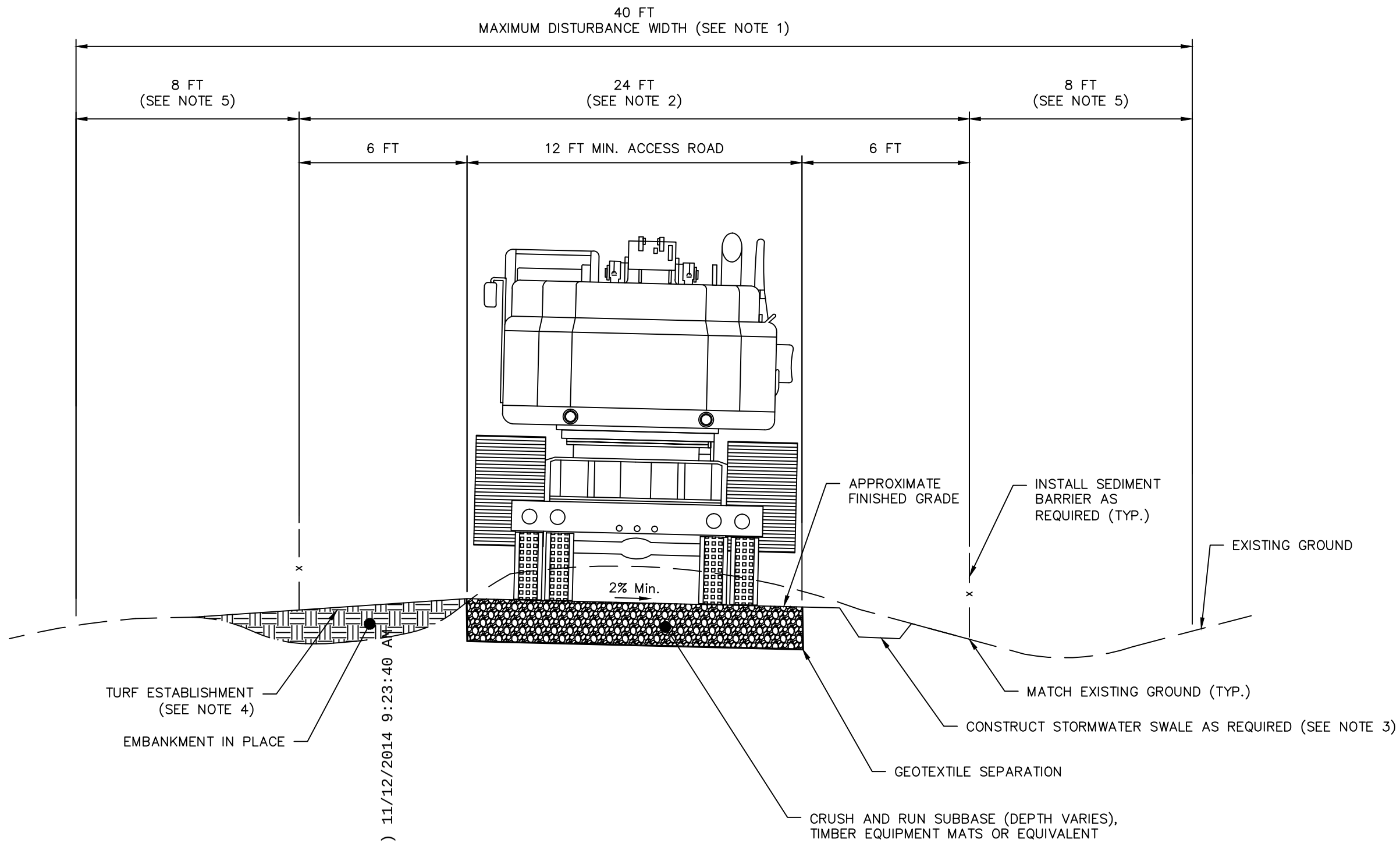

NOTES:

1. THE MAXIMUM DISTURBANCE WIDTH ASSOCIATED WITH THE CONSTRUCTION OF ACCESS ROADS WILL BE 40FT.
2. ACCESS ROADS WILL TYPICALLY INCLUDE A 12 FT TRAVEL LANE AND 12 FT OF GRADING DISTURBANCE. THE GRADING DISTURBANCE WILL BE REQUIRED TO MATCH INTO EXISTING GROUND AND CONSTRUCT REQUIRED EROSION CONTROL MEASURES (E.G. SILT FENCE) AND SEDIMENT CONTROL DEVICES (E.G. STORMWATER SWALE). ADDITIONAL CONSTRUCTION WIDTH MAY BE REQUIRED IN AREAS THAT REQUIRED TRUCK PULL OFFS, TRUCK TURNAROUNDS, AND AROUND SHARP CURVES WHERE EQUIPMENT TRAILERS HAVE LARGE TURNING RADIUSES.
3. REFER TO THE STORMWATER SWALE TABLES FOR LOCATIONS AND SIZES OF ALL SWALES REQUIRED ALONG ACCESS ROADS.
4. SEED MIXES TO BE UTILIZED FOR TURF ESTABLISHMENT ALONG ACCESS ROADS SHALL CONFORM TO THE SEED MIXES OUTLINED IN THE ENVIRONMENTAL CONSTRUCTION PLANS (ECPs).
5. THE ADDITIONAL 16 FT OF DISTURBANCE MAY BE REQUIRED TO ACCOMMODATE TRUCK PULL–OFFS, TRUCK TURNAROUNDS, AND INCREASED TRAVEL LANE WIDTHS AROUND CURVES DUE TO THE LARGE TRUCK TURNING RADIUSES.

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NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.
REVISIONS					

Division: | Op. Area.:
State: | Co./Par.:
Section: | Township: | Range:
Dft: | Date: | Scale:
Chk: | Date:
Appr: | Date: | Filename:

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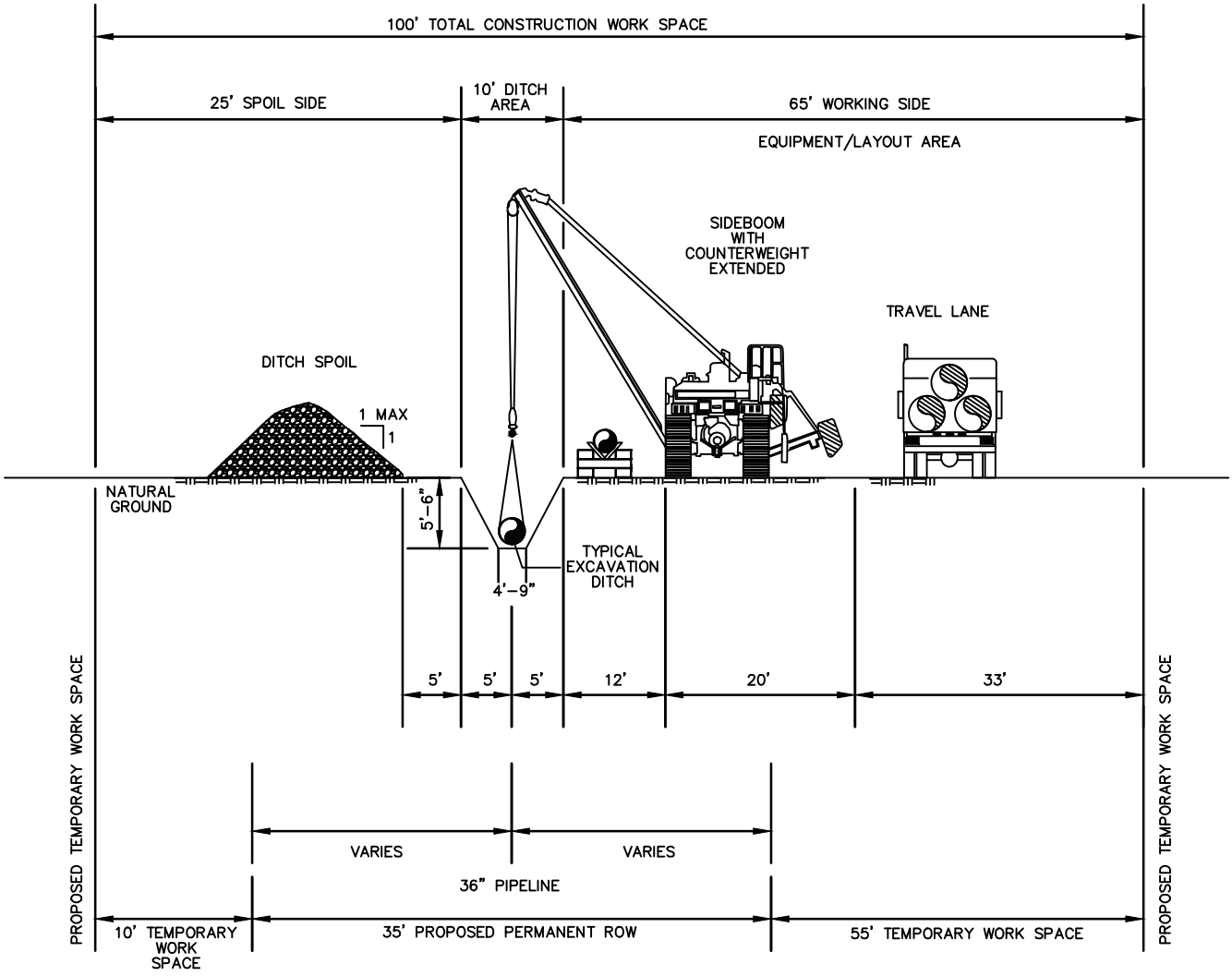
TENNESSE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
TYPICAL ACCESS ROAD
CROSS SECTION

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

FIG. NO. 97 | Sheet: 97 of 127 | Type:

Sep. 17, 2014 – 11:30AM



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Section:	Township:	Range:
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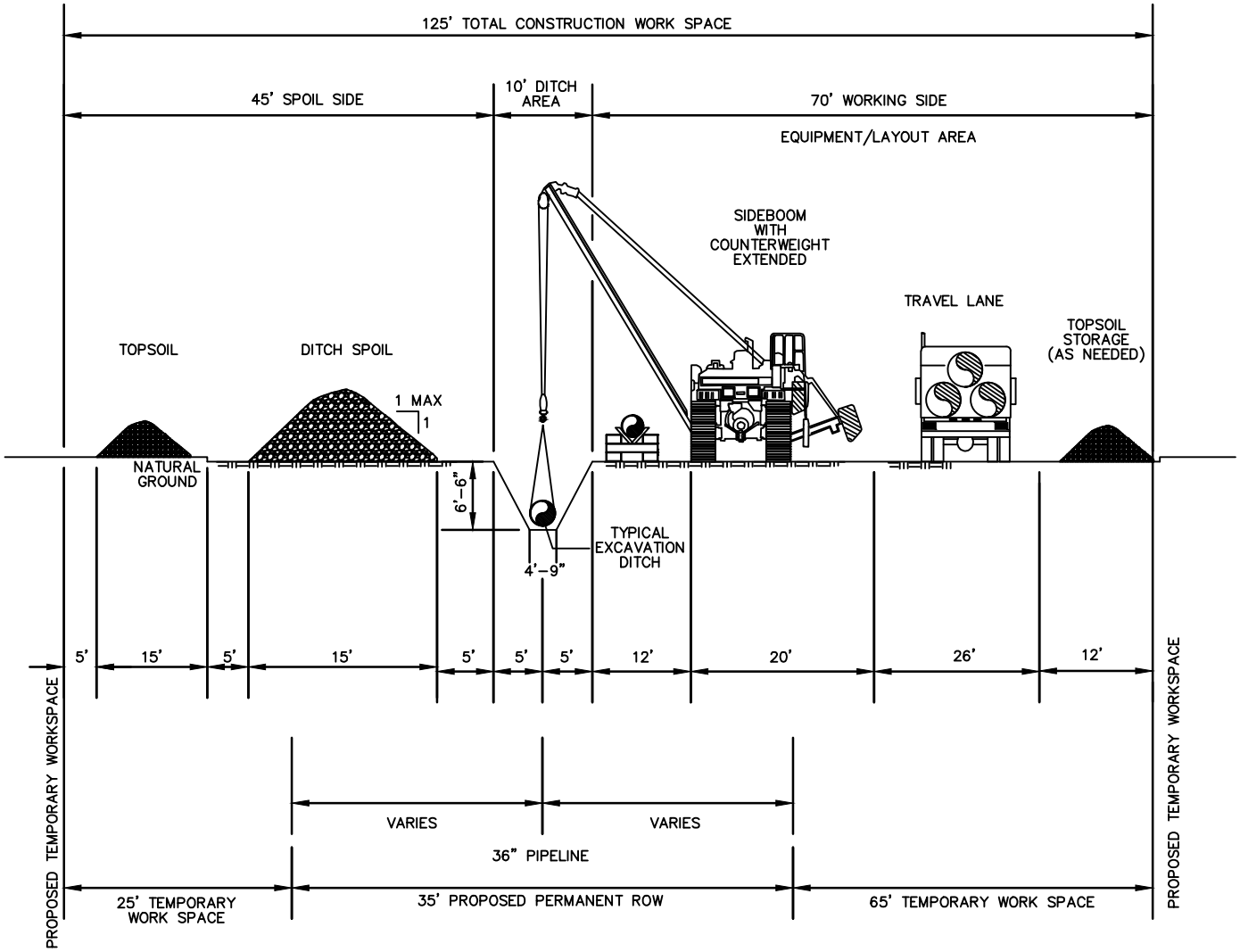
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
TYPICAL ROW CROSS SECTION
CONVENTIONAL CONSTRUCTION

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

FIG. NO. 98

Sheet: 98 of 127
Type:



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TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
TYPICAL ROW CROSS SECTION ACROSS AGRICULTURAL LAND

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

FIG. NO. 99

Sheet: 99 of 127
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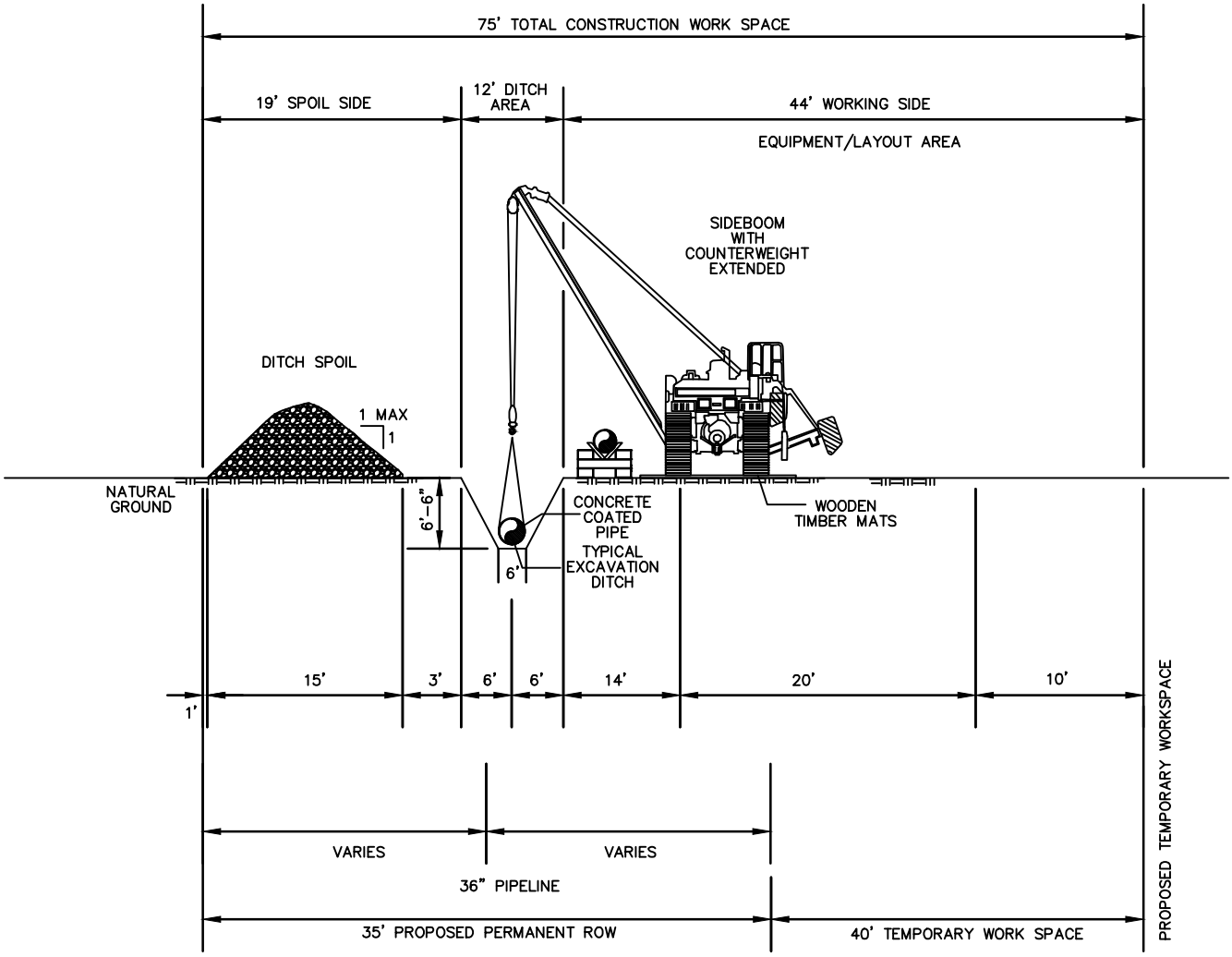

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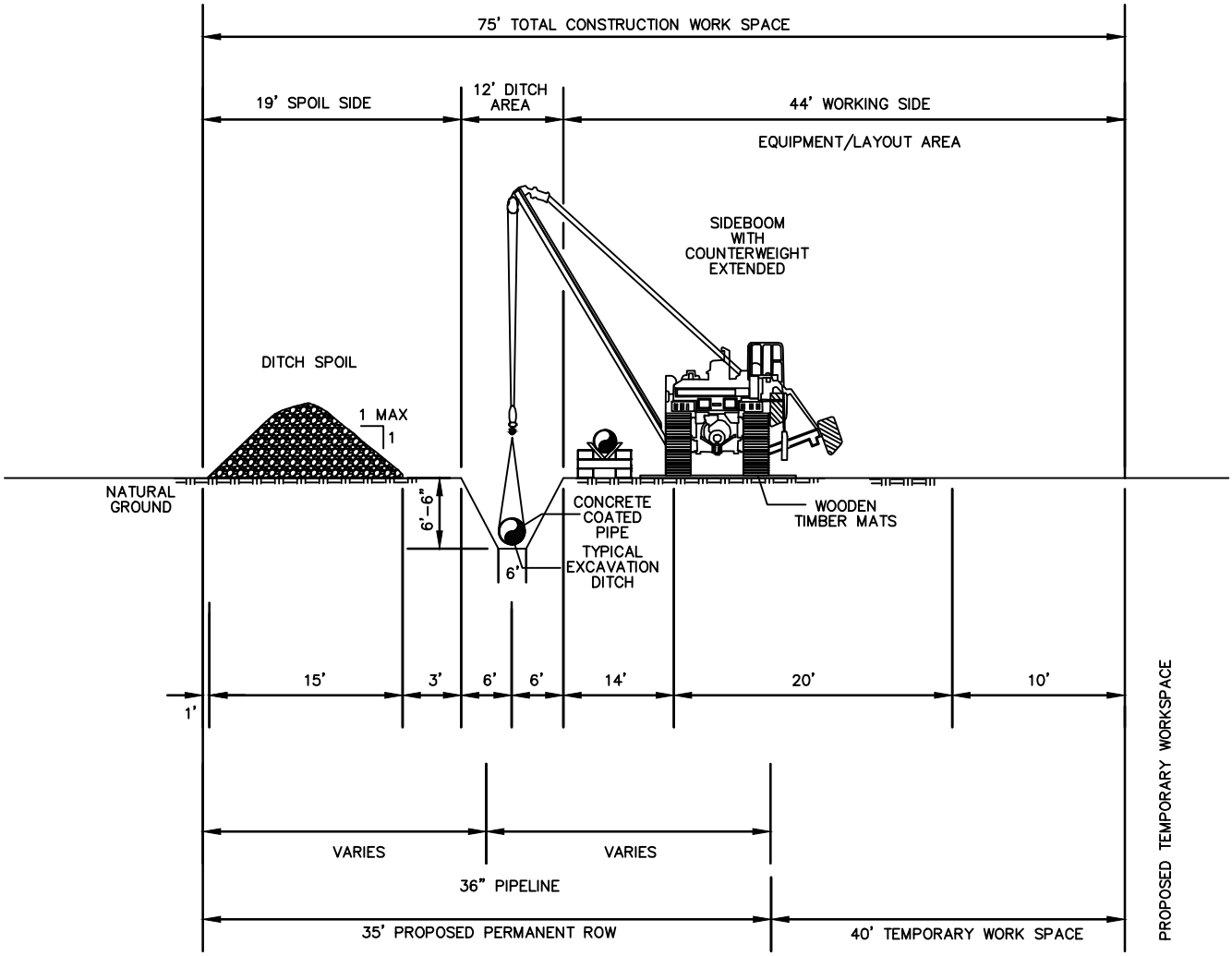
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
TYPICAL ROW CROSS SECTION
ACROSS SATURATED WETLAND

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

FIG. NO. 100

Sheet: 100 of 127
Type:



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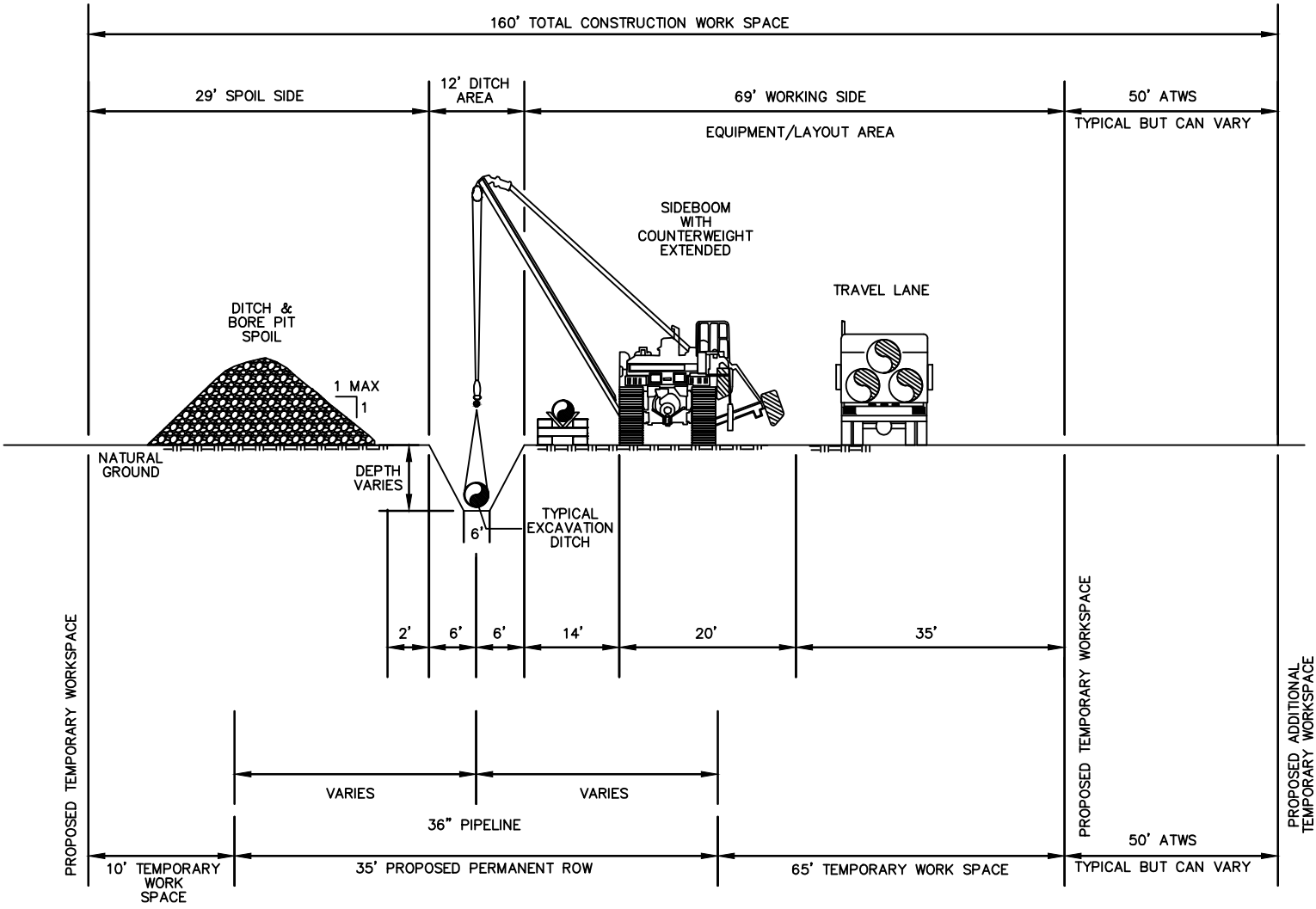
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE,LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
TYPICAL ROW CROSS SECTION–
ACROSS NON–SATURATED WETLANDS

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

FIG. NO. 101

Sheet: 101 of 127
Type:



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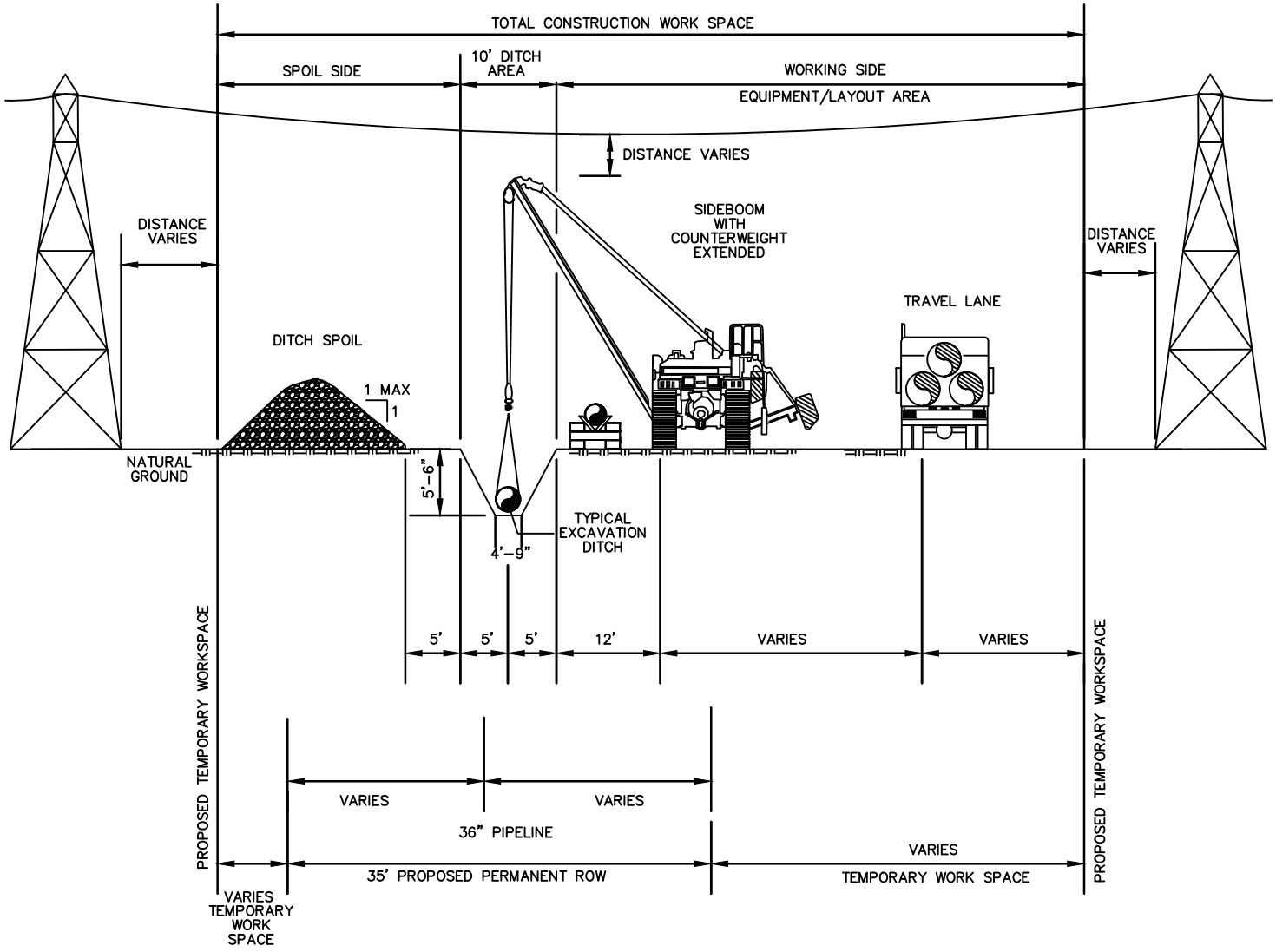
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE,LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
TYPICAL ROW CROSS SECTION–
CONSTRUCTION AT ROAD CROSSING

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

FIG. NO. 102

Sheet: 102 of 127
Type:



NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

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Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE,LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
TYP. ROW CROSS SECTION–CONVENTIONAL
CONSTR. WITH OVERHEAD UTILITY LINE CROSSING

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

FIG. NO. 103

Sheet: 103 of 127
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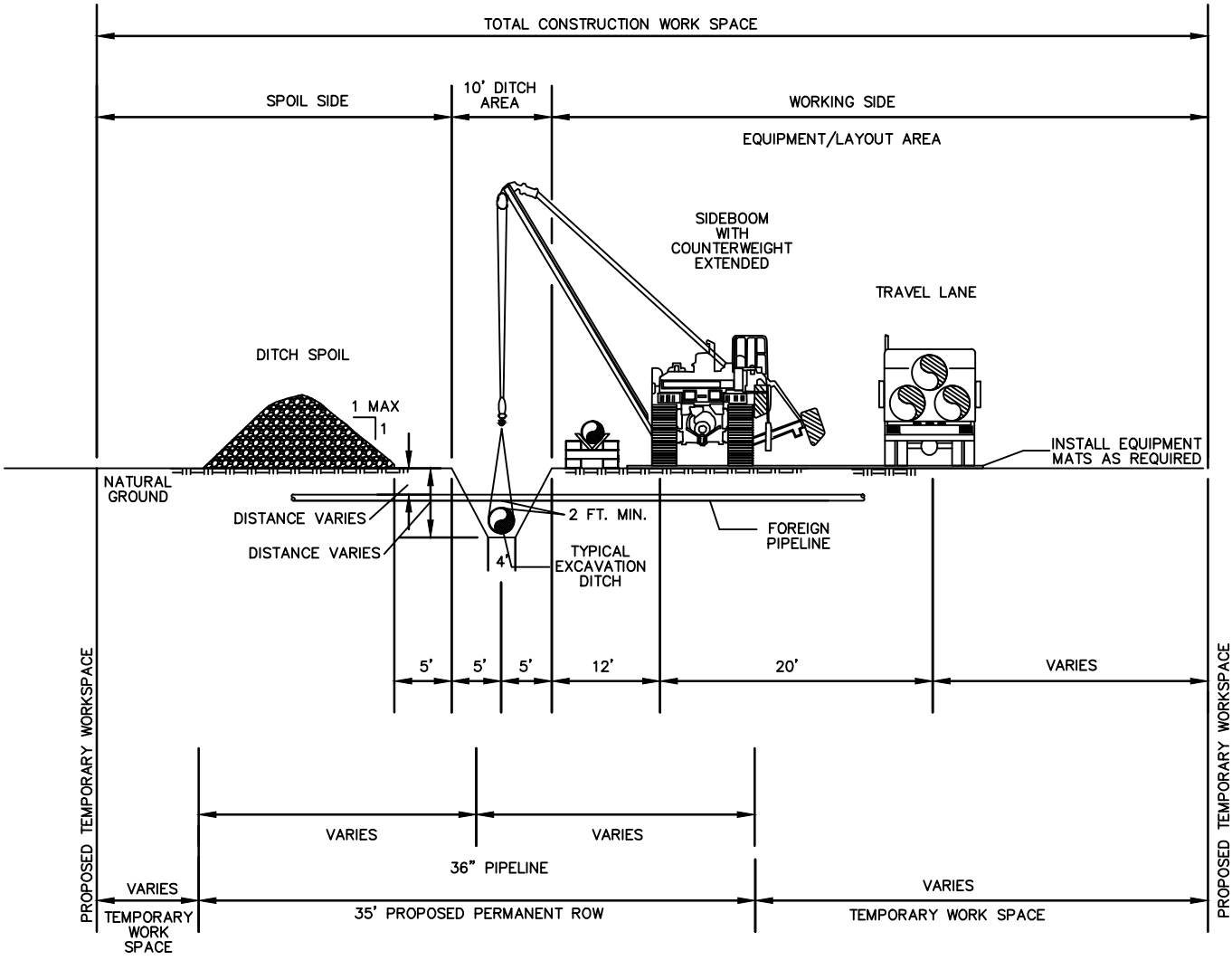

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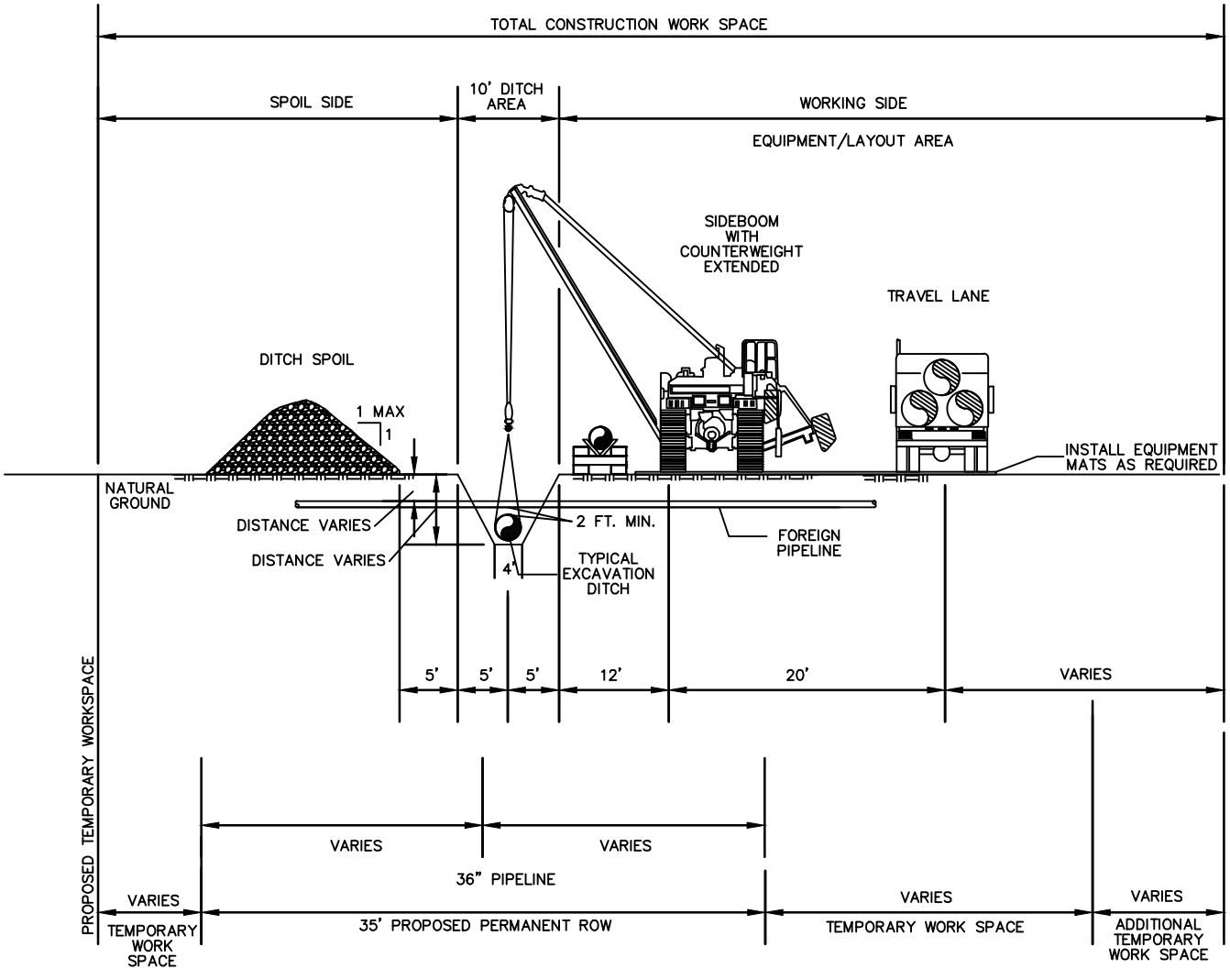
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE,LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
TYP. ROW CROSS SECTION–NORMAL CONSTR.
WITH FOREIGN PIPELINE CROSSING–TWS LEFT

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

FIG. NO. 104

Sheet: 104 of 127
Type:



NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

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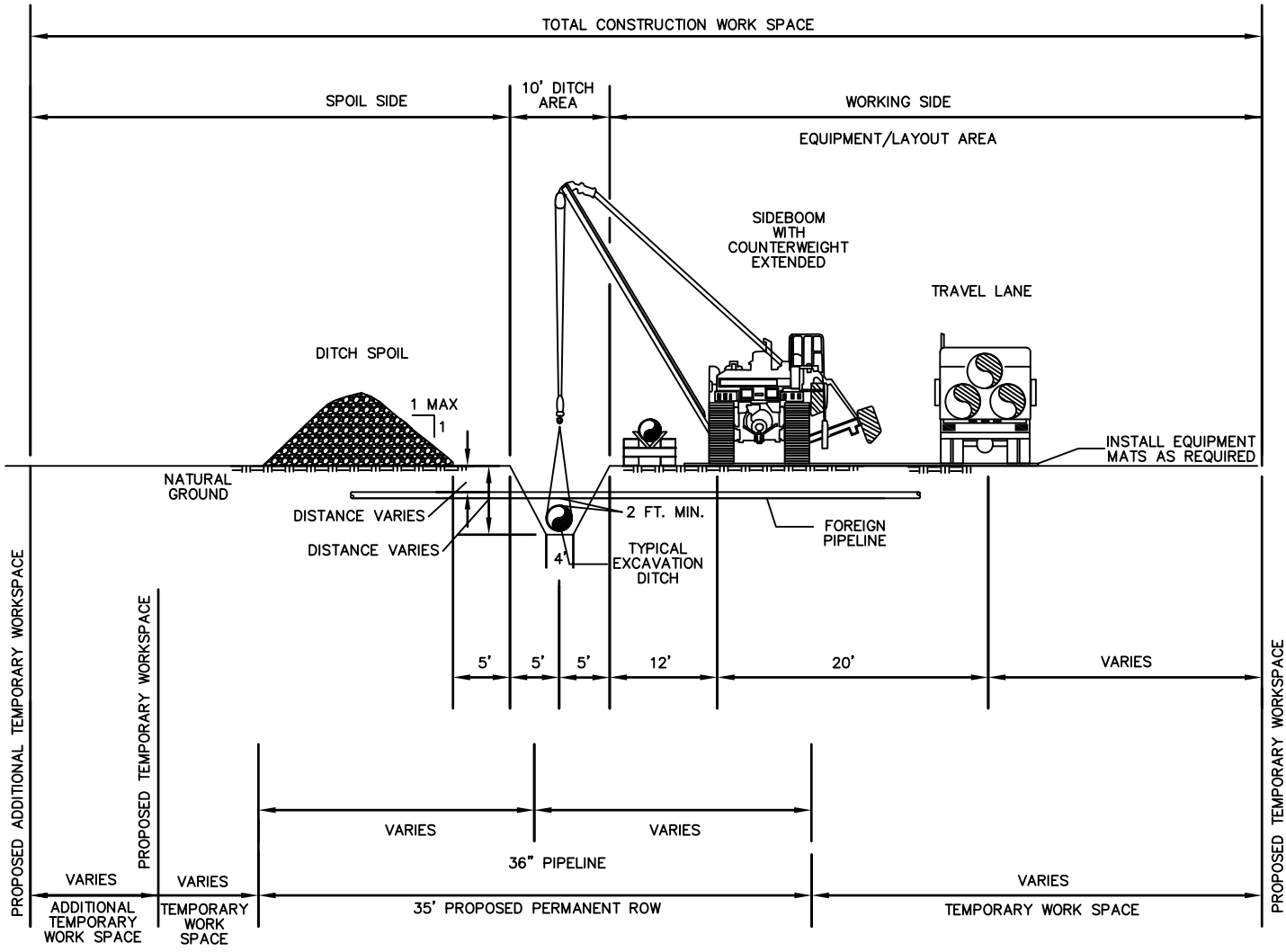
TENNESSEE GAS PIPELINE,LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
TYP. ROW CROSS SECTION–CONVENTIONAL CONSTR.
WITH FOREIGN PIPELINE CROSSING–A TWS LEFT & RIGHT

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

FIG. NO. 105

Sheet: 105 of 127
Type:



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TENNESSEE GAS PIPELINE,LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
TYP. ROW CROSS SECTION–CONVENTIONAL CONSTR.
WITH FOREIGN PIPELINE CROSSING–ATWS LEFT

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

FIG. NO. 106

Sheet: 106 of 127

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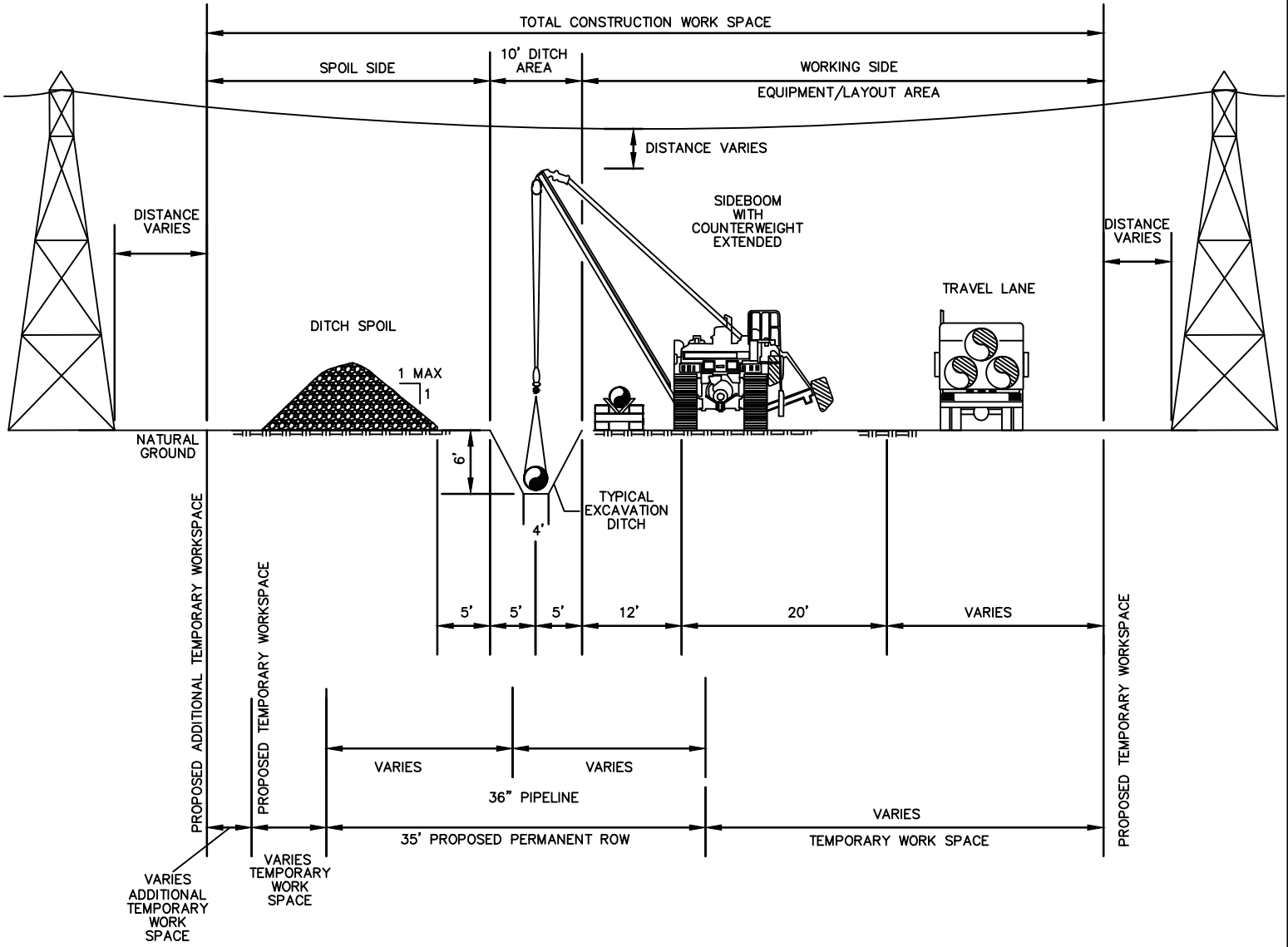

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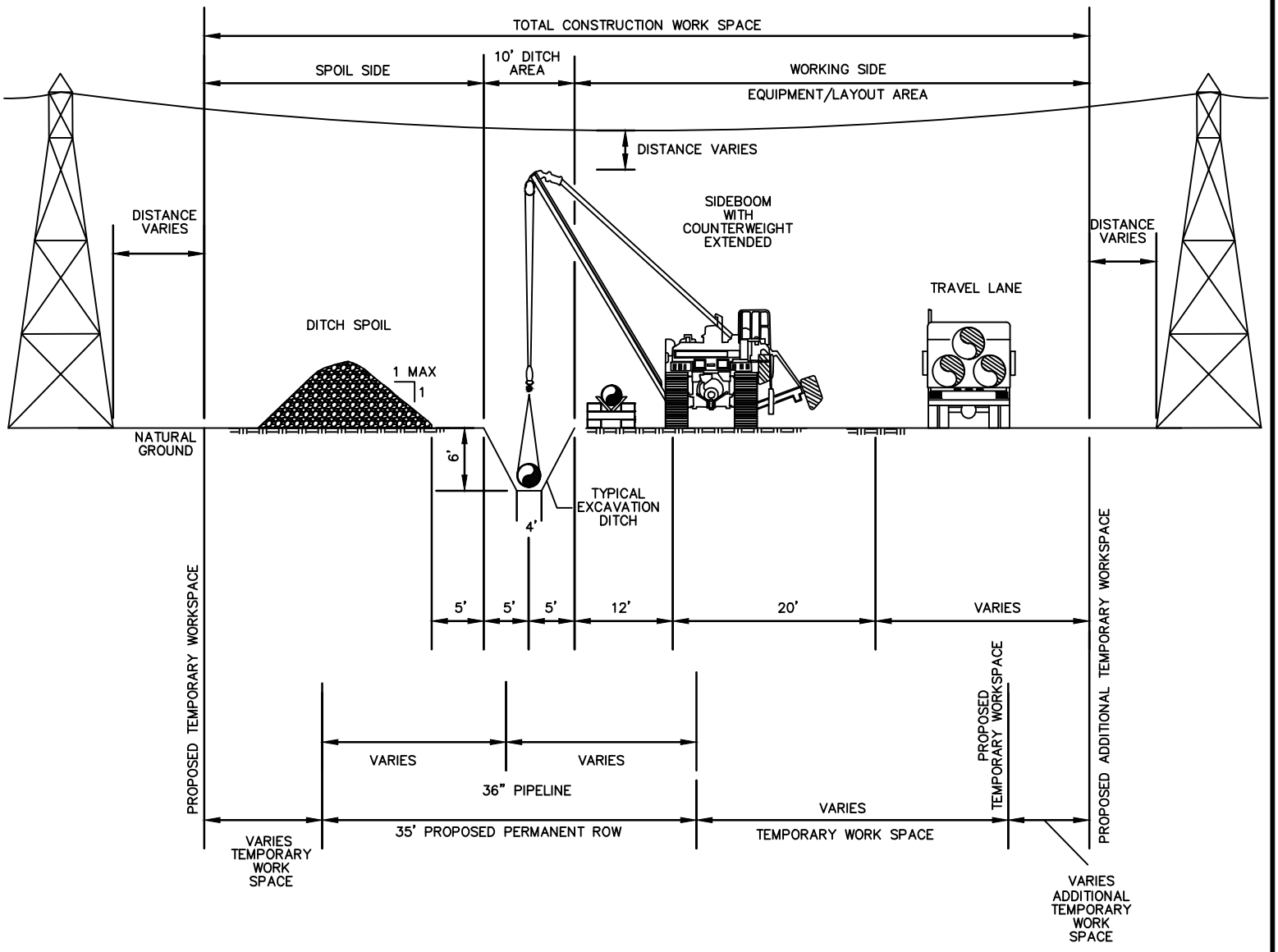
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE,LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
TYP. ROW CROSS SECTION–CONVENTIONAL CONSTR.
WITH OVERHEAD UTILITY LINE CROSSING–ATWS LEFT

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

FIG. NO. 107

Sheet: 107 of 127
Type:



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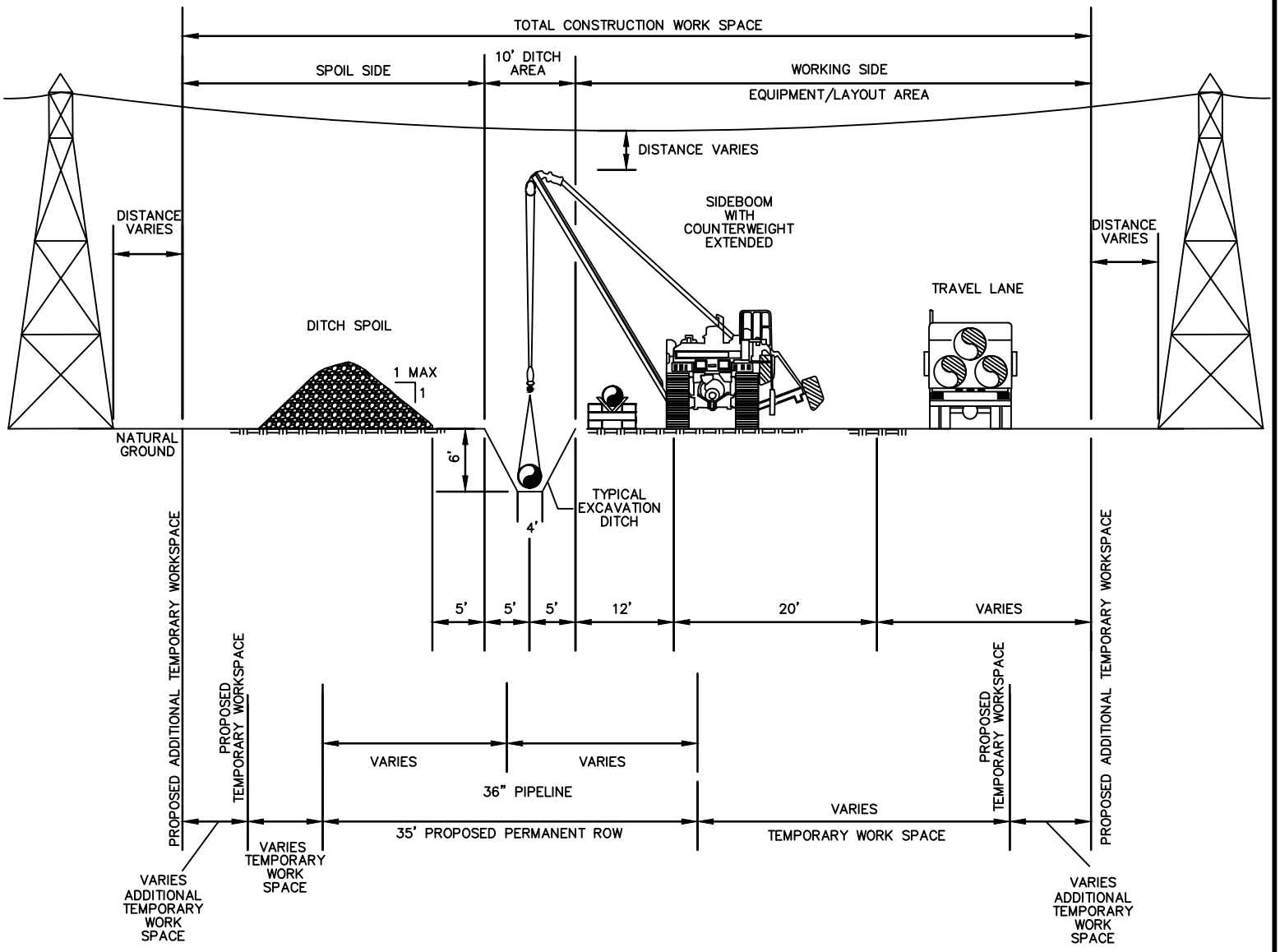
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE,LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
TYP. ROW CROSS SECTION–CONVENTIONAL CONSTR.
WITH OVERHEAD UTILITY LINE CROSSING–ATWS RIGHT

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

FIG. NO. 108

Sheet: 108 of 127
Type:



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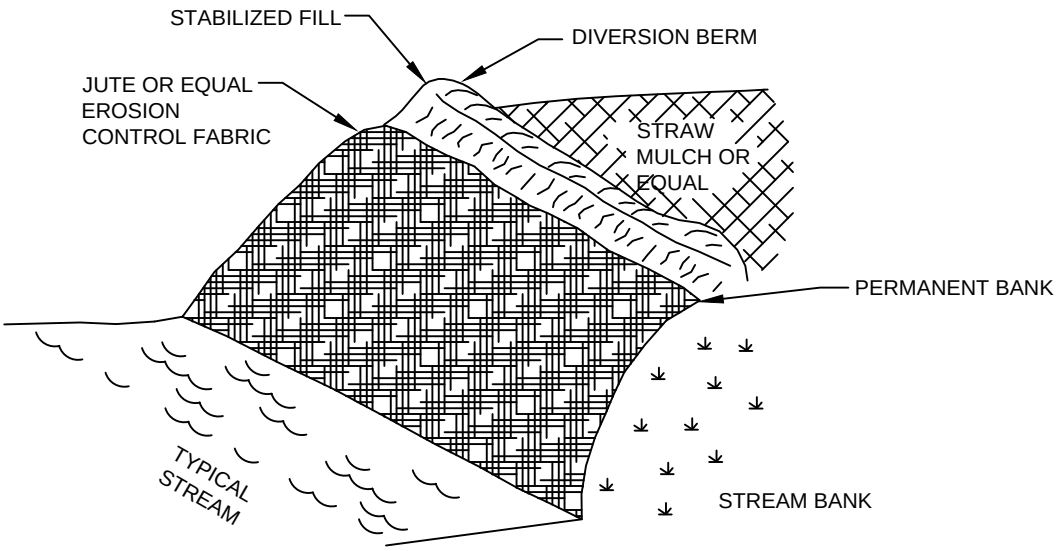
TENNESSEE GAS PIPELINE,LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
TYP. ROW CROSS SECTION–CONVENTIONAL CONSTR.
WITH OVERHEAD UTILITY LINE CROSSING–ATWS LT & RT

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

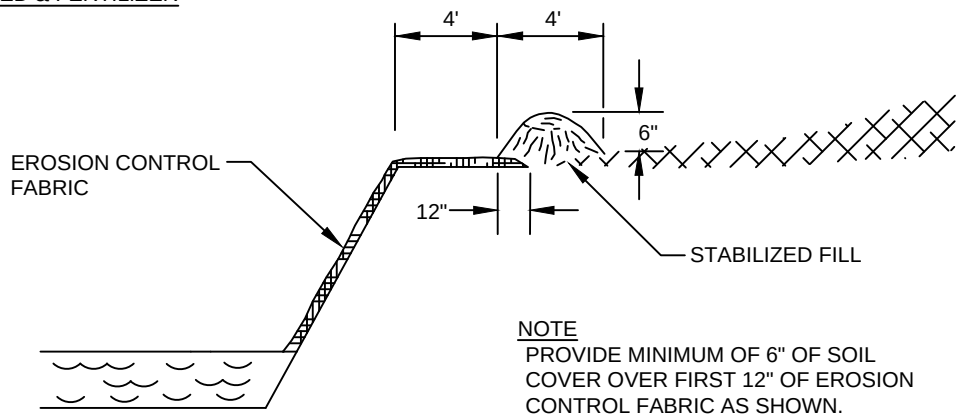
FIG. NO. 109

Sheet: 109 of 127
Type:

STAKE TO THE SLOPE WITH WOOD PEGS OR STAPLE
PER MANUFACTURERS SPECIFICATION



STRAW MULCH OR EQUAL
OVER SEED & FERTILIZER



NOTE
PROVIDE MINIMUM OF 6" OF SOIL
COVER OVER FIRST 12" OF EROSION
CONTROL FABRIC AS SHOWN.

SLOPE SECTION

NOTES:

EROSION CONTROL MATTING WILL BE INSTALLED WITHIN 50' OF BANK FOR ALL HQ/EV WATERSHEDS.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE,LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
TYPICAL EROSION
CONTROL FABRIC

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

FIG. NO. 110

Sheet: 110 of 127
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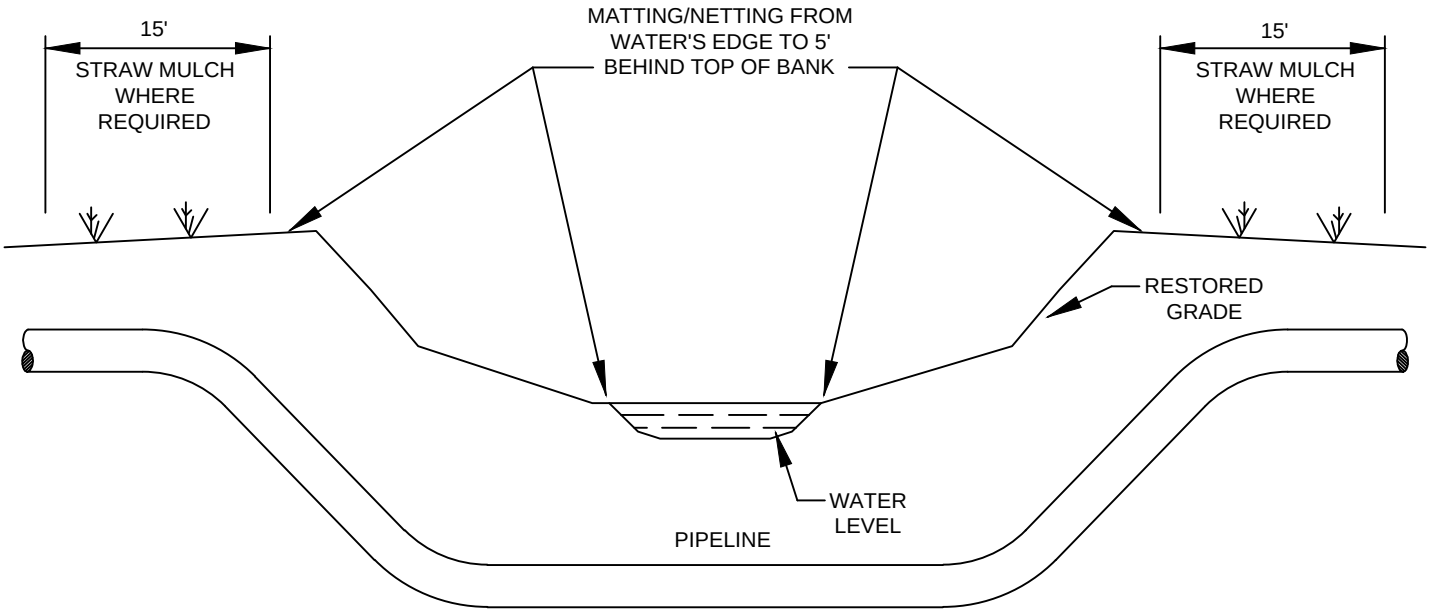
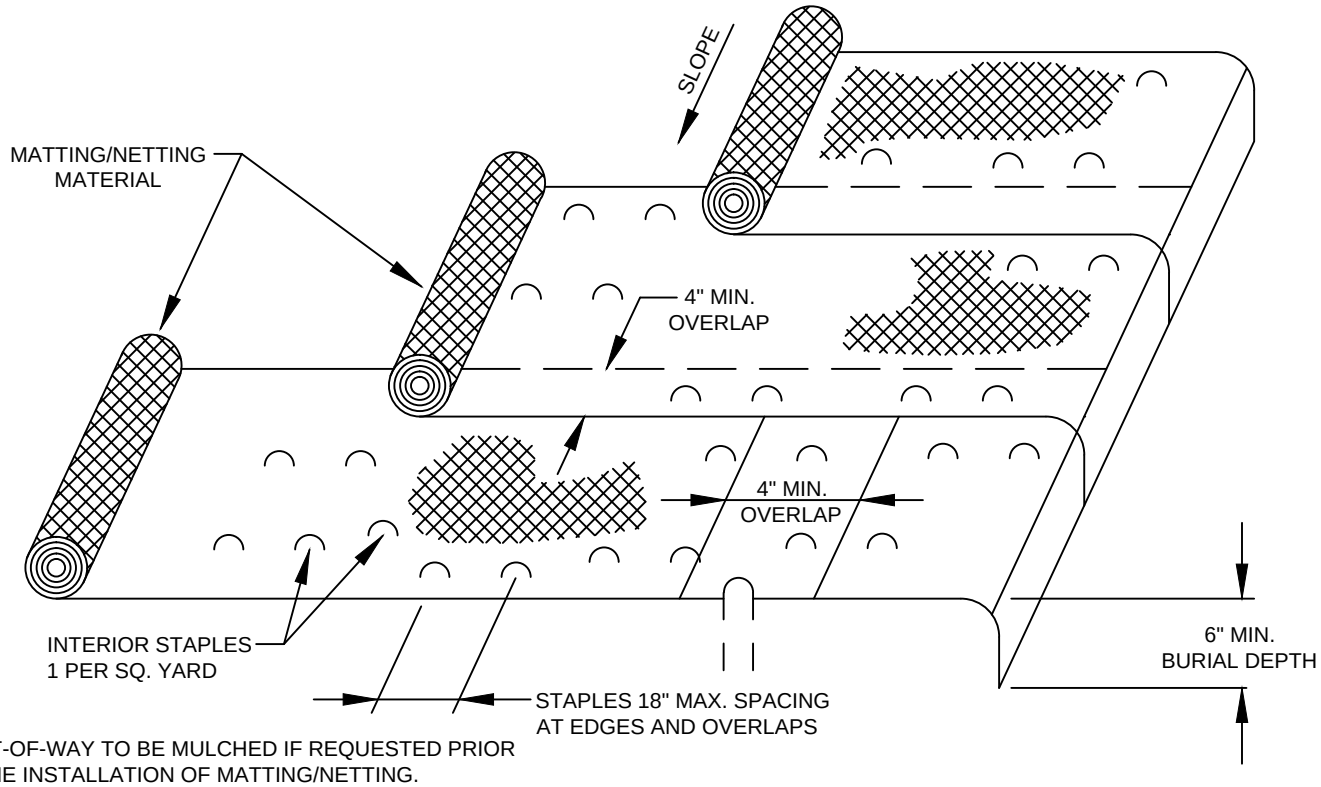


PROFILE
(NOT TO SCALE)



NOTES:

1. RIGHT-OF-WAY TO BE MULCHED IF REQUESTED PRIOR TO THE INSTALLATION OF MATTING/NETTING.
2. MATTING/NETTING SHALL BE RUN HORIZONTAL AND PARALLEL TO THE GROUND CONTOUR.
3. STAPLES SHALL BE 10"-LONG, STANDARD MATTING/NETTING STAPLES.
4. **EROSION CONTROL MATTING WILL BE INSTALLED WITHIN 50' OF BANK FOR ALL HQ/EV WATERSHEDS.**

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

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Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE,LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
TYPICAL MATTING/NETTING
INSTALLATION FOR WATER CROSSING

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

FIG. NO. 111

Sheet: 111 of 127
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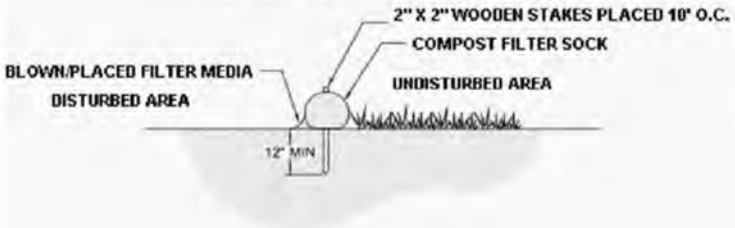
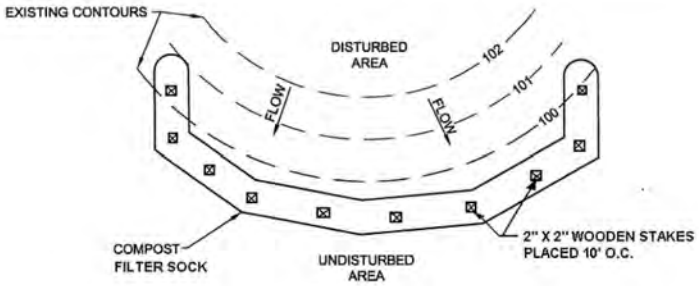
STANDARD CONSTRUCTION DETAIL 4-1
COMPOST FILTER SOCK



SECTION VIEW
NTS



PLAN VIEW
NTS

Adapted from Filtrexx

Sock fabric shall meet standards of Table 4.1. Compost shall meet the following standards:

Organic Matter Content	**80% - 100% (dry weight basis)**
Organic Portion	**Fibrous and elongated**
pH	**5.5 – 8.0**
Moisture Content	**35% - 55%**
Particle Size	**98% pass through 1" screen**
Soluble Salt Concentration	**5.0 dS Maximum**

NOTES:

COMPOST FILTER SOCK SHALL BE PLACED AT EXISTING LEVEL GRADE. BOTH ENDS OF THE SOCK SHALL BE EXTENDED AT LEAST 8 FEET UP SLOPE AT 45 DEGREES TO THE MAIN SOCK ALIGNMENT. MAXIMUM SLOPE LENGTH ABOVE ANY SOCK SHALL NOT EXCEED 500 FEET.

TRAFFIC SHALL NOT BE PERMITTED TO CROSS FILTER SOCKS.

ACCUMULATED SEDIMENT SHALL BE REMOVED WHEN IT REACHES 1/2 THE ABOVE GROUND HEIGHT OF THE SOCK AND DISPOSED IN THE MANNER DESCRIBED ELSEWHERE IN THE PLAN.

SOCKS SHALL BE INSPECTED WEEKLY AND AFTER EACH RUN OFF EVENT. DAMAGED SOCKS SHALL BE REPAIRED ACCORDING TO MANUFACTURE'S SPECIFICATIONS OR REPLACED WITHIN 24 HOURS OF INSPECTION.

BIODEGRADABLE FILTER SOCK SHALL BE REPLACED AFTER 6 MONTHS; PHOTODEGRADABLE SOCKS AFTER 1 YEAR. POLYPROPYLENE SOCKS SHALL BE REPLACED ACCORDING TO MANUFACTURER'S RECOMMENDATIONS.

UPON STABILIZATION OF THE AREA TRIBUTARY TO THE SOCK, STAKES SHALL BE REMOVED. THE SOCK MAY BE LEFT IN PLACE AND VEGETATED OR REMOVED. IN THE LATTER CASE, THE MESH SHALL BE CUT OPEN AND MULCH SPREAD AS SOIL SUPPLEMENT.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

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Division:	Op. Area:	
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Section:	Township:	Range:
Dft:	Date:	Project ID:
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TENNESSEE GAS PIPELINE,LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
STANDARD CONSTRUCTION DETAIL,
COMPOST FILTER SOCK

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

FIG. NO. 112

Sheet: 112 of 127
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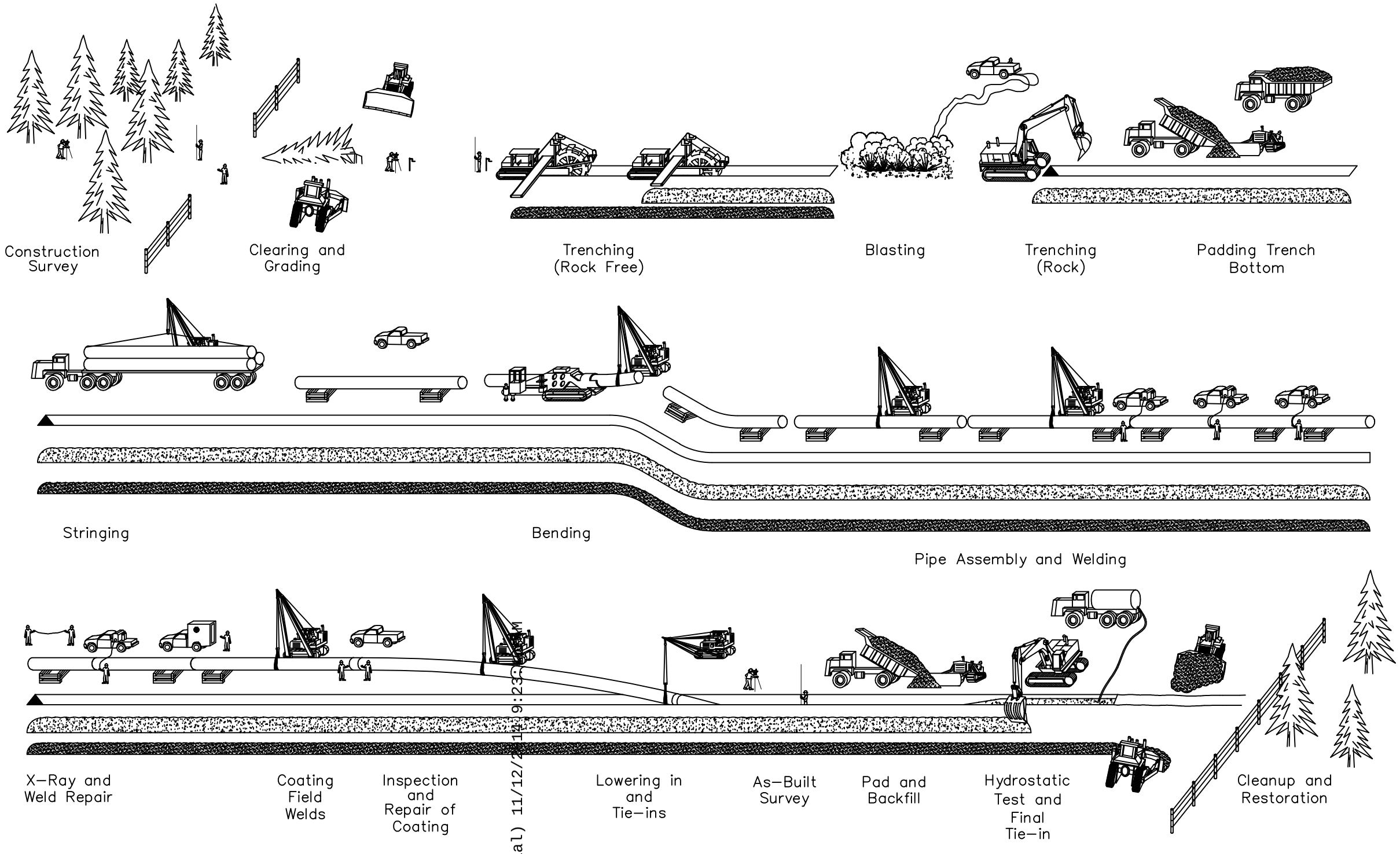

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Appr:	Date:		

TENNESSE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
TYPICAL PIPELINE CONSTRUCTION SEQUENCE

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

FIG. NO. 113

Sheet: 113 of 127
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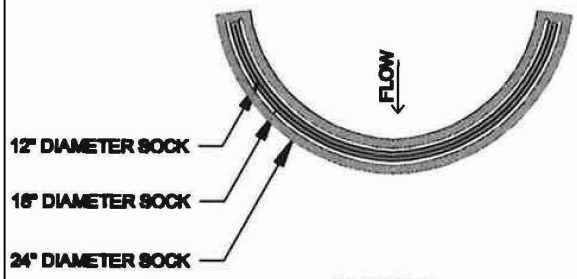
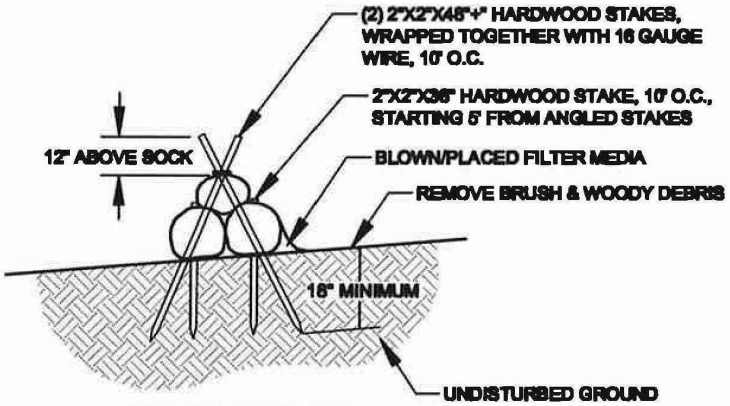
COMPOST SOCK SEDIMENT TRAP



PLAN VIEW

1. COMPOST SOCK SEDIMENT TRAP SHALL BE SIZED TO PROVIDE 2,000 CUBIC FEET OF STORAGE CAPACITY FOR EACH ACRE TRIBUTARY TO THE TRAP.
2. MINIMUM BASE WIDTH IS EQUIVALENT TO THE HEIGHT.
3. SEDIMENT ACCUMULATION SHALL NOT EXCEED 1/3 THE TOTAL HEIGHT OF THE TRAP.
4. SOCKS SHALL BE OF LARGER DIAMETER AT THE BASE OF THE TRAP AND DECREASE IN DIAMETER FOR SUCCESSIVE LAYERS AS INDICATED TO THE LEFT.
5. ENDS OF THE TRAP SHALL BE A MINIMUM OF 1 FOOT HIGHER IN ELEVATION THAN THE MID-SECTION, WHICH SHALL BE LOCATED AT THE POINT OF DISCHARGE.



ADAPTED FROM FILTREXX
STAKING DETAIL

SOCK MATERIAL SHALL MEET THE STANDARDS OF TABLE 4.1 COMPOST SHALL MEET THE FOLLOWING STANDARDS:

ORGANIC MATTER CONTENT	80%-100% (DRY WEIGHT BASIS)
ORGANIC PORTION	FIBROUS AND ELONGATED
pH	5.5-8.0
MOISTURE CONTENT	35%-55%
PARTICLE SIZE	99% PASS THROUGH 1" SCREEN
SOLUBLE SALT CONCENTRATION	5.0 dS MAXIMUM

COMPOST SOCK TRAPS SHALL NOT EXCEED THREE SOCKS IN HEIGHT AND SHALL BE STACKED IN PYRAMIDAL FORM AS SHOWN ABOVE. MINIMUM TRAP HEIGHT IS ON 24" DIAMETER SOCK. ADDITIONAL STORAGE MAY BE PROVIDED BY MEANS OF AN EXCAVATED SUMP 12" DEEP EXTENDING 1 TO 3 FEET UPSLOPE OF THE SOCKS.

COMPOST SOCK TRAPS SHALL PROVIDE 2,000 CUBIC FEET STORAGE CAPACITY WITH 12" FREEBOARD FOR EACH TRIBUTARY DRAINAGE AREA.

THE MAXIMUM TRIBUTARY DRAINAGE AREA IS 5.0 ACRES. SINCE COMPOST SOCKS ARE "FLOW-THROUGH", NO SPILLWAY IS REQUIRED.

COMPOST SOCK TRAPS SHALL BE INSPECTED WEEKLY AND AFTER EACH RUNOFF EVENT. SEDIMENT SHALL BE REMOVED WHEN IT REACHES 1/3 THE HEIGHT OF THE SOCK.

PHOTODEGRADABLE AND BIODEGRADABLE SOCKS SHALL NOT BE USED FOR MORE THAN 1 YEAR.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

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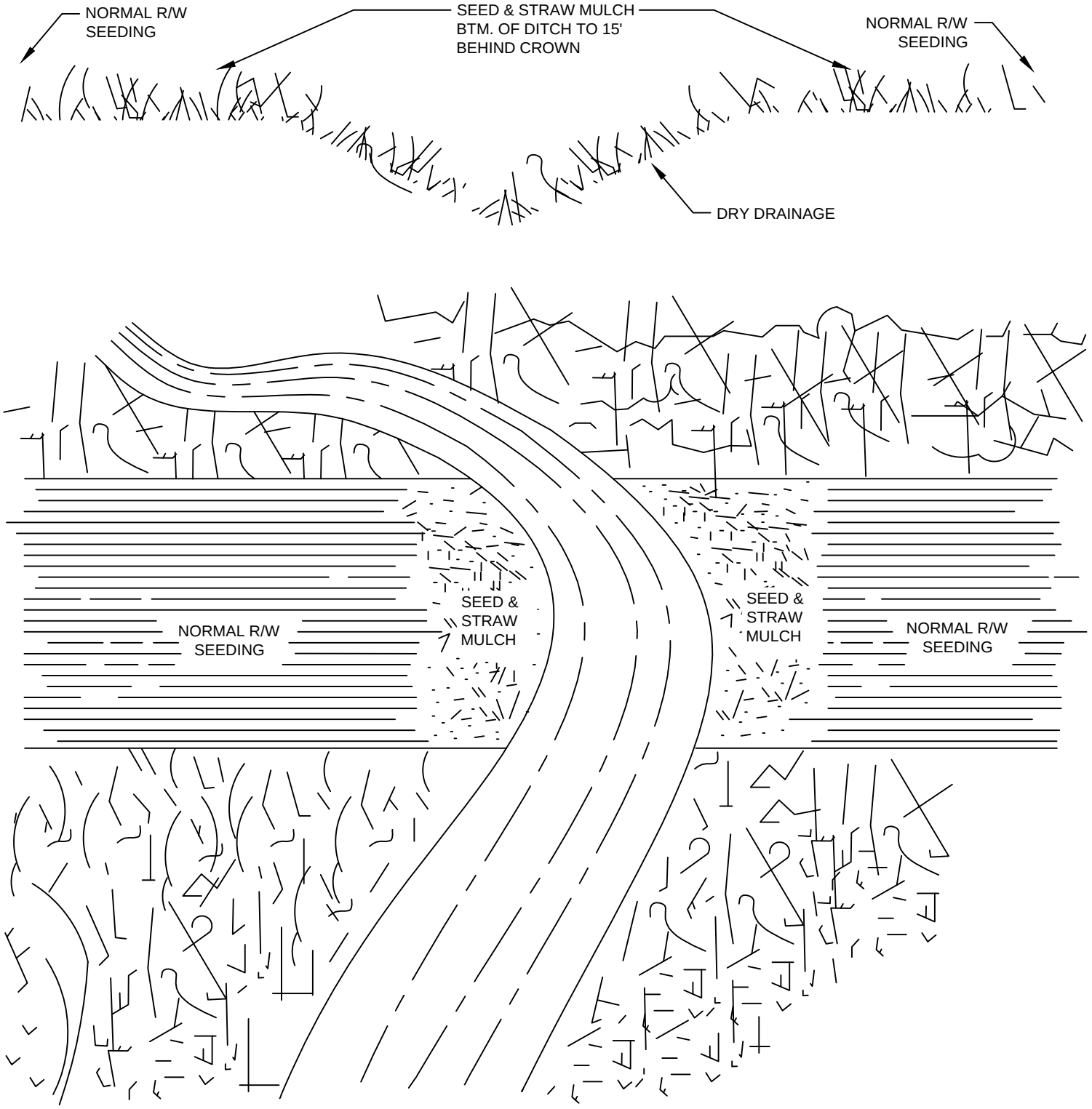
TENNESSEE GAS PIPELINE,LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
COMPOST SOCK
SEDIMENT TRAP

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

FIG. NO. 114

Sheet: 114 of 127
Type:



NOTES:

EROSION CONTROL MATTING WILL BE INSTALLED WITHIN 50' OF BANK FOR ALL HQ/EV WATERSHEDS.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

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Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE,LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
FINAL STREAM
BANK STABILIZATION (1)

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

FIG. NO. 115

Sheet: 115 of 127
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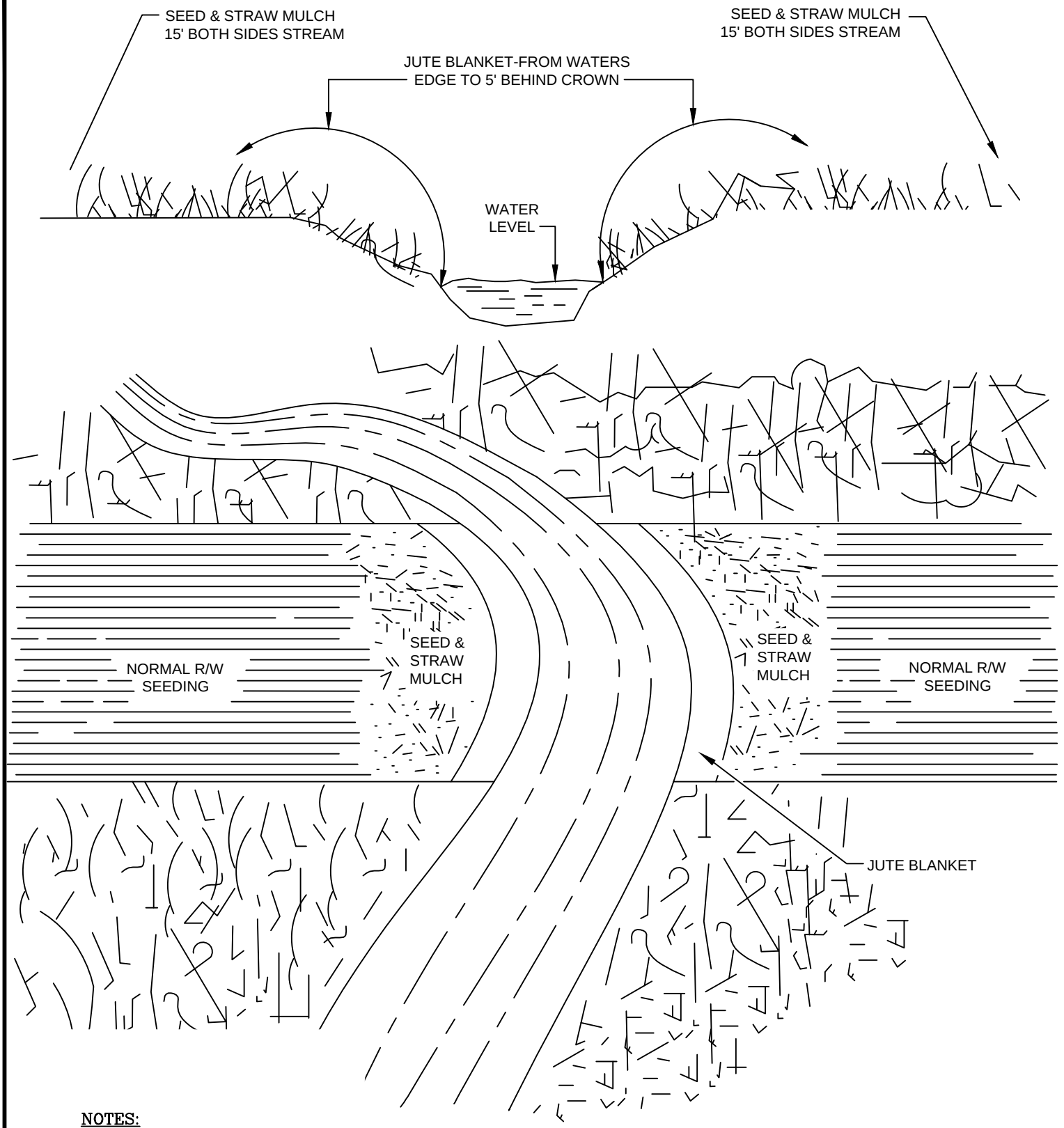

NOTES:

EROSION CONTROL MATTING WILL BE INSTALLED WITHIN 50' OF BANK FOR ALL HQ/EV WATERSHEDS.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

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Division:	Op. Area:	
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Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE,LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
FINAL STREAM BANK
STABILIZATION (2)

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

FIG. NO. 116

Sheet: 116 of 127
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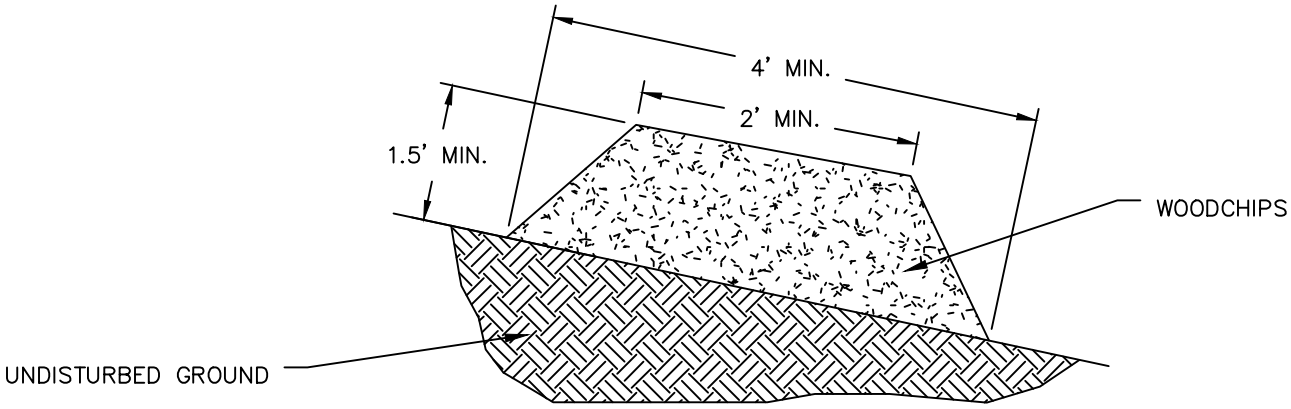


PRIOR TO PLACEMENT OF THE BERM, OBSTRUCTIONS SUCH AS TREE LIMBS, LARGE ROCKS, ETC. SHALL BE REMOVED.

WOOD CHIP FILTER BERM SHALL BE PLACED AT EXISTING LEVEL GRADE. BOTH ENDS OF THE BERM SHALL BE EXTENDED AT LEAST 8 FEET UP SLOPE AT 45 DEGREES TO THE MAIN BERM ALIGNMENT. WOOD CHIP BERMS SHALL NOT BE LOCATED IN AREAS OF CONCENTRATED FLOW OR USED TO CONSTRUCT SEDIMENT TRAPS OR OTHER IMPOUNDMENTS.

A 6" THICK LAYER OF COMPOST SHALL BE ADDED TO THE UPSLOPE SIDE OF ANY WOOD CHIP FILTER BERM LOCATED IN AN HQ WATERSHED. THIS BMP SHALL NOT BE ROUTINELY USED IN EV WATERSHEDS.

BERMS SHALL BE INSPECTED WEEKLY AND AFTER EACH RUNOFF EVENT. SEDIMENT SHALL BE REMOVED WHEN ACCUMULATIONS REACH HALF THE HEIGHT OF THE BERM. DAMAGED OR DETERIORATED PORTIONS OF THE BERM SHALL BE REPLACED IMMEDIATELY UPON INSPECTION.

BERMS MAY BE LEVELED WHEN THE TRIBUTARY AREA HAS BEEN PERMANENTLY STABILIZED OR LEFT IN PLACE.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

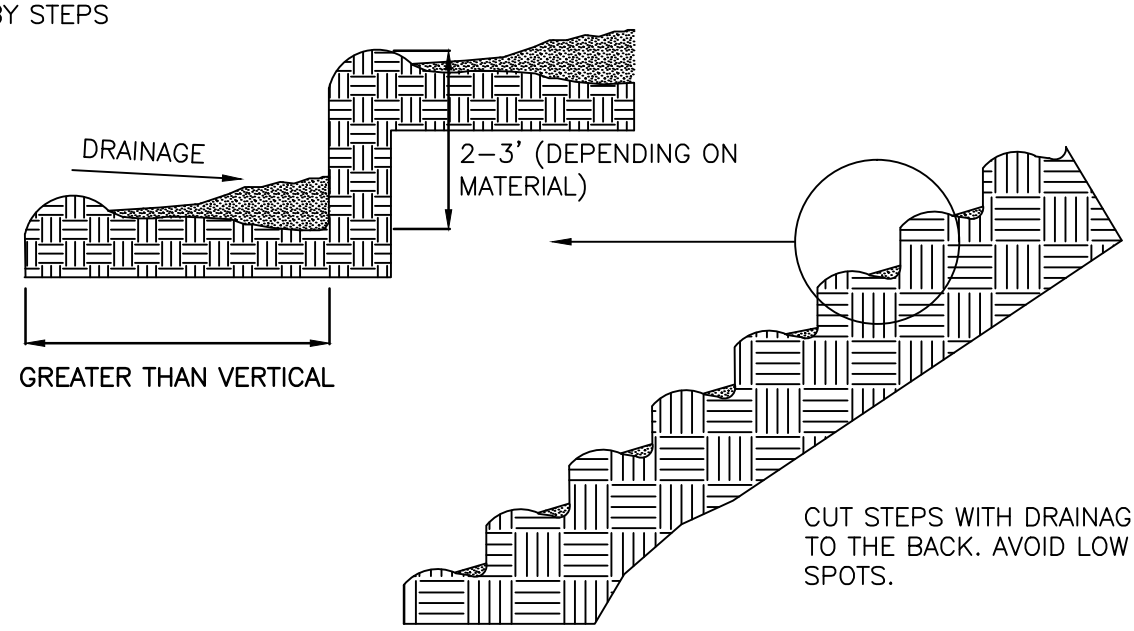
TENNESSEE GAS PIPELINE,LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
WOODCHIP
FILTER BERM

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

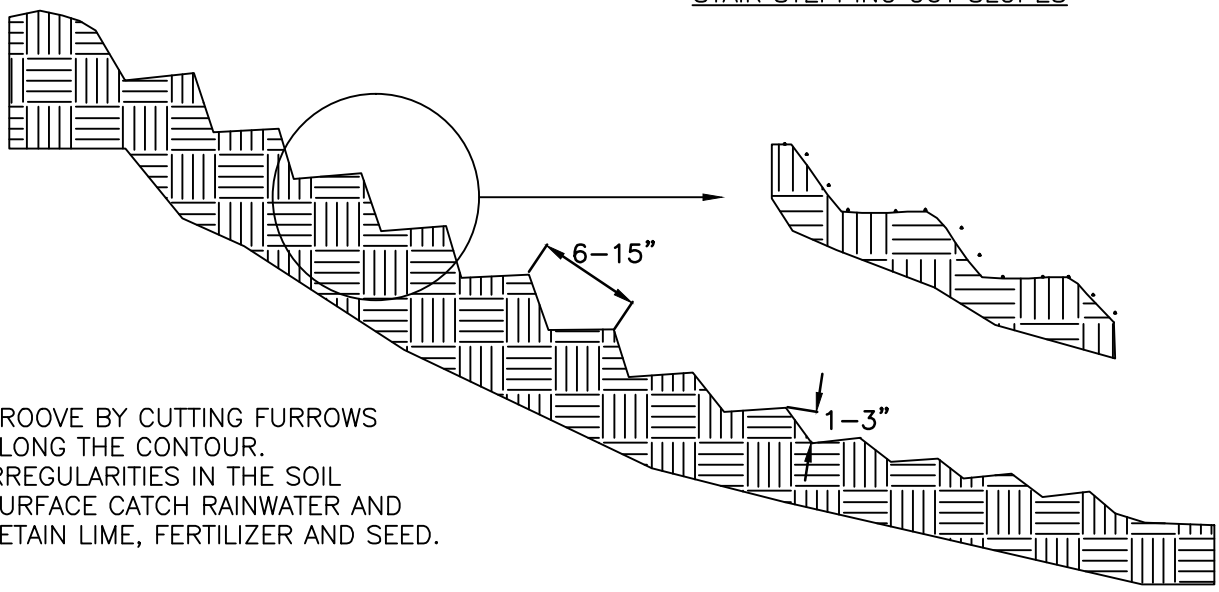
FIG. NO. 117

Sheet: 117 of 127
Type:

DEBRIS FROM SLOPE ABOVE IS CAUGHT BY STEPS



STAIR STEPPING CUT SLOPES



GROOVE BY CUTTING FURROWS ALONG THE CONTOUR. IRREGULARITIES IN THE SOIL SURFACE CATCH RAINWATER AND RETAIN LIME, FERTILIZER AND SEED.

GROOVING SLOPES

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Dft:	Date:	Project ID:	
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Appr:	Date:	Filename:	

TENNESSEE GAS PIPELINE,LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
SURFACE ROUGHENING

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

FIG. NO. 118

Sheet: 118 of 127
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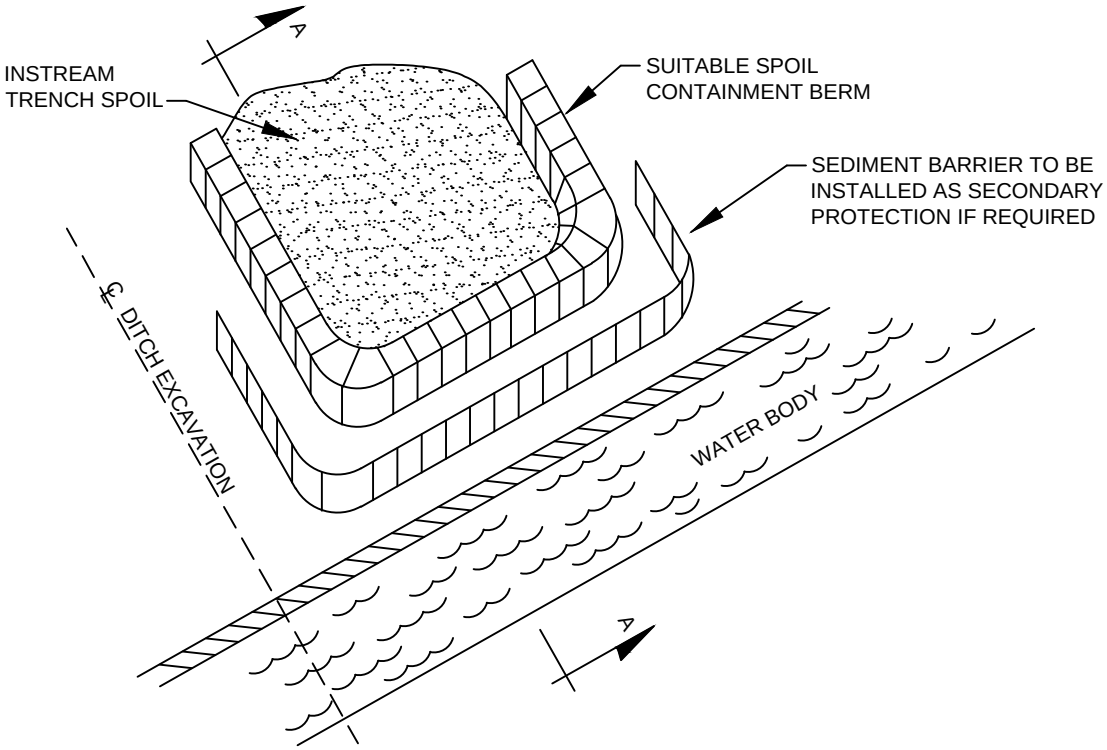
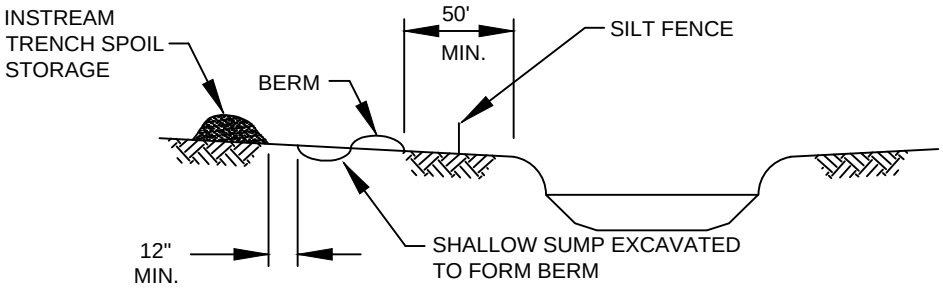




SECTION A-A
NOT TO SCALE

NOTES:

1. SOIL CONTAINMENT BERNS ARE TO BE USED WHERE INSTREAM TRENCH SPOIL COULD REENTER THE WATERCOURSE DIRECTLY OR INDIRECTLY AND WITH STIMULTANEOUS UTILIZATION OF SEDIMENT BARRIERS IF REQUIRED.
2. MATERIAL USED FOR THE CONTAINMENT BERM SHOULD BE A MINIMUM OF 50' FROM THE WATERS EDGE. IT SHOULD BE KEPT TO A HEIGHT WHICH REMAINS STABLE DURING THE CONSTRUCTION PERIOD.
3. CARE SHOULD BE TAKEN THAT THE SPOIL PILE DOES NOT OVERTOP THE CONTAINMENT BERM.
4. THE CONTAINMENT BERM SHOULD BE DISMANTLED AND THE SITE RESTORED TO THE ORIGINAL CONDITION UPON COMPLETION OF THE WATER CROSSING.
5. WHERE POSSIBLE, RIPARIAN VEGETATION SHALL BE LEFT IN PLACE.
6. STAGED MOVEMENT OF INSTREAM SPOIL MAY BE REQUIRED IF QUANTITIES ARE EXCESSIVE.
7. CARE AND ATTENTION MUST BE TAKEN TO ENSURE SPOIL CONTAINMENT BERMS ARE MAINTAINED.
8. FULL CONSIDERATION FOR OVERALL SLOPE STABILITY IS REQUIRED WHEN SELECTING A SPOIL CONTAINMENT LOCATION.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

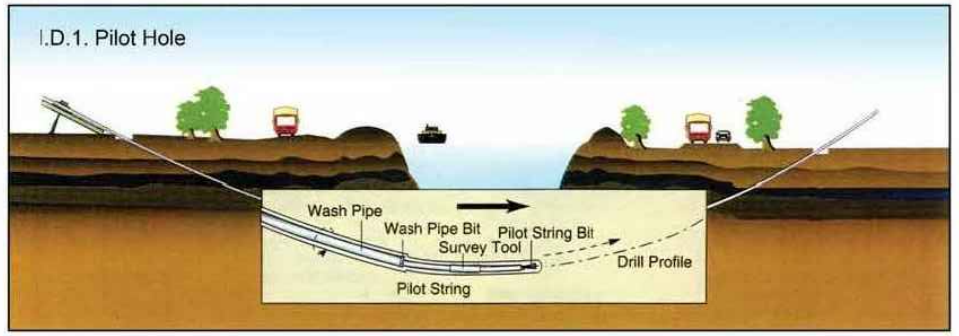
TENNESSEE GAS PIPELINE,LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
TYPICAL TEMPORARY SOIL CONTAINMENT
BERM FOR WATERBODY TRENCH SPOIL

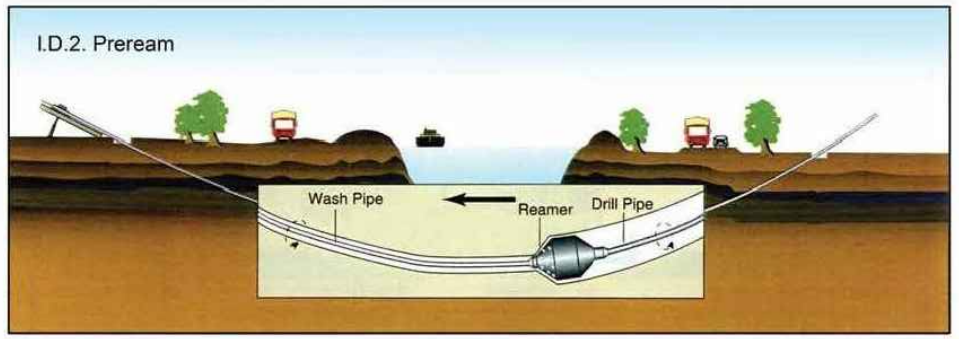
Tennessee Gas Pipeline Company, L.L.C.
a Kinder Morgan company

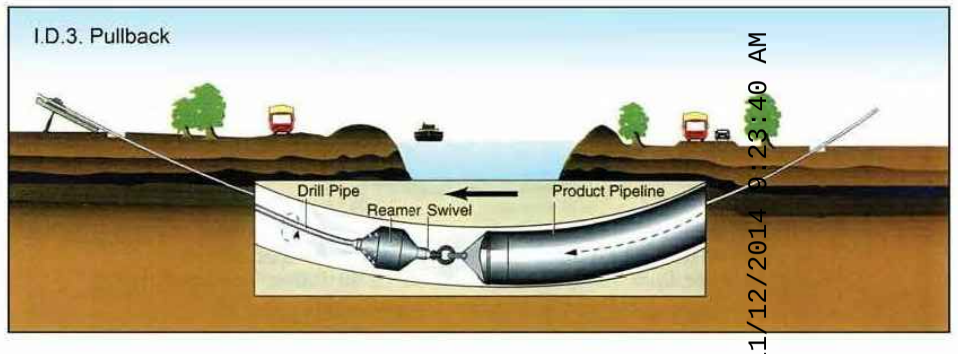
FIG. NO. 119

Sheet: 119 of 127
Type:

Figure 1. Technique







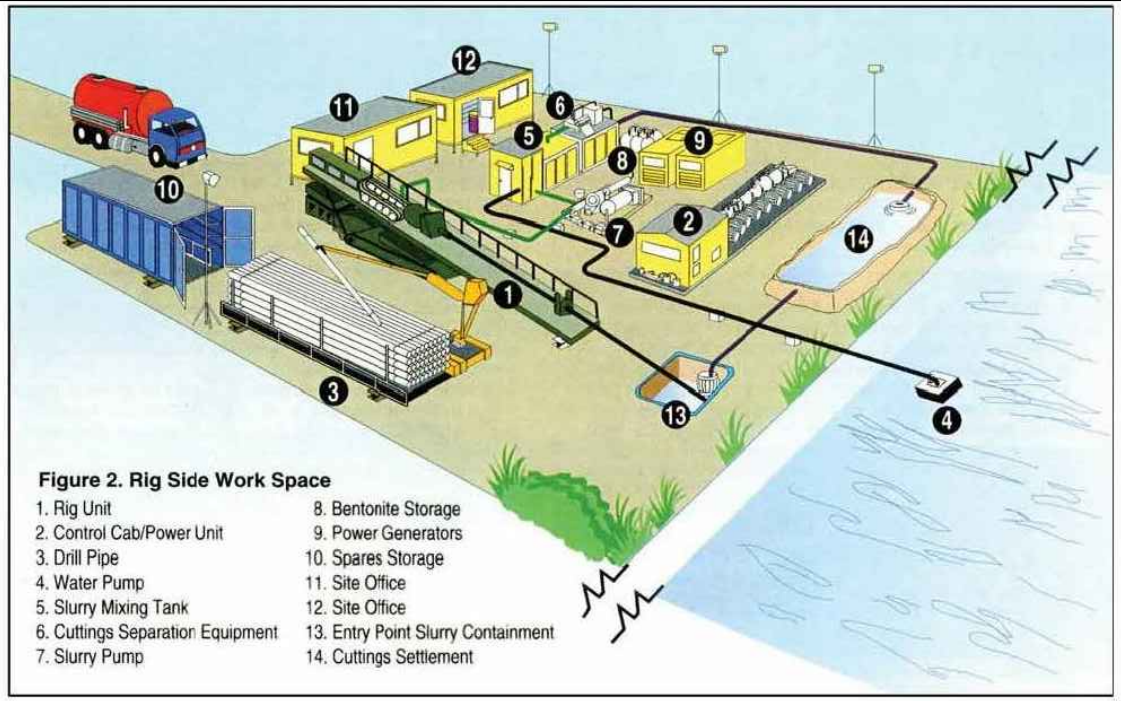


Figure 2. Rig Side Work Space

1. Rig Unit
2. Control Cab/Power Unit
3. Drill Pipe
4. Water Pump
5. Slurry Mixing Tank
6. Cuttings Separation Equipment
7. Slurry Pump
8. Bentonite Storage
9. Power Generators
10. Spares Storage
11. Site Office
12. Site Office
13. Entry Point Slurry Containment
14. Cuttings Settlement

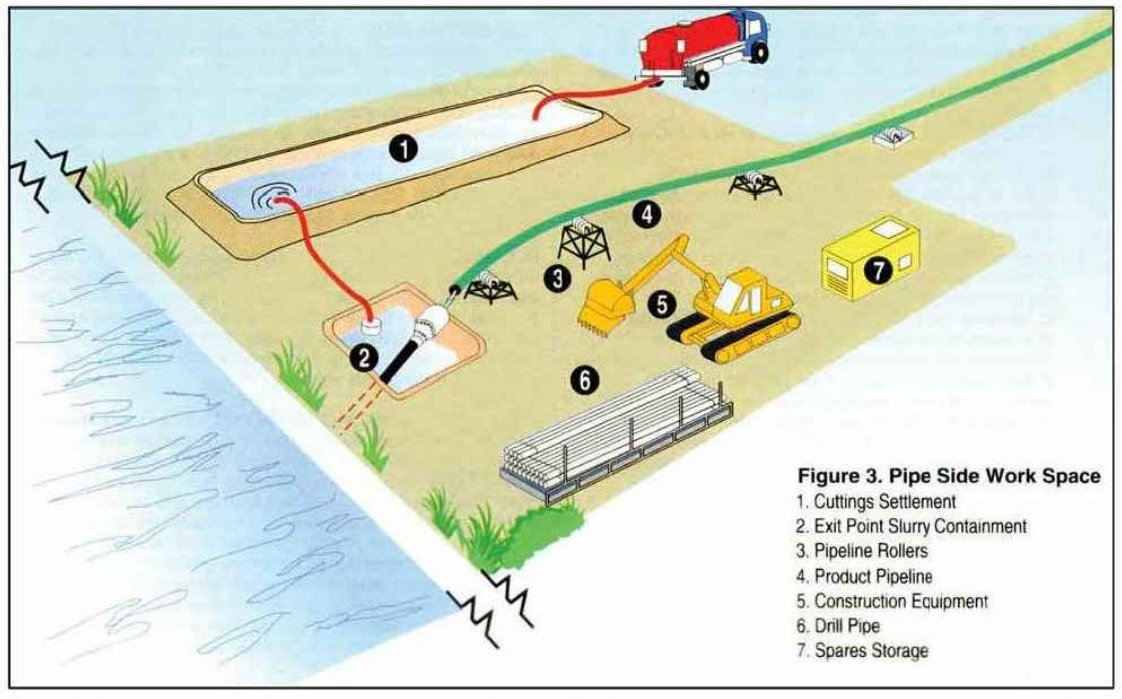


Figure 3. Pipe Side Work Space

1. Cuttings Settlement
2. Exit Point Slurry Containment
3. Pipeline Rollers
4. Product Pipeline
5. Construction Equipment
6. Drill Pipe
7. Spares Storage

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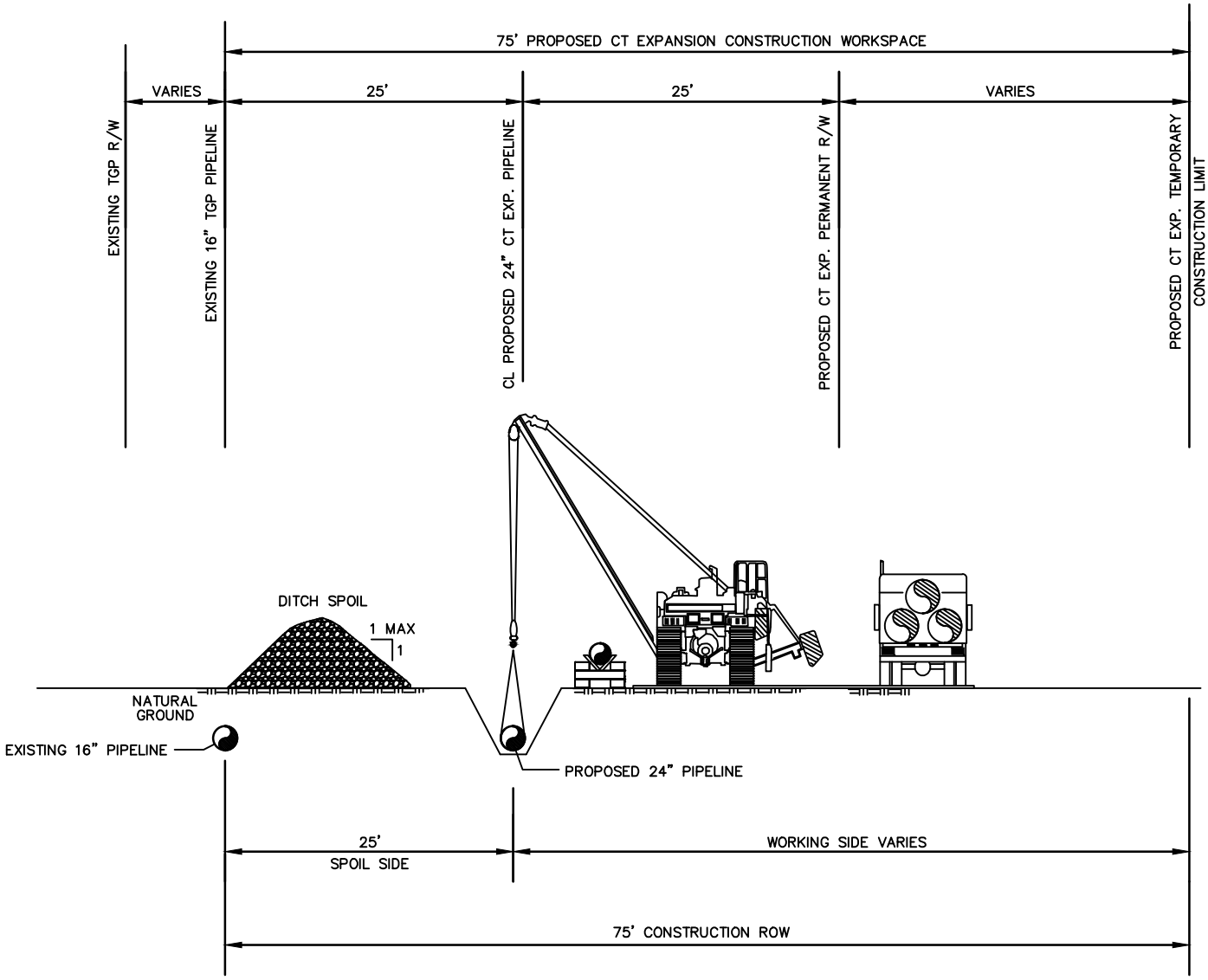
Appr: Date:

TENNESSE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
TYPICAL CONSTRUCTION HORIZONTAL DIRECTIONAL DRILL (HDD)

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

FIG. NO. 120 Sheet: 120 of 127 Type:



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Section:	Township:	Range:
Dft:	Date:	Project ID:
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TENNESSEE GAS PIPELINE,LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
24" TYPICAL 75' CONSTRUCTION WORKSPACE

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

FIG. NO. 121

Sheet: 121 of 127
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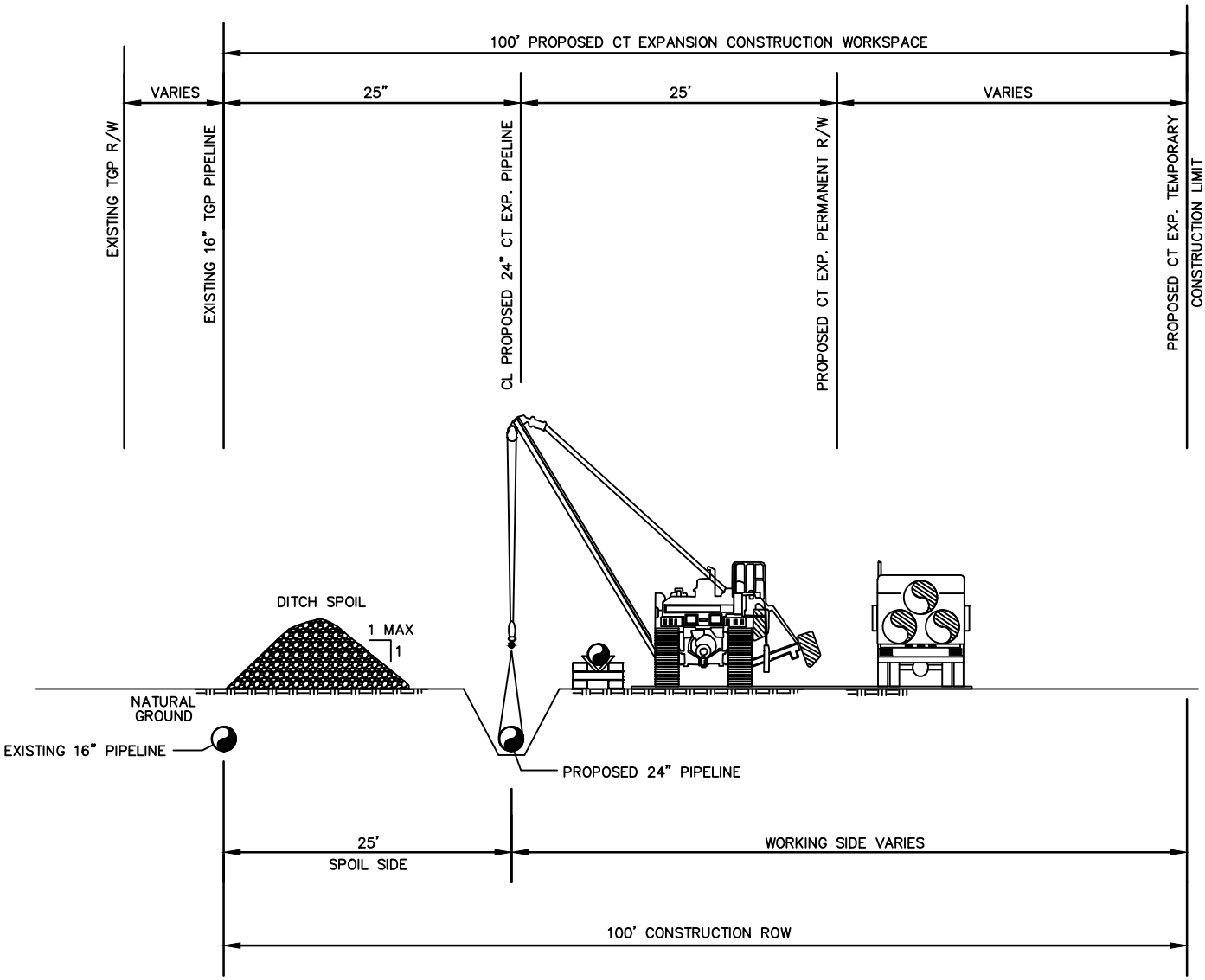

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Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE,LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
24" TYPICAL 100' CONSTRUCTION WORKSPACE

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

FIG. NO. 122

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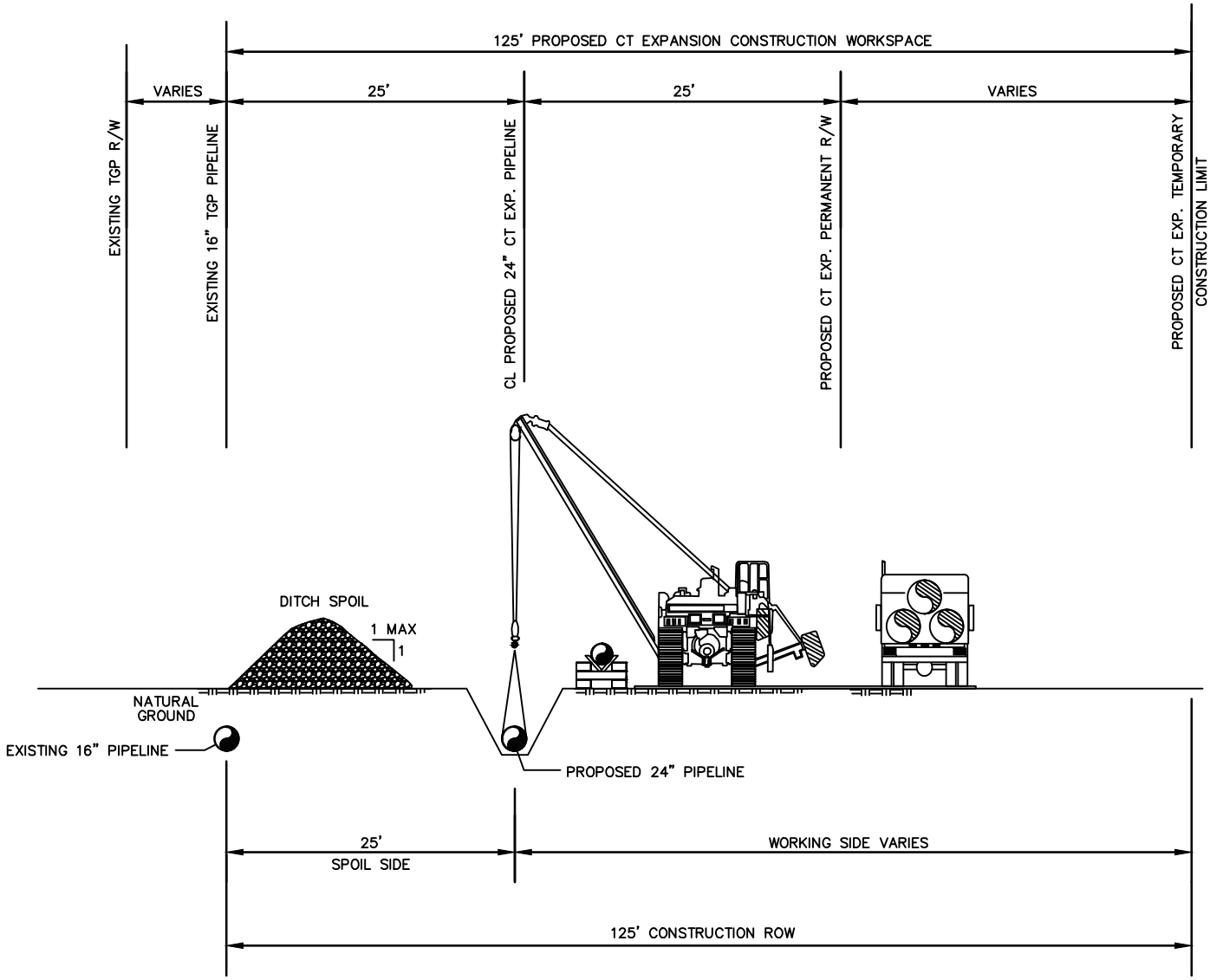

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Dft:	Date:	Project ID:
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TENNESSEE GAS PIPELINE,LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
24" TYPICAL 125' CONSTRUCTION WORKSPACE

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

FIG. NO. 123

Sheet: 123 of 127
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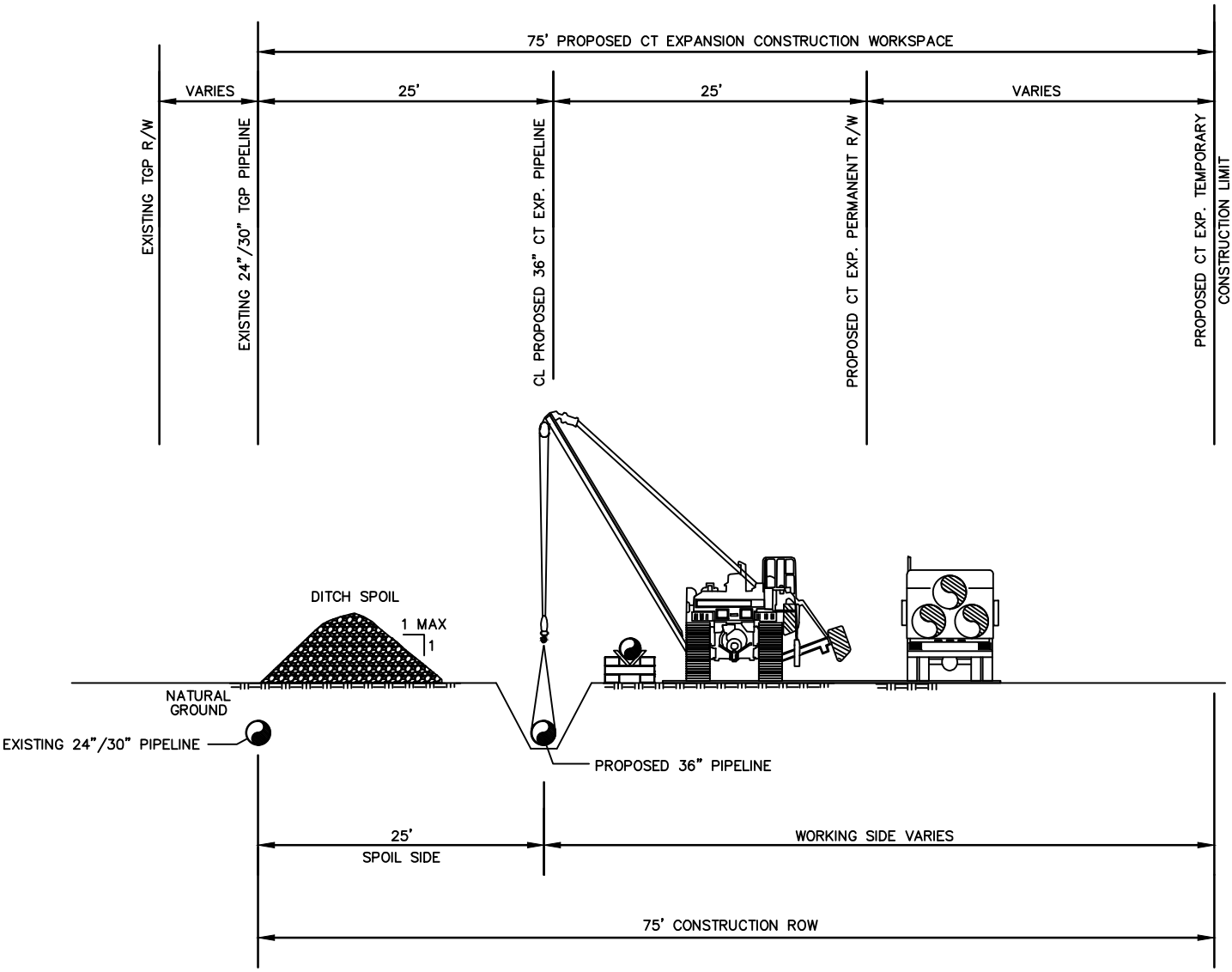

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Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE,LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
36" TYPICAL 75' CONSTRUCTION WORKSPACE

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

FIG. NO. 124

Sheet: 124 of 127
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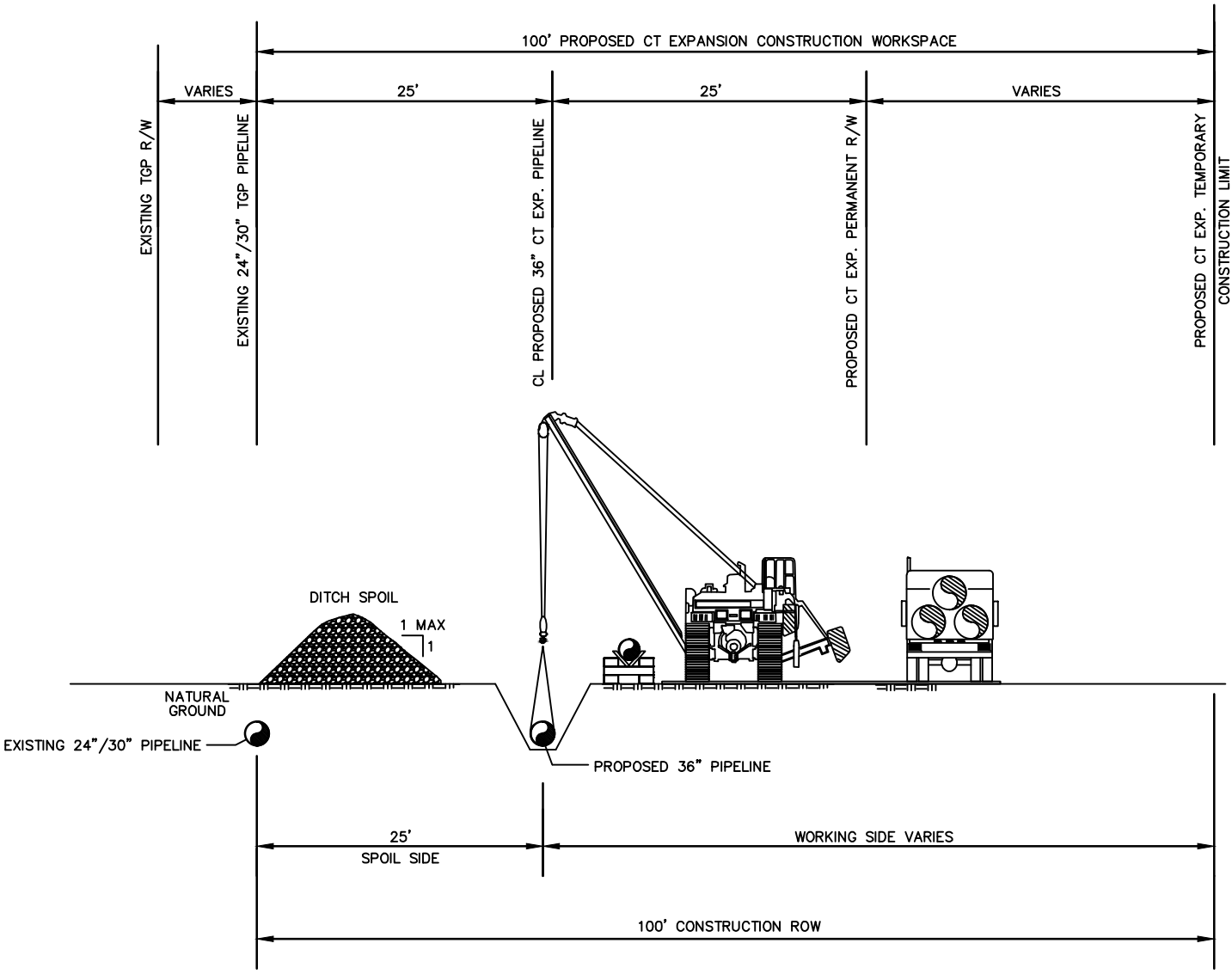

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*MASSACHUSETTS AND NEW YORK LOOP ONLY

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Dft:	Date:	Project ID:
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TENNESSEE GAS PIPELINE,LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
36" TYPICAL 100' CONSTRUCTION WORKSPACE

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

FIG. NO. 125

Sheet: 125 of 127
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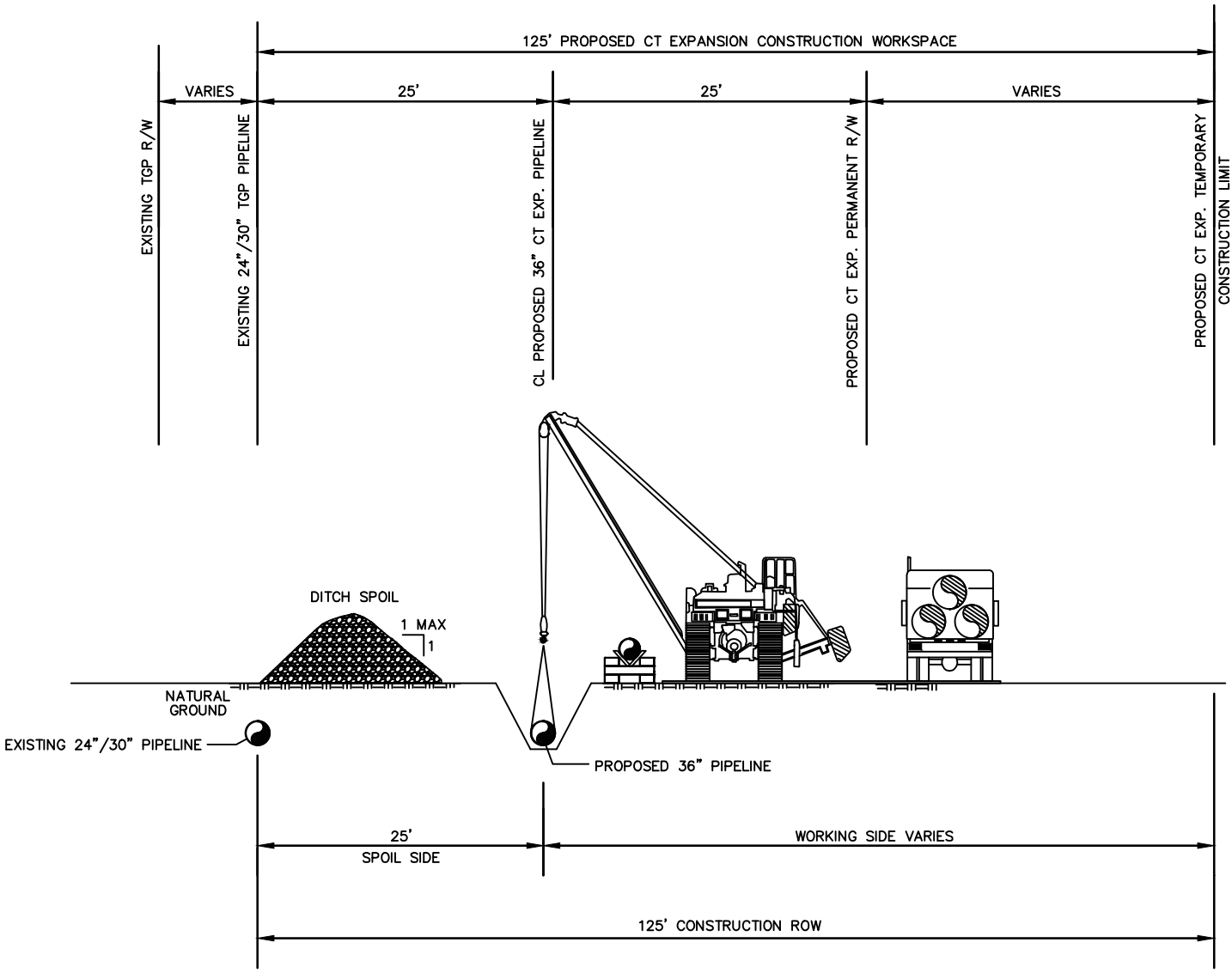

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Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
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TENNESSEE GAS PIPELINE,LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
36" TYPICAL 125' CONSTRUCTION WORKSPACE

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

FIG. NO. 126

Sheet: 126 of 127
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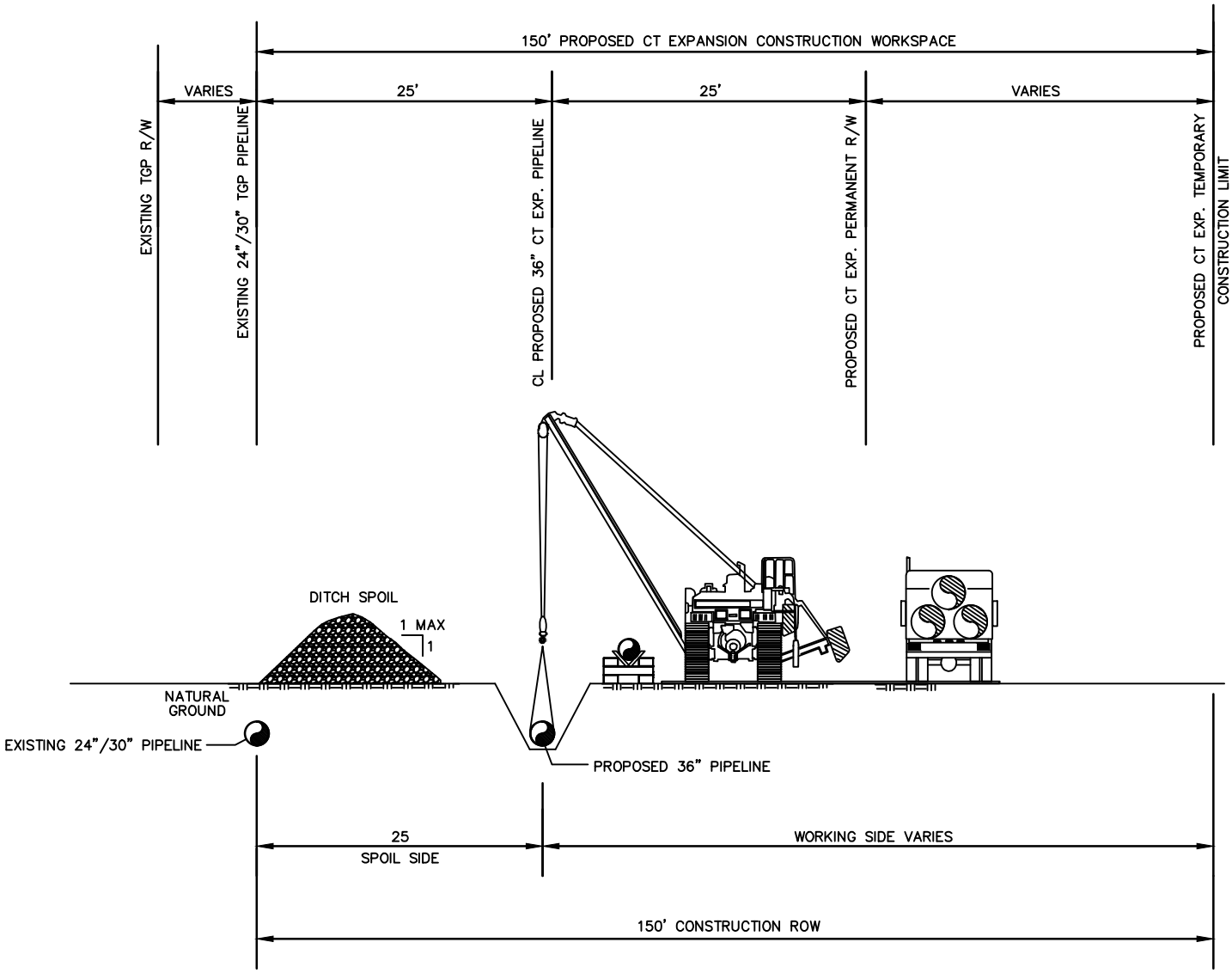

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St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE,LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
36" TYPICAL 150' CONSTRUCTION WORKSPACE

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

FIG. NO. 127

Sheet: 127 of 127
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20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

APPENDIX E

FERC Upland Erosion Control, Revegetation and Maintenance Plan and FERC Wetland and Waterbody Construction and Mitigation Procedures

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Federal Energy Regulatory Commission

Office of Energy Projects

May 2013

UPLAND EROSION CONTROL, REVEGETATION, AND MAINTENANCE PLAN

Washington, DC 20426

MAY 2013 VERSION

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

UPLAND EROSION CONTROL, REVEGETATION, AND MAINTENANCE PLAN

TABLE OF CONTENTS

I. APPLICABILITY 1

II. SUPERVISION AND INSPECTION 2
- A. ENVIRONMENTAL INSPECTION 2
- B. RESPONSIBILITIES OF ENVIRONMENTAL INSPECTORS 2

III. PRECONSTRUCTION PLANNING 4
- A. CONSTRUCTION WORK AREAS 4
- B. DRAIN TILE AND IRRIGATION SYSTEMS 4
- C. GRAZING DEFERMENT 5
- D. ROAD CROSSINGS AND ACCESS POINTS 5
- E. DISPOSAL PLANNING 5
- F. AGENCY COORDINATION 5
- G. SPILL PREVENTION AND RESPONSE PROCEDURES 6
- H. RESIDENTIAL CONSTRUCTION 6
- I. WINTER CONSTRUCTION PLANS 6

IV. INSTALLATION 7
- A. APPROVED AREAS OF DISTURBANCE 7
- B. TOPSOIL SEGREGATION 8
- C. DRAIN TILES 9
- D. IRRIGATION 9
- E. ROAD CROSSINGS AND ACCESS POINTS 9
- F. TEMPORARY EROSION CONTROL 9
  - 1. Temporary Slope Breakers 9
  - 2. Temporary Trench Plugs 10
  - 3. Sediment Barriers 10
  - 4. Mulch 11

V. RESTORATION 12
- A. CLEANUP 12
- B. PERMANENT EROSION CONTROL DEVICES 13
  - 1. Trench Breakers 13
  - 2. Permanent Slope Breakers 14
- C. SOIL COMPACTION MITIGATION 14
- D. REVEGETATION 15
  - 1. General 15
  - 2. Soil Additives 15
  - 3. Seeding Requirements 15

VI. OFF-ROAD VEHICLE CONTROL 16

VII. POST-CONSTRUCTION ACTIVITIES AND REPORTING 17
- A. MONITORING AND MAINTENANCE 17
- B. REPORTING 18

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

UPLAND EROSION CONTROL, REVEGETATION, AND MAINTENANCE PLAN (PLAN)

I. APPLICABILITY

A. The intent of this Plan is to assist project sponsors by identifying baseline mitigation measures for minimizing erosion and enhancing revegetation. Project sponsors shall specify in their applications for a new FERC authorization and in prior notice and advance notice filings, any individual measures in this Plan they consider unnecessary, technically infeasible, or unsuitable due to local conditions and fully describe any alternative measures they would use. Project sponsors shall also explain how those alternative measures would achieve a comparable level of mitigation.

Once a project is authorized, project sponsors can request further changes as variances to the measures in this Plan (or the applicant's approved plan). The Director of the Office of Energy Projects (Director) will consider approval of variances upon the project sponsor's written request, if the Director agrees that a variance:

1. provides equal or better environmental protection;

2. is necessary because a portion of this Plan is infeasible or unworkable based on project-specific conditions; or

3. is specifically required in writing by another federal, state, or Native American land management agency for the portion of the project on its land or under its jurisdiction.

Sponsors of projects planned for construction under the automatic authorization provisions in the FERC's regulations must receive written approval for any variances in advance of construction.

Project-related impacts on wetland and waterbody systems are addressed in the staff's Wetland and Waterbody Construction and Mitigation Procedures (Procedures).

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

II. SUPERVISION AND INSPECTION

A. ENVIRONMENTAL INSPECTION

1. At least one Environmental Inspector is required for each construction spread during construction and restoration (as defined by section V). The number and experience of Environmental Inspectors assigned to each construction spread shall be appropriate for the length of the construction spread and the number/significance of resources affected.

2. Environmental Inspectors shall have peer status with all other activity inspectors.

3. Environmental Inspectors shall have the authority to stop activities that violate the environmental conditions of the FERC's Orders, stipulations of other environmental permits or approvals, or landowner easement agreements; and to order appropriate corrective action.

B. RESPONSIBILITIES OF ENVIRONMENTAL INSPECTORS

At a minimum, the Environmental Inspector(s) shall be responsible for:

1. Inspecting construction activities for compliance with the requirements of this Plan, the Procedures, the environmental conditions of the FERC's Orders, the mitigation measures proposed by the project sponsor (as approved and/or modified by the Order), other environmental permits and approvals, and environmental requirements in landowner easement agreements.

2. Identifying, documenting, and overseeing corrective actions, as necessary to bring an activity back into compliance;

3. Verifying that the limits of authorized construction work areas and locations of access roads are visibly marked before clearing, and maintained throughout construction;

4. Verifying the location of signs and highly visible flagging marking the boundaries of sensitive resource areas, waterbodies, wetlands, or areas with special requirements along the construction work area;

5. Identifying erosion/sediment control and soil stabilization needs in all areas;

6. Ensuring that the design of slope breakers will not cause erosion or direct water into sensitive environmental resource areas, including cultural resource sites, wetlands, waterbodies, and sensitive species habitats;

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

7. Verifying that dewatering activities are properly monitored and do not result in the deposition of sand, silt, and/or sediment into sensitive environmental resource areas, including wetlands, waterbodies, cultural resource sites, and sensitive species habitats; stopping dewatering activities if such deposition is occurring and ensuring the design of the discharge is changed to prevent reoccurrence; and verifying that dewatering structures are removed after completion of dewatering activities;

8. Ensuring that subsoil and topsoil are tested in agricultural and residential areas to measure compaction and determine the need for corrective action;

9. Advising the Chief Construction Inspector when environmental conditions (such as wet weather or frozen soils) make it advisable to restrict or delay construction activities to avoid topsoil mixing or excessive compaction;

10. Ensuring restoration of contours and topsoil;

11. Verifying that the soils imported for agricultural or residential use are certified as free of noxious weeds and soil pests, unless otherwise approved by the landowner;

12. Ensuring that erosion control devices are properly installed to prevent sediment flow into sensitive environmental resource areas (e.g., wetlands, waterbodies, cultural resource sites, and sensitive species habitats) and onto roads, and determining the need for additional erosion control devices;

13. Inspecting and ensuring the maintenance of temporary erosion control measures at least:

    a. on a daily basis in areas of active construction or equipment operation;

    b. on a weekly basis in areas with no construction or equipment operation; and

    c. within 24 hours of each 0.5 inch of rainfall;

14. Ensuring the repair of all ineffective temporary erosion control measures within 24 hours of identification, or as soon as conditions allow if compliance with this time frame would result in greater environmental impacts;

15. Keeping records of compliance with the environmental conditions of the FERC's Orders, and the mitigation measures proposed by the project sponsor in the application submitted to the FERC, and other federal or state environmental permits during active construction and restoration;

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

16. Identifying areas that should be given special attention to ensure stabilization and restoration after the construction phase; and

17. Verifying that locations for any disposal of excess construction materials for beneficial reuse comply with section III.E.

III. PRECONSTRUCTION PLANNING

The project sponsor shall do the following before construction:

A. CONSTRUCTION WORK AREAS

1. Identify all construction work areas (e.g., construction right-of-way, extra work space areas, pipe storage and contractor yards, borrow and disposal areas, access roads) that would be needed for safe construction. The project sponsor must ensure that appropriate cultural resources and biological surveys are conducted, as determined necessary by the appropriate federal and state agencies.

2. Project sponsors are encouraged to consider expanding any required cultural resources and endangered species surveys in anticipation of the need for activities outside of authorized work areas.

3. Plan construction sequencing to limit the amount and duration of open trench sections, as necessary, to prevent excessive erosion or sediment flow into sensitive environmental resource areas.

B. DRAIN TILE AND IRRIGATION SYSTEMS

1. Attempt to locate existing drain tiles and irrigation systems.

2. Contact landowners and local soil conservation authorities to determine the locations of future drain tiles that are likely to be installed within 3 years of the authorized construction.

3. Develop procedures for constructing through drain-tiled areas, maintaining irrigation systems during construction, and repairing drain tiles and irrigation systems after construction.

4. Engage qualified drain tile specialists, as needed to conduct or monitor repairs to drain tile systems affected by construction. Use drain tile specialists from the project area, if available.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

C. GRAZING DEFERMENT

Develop grazing deferment plans with willing landowners, grazing permittees, and land management agencies to minimize grazing disturbance of revegetation efforts.

D. ROAD CROSSINGS AND ACCESS POINTS

Plan for safe and accessible conditions at all roadway crossings and access points during construction and restoration.

E. DISPOSAL PLANNING

Determine methods and locations for the regular collection, containment, and disposal of excess construction materials and debris (e.g., timber, slash, mats, garbage, drill cuttings and fluids, excess rock) throughout the construction process. Disposal of materials for beneficial reuse must not result in adverse environmental impact and is subject to compliance with all applicable survey, landowner or land management agency approval, and permit requirements.

F. AGENCY COORDINATION

The project sponsor must coordinate with the appropriate local, state, and federal agencies as outlined in this Plan and/or required by the FERC's Orders.

1. Obtain written recommendations from the local soil conservation authorities or land management agencies regarding permanent erosion control and revegetation specifications.

2. Develop specific procedures in coordination with the appropriate agencies to prevent the introduction or spread of invasive species, noxious weeds, and soil pests resulting from construction and restoration activities.

3. Develop specific procedures in coordination with the appropriate agencies and landowners, as necessary, to allow for livestock and wildlife movement and protection during construction.

4. Develop specific blasting procedures in coordination with the appropriate agencies that address pre- and post-blast inspections; advanced public notification; and mitigation measures for building foundations, groundwater wells, and springs. Use appropriate methods (e.g., blasting mats) to prevent damage to nearby structures and to prevent debris from entering sensitive environmental resource areas.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

G. SPILL PREVENTION AND RESPONSE PROCEDURES

The project sponsor shall develop project-specific Spill Prevention and Response Procedures, as specified in section IV of the staff's Procedures. A copy must be filed with the Secretary of the FERC (Secretary) prior to construction and made available in the field on each construction spread. The filing requirement does not apply to projects constructed under the automatic authorization provisions in the FERC's regulations.

H. RESIDENTIAL CONSTRUCTION

For all properties with residences located within 50 feet of construction work areas, project sponsors shall: avoid removal of mature trees and landscaping within the construction work area unless necessary for safe operation of construction equipment, or as specified in landowner agreements; fence the edge of the construction work area for a distance of 100 feet on either side of the residence; and restore all lawn areas and landscaping immediately following clean up operations, or as specified in landowner agreements. If seasonal or other weather conditions prevent compliance with these time frames, maintain and monitor temporary erosion controls (sediment barriers and mulch) until conditions allow completion of restoration.

I. WINTER CONSTRUCTION PLANS

If construction is planned to occur during winter weather conditions, project sponsors shall develop and file a project-specific winter construction plan with the FERC application. This filing requirement does not apply to projects constructed under the automatic authorization provisions of the FERC's regulations.

The plan shall address:

1. winter construction procedures (e.g., snow handling and removal, access road construction and maintenance, soil handling under saturated or frozen conditions, topsoil stripping);

2. stabilization and monitoring procedures if ground conditions will delay restoration until the following spring (e.g., mulching and erosion controls, inspection and reporting, stormwater control during spring thaw conditions); and

3. final restoration procedures (e.g., subsidence and compaction repair, topsoil replacement, seeding).

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

IV. INSTALLATION

A. APPROVED AREAS OF DISTURBANCE

1. Project-related ground disturbance shall be limited to the construction right-of-way, extra work space areas, pipe storage yards, borrow and disposal areas, access roads, and other areas approved in the FERC's Orders. Any project-related ground disturbing activities outside these areas will require prior Director approval. This requirement does not apply to activities needed to comply with the Plan and Procedures (i.e., slope breakers, energy-dissipating devices, dewatering structures, drain tile system repairs) or minor field realignments and workspace shifts per landowner needs and requirements that do not affect other landowners or sensitive environmental resource areas. All construction or restoration activities outside of authorized areas are subject to all applicable survey and permit requirements, and landowner easement agreements.

2. The construction right-of-way width for a project shall not exceed 75 feet or that described in the FERC application unless otherwise modified by a FERC Order. However, in limited, non-wetland areas, this construction right-of-way width may be expanded by up to 25 feet without Director approval to accommodate full construction right-of-way topsoil segregation and to ensure safe construction where topographic conditions (e.g., side-slopes) or soil limitations require it. Twenty-five feet of extra construction right-of-way width may also be used in limited, non-wetland or non-forested areas for truck turn-arounds where no reasonable alternative access exists.

   Project use of these additional limited areas is subject to landowner or land management agency approval and compliance with all applicable survey and permit requirements. When additional areas are used, each one shall be identified and the need explained in the weekly or biweekly construction reports to the FERC, if required. The following material shall be included in the reports:

   a. the location of each additional area by station number and reference to previously filed alignment sheets, or updated alignment sheets showing the additional areas;

   b. identification of the filing at FERC containing evidence that the additional areas were previously surveyed; and

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

c. a statement that landowner approval has been obtained and is available in project files.

Prior written approval of the Director is required when the authorized construction right-of-way width would be expanded by more than 25 feet.

B. TOPSOIL SEGREGATION

1. Unless the landowner or land management agency specifically approves otherwise, prevent the mixing of topsoil with subsoil by stripping topsoil from either the full work area or from the trench and subsoil storage area (ditch plus spoil side method) in:

   a. cultivated or rotated croplands, and managed pastures;

   b. residential areas;

   c. hayfields; and

   d. other areas at the landowner's or land managing agency's request.

2. In residential areas, importation of topsoil is an acceptable alternative to topsoil segregation.

3. Where topsoil segregation is required, the project sponsor must:

   a. segregate at least 12 inches of topsoil in deep soils (more than 12 inches of topsoil); and

   b. make every effort to segregate the entire topsoil layer in soils with less than 12 inches of topsoil.

4. Maintain separation of salvaged topsoil and subsoil throughout all construction activities.

5. Segregated topsoil may not be used for padding the pipe, constructing temporary slope breakers or trench plugs, improving or maintaining roads, or as a fill material.

6. Stabilize topsoil piles and minimize loss due to wind and water erosion with use of sediment barriers, mulch, temporary seeding, tackifiers, or functional equivalents, where necessary.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

C. DRAIN TILES

1. Mark locations of drain tiles damaged during construction.

2. Probe all drainage tile systems within the area of disturbance to check for damage.

3. Repair damaged drain tiles to their original or better condition. Do not use filter-covered drain tiles unless the local soil conservation authorities and the landowner agree. Use qualified specialists for testing and repairs.

4. For new pipelines in areas where drain tiles exist or are planned, ensure that the depth of cover over the pipeline is sufficient to avoid interference with drain tile systems. For adjacent pipeline loops in agricultural areas, install the new pipeline with at least the same depth of cover as the existing pipeline(s).

D. IRRIGATION

Maintain water flow in crop irrigation systems, unless shutoff is coordinated with affected parties.

E. ROAD CROSSINGS AND ACCESS POINTS

1. Maintain safe and accessible conditions at all road crossings and access points during construction.

2. If crushed stone access pads are used in residential or agricultural areas, place the stone on synthetic fabric to facilitate removal.

3. Minimize the use of tracked equipment on public roadways. Remove any soil or gravel spilled or tracked onto roadways daily or more frequent as necessary to maintain safe road conditions. Repair any damages to roadway surfaces, shoulders, and bar ditches.

F. TEMPORARY EROSION CONTROL

Install temporary erosion controls immediately after initial disturbance of the soil. Temporary erosion controls must be properly maintained throughout construction (on a daily basis) and reinstalled as necessary (such as after backfilling of the trench) until replaced by permanent erosion controls or restoration is complete.

1. Temporary Slope Breakers

   a. Temporary slope breakers are intended to reduce runoff velocity and divert water off the construction right-of-way. Temporary slope

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

breakers may be constructed of materials such as soil, silt fence, staked hay or straw bales, or sand bags.

b. Install temporary slope breakers on all disturbed areas, as necessary to avoid excessive erosion. Temporary slope breakers must be installed on slopes greater than 5 percent where the base of the slope is less than 50 feet from waterbody, wetland, and road crossings at the following spacing (closer spacing shall be used if necessary):

Slope (%)	Spacing (feet)
5 - 15	300
>15 - 30	200
>30	100

c. Direct the outfall of each temporary slope breaker to a stable, well vegetated area or construct an energy-dissipating device at the end of the slope breaker and off the construction right-of-way.

d. Position the outfall of each temporary slope breaker to prevent sediment discharge into wetlands, waterbodies, or other sensitive environmental resource areas.

2. Temporary Trench Plugs

Temporary trench plugs are intended to segment a continuous open trench prior to backfill.

a. Temporary trench plugs may consist of unexcavated portions of the trench, compacted subsoil, sandbags, or some functional equivalent.

b. Position temporary trench plugs, as necessary, to reduce trenchline erosion and minimize the volume and velocity of trench water flow at the base of slopes.

3. Sediment Barriers

Sediment barriers are intended to stop the flow of sediments and to prevent the deposition of sediments beyond approved workspaces or into sensitive resources.

a. Sediment barriers may be constructed of materials such as silt fence, staked hay or straw bales, compacted earth (e.g., driveable berms across travelways), sand bags, or other appropriate materials.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

b. At a minimum, install and maintain temporary sediment barriers across the entire construction right-of-way at the base of slopes greater than 5 percent where the base of the slope is less than 50 feet from a waterbody, wetland, or road crossing until revegetation is successful as defined in this Plan. Leave adequate room between the base of the slope and the sediment barrier to accommodate ponding of water and sediment deposition.

c. Where wetlands or waterbodies are adjacent to and downslope of construction work areas, install sediment barriers along the edge of these areas, as necessary to prevent sediment flow into the wetland or waterbody.

4. Mulch

a. Apply mulch on all slopes (except in cultivated cropland) concurrent with or immediately after seeding, where necessary to stabilize the soil surface and to reduce wind and water erosion. Spread mulch uniformly over the area to cover at least 75 percent of the ground surface at a rate of 2 tons/acre of straw or its equivalent, unless the local soil conservation authority, landowner, or land managing agency approves otherwise in writing.

b. Mulch can consist of weed-free straw or hay, wood fiber hydromulch, erosion control fabric, or some functional equivalent.

c. Mulch all disturbed upland areas (except cultivated cropland) before seeding if:

(1) final grading and installation of permanent erosion control measures will not be completed in an area within 20 days after the trench in that area is backfilled (10 days in residential areas), as required in section V.A.1; or

(2) construction or restoration activity is interrupted for extended periods, such as when seeding cannot be completed due to seeding period restrictions.

d. If mulching before seeding, increase mulch application on all slopes within 100 feet of waterbodies and wetlands to a rate of 3 tons/acre of straw or equivalent.

e. If wood chips are used as mulch, do not use more than 1 ton/acre and add the equivalent of 11 lbs/acre available nitrogen (at least 50 percent of which is slow release).

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

f. Ensure that mulch is adequately anchored to minimize loss due to wind and water.

g. When anchoring with liquid mulch binders, use rates recommended by the manufacturer. Do not use liquid mulch binders within 100 feet of wetlands or waterbodies, except where the product is certified environmentally non-toxic by the appropriate state or federal agency or independent standards-setting organization.

h. Do not use synthetic monofilament mesh/netted erosion control materials in areas designated as sensitive wildlife habitat, unless the product is specifically designed to minimize harm to wildlife. Anchor erosion control fabric with staples or other appropriate devices.

V. RESTORATION

A. CLEANUP

1. Commence cleanup operations immediately following backfill operations. Complete final grading, topsoil replacement, and installation of permanent erosion control structures within 20 days after backfilling the trench (10 days in residential areas). If seasonal or other weather conditions prevent compliance with these time frames, maintain temporary erosion controls (i.e., temporary slope breakers, sediment barriers, and mulch) until conditions allow completion of cleanup.

   If construction or restoration unexpectedly continues into the winter season when conditions could delay successful decompaction, topsoil replacement, or seeding until the following spring, file with the Secretary for the review and written approval of the Director, a winter construction plan (as specified in section III.I). This filing requirement does not apply to projects constructed under the automatic authorization provisions of the FERC's regulations.

2. A travel lane may be left open temporarily to allow access by construction traffic if the temporary erosion control structures are installed as specified in section IV.F. and inspected and maintained as specified in sections II.B.12 through 14. When access is no longer required the travel lane must be removed and the right-of-way restored.

3. Rock excavated from the trench may be used to backfill the trench only to the top of the existing bedrock profile. Rock that is not returned to the trench shall be considered construction debris, unless approved for use as mulch or for some other use on the construction work areas by the landowner or land managing agency.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

4. Remove excess rock from at least the top 12 inches of soil in all cultivated or rotated cropland, managed pastures, hayfields, and residential areas, as well as other areas at the landowner's request. The size, density, and distribution of rock on the construction work area shall be similar to adjacent areas not disturbed by construction. The landowner or land management agency may approve other provisions in writing.

5. Grade the construction right-of-way to restore pre-construction contours and leave the soil in the proper condition for planting.

6. Remove construction debris from all construction work areas unless the landowner or land managing agency approves leaving materials onsite for beneficial reuse, stabilization, or habitat restoration.

7. Remove temporary sediment barriers when replaced by permanent erosion control measures or when revegetation is successful.

B. PERMANENT EROSION CONTROL DEVICES

1. Trench Breakers

   a. Trench breakers are intended to slow the flow of subsurface water along the trench. Trench breakers may be constructed of materials such as sand bags or polyurethane foam. Do not use topsoil in trench breakers.

   b. An engineer or similarly qualified professional shall determine the need for and spacing of trench breakers. Otherwise, trench breakers shall be installed at the same spacing as and upslope of permanent slope breakers.

   c. In agricultural fields and residential areas where slope breakers are not typically required, install trench breakers at the same spacing as if permanent slope breakers were required.

   d. At a minimum, install a trench breaker at the base of slopes greater than 5 percent where the base of the slope is less than 50 feet from a waterbody or wetland and where needed to avoid draining a waterbody or wetland. Install trench breakers at wetland boundaries, as specified in the Procedures. Do not install trench breakers within a wetland.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

2. Permanent Slope Breakers

a. Permanent slope breakers are intended to reduce runoff velocity, divert water off the construction right-of-way, and prevent sediment deposition into sensitive resources. Permanent slope breakers may be constructed of materials such as soil, stone, or some functional equivalent.

b. Construct and maintain permanent slope breakers in all areas, except cultivated areas and lawns, unless requested by the landowner, using spacing recommendations obtained from the local soil conservation authority or land managing agency.

In the absence of written recommendations, use the following spacing unless closer spacing is necessary to avoid excessive erosion on the construction right-of-way:

Slope (%)	Spacing (feet)
5 - 15	300
>15 - 30	200
>30	100

c. Construct slope breakers to divert surface flow to a stable area without causing water to pool or erode behind the breaker. In the absence of a stable area, construct appropriate energy-dissipating devices at the end of the breaker.

d. Slope breakers may extend slightly (about 4 feet) beyond the edge of the construction right-of-way to effectively drain water off the disturbed area. Where slope breakers extend beyond the edge of the construction right-of-way, they are subject to compliance with all applicable survey requirements.

C. SOIL COMPACTION MITIGATION

1. Test topsoil and subsoil for compaction at regular intervals in agricultural and residential areas disturbed by construction activities. Conduct tests on the same soil type under similar moisture conditions in undisturbed areas to approximate preconstruction conditions. Use penetrometers or other appropriate devices to conduct tests.

2. Plow severely compacted agricultural areas with a paraplow or other deep tillage implement. In areas where topsoil has been segregated, plow the subsoil before replacing the segregated topsoil.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

If subsequent construction and cleanup activities result in further compaction, conduct additional tilling.

3. Perform appropriate soil compaction mitigation in severely compacted residential areas.

D. REVEGETATION

1. General

a. The project sponsor is responsible for ensuring successful revegetation of soils disturbed by project-related activities, except as noted in section V.D.1.b.

b. Restore all turf, ornamental shrubs, and specialized landscaping in accordance with the landowner's request, or compensate the landowner. Restoration work must be performed by personnel familiar with local horticultural and turf establishment practices.

2. Soil Additives

Fertilize and add soil pH modifiers in accordance with written recommendations obtained from the local soil conservation authority, land management agencies, or landowner. Incorporate recommended soil pH modifier and fertilizer into the top 2 inches of soil as soon as practicable after application.

3. Seeding Requirements

a. Prepare a seedbed in disturbed areas to a depth of 3 to 4 inches using appropriate equipment to provide a firm seedbed. When hydroseeding, scarify the seedbed to facilitate lodging and germination of seed.

b. Seed disturbed areas in accordance with written recommendations for seed mixes, rates, and dates obtained from the local soil conservation authority or the request of the landowner or land management agency. Seeding is not required in cultivated croplands unless requested by the landowner.

c. Perform seeding of permanent vegetation within the recommended seeding dates. If seeding cannot be done within those dates, use appropriate temporary erosion control measures discussed in section IV.F and perform seeding of permanent vegetation at the beginning of the next recommended seeding season. Dormant seeding or temporary

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

seeding of annual species may also be used, if necessary, to establish cover, as approved by the Environmental Inspector. Lawns may be seeded on a schedule established with the landowner.

d. In the absence of written recommendations from the local soil conservation authorities, seed all disturbed soils within 6 working days of final grading, weather and soil conditions permitting, subject to the specifications in section V.D.3.a through V.D.3.c.

e. Base seeding rates on Pure Live Seed. Use seed within 12 months of seed testing.

f. Treat legume seed with an inoculant specific to the species using the manufacturer's recommended rate of inoculant appropriate for the seeding method (broadcast, drill, or hydro).

g. In the absence of written recommendations from the local soil conservation authorities, landowner, or land managing agency to the contrary, a seed drill equipped with a cultipacker is preferred for seed application.

Broadcast or hydroseeding can be used in lieu of drilling at double the recommended seeding rates. Where seed is broadcast, firm the seedbed with a cultipacker or roller after seeding. In rocky soils or where site conditions may limit the effectiveness of this equipment, other alternatives may be appropriate (e.g., use of a chain drag) to lightly cover seed after application, as approved by the Environmental Inspector.

VI. OFF-ROAD VEHICLE CONTROL

To each owner or manager of forested lands, offer to install and maintain measures to control unauthorized vehicle access to the right-of-way. These measures may include:

A. signs;

B. fences with locking gates;

C. slash and timber barriers, pipe barriers, or a line of boulders across the right-of-way; and

D. conifers or other appropriate trees or shrubs across the right-of-way.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VII. POST-CONSTRUCTION ACTIVITIES AND REPORTING

A. MONITORING AND MAINTENANCE

1. Conduct follow-up inspections of all disturbed areas, as necessary, to determine the success of revegetation and address landowner concerns. At a minimum, conduct inspections after the first and second growing seasons.

2. Revegetation in non-agricultural areas shall be considered successful if upon visual survey the density and cover of non-nuisance vegetation are similar in density and cover to adjacent undisturbed lands. In agricultural areas, revegetation shall be considered successful when upon visual survey, crop growth and vigor are similar to adjacent undisturbed portions of the same field, unless the easement agreement specifies otherwise.

   Continue revegetation efforts until revegetation is successful.

3. Monitor and correct problems with drainage and irrigation systems resulting from pipeline construction in agricultural areas until restoration is successful.

4. Restoration shall be considered successful if the right-of-way surface condition is similar to adjacent undisturbed lands, construction debris is removed (unless otherwise approved by the landowner or land managing agency per section V.A.6), revegetation is successful, and proper drainage has been restored.

5. Routine vegetation mowing or clearing over the full width of the permanent right-of-way in uplands shall not be done more frequently than every 3 years. However, to facilitate periodic corrosion/leak surveys, a corridor not exceeding 10 feet in width centered on the pipeline may be cleared at a frequency necessary to maintain the 10-foot corridor in an herbaceous state. In no case shall routine vegetation mowing or clearing occur during the migratory bird nesting season between April 15 and August 1 of any year unless specifically approved in writing by the responsible land management agency or the U.S. Fish and Wildlife Service.

6. Efforts to control unauthorized off-road vehicle use, in cooperation with the landowner, shall continue throughout the life of the project. Maintain signs, gates, and permanent access roads as necessary.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

B. REPORTING

1. The project sponsor shall maintain records that identify by milepost:

   a. method of application, application rate, and type of fertilizer, pH modifying agent, seed, and mulch used;

   b. acreage treated;

   c. dates of backfilling and seeding;

   d. names of landowners requesting special seeding treatment and a description of the follow-up actions;

   e. the location of any subsurface drainage repairs or improvements made during restoration; and

   f. any problem areas and how they were addressed.

2. The project sponsor shall file with the Secretary quarterly activity reports documenting the results of follow-up inspections required by section VII.A.1; any problem areas, including those identified by the landowner; and corrective actions taken for at least 2 years following construction.

   The requirement to file quarterly activity reports with the Secretary does not apply to projects constructed under the automatic authorization, prior notice, or advanced notice provisions in the FERC's regulations.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM



Federal Energy Regulatory Commission

Office of Energy Projects

May 2013

WETLAND AND WATERBODY CONSTRUCTION AND MITIGATION PROCEDURES

Washington, DC 20426

MAY 2013 VERSION

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

WETLAND AND WATERBODY CONSTRUCTION AND MITIGATION PROCEDURES

TABLE OF CONTENTS

I. APPLICABILITY 1

II. PRECONSTRUCTION FILING 2

III. ENVIRONMENTAL INSPECTORS 3

IV. PRECONSTRUCTION PLANNING 3

V. WATERBODY CROSSINGS 5
- A. NOTIFICATION PROCEDURES AND PERMITS 5
- B. INSTALLATION 5
  1. Time Window for Construction 5
  2. Extra Work Areas 5
  3. General Crossing Procedures 6
  4. Spoil Pile Placement and Control 7
  5. Equipment Bridges 7
  6. Dry-Ditch Crossing Methods 8
  7. Crossings of Minor Waterbodies 9
  8. Crossings of Intermediate Waterbodies 10
  9. Crossings of Major Waterbodies 10
  10. Temporary Erosion and Sediment Control 10
  11. Trench Dewatering 11
- C. RESTORATION 11
- D. POST-CONSTRUCTION MAINTENANCE 12

VI. WETLAND CROSSINGS 13
- A. GENERAL 13
- B. INSTALLATION 14
  1. Extra Work Areas and Access Roads 14
  2. Crossing Procedures 15
  3. Temporary Sediment Control 16
  4. Trench Dewatering 17
- C. RESTORATION 17
- D. POST-CONSTRUCTION MAINTENANCE AND REPORTING 18

VII. HYDROSTATIC TESTING 19
- A. NOTIFICATION PROCEDURES AND PERMITS 19
- B. GENERAL 19
- C. INTAKE SOURCE AND RATE 19
- D. DISCHARGE LOCATION, METHOD, AND RATE 20

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

WETLAND AND WATERBODY CONSTRUCTION AND MITIGATION PROCEDURES (PROCEDURES)

I. APPLICABILITY

A. The intent of these Procedures is to assist project sponsors by identifying baseline mitigation measures for minimizing the extent and duration of project-related disturbance on wetlands and waterbodies. Project sponsors shall specify in their applications for a new FERC authorization, and in prior notice and advance notice filings, any individual measures in these Procedures they consider unnecessary, technically infeasible, or unsuitable due to local conditions and fully describe any alternative measures they would use. Project sponsors shall also explain how those alternative measures would achieve a comparable level of mitigation.

Once a project is authorized, project sponsors can request further changes as variances to the measures in these Procedures (or the applicant's approved procedures). The Director of the Office of Energy Projects (Director) will consider approval of variances upon the project sponsor's written request, if the Director agrees that a variance:

1. provides equal or better environmental protection;

2. is necessary because a portion of these Procedures is infeasible or unworkable based on project-specific conditions; or

3. is specifically required in writing by another federal, state, or Native American land management agency for the portion of the project on its land or under its jurisdiction.

Sponsors of projects planned for construction under the automatic authorization provisions in the FERC's regulations must receive written approval for any variances in advance of construction.

Project-related impacts on non-wetland areas are addressed in the staff's Upland Erosion Control, Revegetation, and Maintenance Plan (Plan).

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

B. DEFINITIONS

1. "Waterbody" includes any natural or artificial stream, river, or drainage with perceptible flow at the time of crossing, and other permanent waterbodies such as ponds and lakes:

   a. "minor waterbody" includes all waterbodies less than or equal to 10 feet wide at the water's edge at the time of crossing;

   b. "intermediate waterbody" includes all waterbodies greater than 10 feet wide but less than or equal to 100 feet wide at the water's edge at the time of crossing; and

   c. "major waterbody" includes all waterbodies greater than 100 feet wide at the water's edge at the time of crossing.

2. "Wetland" includes any area that is not in actively cultivated or rotated cropland and that satisfies the requirements of the current federal methodology for identifying and delineating wetlands.

II. PRECONSTRUCTION FILING

A. The following information must be filed with the Secretary of the FERC (Secretary) prior to the beginning of construction, for the review and written approval by the Director:

1. site-specific justifications for extra work areas that would be closer than 50 feet from a waterbody or wetland; and

2. site-specific justifications for the use of a construction right-of-way greater than 75-feet-wide in wetlands.

B. The following information must be filed with the Secretary prior to the beginning of construction. These filing requirements do not apply to projects constructed under the automatic authorization provisions in the FERC's regulations:

1. Spill Prevention and Response Procedures specified in section IV.A;

2. a schedule identifying when trenching or blasting will occur within each waterbody greater than 10 feet wide, within any designated coldwater fishery, and within any waterbody identified as habitat for federally-listed threatened or endangered species. The project sponsor will revise the schedule as necessary to provide FERC staff at least 14 days advance notice. Changes within this last 14-day period must provide for at least 48 hours advance notice;

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

3. plans for horizontal directional drills (HDD) under wetlands or waterbodies, specified in section V.B.6.d;

4. site-specific plans for major waterbody crossings, described in section V.B.9;

5. a wetland delineation report as described in section VI.A.1, if applicable; and

6. the hydrostatic testing information specified in section VII.B.3.

III. ENVIRONMENTAL INSPECTORS

A. At least one Environmental Inspector having knowledge of the wetland and waterbody conditions in the project area is required for each construction spread. The number and experience of Environmental Inspectors assigned to each construction spread shall be appropriate for the length of the construction spread and the number/significance of resources affected.

B. The Environmental Inspector's responsibilities are outlined in the Upland Erosion Control, Revegetation, and Maintenance Plan (Plan).

IV. PRECONSTRUCTION PLANNING

A. The project sponsor shall develop project-specific Spill Prevention and Response Procedures that meet applicable requirements of state and federal agencies. A copy must be filed with the Secretary prior to construction and made available in the field on each construction spread. This filing requirement does not apply to projects constructed under the automatic authorization provisions in the FERC's regulations.

1. It shall be the responsibility of the project sponsor and its contractors to structure their operations in a manner that reduces the risk of spills or the accidental exposure of fuels or hazardous materials to waterbodies or wetlands. The project sponsor and its contractors must, at a minimum, ensure that:

a. all employees handling fuels and other hazardous materials are properly trained;

b. all equipment is in good operating order and inspected on a regular basis;

c. fuel trucks transporting fuel to on-site equipment travel only on approved access roads;

d. all equipment is parked overnight and/or fueled at least 100 feet from a waterbody or in an upland area at least 100 feet from a wetland boundary. These activities can occur closer only if the Environmental Inspector determines that there is no reasonable alternative, and the

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

project sponsor and its contractors have taken appropriate steps (including secondary containment structures) to prevent spills and provide for prompt cleanup in the event of a spill;

e. hazardous materials, including chemicals, fuels, and lubricating oils, are not stored within 100 feet of a wetland, waterbody, or designated municipal watershed area, unless the location is designated for such use by an appropriate governmental authority. This applies to storage of these materials and does not apply to normal operation or use of equipment in these areas;

f. concrete coating activities are not performed within 100 feet of a wetland or waterbody boundary, unless the location is an existing industrial site designated for such use. These activities can occur closer only if the Environmental Inspector determines that there is no reasonable alternative, and the project sponsor and its contractors have taken appropriate steps (including secondary containment structures) to prevent spills and provide for prompt cleanup in the event of a spill;

g. pumps operating within 100 feet of a waterbody or wetland boundary utilize appropriate secondary containment systems to prevent spills; and

h. bulk storage of hazardous materials, including chemicals, fuels, and lubricating oils have appropriate secondary containment systems to prevent spills.

2. The project sponsor and its contractors must structure their operations in a manner that provides for the prompt and effective cleanup of spills of fuel and other hazardous materials. At a minimum, the project sponsor and its contractors must:

a. ensure that each construction crew (including cleanup crews) has on hand sufficient supplies of absorbent and barrier materials to allow the rapid containment and recovery of spilled materials and knows the procedure for reporting spills and unanticipated discoveries of contamination;

b. ensure that each construction crew has on hand sufficient tools and material to stop leaks;

c. know the contact names and telephone numbers for all local, state, and federal agencies (including, if necessary, the U. S. Coast Guard and the National Response Center) that must be notified of a spill; and

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

d. follow the requirements of those agencies in cleaning up the spill, in excavating and disposing of soils or other materials contaminated by a spill, and in collecting and disposing of waste generated during spill cleanup.

B. AGENCY COORDINATION

The project sponsor must coordinate with the appropriate local, state, and federal agencies as outlined in these Procedures and in the FERC's Orders.

V. WATERBODY CROSSINGS

A. NOTIFICATION PROCEDURES AND PERMITS

1. Apply to the U.S. Army Corps of Engineers (COE), or its delegated agency, for the appropriate wetland and waterbody crossing permits.

2. Provide written notification to authorities responsible for potable surface water supply intakes located within 3 miles downstream of the crossing at least 1 week before beginning work in the waterbody, or as otherwise specified by that authority.

3. Apply for state-issued waterbody crossing permits and obtain individual or generic section 401 water quality certification or waiver.

4. Notify appropriate federal and state authorities at least 48 hours before beginning trenching or blasting within the waterbody, or as specified in applicable permits.

B. INSTALLATION

1. Time Window for Construction

Unless expressly permitted or further restricted by the appropriate federal or state agency in writing on a site-specific basis, instream work, except that required to install or remove equipment bridges, must occur during the following time windows:

a. coldwater fisheries - June 1 through September 30; and

b. coolwater and warmwater fisheries - June 1 through November 30.

2. Extra Work Areas

a. Locate all extra work areas (such as staging areas and additional spoil storage areas) at least 50 feet away from water's edge, except where

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

the adjacent upland consists of cultivated or rotated cropland or other disturbed land.

b. The project sponsor shall file with the Secretary for review and written approval by the Director, site-specific justification for each extra work area with a less than 50-foot setback from the water's edge, except where the adjacent upland consists of cultivated or rotated cropland or other disturbed land. The justification must specify the conditions that will not permit a 50-foot setback and measures to ensure the waterbody is adequately protected.

c. Limit the size of extra work areas to the minimum needed to construct the waterbody crossing.

3. General Crossing Procedures

a. Comply with the COE, or its delegated agency, permit terms and conditions.

b. Construct crossings as close to perpendicular to the axis of the waterbody channel as engineering and routing conditions permit.

c. Where pipelines parallel a waterbody, maintain at least 15 feet of undisturbed vegetation between the waterbody (and any adjacent wetland) and the construction right-of-way, except where maintaining this offset will result in greater environmental impact.

d. Where waterbodies meander or have multiple channels, route the pipeline to minimize the number of waterbody crossings.

e. Maintain adequate waterbody flow rates to protect aquatic life, and prevent the interruption of existing downstream uses.

f. Waterbody buffers (e.g., extra work area setbacks, refueling restrictions) must be clearly marked in the field with signs and/or highly visible flagging until construction-related ground disturbing activities are complete.

g. Crossing of waterbodies when they are dry or frozen and not flowing may proceed using standard upland construction techniques in accordance with the Plan, provided that the Environmental Inspector verifies that water is unlikely to flow between initial disturbance and final stabilization of the feature. In the event of perceptible flow, the project sponsor must comply with all applicable Procedure requirements for "waterbodies" as defined in section I.B.1.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

4. Spoil Pile Placement and Control

   a. All spoil from minor and intermediate waterbody crossings, and upland spoil from major waterbody crossings, must be placed in the construction right-of-way at least 10 feet from the water's edge or in additional extra work areas as described in section V.B.2.

   b. Use sediment barriers to prevent the flow of spoil or silt-laden water into any waterbody.

5. Equipment Bridges

   a. Only clearing equipment and equipment necessary for installation of equipment bridges may cross waterbodies prior to bridge installation. Limit the number of such crossings of each waterbody to one per piece of clearing equipment.

   b. Construct and maintain equipment bridges to allow unrestricted flow and to prevent soil from entering the waterbody. Examples of such bridges include:

      (1) equipment pads and culvert(s);
      (2) equipment pads or railroad car bridges without culverts;
      (3) clean rock fill and culvert(s); and
      (4) flexi-float or portable bridges.

      Additional options for equipment bridges may be utilized that achieve the performance objectives noted above. Do not use soil to construct or stabilize equipment bridges.

   c. Design and maintain each equipment bridge to withstand and pass the highest flow expected to occur while the bridge is in place. Align culverts to prevent bank erosion or streambed scour. If necessary, install energy dissipating devices downstream of the culverts.

   d. Design and maintain equipment bridges to prevent soil from entering the waterbody.

   e. Remove temporary equipment bridges as soon as practicable after permanent seeding.

   f. If there will be more than 1 month between final cleanup and the beginning of permanent seeding and reasonable alternative access to the right-of-way is available, remove temporary equipment bridges as soon as practicable after final cleanup.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

g. Obtain any necessary approval from the COE, or the appropriate state agency for permanent bridges.

6. Dry-Ditch Crossing Methods

a. Unless approved otherwise by the appropriate federal or state agency, install the pipeline using one of the dry-ditch methods outlined below for crossings of waterbodies up to 30 feet wide (at the water's edge at the time of construction) that are state-designated as either coldwater or significant coolwater or warmwater fisheries, or federally-designated as critical habitat.

b. Dam and Pump

(1) The dam-and-pump method may be used without prior approval for crossings of waterbodies where pumps can adequately transfer streamflow volumes around the work area, and there are no concerns about sensitive species passage.

(2) Implementation of the dam-and-pump crossing method must meet the following performance criteria:

(i) use sufficient pumps, including on-site backup pumps, to maintain downstream flows;
(ii) construct dams with materials that prevent sediment and other pollutants from entering the waterbody (e.g., sandbags or clean gravel with plastic liner);
(iii) screen pump intakes to minimize entrainment of fish;
(iv) prevent streambed scour at pump discharge; and
(v) continuously monitor the dam and pumps to ensure proper operation throughout the waterbody crossing.

c. Flume Crossing

The flume crossing method requires implementation of the following steps:

(1) install flume pipe after blasting (if necessary), but before any trenching;

(2) use sand bag or sand bag and plastic sheeting diversion structure or equivalent to develop an effective seal and to divert stream flow through the flume pipe (some modifications to the stream bottom may be required to achieve an effective seal);

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

(3) properly align flume pipe(s) to prevent bank erosion and streambed scour;

(4) do not remove flume pipe during trenching, pipelaying, or backfilling activities, or initial streambed restoration efforts; and

(5) remove all flume pipes and dams that are not also part of the equipment bridge as soon as final cleanup of the stream bed and bank is complete.

d. Horizontal Directional Drill

For each waterbody or wetland that would be crossed using the HDD method, file with the Secretary for the review and written approval by the Director, a plan that includes:

(1) site-specific construction diagrams that show the location of mud pits, pipe assembly areas, and all areas to be disturbed or cleared for construction;

(2) justification that disturbed areas are limited to the minimum needed to construct the crossing;

(3) identification of any aboveground disturbance or clearing between the HDD entry and exit workspaces during construction;

(4) a description of how an inadvertent release of drilling mud would be contained and cleaned up; and

(5) a contingency plan for crossing the waterbody or wetland in the event the HDD is unsuccessful and how the abandoned drill hole would be sealed, if necessary.

The requirement to file HDD plans does not apply to projects constructed under the automatic authorization provisions in the FERC's regulations.

7. Crossings of Minor Waterbodies

Where a dry-ditch crossing is not required, minor waterbodies may be crossed using the open-cut crossing method, with the following restrictions:

a. except for blasting and other rock breaking measures, complete instream construction activities (including trenching, pipe installation, backfill, and restoration of the streambed contours) within 24 hours.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Streambanks and unconsolidated streambeds may require additional restoration after this period;

b. limit use of equipment operating in the waterbody to that needed to construct the crossing; and

c. equipment bridges are not required at minor waterbodies that do not have a state-designated fishery classification or protected status (e.g., agricultural or intermittent drainage ditches). However, if an equipment bridge is used it must be constructed as described in section V.B.5.

8. Crossings of Intermediate Waterbodies

Where a dry-ditch crossing is not required, intermediate waterbodies may be crossed using the open-cut crossing method, with the following restrictions:

a. complete instream construction activities (not including blasting and other rock breaking measures) within 48 hours, unless site-specific conditions make completion within 48 hours infeasible;

b. limit use of equipment operating in the waterbody to that needed to construct the crossing; and

c. all other construction equipment must cross on an equipment bridge as specified in section V.B.5.

9. Crossings of Major Waterbodies

Before construction, the project sponsor shall file with the Secretary for the review and written approval by the Director a detailed, site-specific construction plan and scaled drawings identifying all areas to be disturbed by construction for each major waterbody crossing (the scaled drawings are not required for any offshore portions of pipeline projects). This plan must be developed in consultation with the appropriate state and federal agencies and shall include extra work areas, spoil storage areas, sediment control structures, etc., as well as mitigation for navigational issues. The requirement to file major waterbody crossing plans does not apply to projects constructed under the automatic authorization provisions of the FERC's regulations.

The Environmental Inspector may adjust the final placement of the erosion and sediment control structures in the field to maximize effectiveness.

10. Temporary Erosion and Sediment Control

Install sediment barriers (as defined in section IV.F.3.a of the Plan) immediately after initial disturbance of the waterbody or adjacent upland.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Sediment barriers must be properly maintained throughout construction and reinstalled as necessary (such as after backfilling of the trench) until replaced by permanent erosion controls or restoration of adjacent upland areas is complete. Temporary erosion and sediment control measures are addressed in more detail in the Plan; however, the following specific measures must be implemented at stream crossings:

a. install sediment barriers across the entire construction right-of-way at all waterbody crossings, where necessary to prevent the flow of sediments into the waterbody. Removable sediment barriers (or driveable berms) must be installed across the travel lane. These removable sediment barriers can be removed during the construction day, but must be re-installed after construction has stopped for the day and/or when heavy precipitation is imminent;

b. where waterbodies are adjacent to the construction right-of-way and the right-of-way slopes toward the waterbody, install sediment barriers along the edge of the construction right-of-way as necessary to contain spoil within the construction right-of-way and prevent sediment flow into the waterbody; and

c. use temporary trench plugs at all waterbody crossings, as necessary, to prevent diversion of water into upland portions of the pipeline trench and to keep any accumulated trench water out of the waterbody.

11. Trench Dewatering

Dewater the trench (either on or off the construction right-of-way) in a manner that does not cause erosion and does not result in silt-laden water flowing into any waterbody. Remove the dewatering structures as soon as practicable after the completion of dewatering activities.

C. RESTORATION

1. Use clean gravel or native cobbles for the upper 1 foot of trench backfill in all waterbodies that contain coldwater fisheries.

2. For open-cut crossings, stabilize waterbody banks and install temporary sediment barriers within 24 hours of completing instream construction activities. For dry-ditch crossings, complete streambed and bank stabilization before returning flow to the waterbody channel.

3. Return all waterbody banks to preconstruction contours or to a stable angle of repose as approved by the Environmental Inspector.

4. Install erosion control fabric or a functional equivalent on waterbody banks at the time of final bank recontouring. Do not use synthetic monofilament

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

mesh/netted erosion control materials in areas designated as sensitive wildlife habitat unless the product is specifically designed to minimize harm to wildlife. Anchor erosion control fabric with staples or other appropriate devices.

5. Application of riprap for bank stabilization must comply with COE, or its delegated agency, permit terms and conditions.

6. Unless otherwise specified by state permit, limit the use of riprap to areas where flow conditions preclude effective vegetative stabilization techniques such as seeding and erosion control fabric.

7. Revegetate disturbed riparian areas with native species of conservation grasses, legumes, and woody species, similar in density to adjacent undisturbed lands.

8. Install a permanent slope breaker across the construction right-of-way at the base of slopes greater than 5 percent that are less than 50 feet from the waterbody, or as needed to prevent sediment transport into the waterbody. In addition, install sediment barriers as outlined in the Plan.

   In some areas, with the approval of the Environmental Inspector, an earthen berm may be suitable as a sediment barrier adjacent to the waterbody.

9. Sections V.C.3 through V.C.7 above also apply to those perennial or intermittent streams not flowing at the time of construction.

D. POST-CONSTRUCTION MAINTENANCE

1. Limit routine vegetation mowing or clearing adjacent to waterbodies to allow a riparian strip at least 25 feet wide, as measured from the waterbody's mean high water mark, to permanently revegetate with native plant species across the entire construction right-of-way. However, to facilitate periodic corrosion/leak surveys, a corridor centered on the pipeline and up to 10 feet wide may be cleared at a frequency necessary to maintain the 10-foot corridor in an herbaceous state. In addition, trees that are located within 15 feet of the pipeline that have roots that could compromise the integrity of the pipeline coating may be cut and removed from the permanent right-of-way. Do not conduct any routine vegetation mowing or clearing in riparian areas that are between HDD entry and exit points.

2. Do not use herbicides or pesticides in or within 100 feet of a waterbody except as allowed by the appropriate land management or state agency.

3. Time of year restrictions specified in section VII.A.5 of the Plan (April 15 – August 1 of any year) apply to routine mowing and clearing of riparian areas.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VI. WETLAND CROSSINGS

A. GENERAL

1. The project sponsor shall conduct a wetland delineation using the current federal methodology and file a wetland delineation report with the Secretary before construction. The requirement to file a wetland delineation report does not apply to projects constructed under the automatic authorization provisions in the FERC's regulations.

   This report shall identify:

   a. by milepost all wetlands that would be affected;

   b. the National Wetlands Inventory (NWI) classification for each wetland;

   c. the crossing length of each wetland in feet; and

   d. the area of permanent and temporary disturbance that would occur in each wetland by NWI classification type.

   The requirements outlined in this section do not apply to wetlands in actively cultivated or rotated cropland. Standard upland protective measures, including workspace and topsoiling requirements, apply to these agricultural wetlands.

2. Route the pipeline to avoid wetland areas to the maximum extent possible. If a wetland cannot be avoided or crossed by following an existing right-of-way, route the new pipeline in a manner that minimizes disturbance to wetlands. Where looping an existing pipeline, overlap the existing pipeline right-of-way with the new construction right-of-way. In addition, locate the loop line no more than 25 feet away from the existing pipeline unless site-specific constraints would adversely affect the stability of the existing pipeline.

3. Limit the width of the construction right-of-way to 75 feet or less. Prior written approval of the Director is required where topographic conditions or soil limitations require that the construction right-of-way width within the boundaries of a federally delineated wetland be expanded beyond 75 feet. Early in the planning process the project sponsor is encouraged to identify site-specific areas where excessively wide trenches could occur and/or where spoil piles could be difficult to maintain because existing soils lack adequate unconfined compressive strength.

4. Wetland boundaries and buffers must be clearly marked in the field with signs and/or highly visible flagging until construction-related ground disturbing activities are complete.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

5. Implement the measures of sections V and VI in the event a waterbody crossing is located within or adjacent to a wetland crossing. If all measures of sections V and VI cannot be met, the project sponsor must file with the Secretary a site-specific crossing plan for review and written approval by the Director before construction. This crossing plan shall address at a minimum:

   a. spoil control;

   b. equipment bridges;

   c. restoration of waterbody banks and wetland hydrology;

   d. timing of the waterbody crossing;

   e. method of crossing; and

   f. size and location of all extra work areas.

6. Do not locate aboveground facilities in any wetland, except where the location of such facilities outside of wetlands would prohibit compliance with U.S. Department of Transportation regulations.

B. INSTALLATION

1. Extra Work Areas and Access Roads

   a. Locate all extra work areas (such as staging areas and additional spoil storage areas) at least 50 feet away from wetland boundaries, except where the adjacent upland consists of cultivated or rotated cropland or other disturbed land.

   b. The project sponsor shall file with the Secretary for review and written approval by the Director, site-specific justification for each extra work area with a less than 50-foot setback from wetland boundaries, except where adjacent upland consists of cultivated or rotated cropland or other disturbed land. The justification must specify the site-specific conditions that will not permit a 50-foot setback and measures to ensure the wetland is adequately protected.

   c. The construction right-of-way may be used for access when the wetland soil is firm enough to avoid rutting or the construction right-of-way has been appropriately stabilized to avoid rutting (e.g., with timber riprap, prefabricated equipment mats, or terra mats).

      In wetlands that cannot be appropriately stabilized, all construction equipment other than that needed to install the wetland crossing shall

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

use access roads located in upland areas. Where access roads in upland areas do not provide reasonable access, limit all other construction equipment to one pass through the wetland using the construction right-of-way.

d. The only access roads, other than the construction right-of-way, that can be used in wetlands are those existing roads that can be used with no modifications or improvements, other than routine repair, and no impact on the wetland.

2. Crossing Procedures

a. Comply with COE, or its delegated agency, permit terms and conditions.

b. Assemble the pipeline in an upland area unless the wetland is dry enough to adequately support skids and pipe.

c. Use "push-pull" or "float" techniques to place the pipe in the trench where water and other site conditions allow.

d. Minimize the length of time that topsoil is segregated and the trench is open. Do not trench the wetland until the pipeline is assembled and ready for lowering in.

e. Limit construction equipment operating in wetland areas to that needed to clear the construction right-of-way, dig the trench, fabricate and install the pipeline, backfill the trench, and restore the construction right-of-way.

f. Cut vegetation just above ground level, leaving existing root systems in place, and remove it from the wetland for disposal.

The project sponsor can burn woody debris in wetlands, if approved by the COE and in accordance with state and local regulations, ensuring that all remaining woody debris is removed for disposal.

g. Limit pulling of tree stumps and grading activities to directly over the trenchline. Do not grade or remove stumps or root systems from the rest of the construction right-of-way in wetlands unless the Chief Inspector and Environmental Inspector determine that safety-related construction constraints require grading or the removal of tree stumps from under the working side of the construction right-of-way.

h. Segregate the top 1 foot of topsoil from the area disturbed by trenching, except in areas where standing water is present or soils are

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

saturated. Immediately after backfilling is complete, restore the segregated topsoil to its original location.

i. Do not use rock, soil imported from outside the wetland, tree stumps, or brush riprap to support equipment on the construction right-of-way.

j. If standing water or saturated soils are present, or if construction equipment causes ruts or mixing of the topsoil and subsoil in wetlands, use low-ground-weight construction equipment, or operate normal equipment on timber riprap, prefabricated equipment mats, or terra mats.

k. Remove all project-related material used to support equipment on the construction right-of-way upon completion of construction.

3. Temporary Sediment Control

Install sediment barriers (as defined in section IV.F.3.a of the Plan) immediately after initial disturbance of the wetland or adjacent upland. Sediment barriers must be properly maintained throughout construction and reinstalled as necessary (such as after backfilling of the trench). Except as noted below in section VI.B.3.c, maintain sediment barriers until replaced by permanent erosion controls or restoration of adjacent upland areas is complete. Temporary erosion and sediment control measures are addressed in more detail in the Plan.

a. Install sediment barriers across the entire construction right-of-way immediately upslope of the wetland boundary at all wetland crossings where necessary to prevent sediment flow into the wetland.

b. Where wetlands are adjacent to the construction right-of-way and the right-of-way slopes toward the wetland, install sediment barriers along the edge of the construction right-of-way as necessary to contain spoil within the construction right-of-way and prevent sediment flow into the wetland.

c. Install sediment barriers along the edge of the construction right-of-way as necessary to contain spoil and sediment within the construction right-of-way through wetlands. Remove these sediment barriers during right-of-way cleanup.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

4. Trench Dewatering

   Dewater the trench (either on or off the construction right-of-way) in a manner that does not cause erosion and does not result in silt-laden water flowing into any wetland. Remove the dewatering structures as soon as practicable after the completion of dewatering activities.

C. RESTORATION

1. Where the pipeline trench may drain a wetland, construct trench breakers at the wetland boundaries and/or seal the trench bottom as necessary to maintain the original wetland hydrology.

2. Restore pre-construction wetland contours to maintain the original wetland hydrology.

3. For each wetland crossed, install a trench breaker at the base of slopes near the boundary between the wetland and adjacent upland areas. Install a permanent slope breaker across the construction right-of-way at the base of slopes greater than 5 percent where the base of the slope is less than 50 feet from the wetland, or as needed to prevent sediment transport into the wetland. In addition, install sediment barriers as outlined in the Plan. In some areas, with the approval of the Environmental Inspector, an earthen berm may be suitable as a sediment barrier adjacent to the wetland.

4. Do not use fertilizer, lime, or mulch unless required in writing by the appropriate federal or state agency.

5. Consult with the appropriate federal or state agencies to develop a project-specific wetland restoration plan. The restoration plan shall include measures for re-establishing herbaceous and/or woody species, controlling the invasion and spread of invasive species and noxious weeds (e.g., purple loosestrife and phragmites), and monitoring the success of the revegetation and weed control efforts. Provide this plan to the FERC staff upon request.

6. Until a project-specific wetland restoration plan is developed and/or implemented, temporarily revegetate the construction right-of-way with annual ryegrass at a rate of 40 pounds/acre (unless standing water is present).

7. Ensure that all disturbed areas successfully revegetate with wetland herbaceous and/or woody plant species.

8. Remove temporary sediment barriers located at the boundary between wetland and adjacent upland areas after revegetation and stabilization of adjacent upland areas are judged to be successful as specified in section VII.A.4 of the Plan.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

D. POST-CONSTRUCTION MAINTENANCE AND REPORTING

1. Do not conduct routine vegetation mowing or clearing over the full width of the permanent right-of-way in wetlands. However, to facilitate periodic corrosion/leak surveys, a corridor centered on the pipeline and up to 10 feet wide may be cleared at a frequency necessary to maintain the 10-foot corridor in an herbaceous state. In addition, trees within 15 feet of the pipeline with roots that could compromise the integrity of pipeline coating may be selectively cut and removed from the permanent right-of-way. Do not conduct any routine vegetation mowing or clearing in wetlands that are between HDD entry and exit points.

2. Do not use herbicides or pesticides in or within 100 feet of a wetland, except as allowed by the appropriate federal or state agency.

3. Time of year restrictions specified in section VII.A.5 of the Plan (April 15 – August 1 of any year) apply to routine mowing and clearing of wetland areas.

4. Monitor and record the success of wetland revegetation annually until wetland revegetation is successful.

5. Wetland revegetation shall be considered successful if all of the following criteria are satisfied:

   a. the affected wetland satisfies the current federal definition for a wetland (i.e., soils, hydrology, and vegetation);

   b. vegetation is at least 80 percent of either the cover documented for the wetland prior to construction, or at least 80 percent of the cover in adjacent wetland areas that were not disturbed by construction;

   c. if natural rather than active revegetation was used, the plant species composition is consistent with early successional wetland plant communities in the affected ecoregion; and

   d. invasive species and noxious weeds are absent, unless they are abundant in adjacent areas that were not disturbed by construction.

6. Within 3 years after construction, file a report with the Secretary identifying the status of the wetland revegetation efforts and documenting success as defined in section VI.D.5, above. The requirement to file wetland restoration reports with the Secretary does not apply to projects constructed under the automatic authorization, prior notice, or advance notice provisions in the FERC's regulations.

   For any wetland where revegetation is not successful at the end of 3 years after construction, develop and implement (in consultation with a

professional wetland ecologist) a remedial revegetation plan to actively revegetate wetlands. Continue revegetation efforts and file a report annually documenting progress in these wetlands until wetland revegetation is successful.

VII. HYDROSTATIC TESTING

A. NOTIFICATION PROCEDURES AND PERMITS

1. Apply for state-issued water withdrawal permits, as required.

2. Apply for National Pollutant Discharge Elimination System (NPDES) or state-issued discharge permits, as required.

3. Notify appropriate state agencies of intent to use specific sources at least 48 hours before testing activities unless they waive this requirement in writing.

B. GENERAL

1. Perform 100 percent radiographic inspection of all pipeline section welds or hydrotest the pipeline sections, before installation under waterbodies or wetlands.

2. If pumps used for hydrostatic testing are within 100 feet of any waterbody or wetland, address secondary containment and refueling of these pumps in the project's Spill Prevention and Response Procedures.

3. The project sponsor shall file with the Secretary before construction a list identifying the location of all waterbodies proposed for use as a hydrostatic test water source or discharge location. This filing requirement does not apply to projects constructed under the automatic authorization provisions of the FERC's regulations.

C. INTAKE SOURCE AND RATE

1. Screen the intake hose to minimize the potential for entrainment of fish.

2. Do not use state-designated exceptional value waters, waterbodies which provide habitat for federally listed threatened or endangered species, or waterbodies designated as public water supplies, unless appropriate federal, state, and/or local permitting agencies grant written permission.

3. Maintain adequate flow rates to protect aquatic life, provide for all waterbody uses, and provide for downstream withdrawals of water by existing users.

4. Locate hydrostatic test manifolds outside wetlands and riparian areas to the maximum extent practicable.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

D. DISCHARGE LOCATION, METHOD, AND RATE

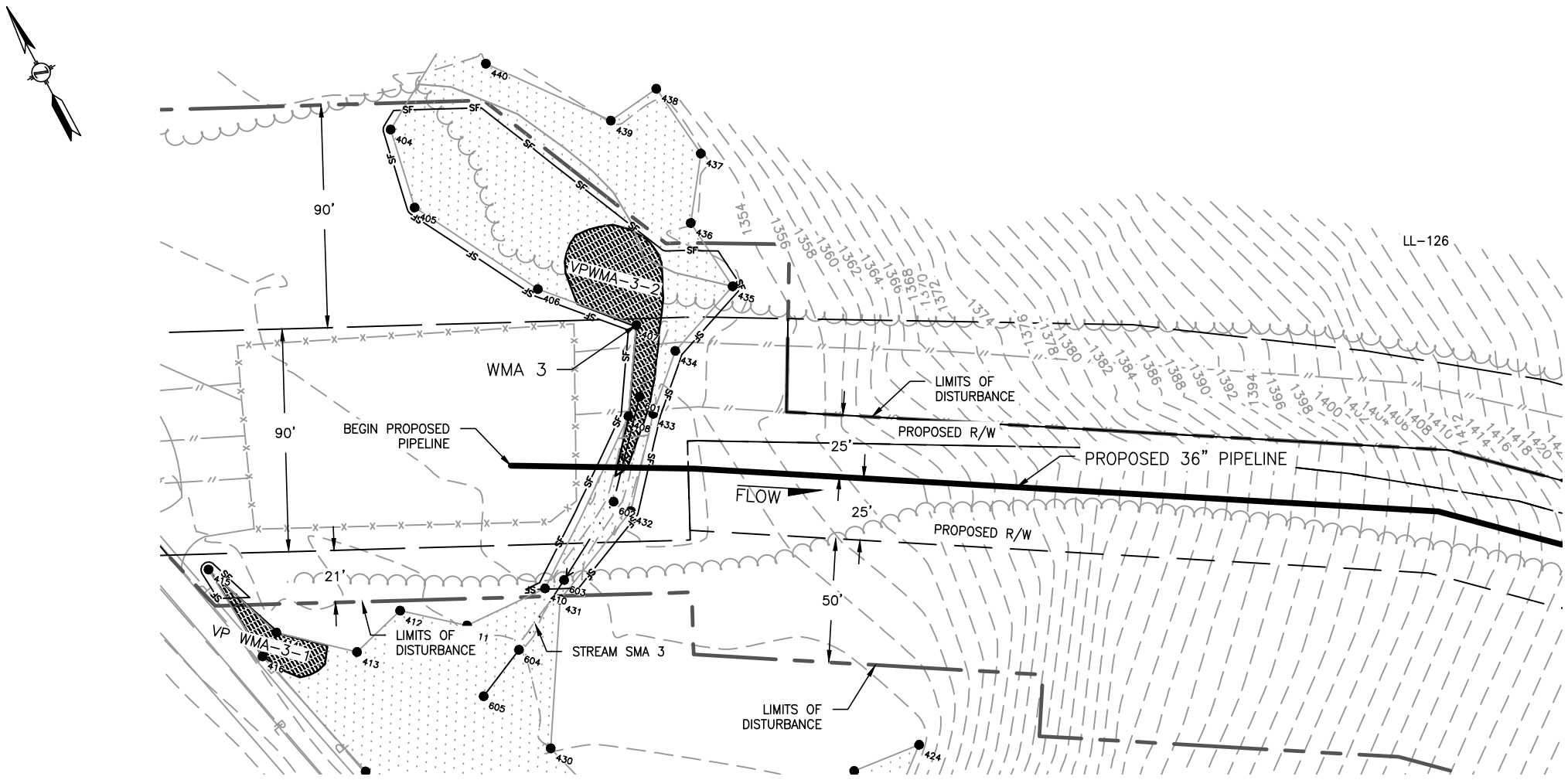
1. Regulate discharge rate, use energy dissipation device(s), and install sediment barriers, as necessary, to prevent erosion, streambed scour, suspension of sediments, or excessive streamflow.

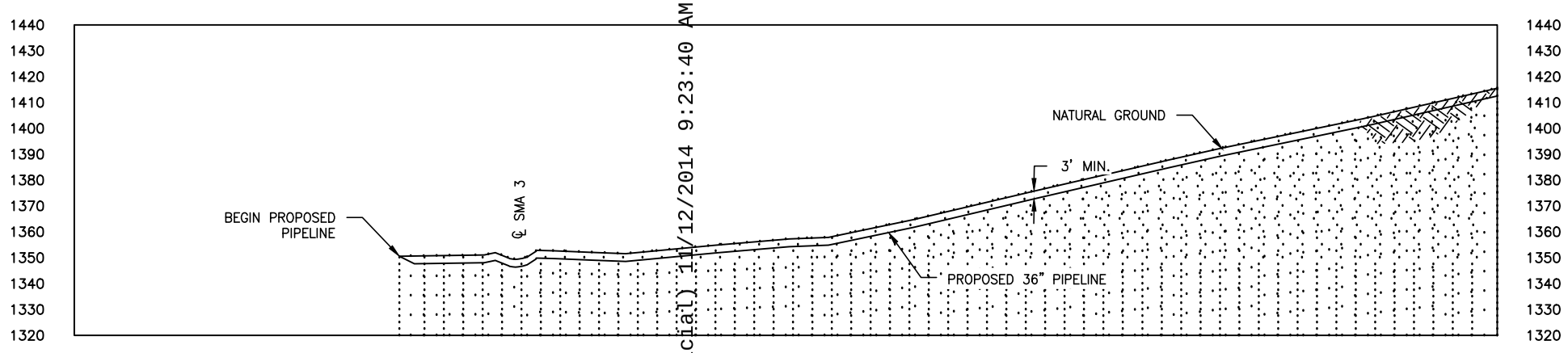
2. Do not discharge into state-designated exceptional value waters, waterbodies which provide habitat for federally listed threatened or endangered species, or waterbodies designated as public water supplies, unless appropriate federal, state, and local permitting agencies grant written permission.

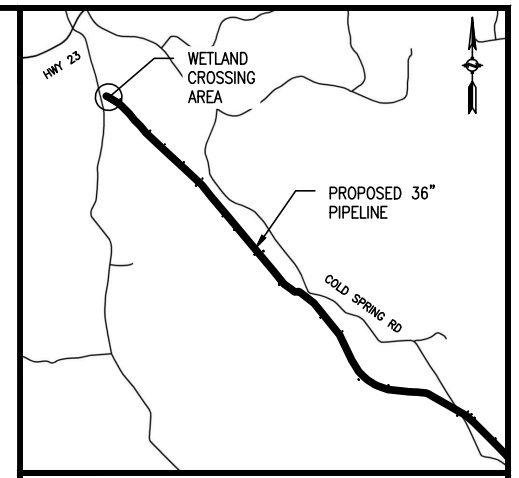
20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

APPENDIX E

Site Specific Wetland and Waterbody Crossing Drawings







VICINITY MAP

5000 2500 0 5000

SCALE IN FEET

DELINEATED WETLANDS

DELINEATED VERNAL POOLS

EXISTING PERMANENT EASEMENT

LIMITS OF DISTURBANCE

PROPOSED PERMANENT EASEMENT

PROPOSED PIPELINE

EXISTING PIPELINE

PROPERTY LINE

FENCE

TREE LINE

POWER LINES

SILT FENCE

DELINEATED STREAMS

CENTERLINE OF ROAD

CONTOUR LINE

DELINEATED WETLAND/WATERBODY FLAGS

60 30 0 60

SCALE IN FEET

Wetland ID	Wetland Class	Crossing Length (feet)	Wetland Impact (acres)					State Wetland Classification	Stream Disturbance (Acres)	Crossing Method
			Construction			Operation				
			PFO	PSS	PEM	PFO	PSS			
WMA 3	N/A	11.58	0.03	N/A	0.15	0.01	N/A	N/A	0.006	Conventional

APPLICATION NO.: NAE-2013-02329

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.
2	9/15/14	JD	ISSUED FOR MEPA		RE
1	7/17/14	JD	REVISED PER AECOM COMMENTS		RE

REVISIONS

Division: Op. Area.:

State: MA Co./Par.: BERKSHIRE

Section: Township: Range:

Dft: AP Date: 7/2/14

Chk: JD Date: 7/3/14

Appr: RE Date: 7/7/14

Scale: AS SHOWN

Filename: SK14C4781MA04_WetlandSS.dwg

CONNECTICUT EXPANSION
MASSACHUSETTS LOOP 200-3
PROPOSED 36" NATURAL GAS PIPELINE
WETLAND CROSSING WMA 3 @ M.P. 0.01
TOWN OF SANDISFIELD
BERKSHIRE COUNTY, MASSACHUSETTS

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

Sheet: 1 of 19

Type:

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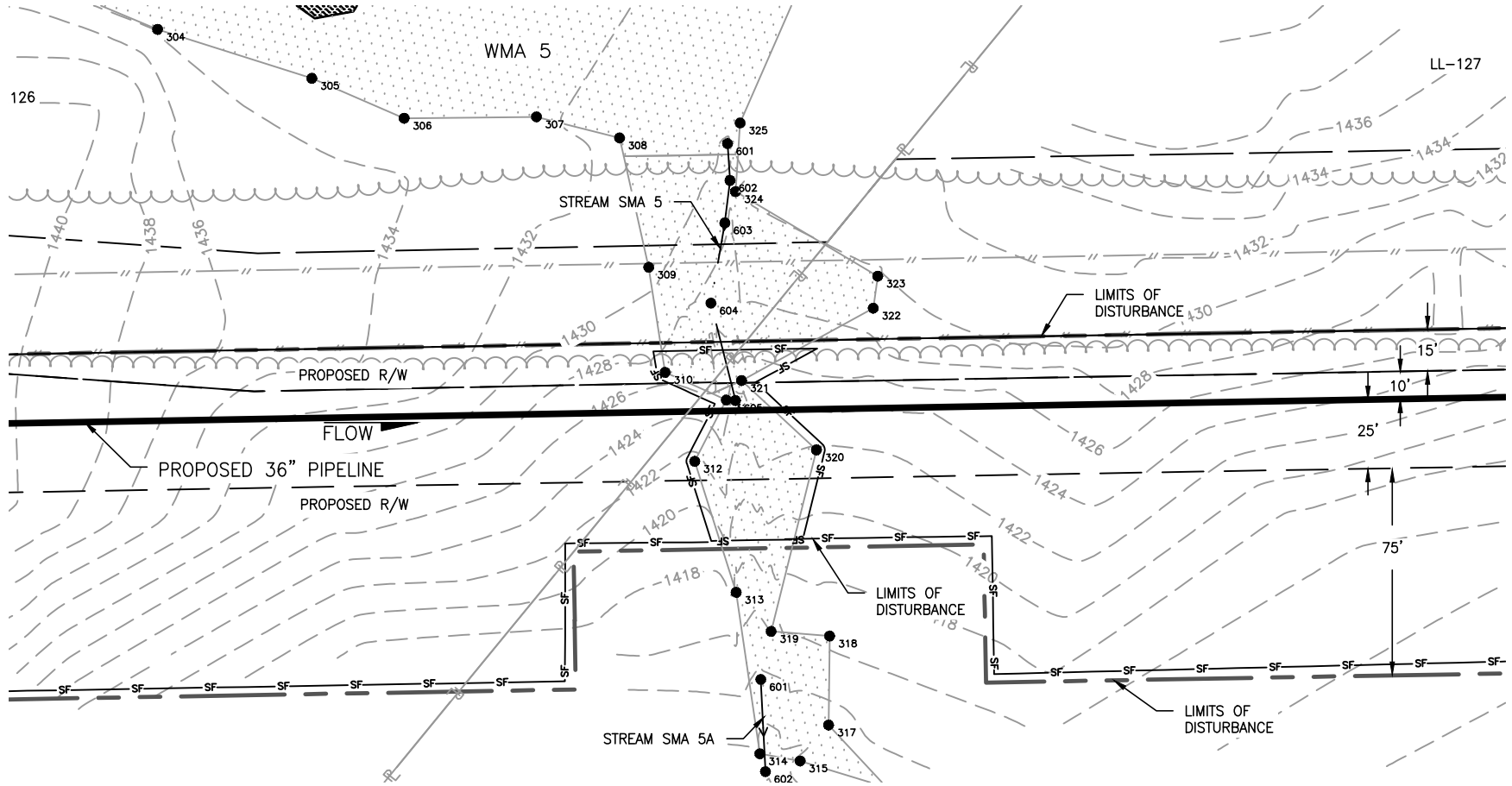
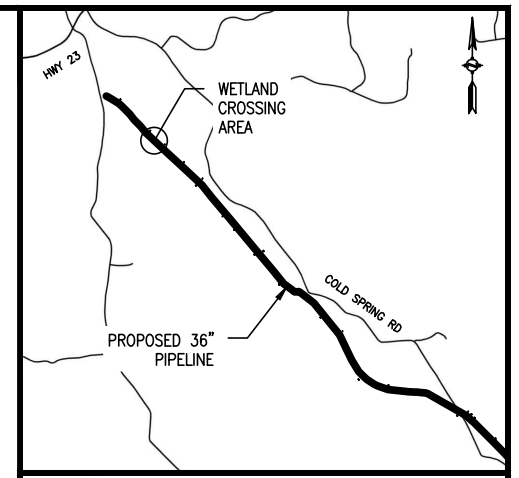




VICINITY MAP

5000 2500 0 5000

SCALE IN FEET

DELINEATED WETLANDS

DELINEATED VERNAL POOLS

EXISTING PERMANENT EASEMENT

LIMITS OF DISTURBANCE

PROPOSED PERMANENT EASEMENT

PROPOSED PIPELINE

EXISTING PIPELINE

PROPERTY LINE

FENCE

TREE LINE

POWER LINES

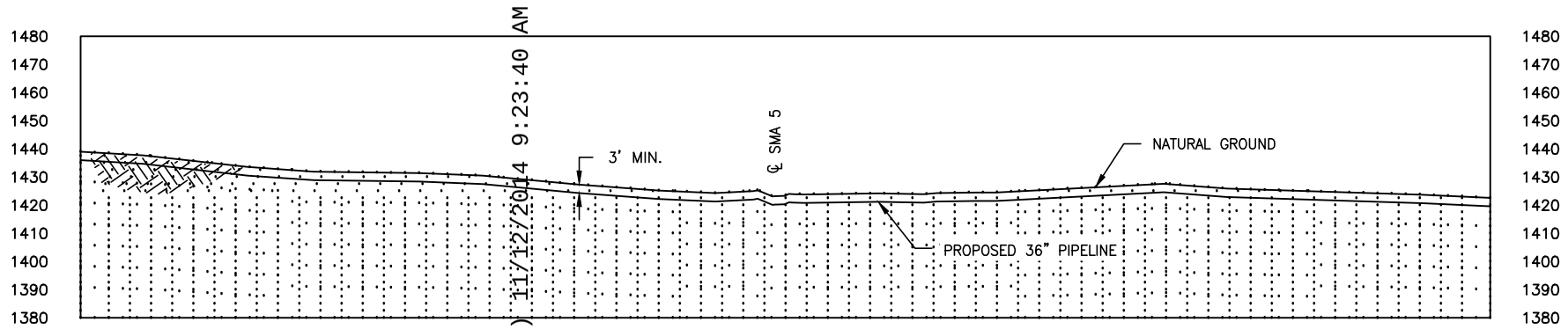
SILT FENCE

DELINEATED STREAMS

CENTERLINE OF ROAD

CONTOUR LINE

DELINEATED WETLAND/WATERBODY FLAGS



60 30 0 60

SCALE IN FEET

Wetland ID	Wetland Class	Crossing Length (feet)	Wetland Impact (acres)					State Wetland Classification	Stream Disturbance (Acres)	Crossing Method
			Construction			Operation				
			PFO	PSS	PEM	PFO	PSS			
WMA 5	N/A	19.09	0.04	N/A	0.01	0.01	N/A	N/A	0.001	Conventional

APPLICATION NO.: NAE-2013-02329

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.
2	9/15/14	JD	ISSUED FOR MEPA		RE
1	7/17/14	JD	REVISED PER AECOM COMMENTS		RE

REVISIONS

Division: Op. Area.:

State: MA Co./Par.: BERKSHIRE

Section: Township: Range:

Dft: AP	Date: 7/2/14	Scale:	AS SHOWN
Chk: JD	Date: 7/3/14	Filename:	SK14C4781MA04_WetlandSS.dwg
Appr: RE	Date: 7/7/14		

CONNECTICUT EXPANSION
MASSACHUSETTS LOOP 200-3
PROPOSED 36" NATURAL GAS PIPELINE
WETLAND CROSSING WMA 5 @ M.P. 0.33
TOWN OF SANDISFIELD
BERKSHIRE COUNTY, MASSACHUSETTS

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

Sheet: 2 of 19
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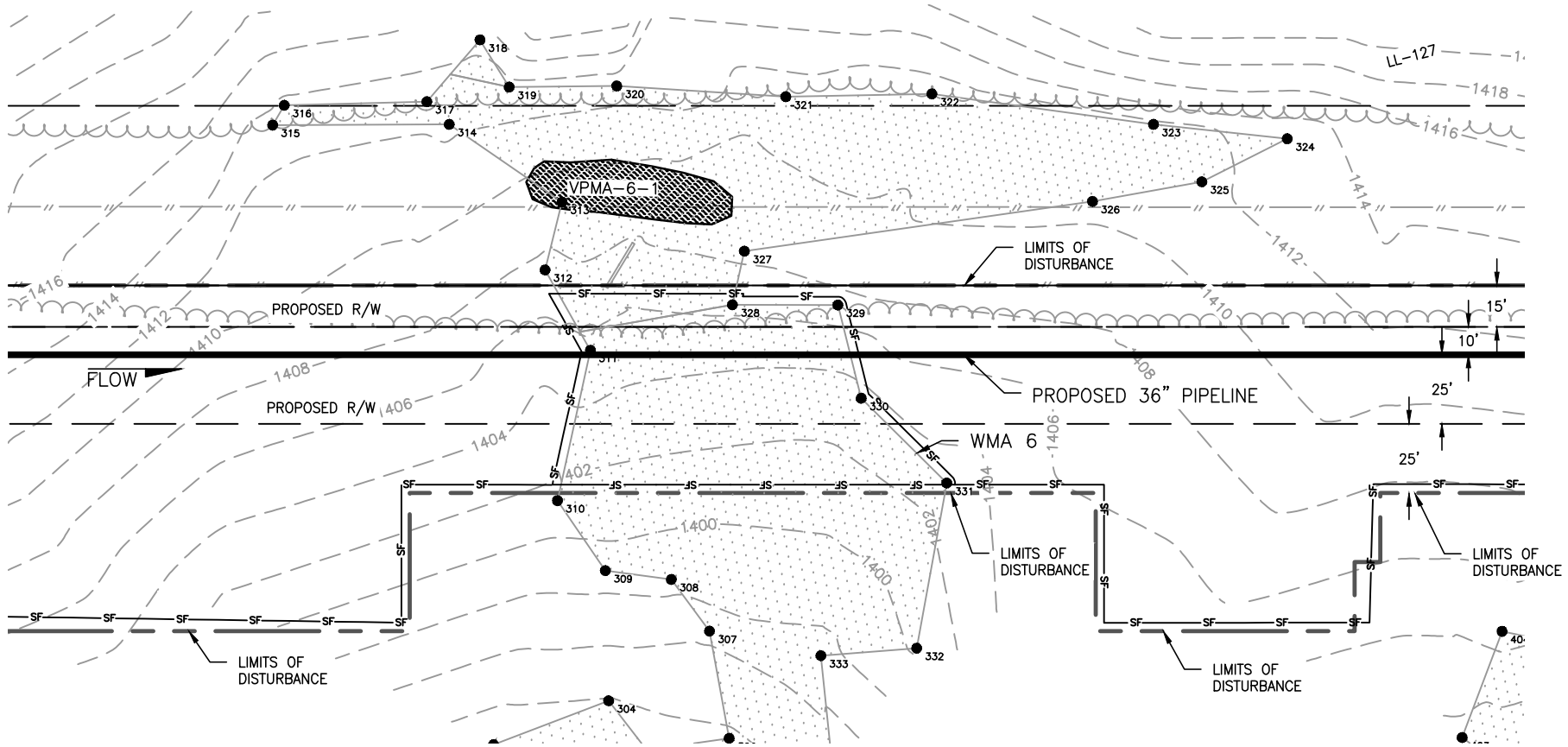

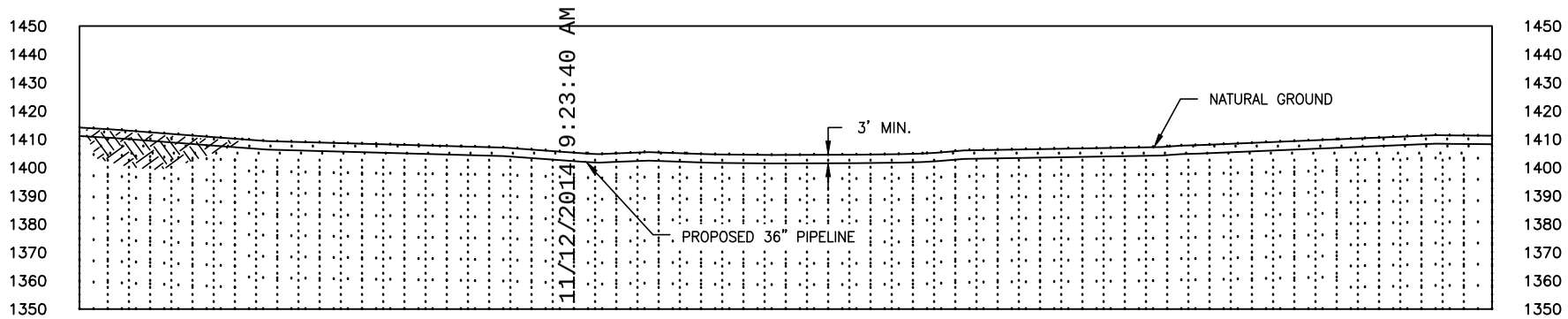

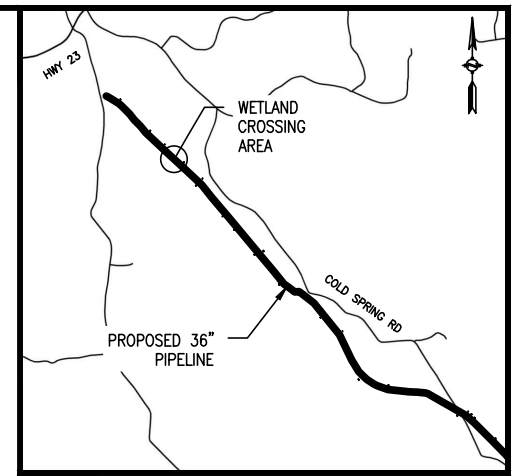

VICINITY MAP

5000 2500 0 5000

SCALE IN FEET

DELINEATED WETLANDS

DELINEATED VERNAL POOLS

EXISTING PERMANENT EASEMENT

LIMITS OF DISTURBANCE

PROPOSED PERMANENT EASEMENT

PROPOSED PIPELINE

EXISTING PIPELINE

PROPERTY LINE

FENCE

TREE LINE

POWER LINES

SILT FENCE

DELINEATED STREAMS

CENTERLINE OF ROAD

CONTOUR LINE

DELINEATED WETLAND/WATERBODY FLAGS

60 30 0 60

SCALE IN FEET

Wetland ID	Wetland Class	Crossing Length (feet)	Wetland Impact (acres)					State Wetland Classification	Stream Disturbance (Acres)	Crossing Method
			Construction			Operation				
			PFO	PSS	PEM	PFO	PSS			
WMA 6	N/A	94.40	0.16	N/A	0.02	0.06	N/A	N/A	N/A	Conventional

APPLICATION NO.: NAE-2013-02329

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.
2	9/15/14	JD	ISSUED FOR MEPA		RE
1	7/17/14	JD	REVISED PER AECOM COMMENTS		RE

REVISIONS

Division: Op. Area.:

State: MA Co./Par.: BERKSHIRE

Section: Township: Range:

Dft: AP Date: 7/2/14

Chk: JD Date: 7/3/14

Appr: RE Date: 7/7/14

Scale: AS SHOWN

Filename: SK14C4781MA04_WetlandSS.dwg

CONNECTICUT EXPANSION
MASSACHUSETTS LOOP 200-3
PROPOSED 36" NATURAL GAS PIPELINE
WETLAND CROSSING WMA 6 @ M.P. 0.46
TOWN OF SANDISFIELD
BERKSHIRE COUNTY, MASSACHUSETTS

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

Sheet: 3 of 19

Type:

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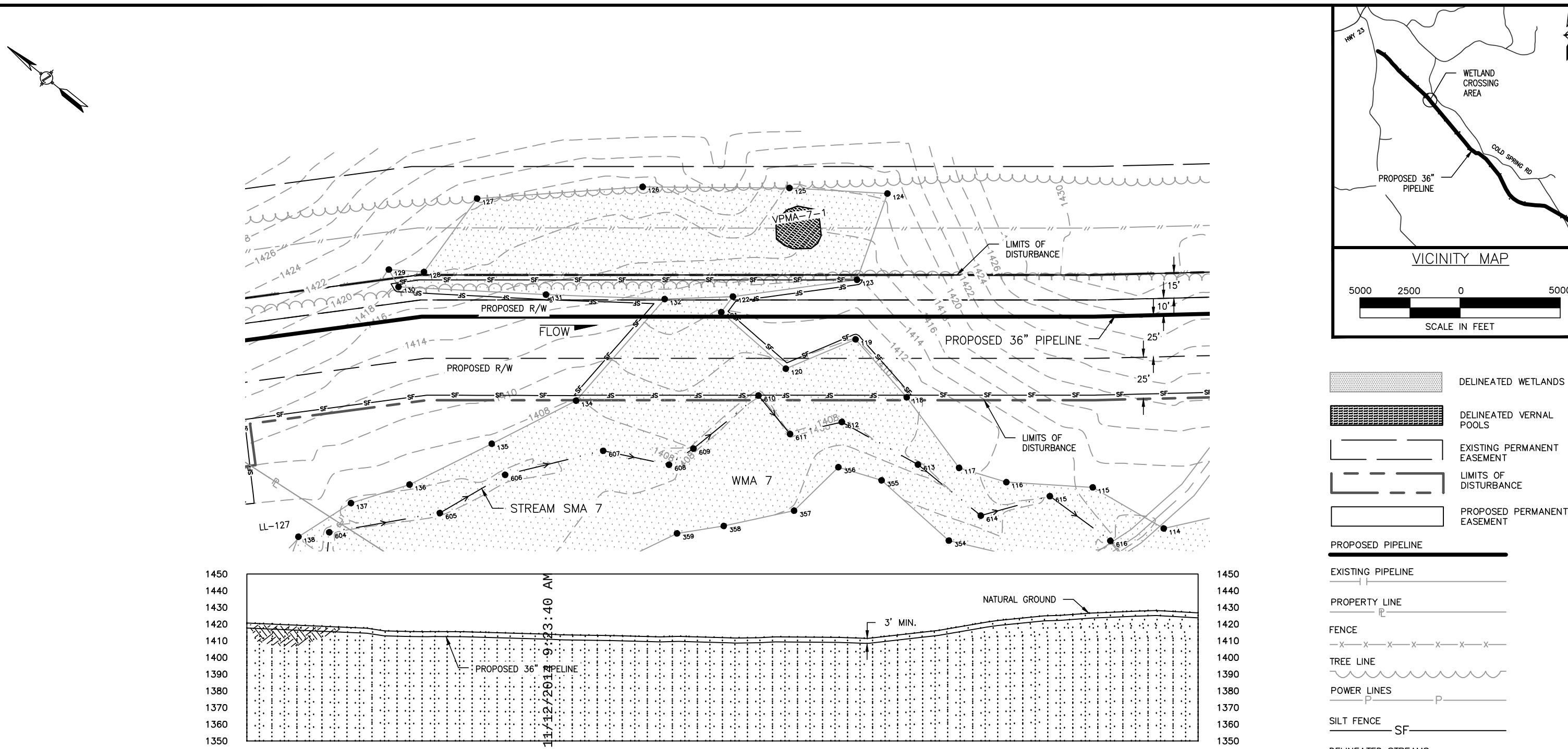

VICINITY MAP

5000 2500 0 5000

SCALE IN FEET

- DELINEATED WETLANDS
- DELINEATED VERNAL POOLS
- EXISTING PERMANENT EASEMENT
- LIMITS OF DISTURBANCE
- PROPOSED PERMANENT EASEMENT
- PROPOSED PIPELINE
- EXISTING PIPELINE
- PROPERTY LINE
- FENCE
- TREE LINE
- POWER LINES
- SILT FENCE
- DELINEATED STREAMS
- CENTERLINE OF ROAD
- CONTOUR LINE
- DELINEATED WETLAND/WATERBODY FLAGS

60 30 0 60

SCALE IN FEET

Wetland ID	Wetland Class	Crossing Length (feet)	Wetland Impact (acres)					State Wetland Classification	Stream Disturbance (Acres)	Crossing Method
			Construction			Operation				
			PFO	PSS	PEM	PFO	PSS			
WMA 7	N/A	1118.82	1.59	N/A	0.16	0.75	N/A	N/A	0.0005	Conventional

APPLICATION NO.: NAE-2013-02329

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.
2	9/15/14	JD	ISSUED FOR MEPA		RE
1	7/17/14	JD	REVISED PER AECOM COMMENTS		RE

REVISIONS

Division: Op. Area.:
State: MA Co./Par.: BERKSHIRE
Section: Township: Range:
Dft: AP Date: 7/2/14
Chk: JD Date: 7/3/14
Appr: RE Date: 7/7/14
Scale: AS SHOWN
Filename: SK14C4781MA04_WetlandSS.dwg

CONNECTICUT EXPANSION
MASSACHUSETTS LOOP 200-3
PROPOSED 36" NATURAL GAS PIPELINE
WETLAND CROSSING WMA 7 @ M.P. 0.89
TOWN OF SANDISFIELD
BERKSHIRE COUNTY, MASSACHUSETTS

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

Sheet: 4 of 19
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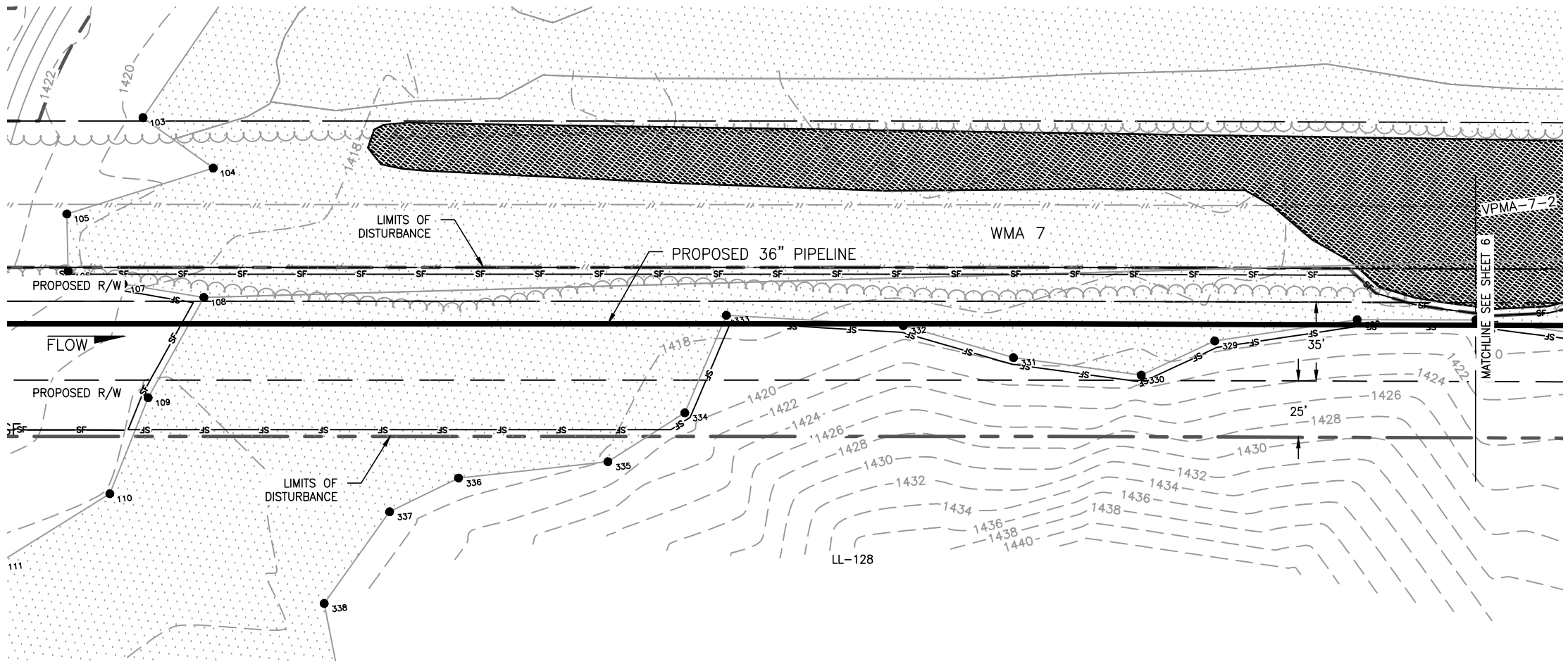

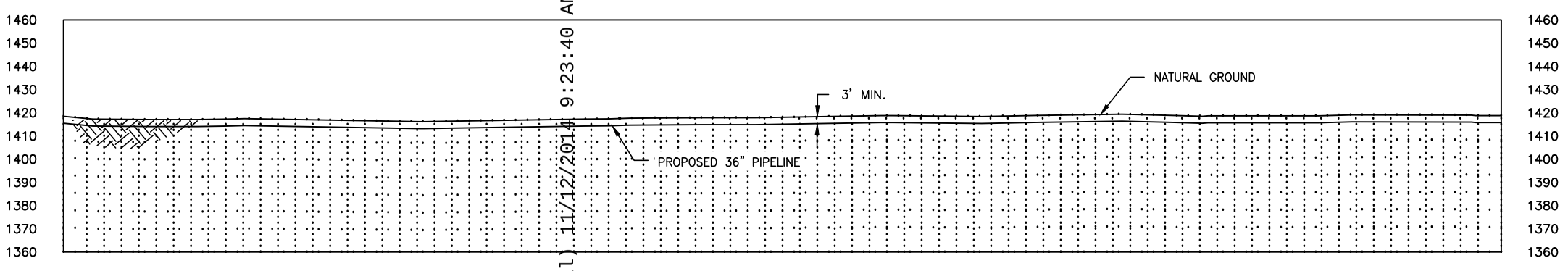

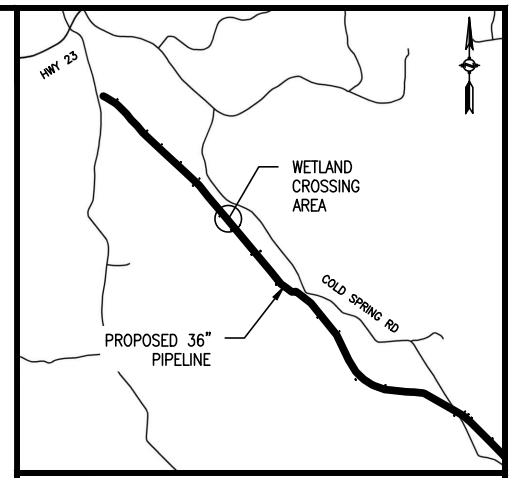

VICINITY MAP

5000 2500 0 5000

SCALE IN FEET

DELINEATED WETLANDS

DELINEATED VERNAL POOLS

EXISTING PERMANENT EASEMENT

LIMITS OF DISTURBANCE

PROPOSED PERMANENT EASEMENT

PROPOSED PIPELINE

EXISTING PIPELINE

PROPERTY LINE

FENCE

TREE LINE

POWER LINES

SILT FENCE

DELINEATED STREAMS

CENTERLINE OF ROAD

CONTOUR LINE

DELINEATED WETLAND/WATERBODY FLAGS

60 30 0 60

SCALE IN FEET

Wetland ID	Wetland Class	Crossing Length (feet)	Wetland Impact (acres)					State Wetland Classification	Stream Disturbance (Acres)	Crossing Method
			Construction			Operation				
			PFO	PSS	PEM	PFO	PSS			
WMA 7	N/A	1118.82	1.59	N/A	0.16	0.75	N/A	N/A	N/A	Conventional

APPLICATION NO.: NAE-2013-02329

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.
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Division: Op. Area.:

State: MA Co./Par.: BERKSHIRE

Section: Township: Range:

Dft: AP Date: 7/2/14

Chk: JD Date: 7/3/14

Appr: RE Date: 7/7/14

Scale: AS SHOWN

Filename: SK14C4781MA04_WetlandSS.dwg

CONNECTICUT EXPANSION
MASSACHUSETTS LOOP 200-3
PROPOSED 36" NATURAL GAS PIPELINE
WETLAND CROSSING WMA 7 @ M.P. 0.89
TOWN OF SANDISFIELD
BERKSHIRE COUNTY, MASSACHUSETTS

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

Sheet: 5 of 19

Type:

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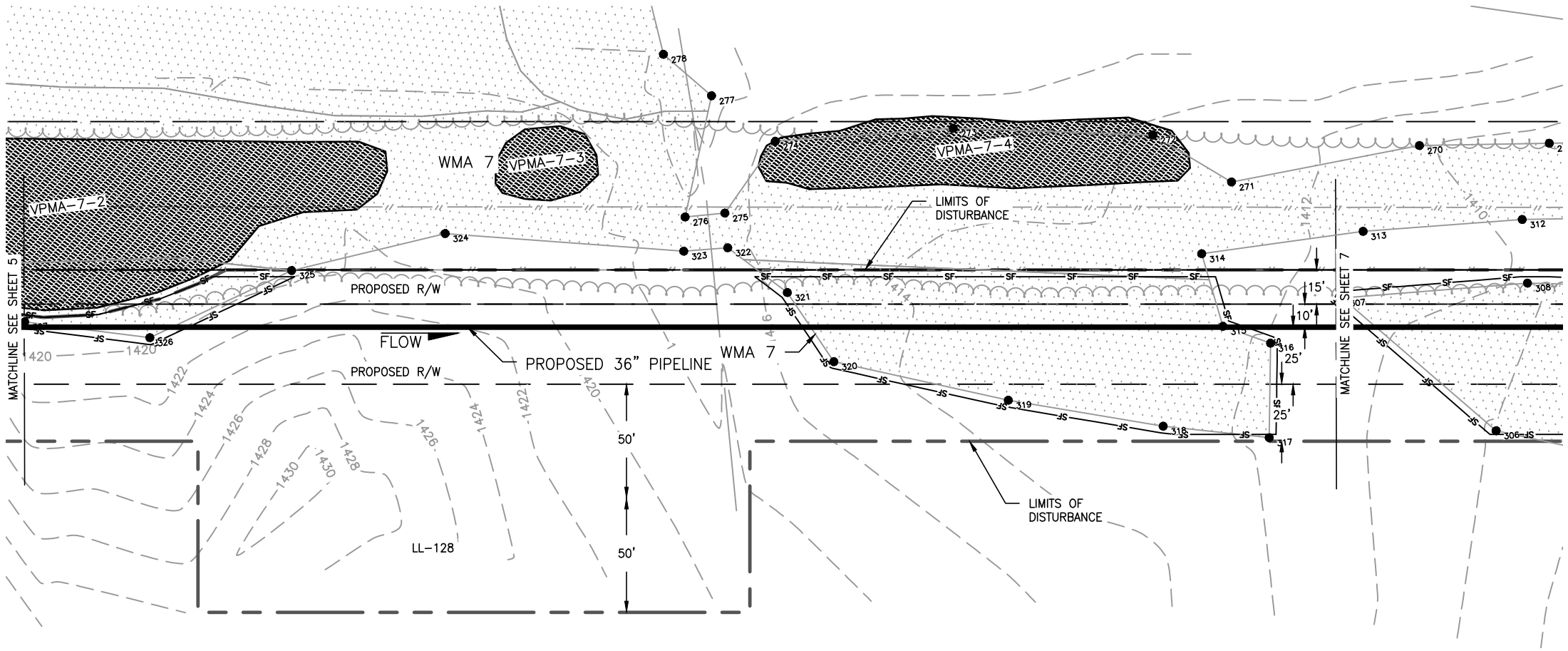

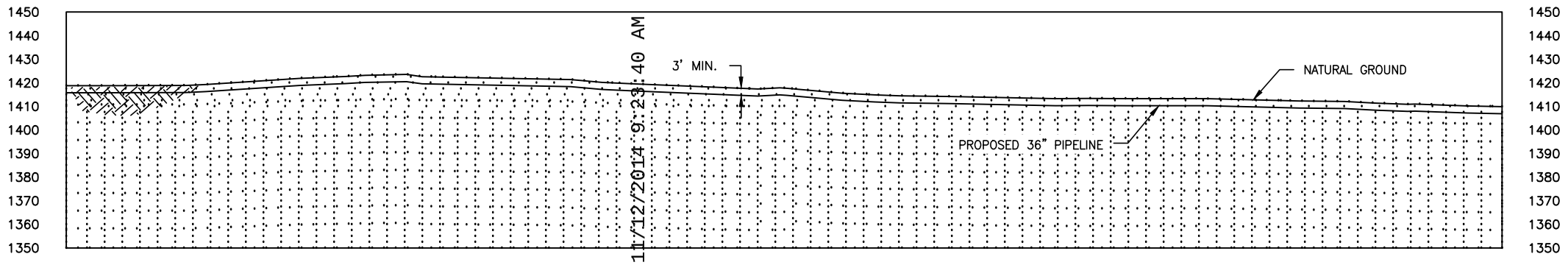

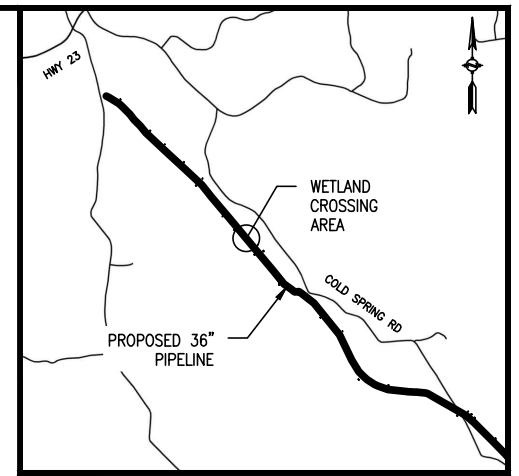

VICINITY MAP

5000 2500 0 5000

SCALE IN FEET

DELINEATED WETLANDS

DELINEATED VERNAL POOLS

EXISTING PERMANENT EASEMENT

LIMITS OF DISTURBANCE

PROPOSED PERMANENT EASEMENT

PROPOSED PIPELINE

EXISTING PIPELINE

PROPERTY LINE

FENCE

TREE LINE

POWER LINES

SILT FENCE

DELINEATED STREAMS

CENTERLINE OF ROAD

CONTOUR LINE

DELINEATED WETLAND/WATERBODY FLAGS

60 30 0 60

SCALE IN FEET

Wetland ID	Wetland Class	Crossing Length (feet)	Wetland Impact (acres)					State Wetland Classification	Stream Disturbance (Acres)	Crossing Method
			Construction			Operation				
			PFO	PSS	PEM	PFO	PSS			
WMA 7	N/A	1118.82	1.59	N/A	0.16	0.75	N/A	N/A	N/A	Conventional

APPLICATION NO.: NAE-2013-02329

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.
2	9/15/14	JD	ISSUED FOR MEPA		RE
1	7/17/14	JD	REVISED PER AECOM COMMENTS		RE

REVISIONS

Division: Op. Area.:

State: MA Co./Par.: BERKSHIRE

Section: Township: Range:

Dft: AP Date: 7/2/14

Chk: JD Date: 7/3/14

Appr: RE Date: 7/7/14

Scale: AS SHOWN

Filename: SK14C4781MA04_WetlandSS.dwg

CONNECTICUT EXPANSION
MASSACHUSETTS LOOP 200-3
PROPOSED 36" NATURAL GAS PIPELINE
WETLAND CROSSING WMA 7 @ M.P. 0.89
TOWN OF SANDISFIELD
BERKSHIRE COUNTY, MASSACHUSETTS

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

Sheet: 6 of 19

Type:

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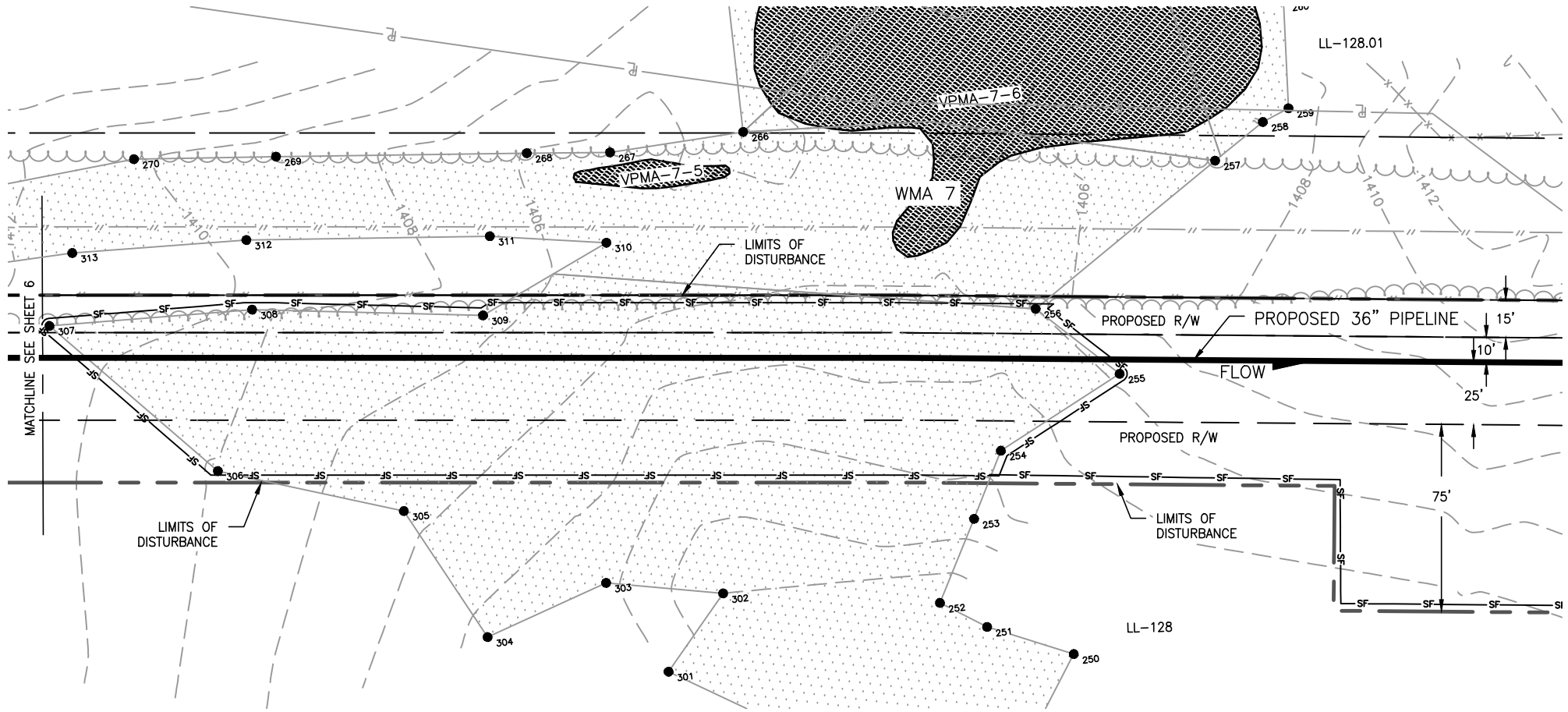

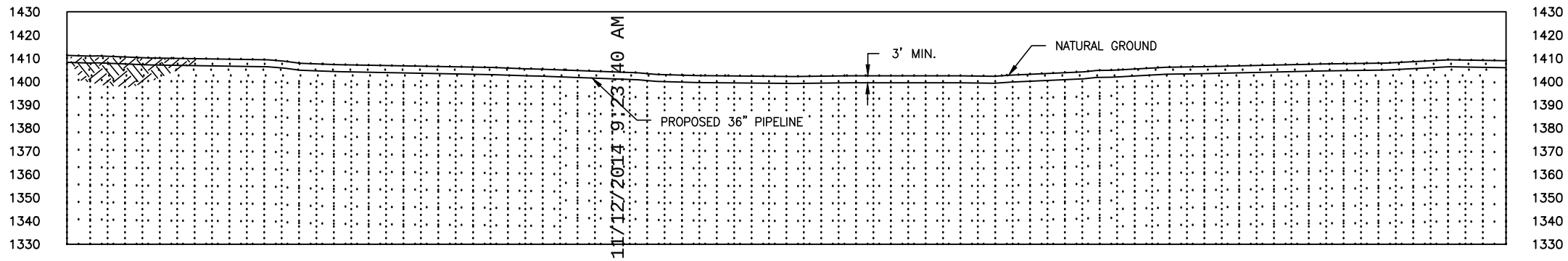

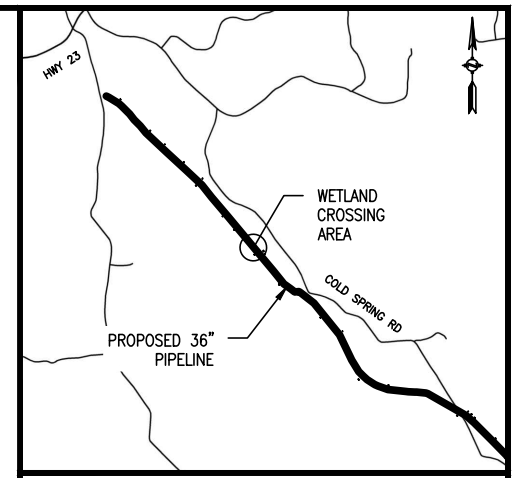

VICINITY MAP

5000 2500 0 5000

SCALE IN FEET

DELINEATED WETLANDS

DELINEATED VERNAL POOLS

EXISTING PERMANENT EASEMENT

LIMITS OF DISTURBANCE

PROPOSED PERMANENT EASEMENT

PROPOSED PIPELINE

EXISTING PIPELINE

PROPERTY LINE

FENCE

TREE LINE

POWER LINES

SILT FENCE

DELINEATED STREAMS

CENTERLINE OF ROAD

CONTOUR LINE

DELINEATED WETLAND/WATERBODY FLAGS

60 30 0 60

SCALE IN FEET

Wetland ID	Wetland Class	Crossing Length (feet)	Wetland Impact (acres)					State Wetland Classification	Stream Disturbance (Acres)	Crossing Method
			Construction			Operation				
			PFO	PSS	PEM	PFO	PSS			
WMA 7	N/A	1118.82	1.59	N/A	0.16	0.75	N/A	N/A	N/A	Conventional

APPLICATION NO.: NAE-2013-02329

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.
2	9/15/14	JD	ISSUED FOR MEPA		RE
1	7/17/14	JD	REVISED PER AECOM COMMENTS		RE

REVISIONS

Division: Op. Area.:

State: MA Co./Par.: BERKSHIRE

Section: Township: Range:

Dft: AP Date: 7/2/14 Scale: AS SHOWN

Chk: JD Date: 7/3/14

Appr: RE Date: 7/7/14 Filename: SK14C4781MA04_WetlandSS.dwg

CONNECTICUT EXPANSION
MASSACHUSETTS LOOP 200-3
PROPOSED 36" NATURAL GAS PIPELINE
WETLAND CROSSING WMA 7 @ M.P. 0.89
TOWN OF SANDISFIELD
BERKSHIRE COUNTY, MASSACHUSETTS

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

Sheet: 7 of 19
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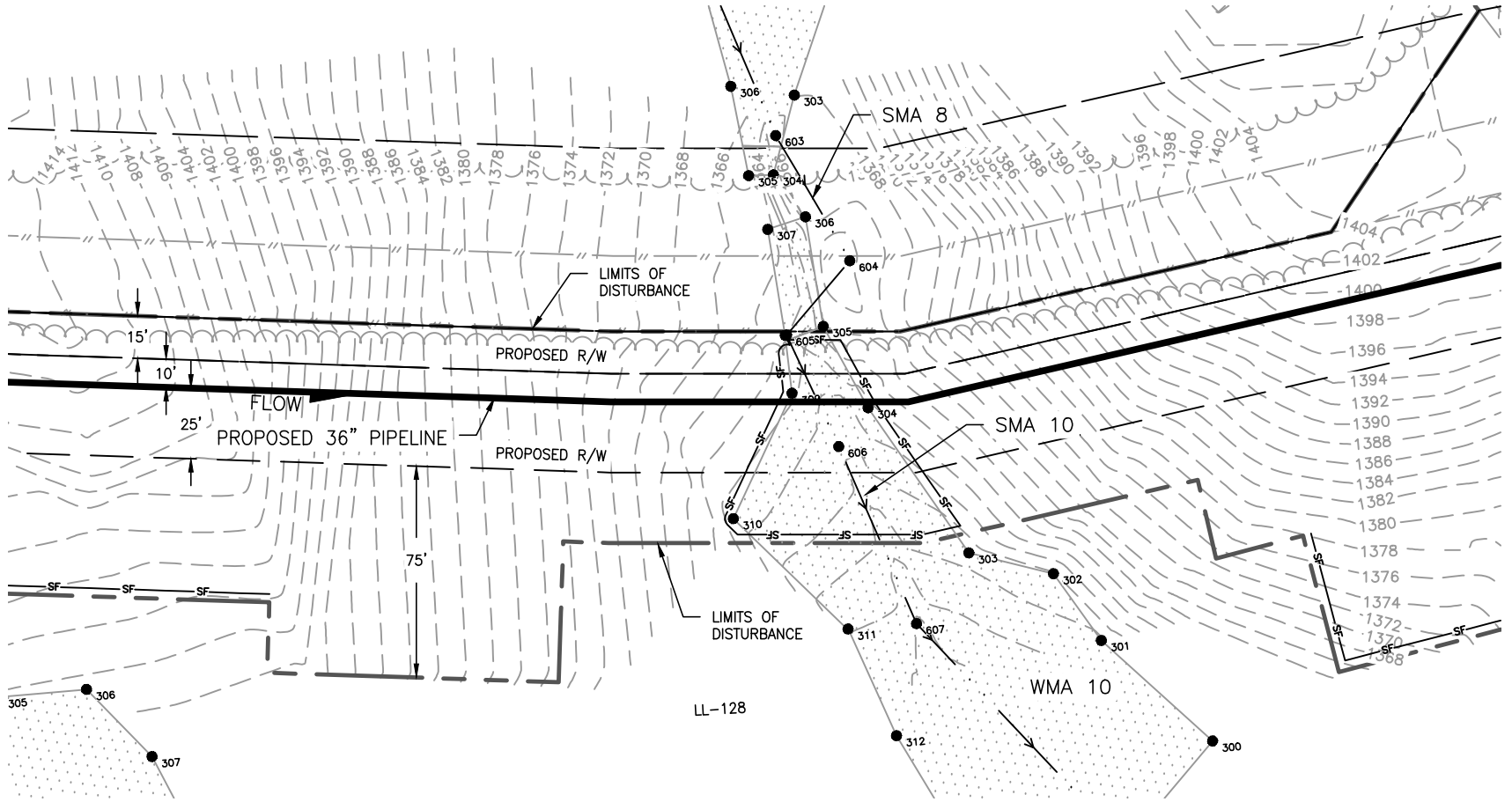

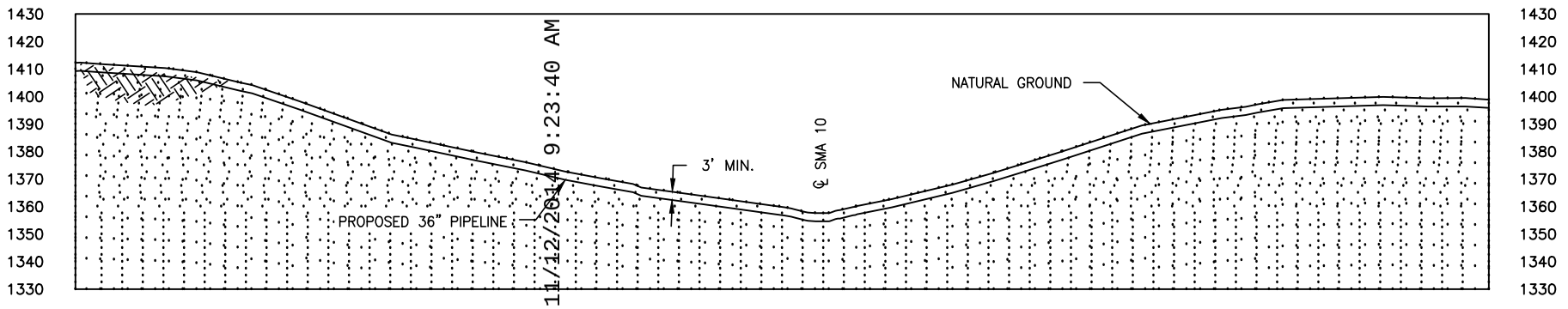

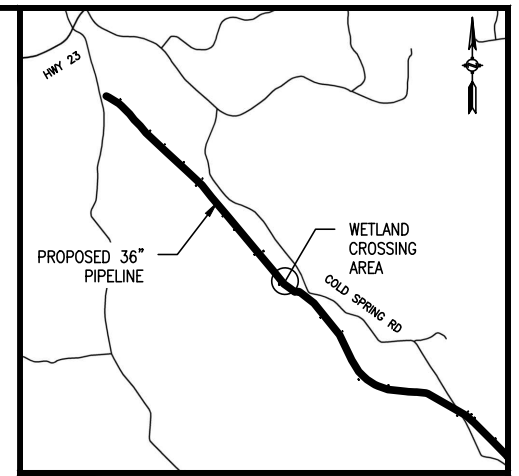

VICINITY MAP

5000 2500 0 5000

SCALE IN FEET

DELINEATED WETLANDS

DELINEATED VERNAL POOLS

EXISTING PERMANENT EASEMENT

LIMITS OF DISTURBANCE

PROPOSED PERMANENT EASEMENT

PROPOSED PIPELINE

EXISTING PIPELINE

PROPERTY LINE

FENCE

TREE LINE

POWER LINES

SILT FENCE

DELINEATED STREAMS

CENTERLINE OF ROAD

CONTOUR LINE

DELINEATED WETLAND/WATERBODY FLAGS

60 30 0 60

SCALE IN FEET

Wetland ID	Wetland Class	Crossing Length (feet)	Wetland Impact (acres)					State Wetland Classification	Stream Disturbance (Acres)	Crossing Method
			Construction			Operation				
			PFO	PSS	PEM	PFO	PSS			
WMA 10	N/A	21.82	0.06	N/A	N/A	0.02	N/A	N/A	0.00004	Conventional

APPLICATION NO.: NAE-2013-02329

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.
2	9/15/14	JD	ISSUED FOR MEPA		RE
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REVISIONS

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Chk: JD	Date: 7/3/14	Filename:	SK14C4781MA04_WetlandSS.dwg
Appr: RE	Date: 7/7/14		

CONNECTICUT EXPANSION
MASSACHUSETTS LOOP 200-3
PROPOSED 36" NATURAL GAS PIPELINE
WETLAND CROSSING WMA 10 @ M.P. 1.27
TOWN OF SANDISFIELD
BERKSHIRE COUNTY, MASSACHUSETTS

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

Sheet: 8 of 19
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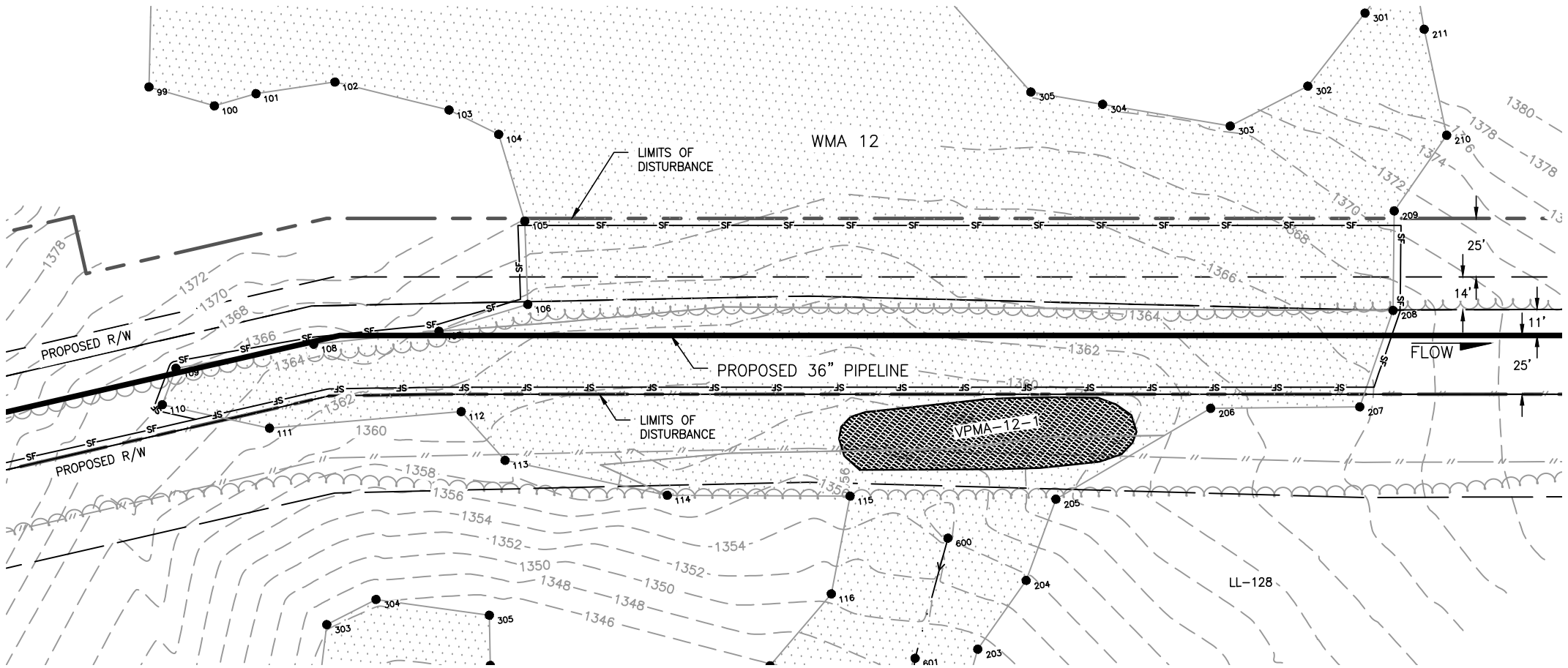

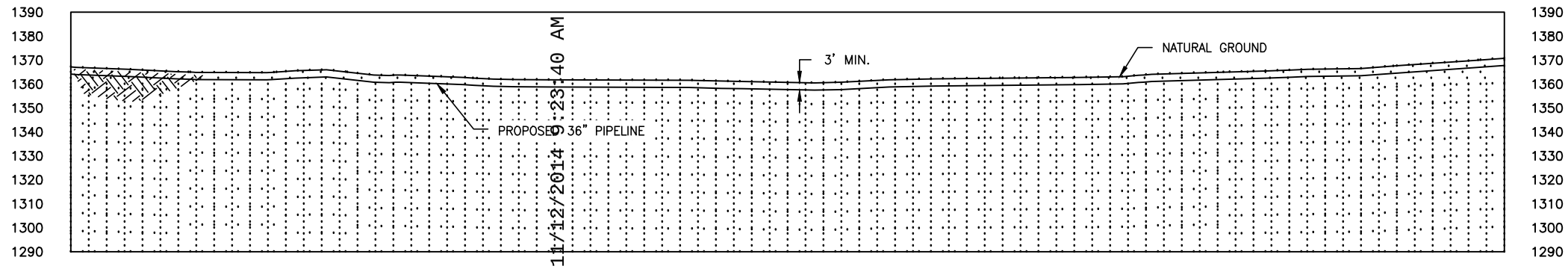

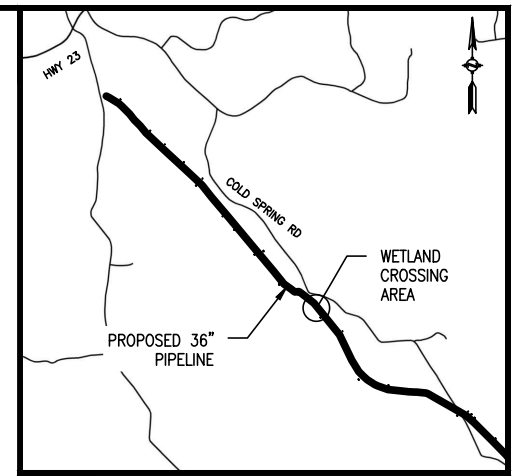

VICINITY MAP

5000 2500 0 5000

SCALE IN FEET

DELINEATED WETLANDS

DELINEATED VERNAL POOLS

EXISTING PERMANENT EASEMENT

LIMITS OF DISTURBANCE

PROPOSED PERMANENT EASEMENT

PROPOSED PIPELINE

EXISTING PIPELINE

PROPERTY LINE

FENCE

TREE LINE

POWER LINES

SILT FENCE

DELINEATED STREAMS

CENTERLINE OF ROAD

CONTOUR LINE

DELINEATED WETLAND/WATERBODY FLAGS

60 30 0 60

SCALE IN FEET

Wetland ID	Wetland Class	Crossing Length (feet)	Wetland Impact (acres)					State Wetland Classification	Stream Disturbance (Acres)	Crossing Method
			Construction			Operation				
			PFO	PSS	PEM	PFO	PSS			
WMA 12	N/A	461.44	0.34	N/A	0.39	0.04	N/A	N/A	N/A	Conventional

APPLICATION NO.: NAE-2013-02329

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.
2	9/15/14	JD	ISSUED FOR MEPA		RE
1	7/17/14	JD	REVISED PER AECOM COMMENTS		RE

REVISIONS

Division: Op. Area.:

State: MA Co./Par.: BERKSHIRE

Section: Township: Range:

Dft: AP Date: 7/2/14

Chk: JD Date: 7/3/14

Appr: RE Date: 7/7/14

Scale: AS SHOWN

Filename: SK14C4781MA04_WetlandSS.dwg

CONNECTICUT EXPANSION
MASSACHUSETTS LOOP 200-3
PROPOSED 36" NATURAL GAS PIPELINE
WETLAND CROSSING WMA 12 @ M.P. 1.51
TOWN OF SANDISFIELD
BERKSHIRE COUNTY, MASSACHUSETTS

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

Sheet: 9 of 19

Type:

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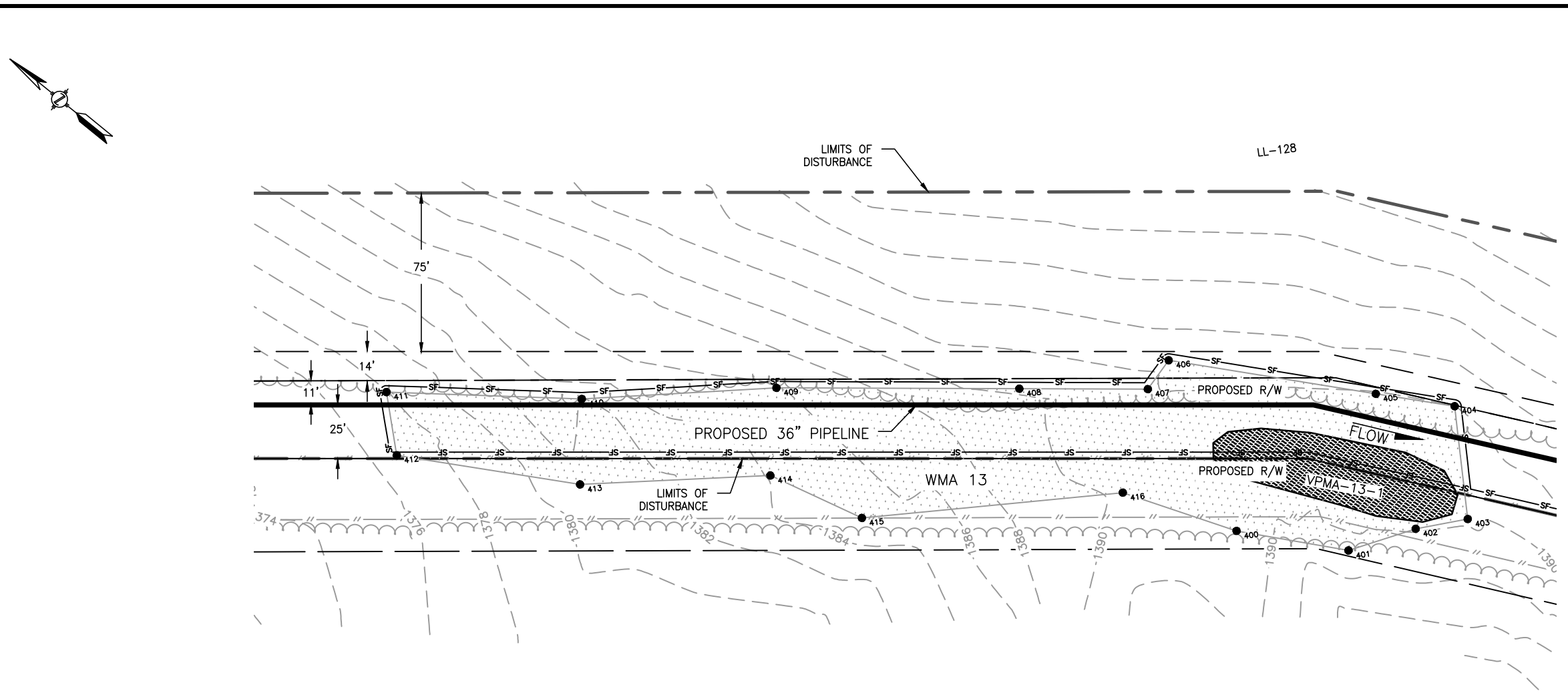

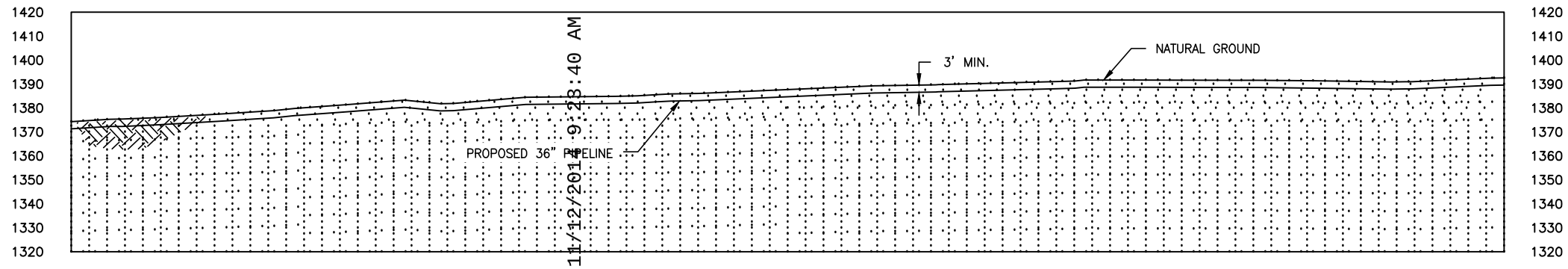

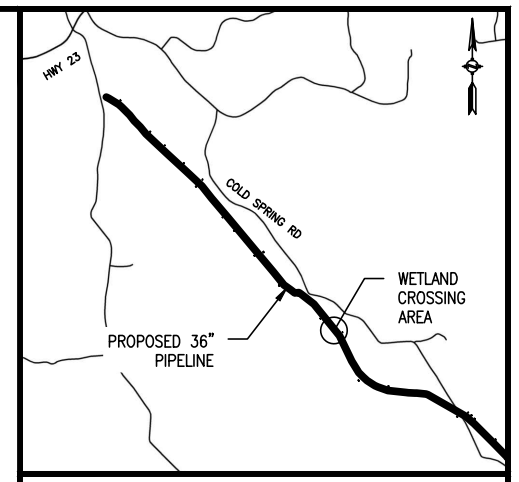

VICINITY MAP

5000 2500 0 5000

SCALE IN FEET

DELINEATED WETLANDS

DELINEATED VERNAL POOLS

EXISTING PERMANENT EASEMENT

LIMITS OF DISTURBANCE

PROPOSED PERMANENT EASEMENT

PROPOSED PIPELINE

EXISTING PIPELINE

PROPERTY LINE

FENCE

TREE LINE

POWER LINES

SILT FENCE

DELINEATED STREAMS

CENTERLINE OF ROAD

CONTOUR LINE

● DELINEATED WETLAND/WATERBODY FLAGS

60 30 0 60

SCALE IN FEET

Wetland ID	Wetland Class	Crossing Length (feet)	Wetland Impact (acres)					State Wetland Classification	Stream Disturbance (Acres)	Crossing Method
			Construction			Operation				
			PFO	PSS	PEM	PFO	PSS			
WMA 13	N/A	502.31	N/A	N/A	0.39	N/A	N/A	N/A	N/A	Conventional

APPLICATION NO.: NAE-2013-02329

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.
2	9/15/14	JD	ISSUED FOR MEPA		RE
1	7/17/14	JD	REVISED PER AECOM COMMENTS		RE

REVISIONS

Division: Op. Area.:
State: MA Co./Par.: BERKSHIRE
Section: Township: Range:
Dft: AP Date: 7/2/14
Chk: JD Date: 7/3/14
Appr: RE Date: 7/7/14
Scale: AS SHOWN
Filename: SK14C4781MA04_WetlandSS.dwg

CONNECTICUT EXPANSION
MASSACHUSETTS LOOP 200-3
PROPOSED 36" NATURAL GAS PIPELINE
WETLAND CROSSING WMA 13 @ M.P. 1.63
TOWN OF SANDISFIELD
BERKSHIRE COUNTY, MASSACHUSETTS

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

Sheet: 10 of 19
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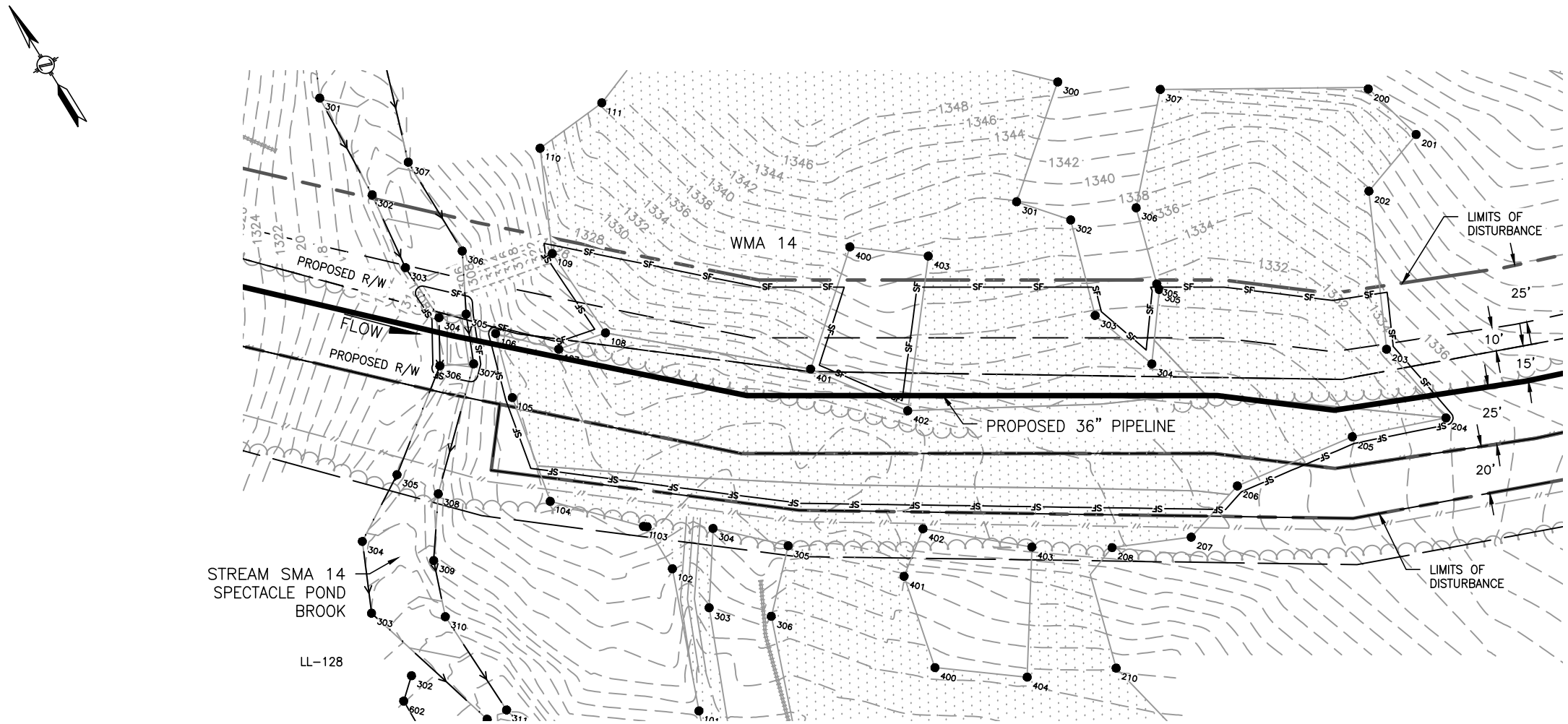

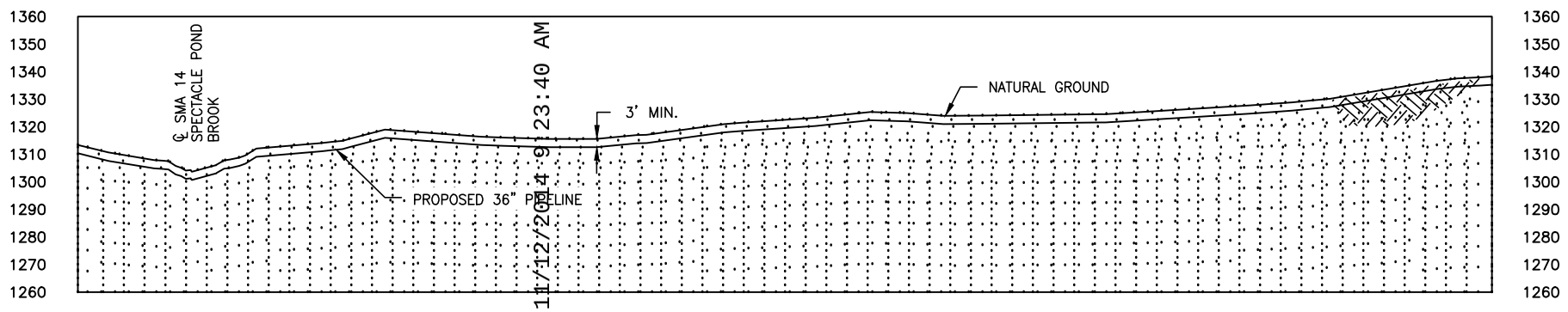

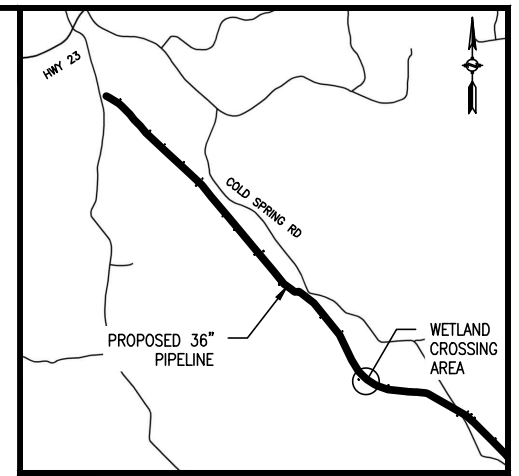

VICINITY MAP

5000 2500 0 5000

SCALE IN FEET

DELINEATED WETLANDS

DELINEATED VERNAL POOLS

EXISTING PERMANENT EASEMENT

LIMITS OF DISTURBANCE

PROPOSED PERMANENT EASEMENT

PROPOSED PIPELINE

EXISTING PIPELINE

PROPERTY LINE

FENCE

TREE LINE

POWER LINES

SILT FENCE

DELINEATED STREAMS

CENTERLINE OF ROAD

CONTOUR LINE

DELINEATED WETLAND/WATERBODY FLAGS

60 30 0 60

SCALE IN FEET

Wetland ID	Wetland Class	Crossing Length (feet)	Wetland Impact (acres)					State Wetland Classification	Stream Disturbance (Acres)	Crossing Method
			Construction			Operation				
			PFO	PSS	PEM	PFO	PSS			
WMA 14	N/A	388.57	0.39	N/A	0.36	0.09	N/A	N/A	0.04	Conventional

APPLICATION NO.: NAE-2013-02329

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.
2	9/15/14	JD	ISSUED FOR MEPA		RE
1	7/17/14	JD	REVISED PER AECOM COMMENTS		RE

REVISIONS

Division: Op. Area.:

State: MA Co./Par.: BERKSHIRE

Section: Township: Range:

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Chk: JD Date: 7/3/14

Appr: RE Date: 7/7/14

Scale: AS SHOWN

Filename: SK14C4781MA04_WetlandSS.dwg

CONNECTICUT EXPANSION
MASSACHUSETTS LOOP 200-3
PROPOSED 36" NATURAL GAS PIPELINE
WETLAND CROSSING WMA 14 @ M.P. 1.94
TOWN OF SANDISFIELD
BERKSHIRE COUNTY, MASSACHUSETTS

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

Sheet: 11 of 19

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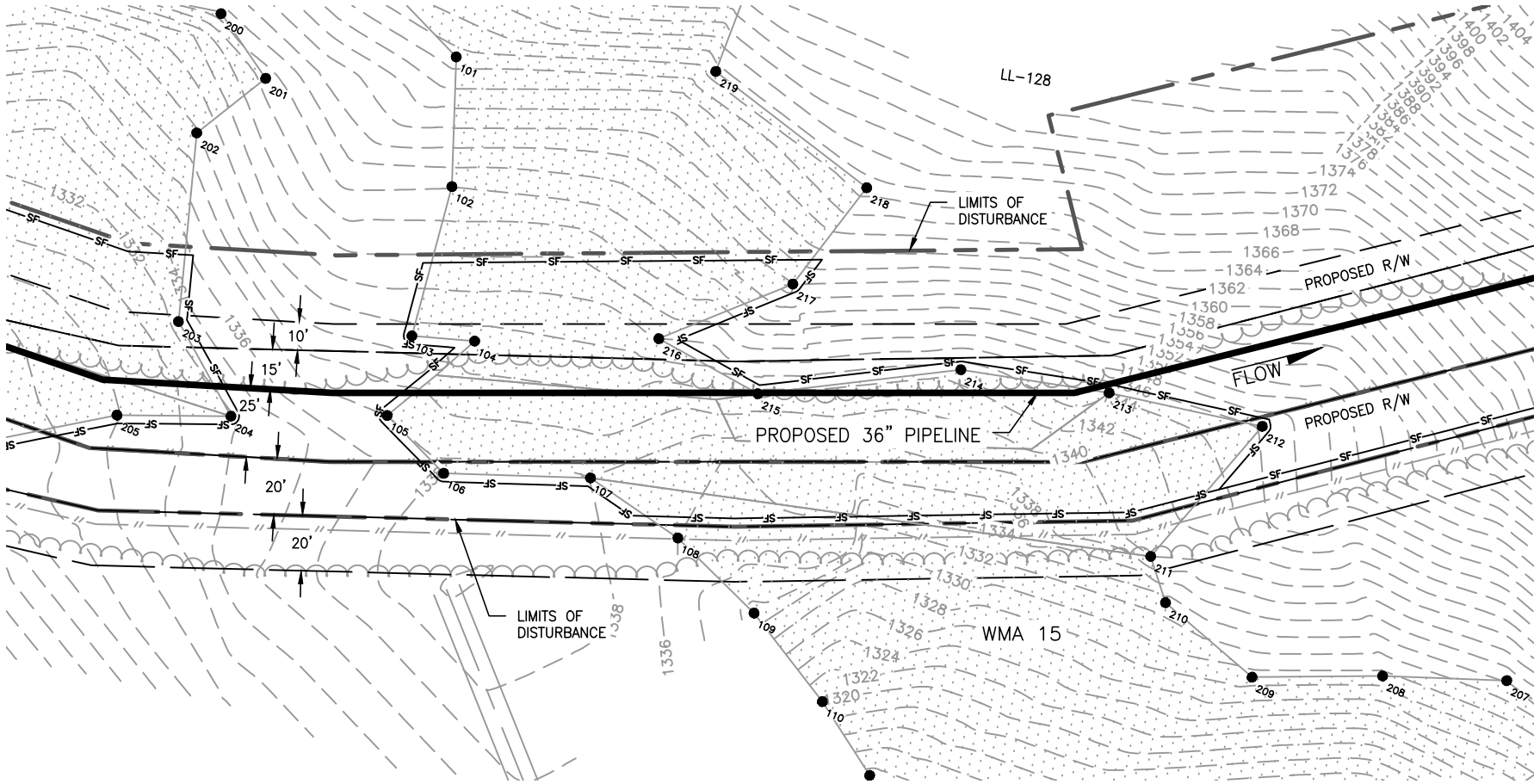

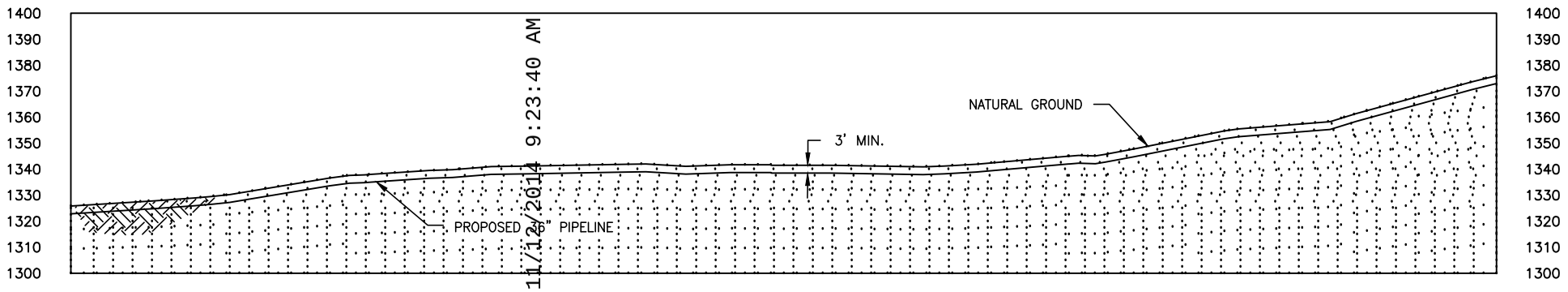

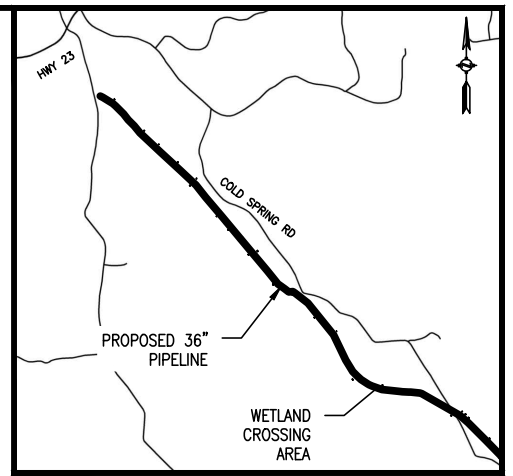

VICINITY MAP

5000 2500 0 5000

SCALE IN FEET

DELINEATED WETLANDS

DELINEATED VERNAL POOLS

EXISTING PERMANENT EASEMENT

LIMITS OF DISTURBANCE

PROPOSED PERMANENT EASEMENT

PROPOSED PIPELINE

EXISTING PIPELINE

PROPERTY LINE

FENCE

TREE LINE

POWER LINES

SILT FENCE

DELINEATED STREAMS

CENTERLINE OF ROAD

CONTOUR LINE

DELINEATED WETLAND/WATERBODY FLAGS

60 30 0 60

SCALE IN FEET

Wetland ID	Wetland Class	Crossing Length (feet)	Wetland Impact (acres)					State Wetland Classification	Stream Disturbance (Acres)	Crossing Method
			Construction			Operation				
			PFO	PSS	PEM	PFO	PSS			
WMA 15	N/A	241.83	0.21	N/A	0.22	0.09	N/A	N/A	N/A	Conventional

APPLICATION NO.: NAE-2013-02329

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.
2	9/15/14	JD	ISSUED FOR MEPA		RE
1	7/17/14	JD	REVISED PER AECOM COMMENTS		RE

REVISIONS

Division: Op. Area.:

State: MA Co./Par.: BERKSHIRE

Section: Township: Range:

Dft: AP Date: 7/2/14

Chk: JD Date: 7/3/14

Appr: RE Date: 7/7/14

Scale: AS SHOWN

Filename: SK14C4781MA04_WetlandSS.dwg

CONNECTICUT EXPANSION
MASSACHUSETTS LOOP 200-3
PROPOSED 36" NATURAL GAS PIPELINE
WETLAND CROSSING WMA 15 @ M.P. 2.01
TOWN OF SANDISFIELD
BERKSHIRE COUNTY, MASSACHUSETTS

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

Sheet: 12 of 19

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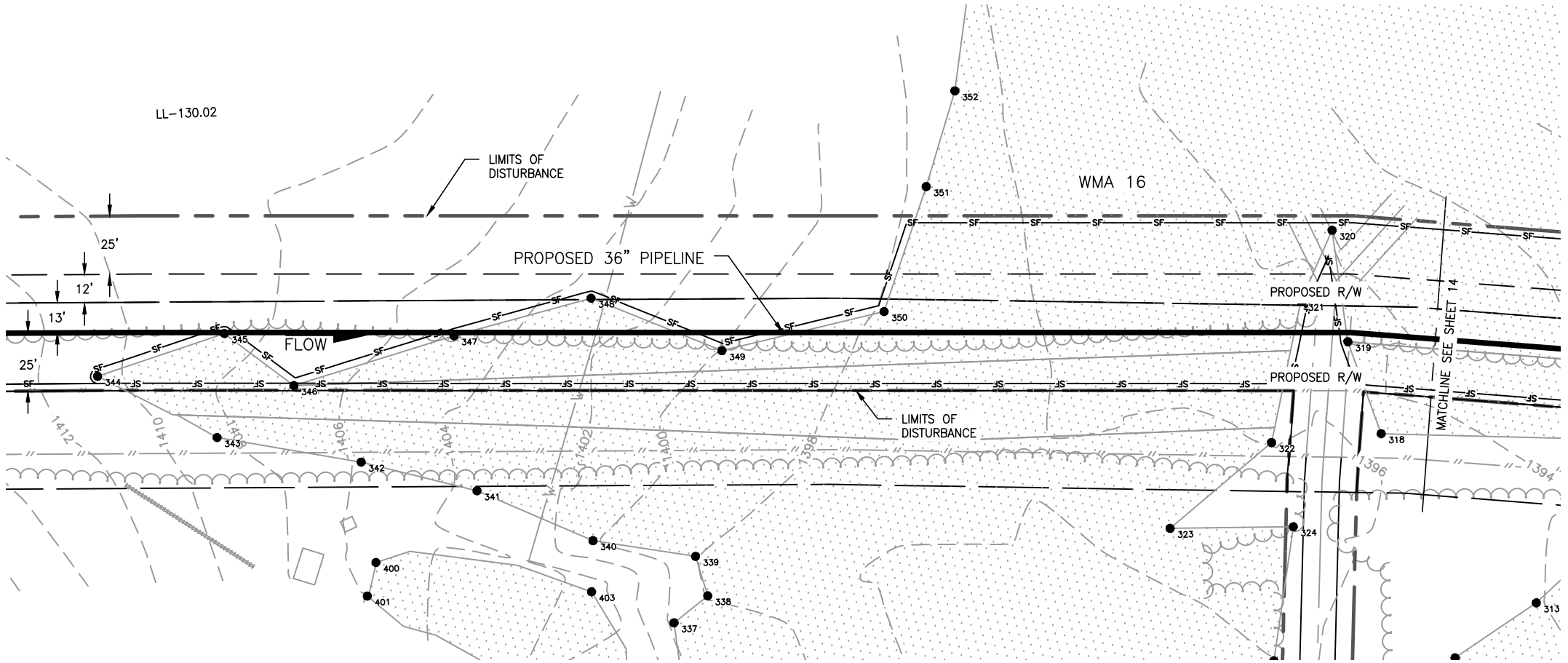

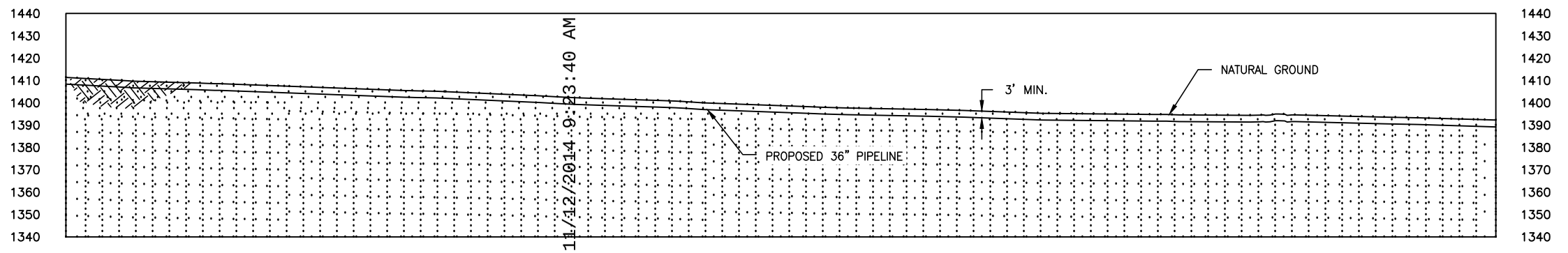

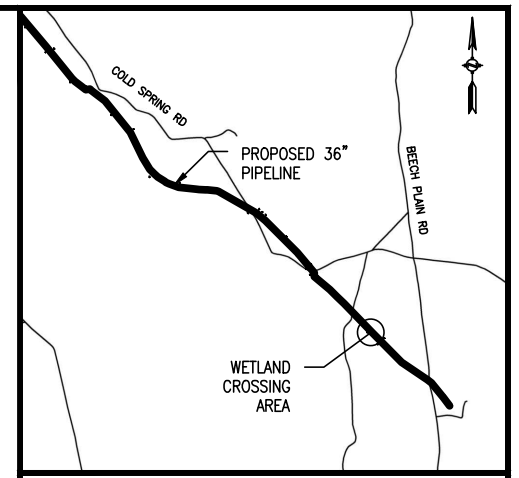

VICINITY MAP

5000 2500 0 5000

SCALE IN FEET

DELINEATED WETLANDS

DELINEATED VERNAL POOLS

EXISTING PERMANENT EASEMENT

LIMITS OF DISTURBANCE

PROPOSED PERMANENT EASEMENT

PROPOSED PIPELINE

EXISTING PIPELINE

PROPERTY LINE

FENCE

TREE LINE

POWER LINES

SILT FENCE

DELINEATED STREAMS

CENTERLINE OF ROAD

CONTOUR LINE

● DELINEATED WETLAND/WATERBODY FLAGS

60 30 0 60

SCALE IN FEET

Wetland ID	Wetland Class	Crossing Length (feet)	Wetland Impact (acres)					State Wetland Classification	Stream Disturbance (Acres)	Crossing Method
			Construction			Operation				
			PFO	PSS	PEM	PFO	PSS			
WMA 16	N/A	888.50	0.97	0.15	0.47	0.40	0.07	N/A	N/A	Conventional

APPLICATION NO.: NAE–2013–02329

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.
2	9/15/14	JD	ISSUED FOR MEPA		RE
1	7/17/14	JD	REVISED PER AECOM COMMENTS		RE

REVISIONS

Division: Op. Area.:

State: MA Co./Par.: BERKSHIRE

Section: Township: Range:

Dft: AP	Date: 7/2/14	Scale:	AS SHOWN
Chk: JD	Date: 7/3/14	Filename:	SK14C4781MA04_WetlandSS.dwg
Appr: RE	Date: 7/7/14		

CONNECTICUT EXPANSION
MASSACHUSETTS LOOP 200–3
PROPOSED 36" NATURAL GAS PIPELINE
WETLAND CROSSING WMA 16 @ M.P. 2.76
TOWN OF SANDISFIELD
BERKSHIRE COUNTY, MASSACHUSETTS

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

Sheet: 13 of 19
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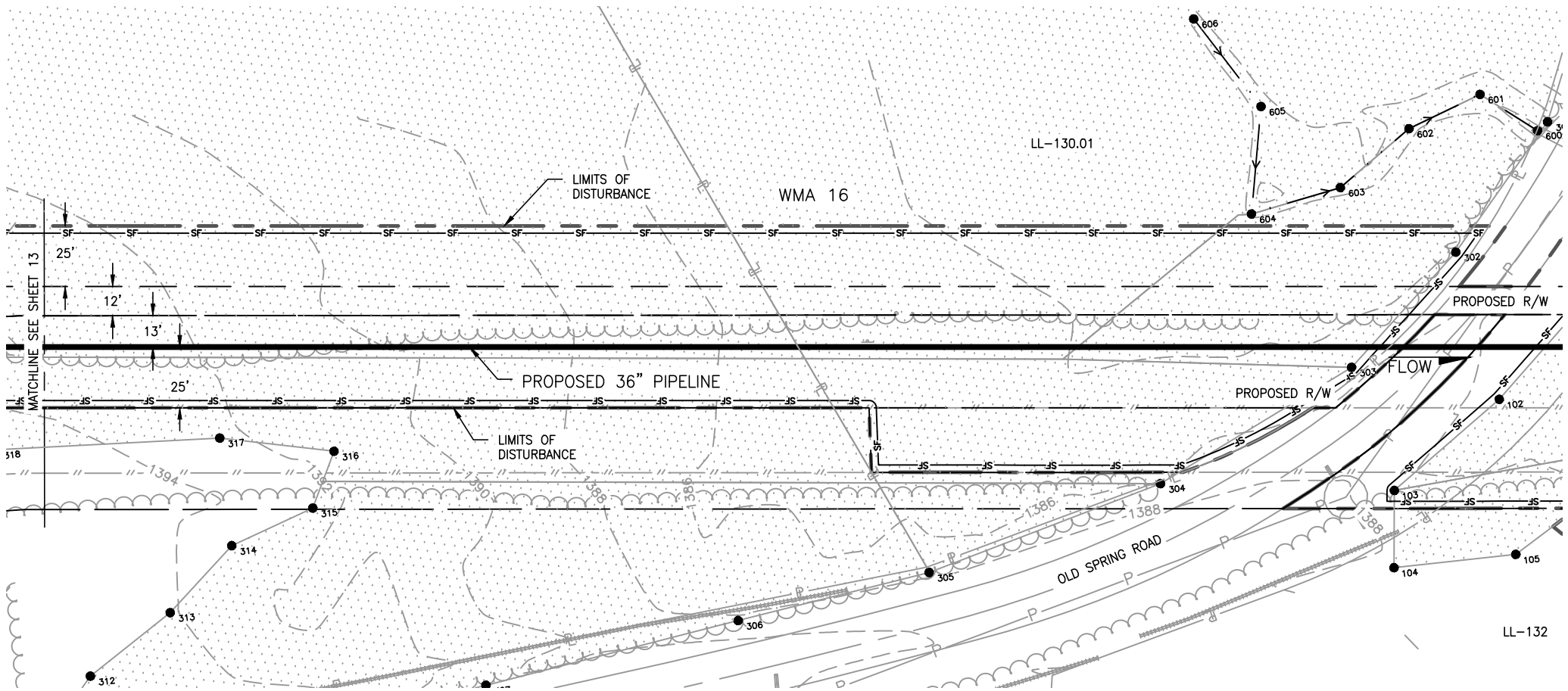

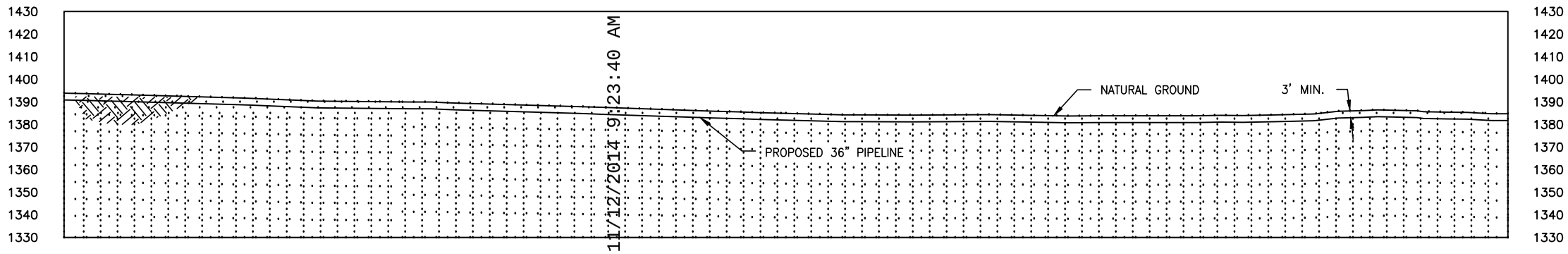

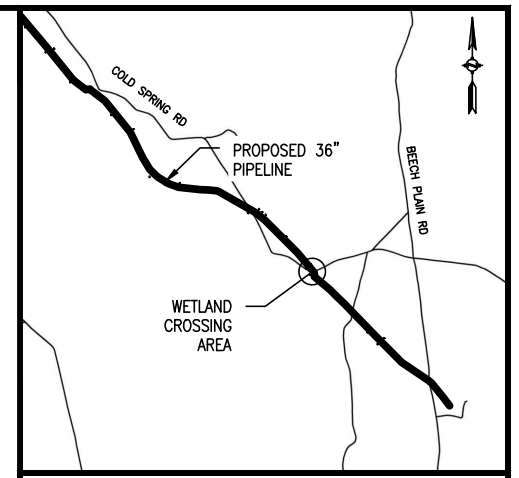

VICINITY MAP

5000 2500 0 5000

SCALE IN FEET

DELINEATED WETLANDS

DELINEATED VERNAL POOLS

EXISTING PERMANENT EASEMENT

LIMITS OF DISTURBANCE

PROPOSED PERMANENT EASEMENT

PROPOSED PIPELINE

EXISTING PIPELINE

PROPERTY LINE

FENCE

TREE LINE

POWER LINES

SILT FENCE

DELINEATED STREAMS

CENTERLINE OF ROAD

CONTOUR LINE

DELINEATED WETLAND/WATERBODY FLAGS

60 30 0 60

SCALE IN FEET

Wetland ID	Wetland Class	Crossing Length (feet)	Wetland Impact (acres)					State Wetland Classification	Stream Disturbance (Acres)	Crossing Method
			Construction			Operation				
			PFO	PSS	PEM	PFO	PSS			
WMA 16	N/A	888.50	0.97	0.15	0.47	0.40	0.12	N/A	N/A	Conventional

APPLICATION NO.: NAE-2013-02329

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.
2	9/15/14	JD	ISSUED FOR MEPA		RE
1	7/17/14	JD	REVISED PER AECOM COMMENTS		RE

REVISIONS

Division: Op. Area.:

State: MA Co./Par.: BERKSHIRE

Section: Township: Range:

Dft: AP Date: 7/2/14

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Appr: RE Date: 7/7/14

Scale: AS SHOWN

Filename: SK14C4781MA04_WetlandSS.dwg

CONNECTICUT EXPANSION
MASSACHUSETTS LOOP 200-3
PROPOSED 36" NATURAL GAS PIPELINE
WETLAND CROSSING WMA 16 @ M.P. 2.76
TOWN OF SANDISFIELD
BERKSHIRE COUNTY, MASSACHUSETTS

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

Sheet: 14 of 19

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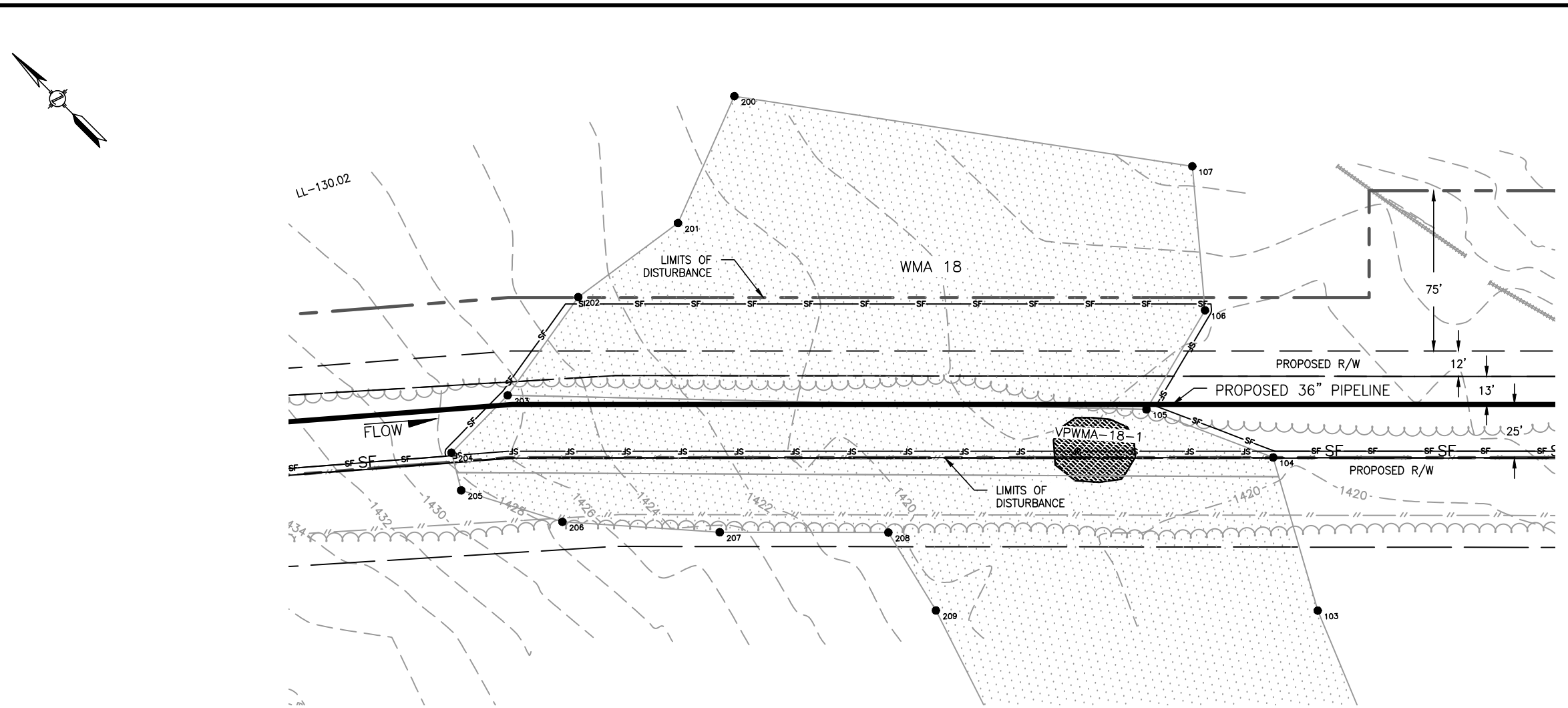

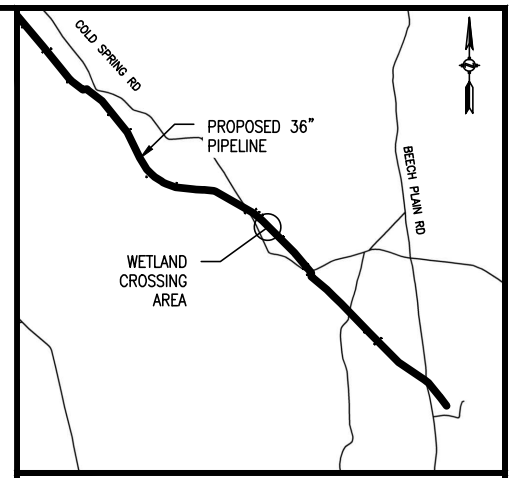

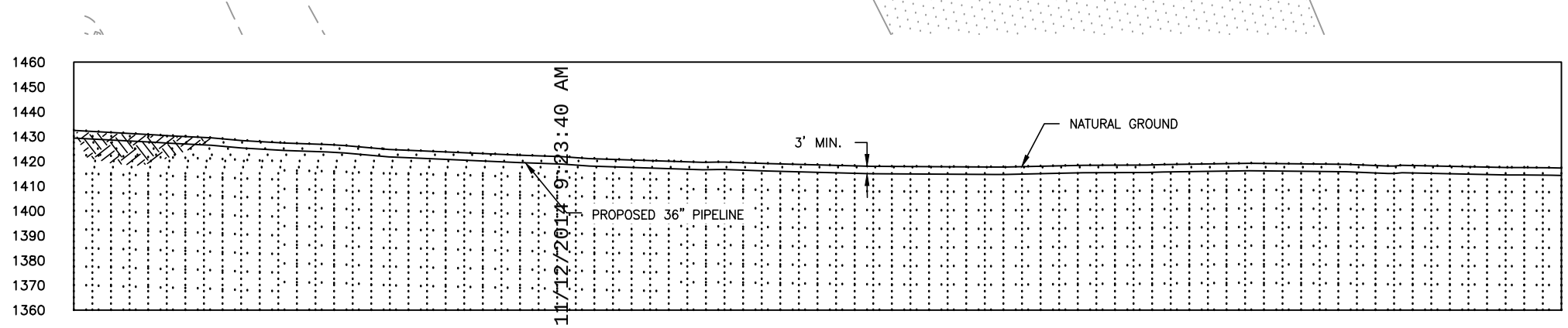

DELINEATED WETLANDS

DELINEATED VERNAL POOLS

EXISTING PERMANENT EASEMENT

LIMITS OF DISTURBANCE

PROPOSED PERMANENT EASEMENT

PROPOSED PIPELINE

EXISTING PIPELINE

PROPERTY LINE

FENCE

TREE LINE

POWER LINES

SILT FENCE

DELINEATED STREAMS

CENTERLINE OF ROAD

CONTOUR LINE

● DELINEATED WETLAND/WATERBODY FLAGS

60 30 0 60
SCALE IN FEET

Wetland ID	Wetland Class	Crossing Length (feet)	Wetland Impact (acres)					State Wetland Classification	Stream Disturbance (Acres)	Crossing Method
			Construction			Operation				
			PFO	PSS	PEM	PFO	PSS			
WMA 18	N/A	305.01	0.34	N/A	0.20	0.10	N/A	N/A	N/A	Conventional

APPLICATION NO.: NAE-2013-02329

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.
2	9/15/14	JD	ISSUED FOR MEPA		RE
1	7/17/14	JD	REVISED PER AECOM COMMENTS		RE

REVISIONS

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Section: Township: Range:
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Chk: JD Date: 7/3/14
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Scale: AS SHOWN
Filename: SK14C4781MA04_WetlandSS.dwg

CONNECTICUT EXPANSION
MASSACHUSETTS LOOP 200-3
PROPOSED 36" NATURAL GAS PIPELINE
WETLAND CROSSING WMA 18 @ M.P. 2.54
TOWN OF SANDISFIELD
BERKSHIRE COUNTY, MASSACHUSETTS

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

Sheet: 15 of 19
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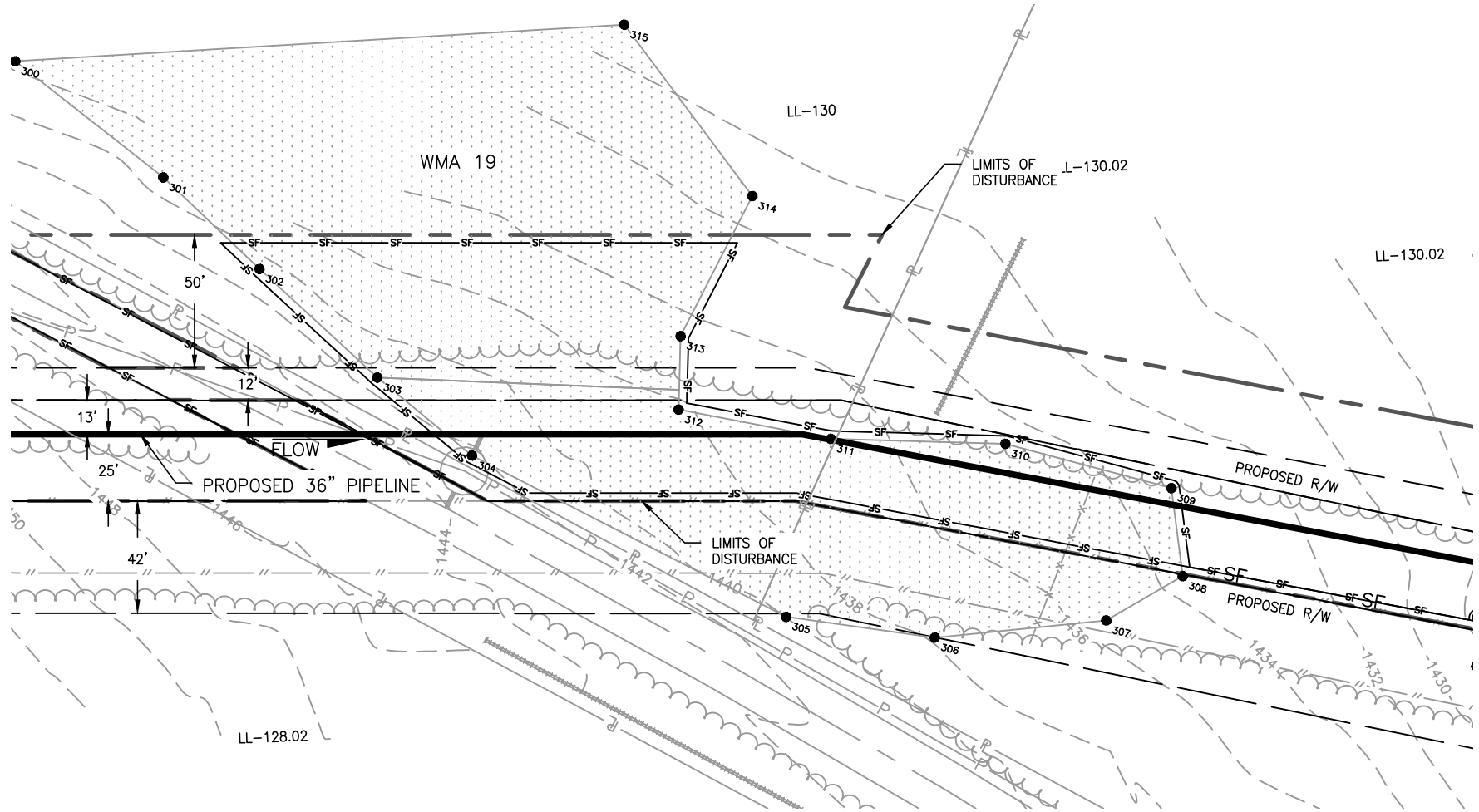

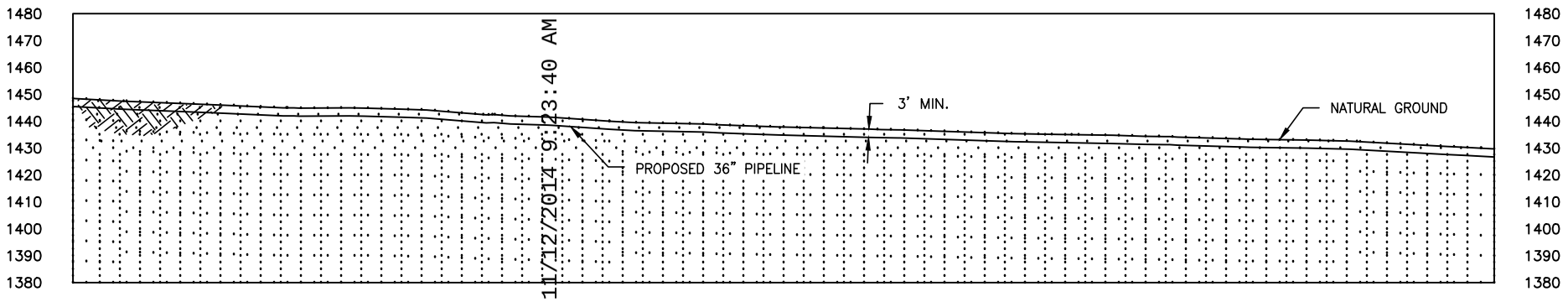

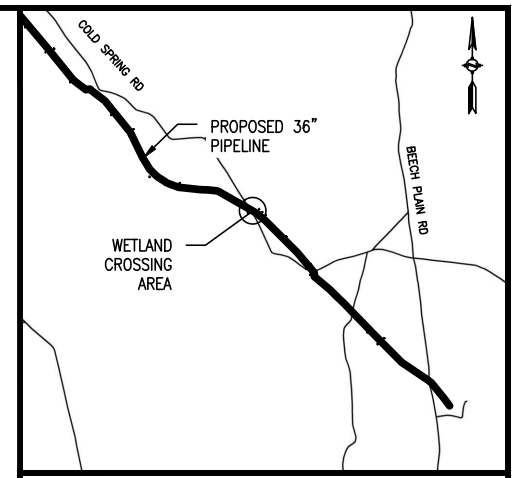

DELINEATED WETLANDS

DELINEATED VERNAL POOLS

EXISTING PERMANENT EASEMENT

LIMITS OF DISTURBANCE

PROPOSED PERMANENT EASEMENT

PROPOSED PIPELINE

EXISTING PIPELINE

PROPERTY LINE

FENCE

TREE LINE

POWER LINES

SILT FENCE

DELINEATED STREAMS

CENTERLINE OF ROAD

CONTOUR LINE

DELINEATED WETLAND/WATERBODY FLAGS

60 30 0 60
SCALE IN FEET

Wetland ID	Wetland Class	Crossing Length (feet)	Wetland Impact (acres) Construction PFO	Construction PSS	Construction PEM	Operation PFO	Operation PSS	State Wetland Classification	Stream Disturbance (Acres)	Crossing Method
WMA 19	N/A	275.80	0.19	N/A	0.22	N/A	N/A	N/A	N/A	Conventional

APPLICATION NO.: NAE-2013-02329

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1	7/17/14	JD	REVISED PER AECOM COMMENTS		RE

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Appr: RE Date: 7/7/14
Scale: AS SHOWN
Filename: SK14C4781MA04_WetlandSS.dwg

CONNECTICUT EXPANSION
MASSACHUSETTS LOOP 200-3
PROPOSED 36" NATURAL GAS PIPELINE
WETLAND CROSSING WMA 19 @ M.P. 2.45
TOWN OF SANDISFIELD
BERKSHIRE COUNTY, MASSACHUSETTS

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

Sheet: 16 of 19
Type:

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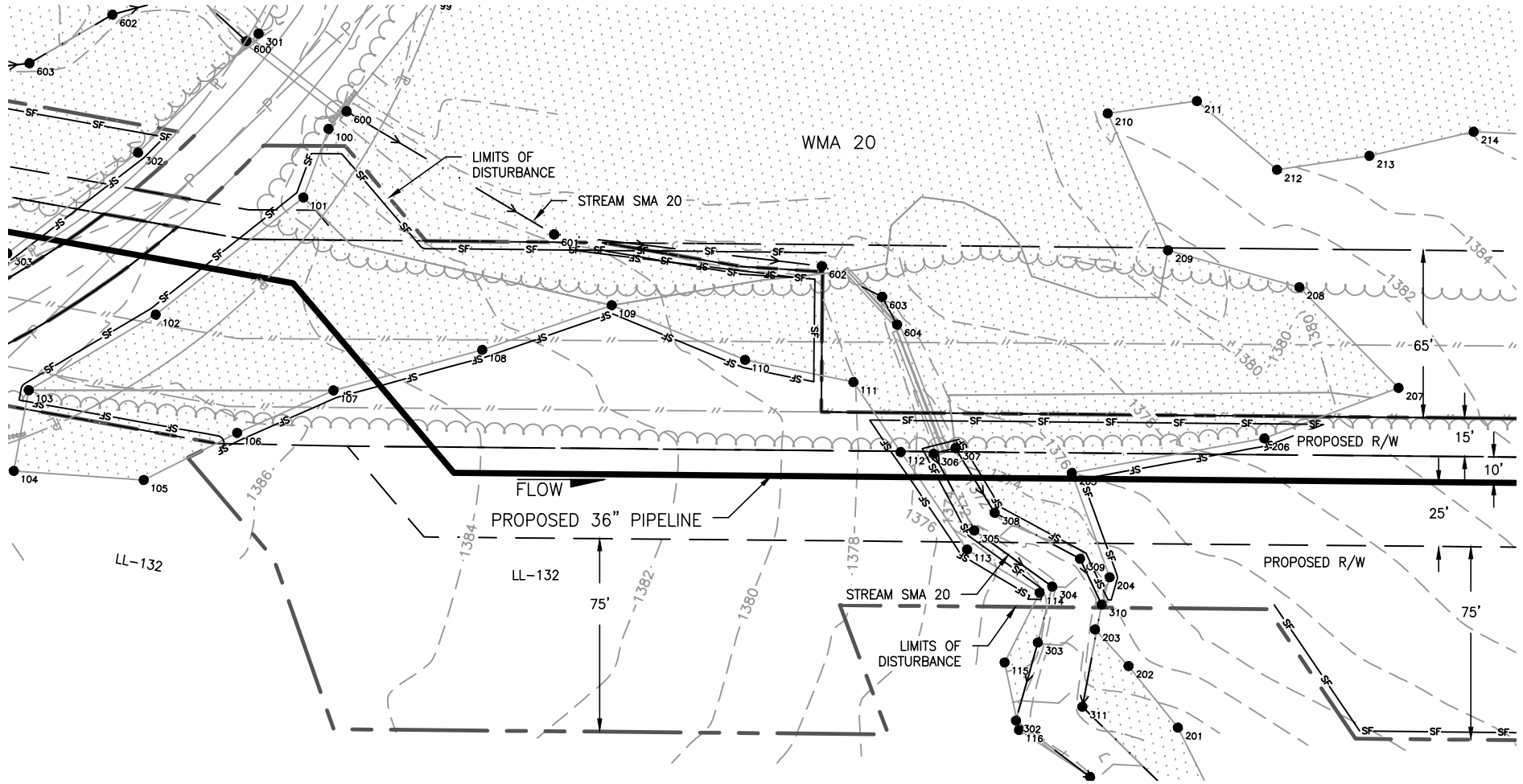

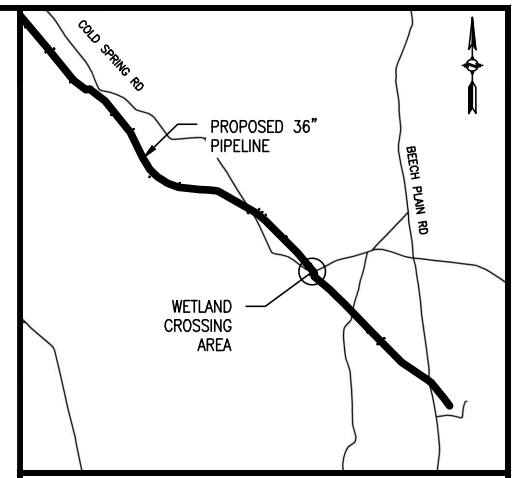

DELINEATED WETLANDS

DELINEATED VERNAL POOLS

EXISTING PERMANENT EASEMENT

LIMITS OF DISTURBANCE

PROPOSED PERMANENT EASEMENT

PROPOSED PIPELINE

EXISTING PIPELINE

PROPERTY LINE

FENCE

TREE LINE

POWER LINES

SILT FENCE

DELINEATED STREAMS

CENTERLINE OF ROAD

CONTOUR LINE

● DELINEATED WETLAND/WATERBODY FLAGS

60 30 0 60
SCALE IN FEET

Wetland ID	Wetland Class	Crossing Length (feet)	Wetland Impact (acres)					State Wetland Classification	Stream Disturbance (Acres)	Crossing Method
			Construction			Operation				
			PFO	PSS	PEM	PFO	PSS			
WMA 20	N/A	130.25	0.19	N/A	0.23	0.04	N/A	N/A	0.03	Conventional

APPLICATION NO.: NAE-2013-02329

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.
2	9/15/14	JD	ISSUED FOR MEPA		RE
1	7/17/14	JD	REVISED PER AECOM COMMENTS		RE

REVISIONS

Division: Op. Area.:
State: MA Co./Par.: BERKSHIRE
Section: Township: Range:
Dft: AP Date: 7/2/14
Chk: JD Date: 7/3/14
Appr: RE Date: 7/7/14
Scale: AS SHOWN
Filename: SK14C4781MA04_WetlandSS.dwg

CONNECTICUT EXPANSION
MASSACHUSETTS LOOP 200-3
PROPOSED 36" NATURAL GAS PIPELINE
WETLAND CROSSING WMA 20 @ M.P. 2.89
TOWN OF SANDISFIELD
BERKSHIRE COUNTY, MASSACHUSETTS

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

Sheet: 17 of 19
Type:

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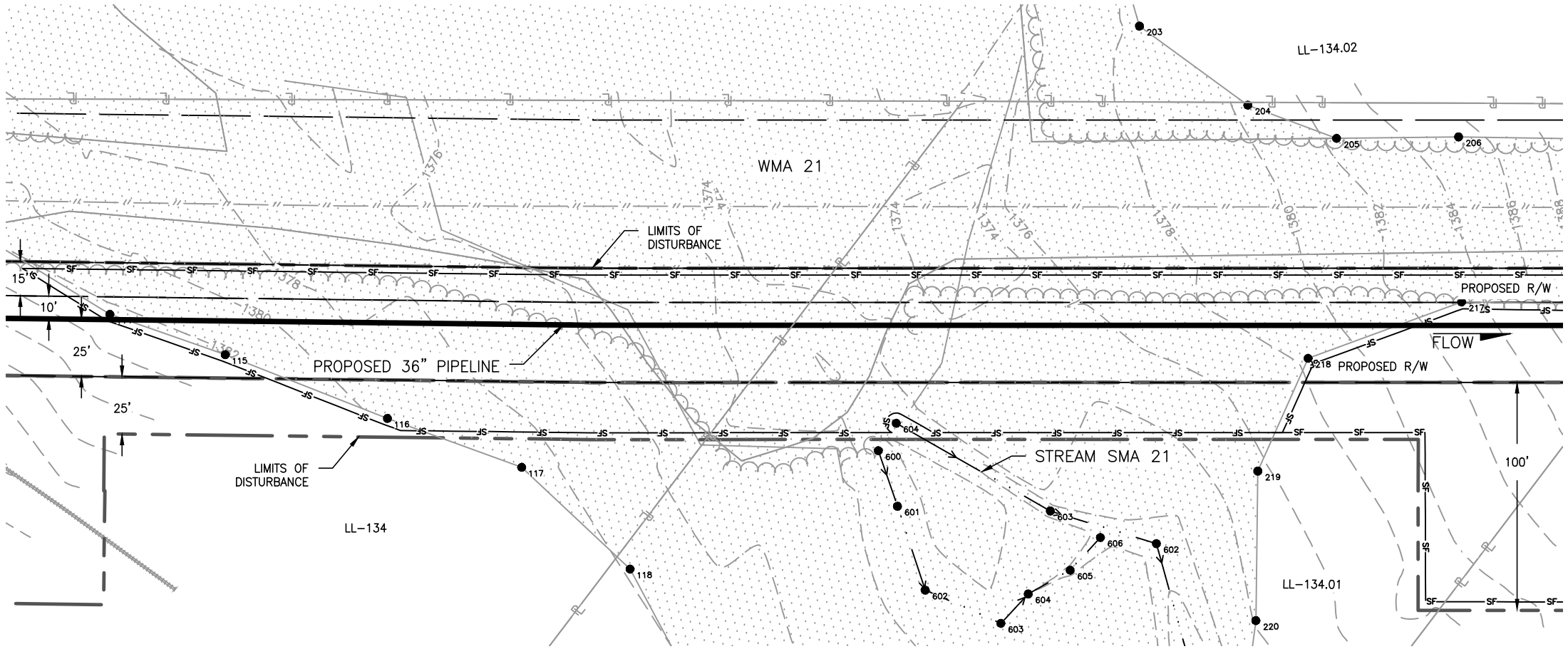

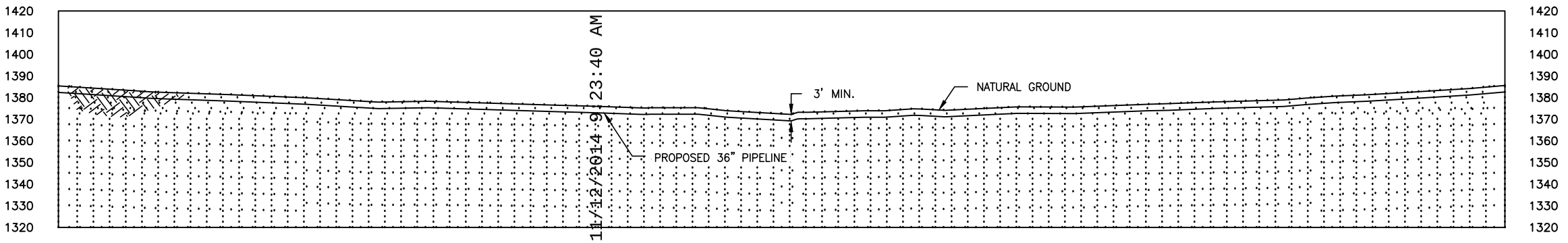

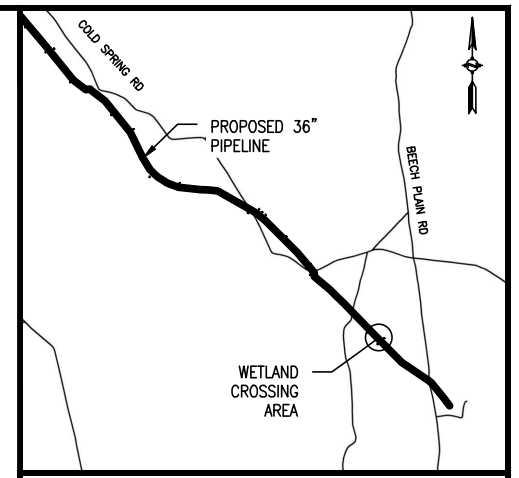

DELINEATED WETLANDS

DELINEATED VERNAL POOLS

EXISTING PERMANENT EASEMENT

LIMITS OF DISTURBANCE

PROPOSED PERMANENT EASEMENT

PROPOSED PIPELINE

EXISTING PIPELINE

PROPERTY LINE

FENCE

TREE LINE

POWER LINES

SILT FENCE

DELINEATED STREAMS

CENTERLINE OF ROAD

CONTOUR LINE

● DELINEATED WETLAND/WATERBODY FLAGS

60 30 0 60
SCALE IN FEET

Wetland ID	Wetland Class	Crossing Length (feet)	Wetland Impact (acres) Construction PFO	Construction PSS	Construction PEM	Operation PFO	Operation PSS	State Wetland Classification	Stream Disturbance (Acres)	Crossing Method
WMA 21	N/A	557.89	0.72	N/A	0.18	0.31	N/A	N/A	0.007	Conventional

APPLICATION NO.: NAE-2013-02329

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.
2	9/15/14	JD	ISSUED FOR MEPA		RE
1	7/17/14	JD	REVISED PER AECOM COMMENTS		RE

REVISIONS

Division: Op. Area.:
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Appr: RE Date: 7/7/14
Scale: AS SHOWN
Filename: SK14C4781MA04_WetlandSS.dwg

CONNECTICUT EXPANSION
MASSACHUSETTS LOOP 200-3
PROPOSED 36" NATURAL GAS PIPELINE
WETLAND CROSSING WMA 21 @ M.P. 3.30
TOWN OF SANDISFIELD
BERKSHIRE COUNTY, MASSACHUSETTS

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

Sheet: 18 of 19
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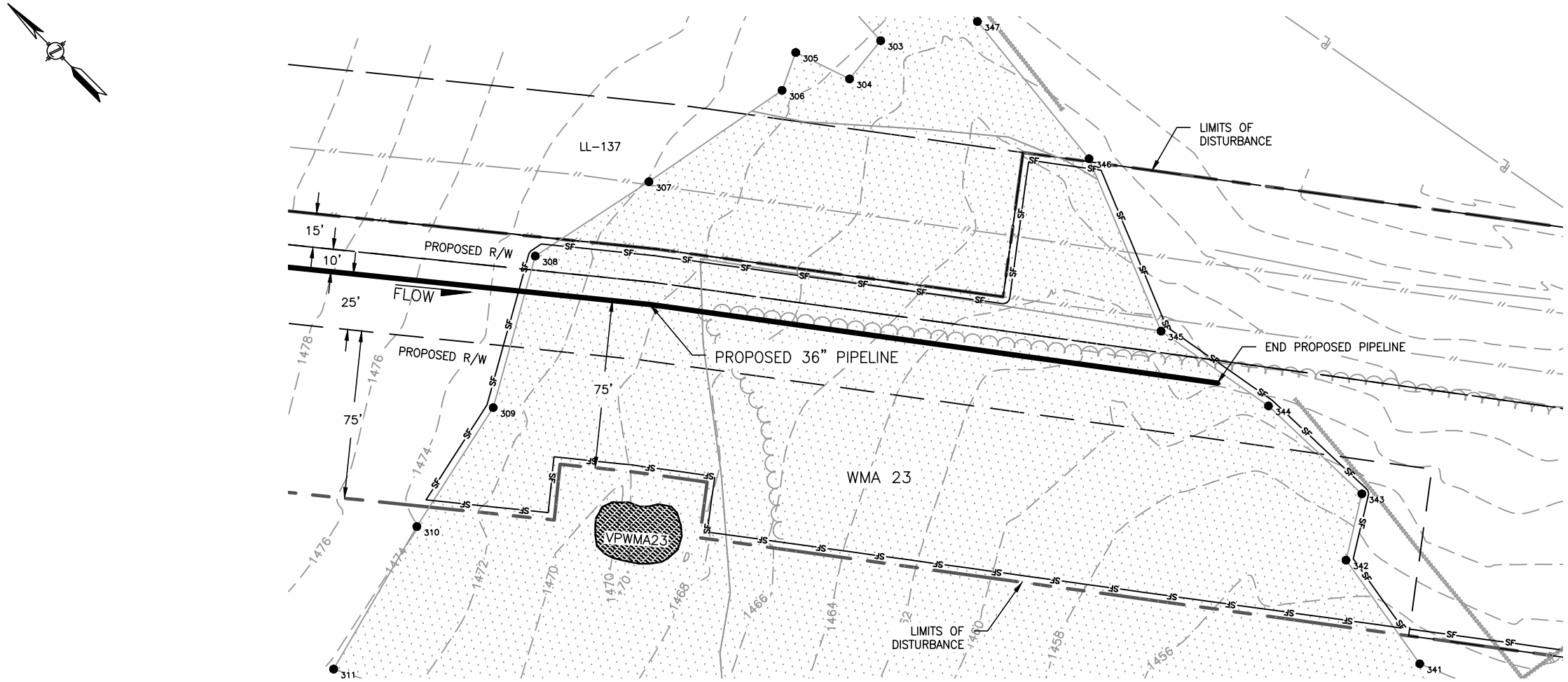

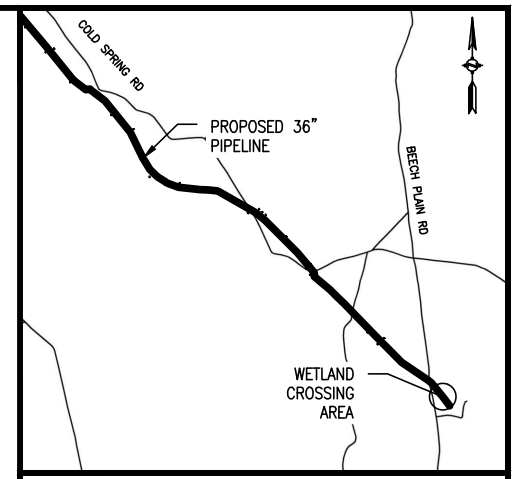

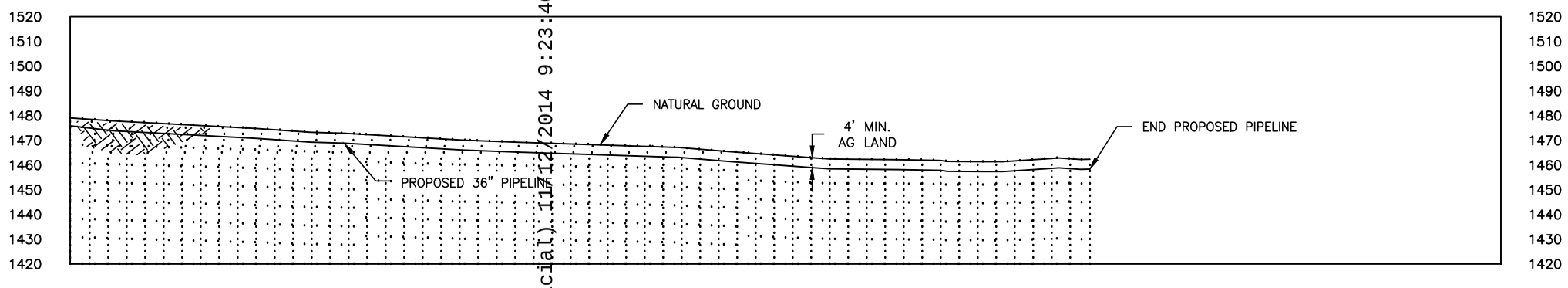

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Wetland ID	Wetland Class	Crossing Length (feet)	Wetland Impact (acres) Construction PFO	Construction PSS	Construction PEM	Operation PFO	Operation PSS	State Wetland Classification	Stream Disturbance (Acres)	Crossing Method
WMA 23	N/A	311.38	0.76	0.06	0.33	0.16	N/A	N/A	N/A	Conventional

APPLICATION NO.: NAE-2013-02329

DELINEATED WETLANDS
DELINEATED VERNAL POOLS
EXISTING PERMANENT EASEMENT
LIMITS OF DISTURBANCE
PROPOSED PERMANENT EASEMENT
PROPOSED PIPELINE
EXISTING PIPELINE
PROPERTY LINE
FENCE
TREE LINE
POWER LINES
SILT FENCE
DELINEATED STREAMS
CENTERLINE OF ROAD
CONTOUR LINE
DELINEATED WETLAND/WATERBODY FLAGS

60 30 0 60
SCALE IN FEET

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.
2	9/15/14	JD	ISSUED FOR MEPA		RE
1	7/17/14	JD	REVISED PER AECOM COMMENTS		RE

REVISIONS

Division: Op. Area.:
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Appr: RE Date: 7/7/14
Scale: AS SHOWN
Filename: SK14C4781MA04_WetlandSS.dwg

CONNECTICUT EXPANSION
MASSACHUSETTS LOOP 200-3
PROPOSED 36" NATURAL GAS PIPELINE
WETLAND CROSSING WMA 23 @ M.P. 3.79
TOWN OF SANDISFIELD
BERKSHIRE COUNTY, MASSACHUSETTS

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

Sheet: 19 of 19
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APPENDIX E

Silt Fence Calculation Report

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CT EXPANSION PROJECT

SILT FENCE DESIGN CRITERIA AND METHODOLOGY

MASSACHUSETTS LOOP

Submitted by:

••

Tennessee Gas Company L.L.C.
1001 Louisiana St, Suite 1000
Houston, TX 77002

July 2014

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INTRODUCTION

The following description of silt fence design criteria and methodology was performed as part of a comprehensive erosion and sedimentation control design of the Connecticut Expansion Pipeline (Project) within Massachusetts State. Tennessee Gas Pipeline Company ("Tennessee") is filing an application for a certificate of public convenience and necessity with the Federal Energy Regulatory Commission ("Commission" or "FERC") for the Project in Albany County, New York, Berkshire and Hampden Counties, Massachusetts and Hartford County, Connecticut. The proposed Project involves the construction of two sections of new 36-inch pipeline looping totaling 1.4 miles in New York and 3.8 miles in Massachusetts, and one section of new 24-inch pipeline looping totaling 8.1 miles in Massachusetts and Connecticut. To the extent that it is practicable, feasible, and in compliance with existing law, Tennessee proposes to locate the pipeline loops within or adjacent to the right-of-way ("ROW") associated with its existing pipelines designated as the 200 and 300 Lines. Tennessee proposes to begin construction of the Project facilities in 2015 and to place the facilities in-service by November 2016.

DESIGN CRITERIA AND METHODOLOGY

In order to reduce runoff velocity and effect deposition of transported sediment load, both standard and reinforced silt fencing has been specified for use in the Massachusetts portion of the Tennessee Pipeline Construction areas.

As per Massachusetts Guideline of Erosion and Sediment Control for Urban and Suburban Areas (May 2003, pages 146-151), the design recommendations for 20" reinforced silt fence are as follows:

1. Depth

Depth of impounded water should not exceed 1.5 feet at any point

2. Drainage area

Limited to ¼ acre per 100 ft of fence, and no more than 1.5 acres in total; or in combination with a sediment basin on a larger site. Area is further restricted by slope steepness as shown in the following table:

Slope Steepness	Slope Steepness (%)	Maximum Slope Length (ft)
	30	30
5:1 or flatter	20	50
	10	100
	5	180
	2	250

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3. Location

Locate the fence at least 10 feet from the toe of steep slopes to provide sediment storage and access for cleanout The fence line should be nearly level through most of its length to impound a broad, temporary pool. The last 10 to 20 feet at each end of the fence should be swung slightly uphill (approximately 0.5 feet in elevation)to provide storage capacity.

As there are no Massachusetts State standards for silt fence specification where either maximum slope steepness or slope length is exceeded (as in noted in the above table), Tennessee specifies the use of reinforced silt fence and super silt fence with the following maximum allowable slope length (see standard environmental details at the end of this document):

Maximum Slope Length (ft) Above Fence [1]		
Slope Steepness	**Slope Percent (%)**	**Super Silt Fence**
2:1	50	50
-	45	60
-	40	75
-	35	85
-	30	100
4:1	25	135
5:1	20	275
-	15	215
10:1	10	325
20:1	5	500
50:1	2	1000

[1]This table is based on the table 4.4 Maximum Slope Length for Silt Fence of the PA DEP Erosion and Sediment Pollution Control Manual, 2012, page 76

Locations where reinforced silt barrier slope steepness or slope length are exceeded (as noted in the above table), Tennessee will be utilizing a swale to intercept runoff up gradient of the construction areas, sized appropriately to either transfer flow to a nearby waterbody, if appropriate or directed via storm drainage pipe through the construction area and outletting in a preferred down gradient location.

Finally, Silt fence materials will be according to specifications as noted in the Best Management Practices (BMPs) for Construction Activities in Massachusetts.

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

Tennessee Gas Pipeline Company, L.L.C.
Connecticut Expansion Project
Sediment Barrier Backup Calculations
Massachusetts Loop

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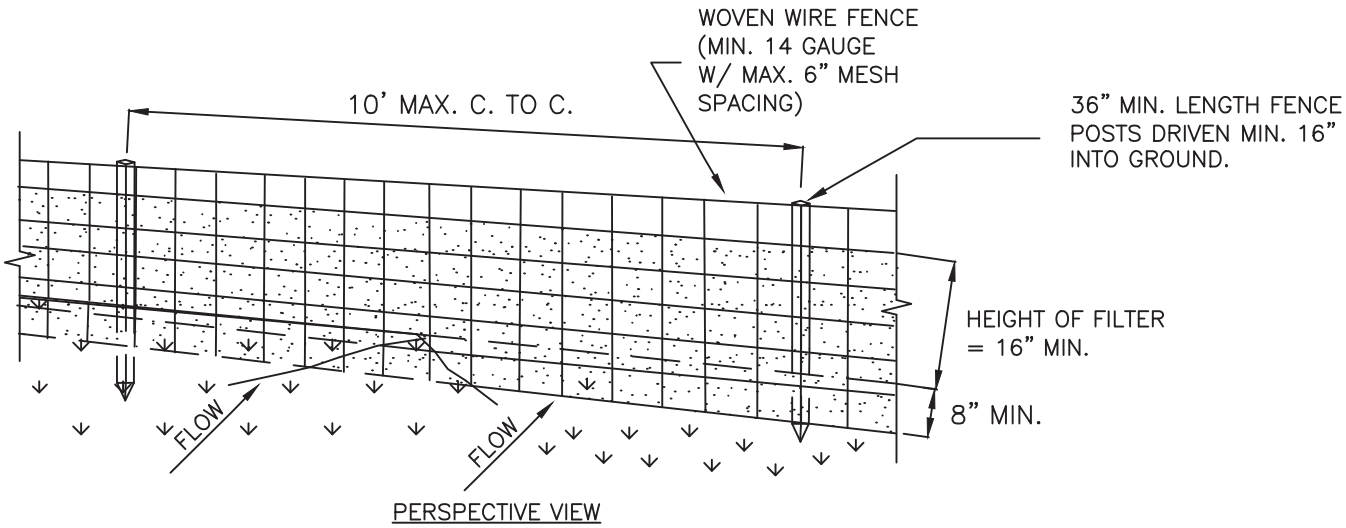
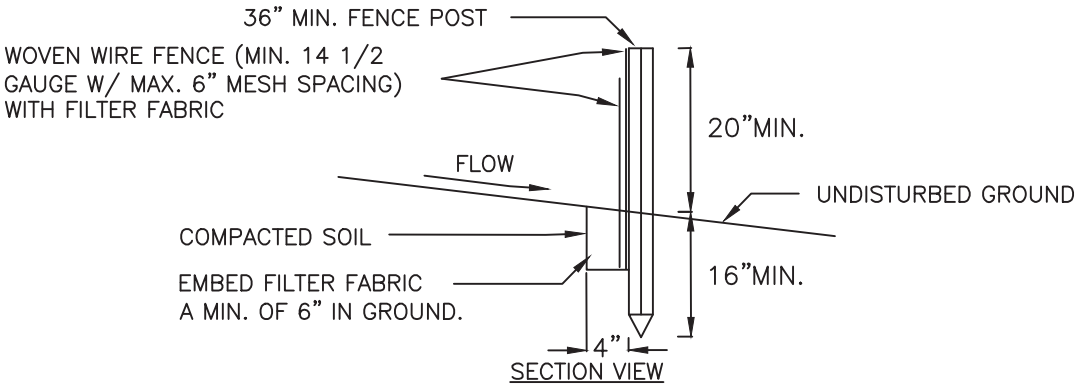
Left or Right of Baseline		SEDIMENT BARRIER LOCATION NEW (STA to STA)		Length of Barrier (FT)	SEDIMENT BARRIER TYPE	ACTUAL SLOPE PERCENT ABOVE BARRIER (%)	ACTUAL SLOPE LENGTH ABOVE BARRIER (FT)	ALLOWABLE SLOPE LENGTH ABOVE BARRIER (FT)	REMAINING SLOPE LENGTH (FT)	PERCENTAGE OF SLOPE LENGTH REMAINING	RESULT	Comments
			0	593	SUPER SILT FENCE	15	1041	215	0	0%	NO GOOD	WETLAND, SWALE REQ'D
		650	850	216	SUPER SILT FENCE	4	165	500	335	67%	OK	SIDESLOPE
		900	1050	165	20 INCH SILT FENCE	4	50	100	50	50%	OK	SIDESLOPE
		1050	1650	767	20 INCH SILT FENCE	10	100	100	0	0%	OK	SI DESLOPE WITH WATERBARS
		1600	1660	272	20 INCH SILT FENCE	4	50	100	50	50%	OK	WETLAND
		1650	2300	727	SUPER SILT FENCE	5	1314	500	0	0%	NO GOOD	SIDESLOPE, SWALE REQ'D
		2300	2400	408	20 INCH SILT FENCE	2	100	100	0	0%	OK	WETLAND
		2400	3450	1191	SUPER SILT FENCE	7	932	325	0	0%	NO GOOD	SIDESLOPE, SWALE REQ'D
		3350	3650	944	20 INCH SILT FENCE	2	100	100	0	0%	OK	WETLAND
		3650	4000	342	SUPER SILT FENCE	5	887	500	0	0%	NO GOOD	SIDESLOPE, SWALE REQ'D
		3950	4700	1628	SUPER SILT FENCE	20	120	175	55	31%	OK	WETLAND
		4910	5140	537	20 INCH SILT FENCE	2	50	100	50	50%	OK	WETLAND WITH WATERBAR
		5150	5600	927	20 INCH SILT FENCE	2	50	100	50	50%	OK	WETLAND
		5550	6450	988	SUPER SILT FENCE	7	922	325	0	0%	NO GOOD	SIDESLOPE, SWALE REQ'D
		6800	7550	847	SUPER SILT FENCE	13	1343	215	0	0%	NO GOOD	SIDESLOPE, SWALE REQ'D
		7550	8100	1174	20 INCH SILT FENCE	18	100	100	0	0%	OK	WETLAND
		8250	8750	1093	SUPER SILT FENCE	4	632	500	0	0%	NO GOOD	WETLAND, SWALE REQ'D
		8750	9450	767	SUPER SILT FENCE	7	689	325	0	0%	NO GOOD	WETLAND, SWALE REQ'D
		9940	9960	118	20 INCH SILT FENCE	1	50	100	50	50%	OK	WETLAND
		9950	10380	1128	SUPER SILT FENCE	14	1377	215	0	0%	NO GOOD	WETLAND, SWALE REQ'D
		10450	10750	865	SUPER SILT FENCE	16	1376	175	0	0%	NO GOOD	WETLAND, SWALE REQ'D
		11380	11500	265	SUPER SILT FENCE	9	300	325	25	8%	OK	SIDESLOPE
		11680	12280	609	SUPER SILT FENCE	14	819	215	0	0%	NO GOOD	SIDESLOPE, SWALE REQ'D
			12660	271	20 INCH SILT FENCE	1	50	100	50	50%	OK	ROAD CROSSING WITH WATERBAR
			12700	215	20 INCH SILT FENCE	1	50	100	50	50%	OK	ROAD CROSSING WITH WATERBAR
		12680	13025	880	20 INCH SILT FENCE	1	50	100	50	50%	OK	WETLAND WITH WATERBAR
	LEFT	13050	13200	150	20 INCH SILT FENCE	4	50	100	50	50%	OK	SIDESLOPE WITH WATERBAR
		13150	13525	896	20 INCH SILT FENCE	4	50	100	50	50%	OK	WETLAND
	LEFT	13500	13825	325	20 INCH SILT FENCE	4	50	100	50	50%	OK	SIDESLOPE WITH WATERBAR
		13800	14950	2540	20 INCH SILT FENCE	4	50	100	50	50%	OK	WETLAND WITH WATERBAR
	LEFT	14950	15030	60	20 INCH SILT FENCE	4	50	100	50	50%	OK	SIDESLOPE WITH WATERBAR
		14950	15280	736	20 INCH SILT FENCE	4	50	100	50	50%	OK	WETLAND
		15300	15580	451	20 INCH SILT FENCE	4	50	100	50	50%	OK	WETLAND WITH WATERBAR
		15450	15650	240	20 INCH SILT FENCE	6	100	100	0	0%	OK	SIDESLOPE WITH WATERBAR
	LEFT	16550	16990	450	SUPER SILT FENCE	4	275	500	225	45%	OK	SIDESLOPE WITH WATERBAR
		17000	17750	1614	20 INCH SILT FENCE	4	50	100	50	50%	OK	WETLAND WITH WATERBAR
RIGHT		17550	18350	905	20 INCH SILT FENCE	8	100	100	0	0%	OK	SIDESLOPE WITH WATERBAR
		18850	19500	996	20 INCH SILT FENCE	4	100	100	0	0%	OK	SIDESLOPE, ROAD WITH WATERBAR
		19700	20033	1134	20 INCH SILT FENCE	2	50	100	50	50%	OK	WETLAND WITH WATERBAR
		20033+		672	SUPER SILT FENCE	9	670	325	0	0%	NO GOOD	SIDESLOPE, WETLAND, SWALE REQ'D



PERSPECTIVE VIEW



SECTION VIEW

CONSTRUCTION SPECIFICATIONS

1. WOVEN WIRE FENCE TO BE FASTENED SECURELY TO FENCE POSTS WITH WIRE TIES OR STAPLES. POSTS SHALL BE STEEL EITHER "T" OR "U" TYPE OR HARDWOOD.
2. FILTER CLOTH TO BE TO BE FASTENED SECURELY TO WOVEN WIRE FENCE WITH TIES SPACED EVERY 24" AT TOP AND MID SECTION. FENCE SHALL BE WOVEN WIRE, 14 GAUGE, 6" MAXIMUM MESH OPENING.
3. WHEN TWO SECTIONS OF FILTER FABRIC ADJOIN EACH OTHER THEY SHALL BE OVER–LAPPED BY SIX INCHES AND FOLDED. FILTER FABRIC SHALL BE EITHER FILTER X, MIRAFI 100X, STABILINKA T140N, OR APPROVED EQUIVALENT.
4. PREFABRICATED UNITS SHALL BE GEOFAB, ENVIROFENCE, OR APPROVED EQUIVALENT.
5. MAINTENANCE SHALL BE PERFORMED AS NEEDED AND MATERIAL REMOVED WHEN "BULGES" DEVELOP IN THE SILT FENCE.
6. MAXIMUM DRAINAGE AREA FOR OVERLAND FLOW TO A SILT FENCE SHALL NOT EXCEED 1/4 ACRE PER 100 FEET OF FENCE.
7. MAXIMUM ALLOWABLE SLOPE LENGTHS CONTRIBUTING RUNOFF TO SILT FENCE PLACED ON A SLOPE ARE AS FOLLOWS:

SLOPE STEEPNESS	MAXIMUM LENGTH (FT)
2:1	25
3:1	50
4:1	75
5:1 OR GREATER	100

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:		Op. Area:	
St.:		Co./Par.:	
Section:	Township:	Range:	
Dft:	Date:	Project ID:	
Chk:	Date:	Scale:	
Appr:	Date:	Filename:	

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
REINFORCED SILT FENCE

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

FIG. NO. 31

Sheet: 31 of 127
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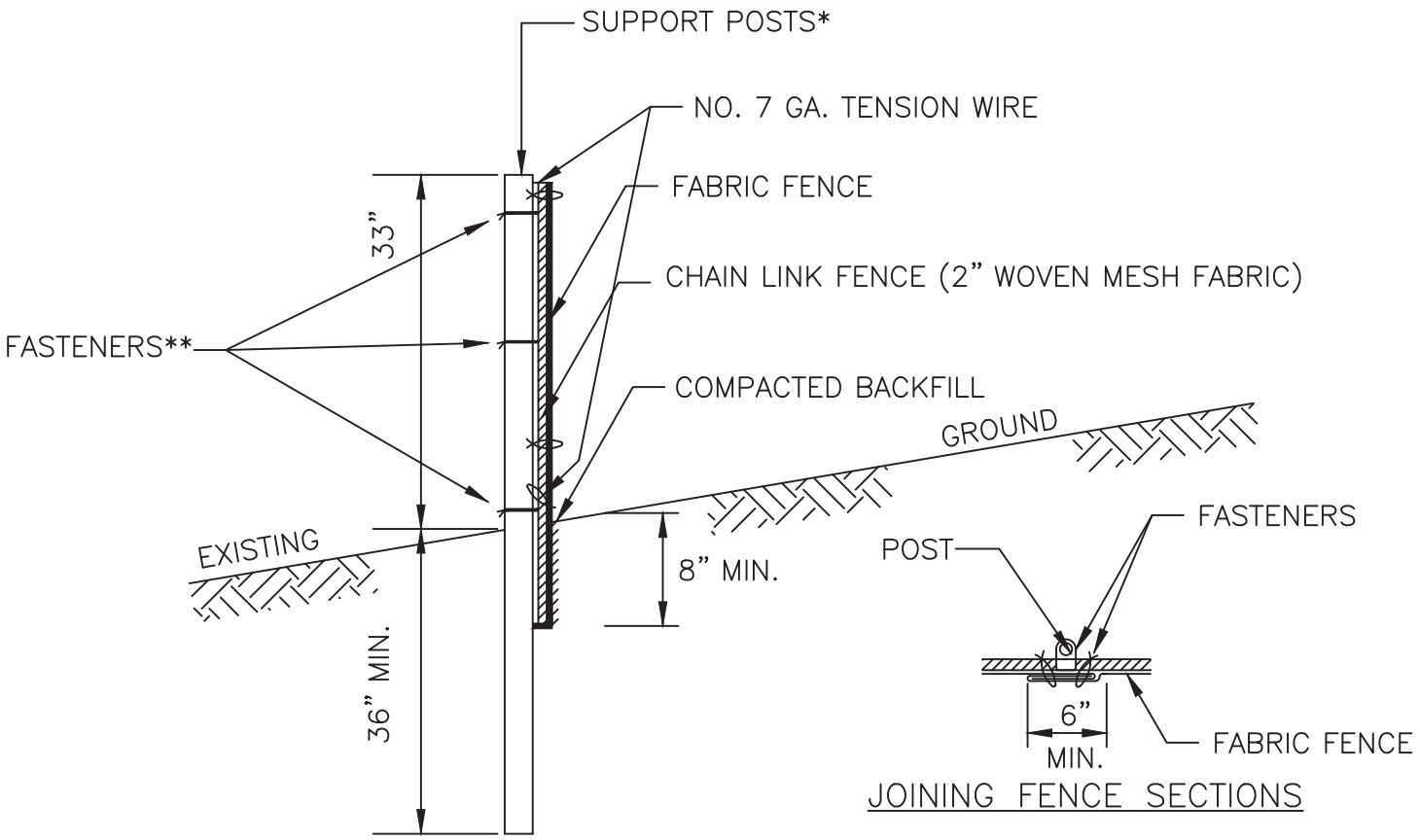
STANDARD CONSTRUCTION DETAIL #22
Super Filter Fabric Fence



* POSTS SPACED @ 10' MAX. USE 2 1/2" DIA. GALVANIZED OR ALUMINUM POSTS.

** CHAIN LINK TO POST FASTENERS SPACED @ 14" MAX. USE NO. 6 GA. ALUMINUM WIRE OR NO. 9 GALVANIZED STEEL PRE-FORMED CLIPS. CHAIN LINK TO TENSION WIRE FASTENERS SPACED @ 60" MAX. USE NO. 10 GA. GALVANIZED STEEL WIRE. FABRIC TO CHAIN FASTENERS SPACED @ 24" MAX. C TO C.

NO. 7 GA. TENSION WIRE INSTALLED HORIZONTALLY AT TOP AND BOTTOM OF CHAIN-LINK FENCE.

FILTER FABRIC FENCE MUST BE PLACED AT EXISTING LEVEL GRADE. BOTH ENDS OF THE BARRIER MUST BE EXTENDED AT LEAST 8 FEET UPSLOPE AT 45 DEGREES TO THE MAIN BARRIER ALIGNMENT.

SEDIMENT MUST BE REMOVED WHEN ACCUMULATIONS REACH 1/2 THE ABOVE GROUND HEIGHT OF THE FENCE.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
SUPER SILT FENCE (1)

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

FIG. NO. 32

Sheet: 32 of 127

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APPENDIX E

Erosion Control Drawings

PROTECTION EASEMENT

LINE LIST

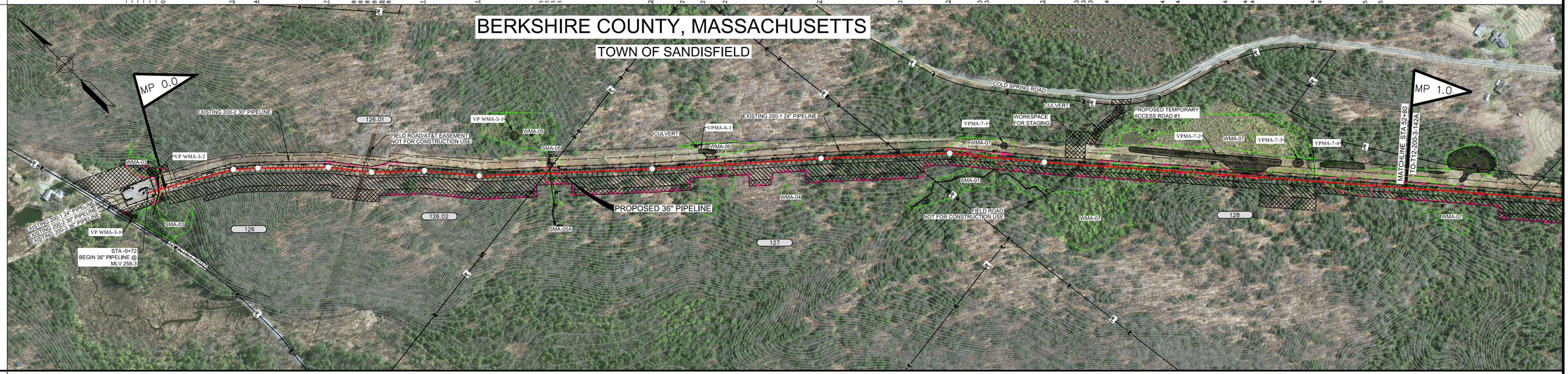
RODS

126	126.01	126.02	127	128
0+72 – 8+47	8+47 – 8+60	8+60 – 16+29	16+29 – 31+40	31+40 – 52+80
51.3	0.8	46.6	91.6	129.7

PIPELINE STATIONING

0+72 BEGIN STATION FOR PROPOSED 36" PIPELINE
0+72 ENTER WETLAND WMA-03
0+72 TOP OF BANK
0+72 TOP OF BANK
0+72 EXIT WETLAND WMA-03
0+00 BEGIN PIPELINE COMMENCEMENT
3+01 P.I. < 11°36'05" RT.
4+04 P.I. < 2°32'06" RT.
7+02 P.I. < 7°18'01" RT.
8+47 EDGE OF ROAD
8+53 TELEPHONE CABLE CROSSING
8+53 ℄ OF DIRT ROAD (SNOWMOBILE TRAIL)
8+60 EDGE OF ROAD
8+61 P.I. < 42°26'29" LT.
8+88 TREE LINE CROSSING
11+12 P.I. < 7°16'24" RT.
13+46 P.I. < 7°44'09" LT.
16+29 PROPERTY LINE
16+29 ENTER WETLAND WMA-05
16+47 ℄ OF STREAM SMA-05
16+59 EXIT WETLAND WMA-05
20+28 P.I. < 1°16'19" LT.
22+06 12" CULVERT 24" LT. (PVC)
23+01 ENTER WETLAND WMA-06
23+86 EXIT WETLAND WMA-06
27+36 P.I. < 1°16'49" RT.
31+40 PROPERTY LINE
33+41 P.I. < 7°35'07" RT.
34+78 ENTER WETLAND WMA-07
35+24 EXIT WETLAND WMA-07
37+44 P.I. < 1°23'41" LT.
38+89 EDGE OF ROAD
38+95 ℄ OF PROPOSED TEMPORARY ACCESS ROAD #1
39+40 EDGE OF ROAD
40+18 ENTER WETLAND WMA-07
42+55 EXIT WETLAND WMA-07
43+20 ENTER WETLAND WMA-07
45+21 EXIT WETLAND WMA-07
46+07 ENTER WETLAND WMA-07
46+54 EXIT WETLAND WMA-07
48+93 ℄ OF FIELD ROAD
49+33 ENTER WETLAND WMA-07
51+15 EXIT WETLAND WMA-07
51+81 ENTER WETLAND WMA-07

ALIGNMENT STRIP MAP



MATERIAL

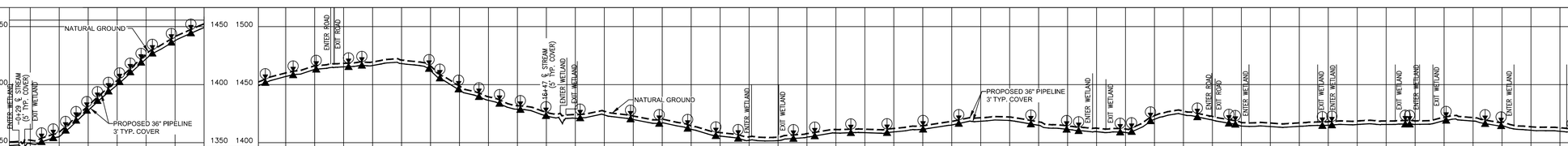
COATING

DESIGN FACTOR

CLASS LOCATION

PROFILE

GENERAL NOTES:
1. THE BEST MANAGEMENT PRACTICE (BMP) NUMBERS NOTED ABOVE CORRESPOND TO SPECIFIC DETAILS FOUND ON THE BEST MANAGEMENT PRACTICE DETAIL SHEETS. THE BMP DETAILS INCLUDE GENERAL LAYOUT, LOCATION, DIMENSIONS, CONSTRUCTION NOTES, MATERIALS, ETC. THAT SHOULD BE FOLLOWED DURING CONSTRUCTION OF THE PIPELINE.
2. THE APPROXIMATE LOCATION AND TYPE OF SEDIMENT BARRIERS TO BE INSTALLED ALONG THE CONSTRUCTION WORKSPACE ARE LOCATED IN TABLES IN THE SILT FENCE DESIGN CRITERIA FOR MASSACHUSETTS. THE ACTUAL LOCATION SHALL BE DETERMINED IN THE FIELD BY THE ENVIRONMENTAL INSPECTOR AND CONTRACTOR.
3. TEMPORARY AND PERMANENT SLOPE BREAKER SPACING IS THE SAME. SLOPE BREAKERS SHALL BE MAINTAINED IN PLACE AT ALL TIMES.



THE LOCATIONS OF TRENCH BREAKERS AND SLOPE BREAKERS SHOWN ON THE PROFILE SHALL BE USED AS A GUIDELINE ONLY. THE ACTUAL LOCATION OF THE BREAKERS SHALL BE DETERMINED IN THE FIELD BASED ON FIELD CONDITIONS BY THE ENVIRONMENTAL INSPECTOR AND CONTRACTOR.

PERMANENT SLOPE BREAKER (ARROW INDICATES FLOW VIEW FLOW DIRECTION)

PERMANENT TRENCH BREAKER

*AT A MINIMUM, TRENCH BREAKERS AND SLOPE BREAKERS SHALL BE LOCATED WITHIN 50 FT. OF THE EDGE (BOTH SIDES) OF WETLANDS AND WATERBODIES. ACTUAL LOCATION SHALL BE DETERMINED BY THE ENVIRONMENTAL INSPECTOR AND CONTRACTOR.

PERMANENT TRENCH / SLOPE BREAKER SPACING	
SLOPE (%)	SPACING (FT)
<5	125
5–10	100
>10–20	75
>20–35	50
>35	25

ENVIRONMENTAL

AVERAGE SLOPE	1%	4%	10%	23%	14%	11%	11%	6%	8%	2%	1%	3%	4%	3%	3%	4%	24%	16%	6%	9%	1%	4%	7%	4%	1%	5%	8%	5%	8%	3%	7%	4%	1%	8%	2%	4%	1%	2%	5%	3%	4%	5%	1%	4%	15%	0%	4%	3%	1%	5%	4%	1%	2%	1%	2%	3%	0%	3%	0%	7%	14%	2%	3%	4%	6%	2%	0%	2%	4%	13%	4%
	W	S							R														W										W													

PROTECTION EASEMENT

LINE LIST
RODS

PIPELINE STATIONING

ALIGNMENT STRIP MAP

MATERIAL

COATING

DESIGN FACTOR

CLASS LOCATION

PROFILE

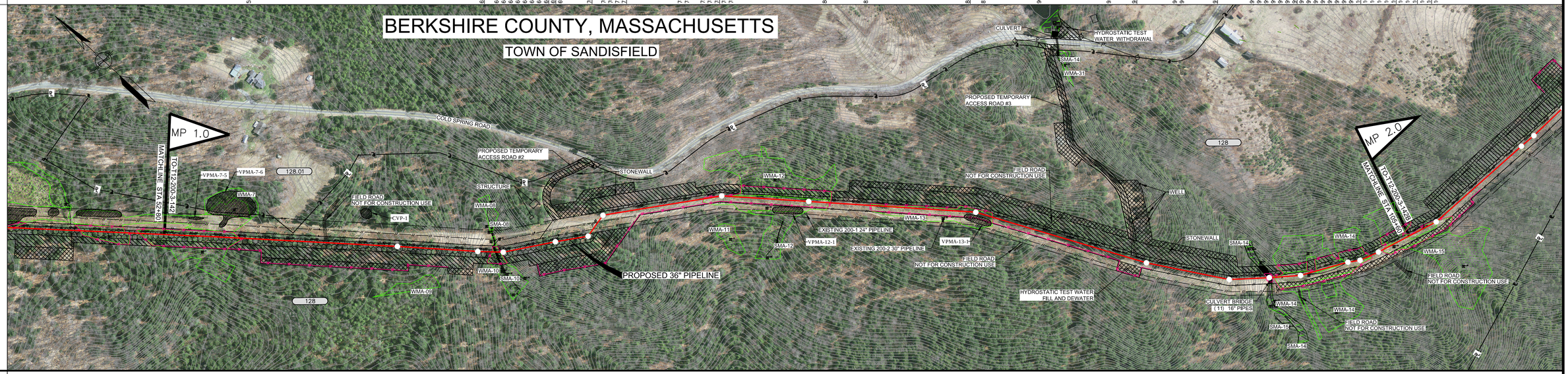
ENVIRONMENTAL

SOIL TYPE

WORKSPACE SCHEMATIC

BERKSHIRE COUNTY, MASSACHUSETTS

TOWN OF SANDISFIELD



MATERIAL	
COATING	
DESIGN FACTOR	
CLASS LOCATION	

GENERAL NOTES

1. THE BEST MANAGEMENT PRACTICE (BMP) NUMBERS NOTED ABOVE CORRESPOND TO SPECIFIC DETAILS FOUND ON THE BEST MANAGEMENT PRACTICE DETAIL SHEETS. THE BMP DETAILS INCLUDE GENERAL LAYOUT, LOCATION, DIMENSIONS, CONSTRUCTION NOTES, MATERIALS, ETC. THAT SHOULD BE FOLLOWED DURING CONSTRUCTION OF THE PIPELINE.
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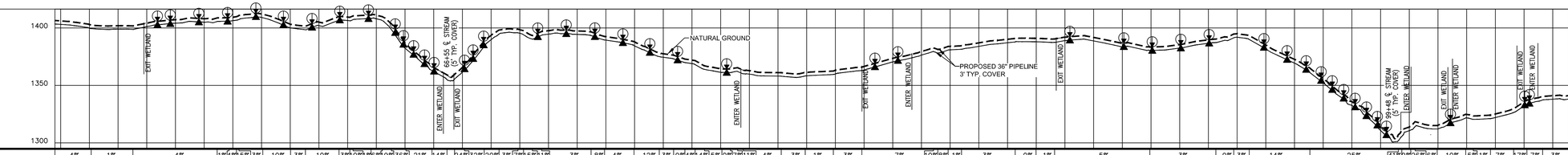

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PERMANENT SLOPE BREAKER (ARROW INDICATES FLOW FLOW DIRECTION)

PERMANENT TRENCH BREAKER

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SLOPE (%)	SPACING (FT)
<5	125
5–10	100
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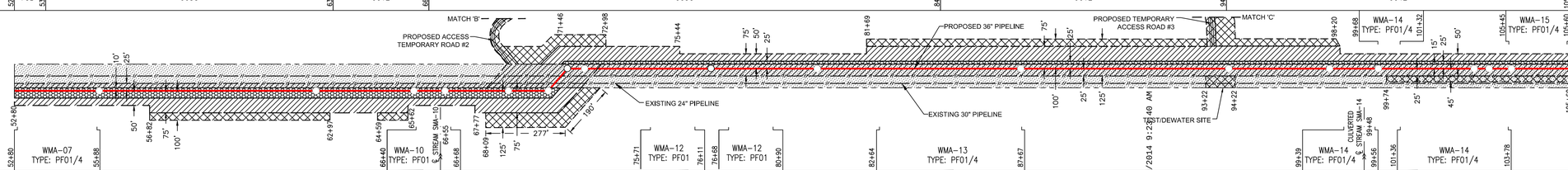
AVERAGE SLOPE	4%	1%	4%	12%	4%	5%	3%	10%	3%	10%	3%	0%	2%	6%	9%	36%	21%	14%	24%	32%	20%	3%	7%	15%	11%	3%	8%	4%	12%	3%	9%	4%	14%	5%	0%	2%	11%	4%	3%	1%	3%	7%	10%	8%	1%	3%	0%	1%	5%	3%	9%	3%	14%	25%	41%	9%	26%	6%	10%	5%	1%	7%	7%	7%	3%
ENVIRONMENTAL		W																																										W	S																												

GENERAL E&S FIGURES: 19 20 29 30 31 34 41; 65 81 82 83 84 96 110 118

SOIL TYPE: 75B | 905C | 901E | 905C | 901E | 904E

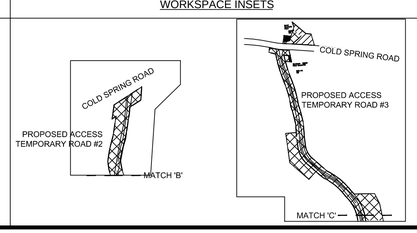


LEGEND

- EXISTING PERMANENT EASEMENT
- PROPOSED PERMANENT EASEMENT
- TEMPORARY WORKSPACE
- ADDITIONAL TEMPORARY WORKSPACE (ATWS)
- LIMITS OF DISTURBANCE
- ℄ Proposed 36" Pipeline
- ℄ Existing Pipeline
- SF Silt Fence

L.L. NO.	OWNERSHIP
128	
128.01	

WORKSPACE INSETS



REFERENCE DRAWINGS

BMP GROUP LEGEND

SYMBOL	BMP GROUP	ASSOCIATED BMP FIGURE NUMBERS
W	WETLANDS CROSSING	2,11,12,13,19,20,29,34,37,40,46,58A,90,91
S	WATERBODY CROSSING	1,2,5,6,7,19,20,30,31,36,37,38,39,41,44,63,80
R	ROAD CROSSING	3,15,49,50

SOIL TYPE LEGEND

75B	Pillsbury loam, 0 to 8 percent slopes, extremely stony
905C	Peru-Marlow association, rolling, extremely stony
901E	Berkshire-Marlow association, 15 to 45 percent slopes, steep, extremely stony
904E	Lyman-Tunbridge association, steep, very stony

ISSUED FOR MEPA

NOTE: MAOP IS 880 PSIG, OPERATING 760 PSIG

SCALE

200 100 0 200 400

IMAGERY DATE: SPRING, 2009

REVISIONS

NO	PROJ ID	DESCRIPTION	DATE	BY	CK	APPR
1		ISSUED FOR MEPA	9/18/14	JMD	AP	RE
0		ISSUED FOR FERC	7/21/14	MS	BP	RG

AREA: AGAWAM	DIV.: 10	Tennessee Gas Pipeline Company, L.L.C. a Kinder Morgan company	
DRAFTER: MS	DATE: 06/27/14		
DRAFT COORD: JD	DATE: 06/30/14		

CONNECTICUT EXPANSION
MASSACHUSETTS LOOP 200-3
PROPOSED 36" NATURAL GAS PIPELINE
EROSION & SEDIMENTATION CONTROL PLAN
BERKSHIRE COUNTY, MASSACHUSETTS

DESIGN COORD:	DATE:	SCALE: 1" = 200'	AFE: 67158
PROJECT COORD:	DATE:	TO-T12-200-3-142A	1
OPER. APPR:	DATE:		

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PROTECTION EASEMENT

LINE LIST

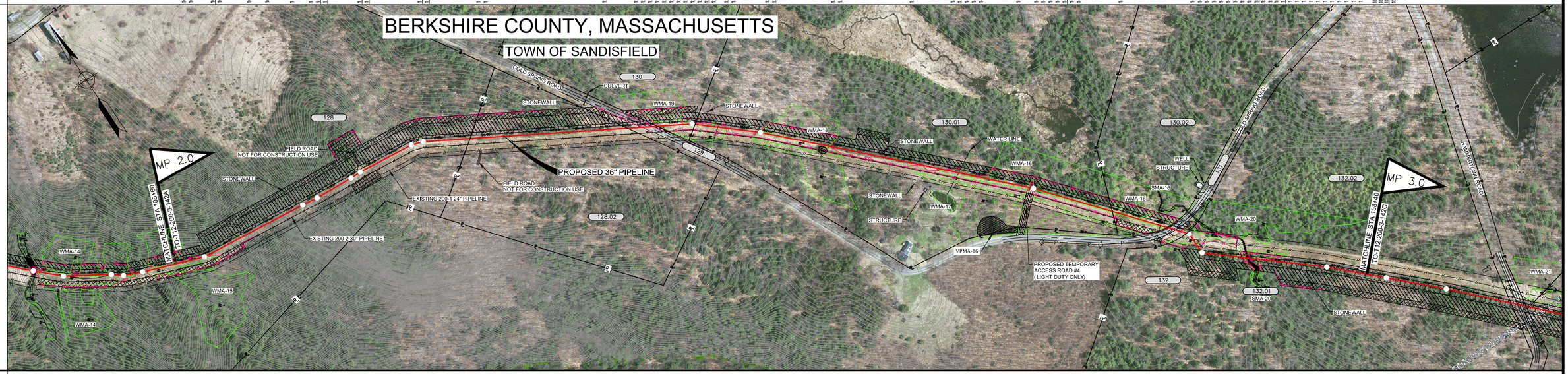
RODS

105+60	128	119+33	128.02	126+02	129	127+29	130	128+83	130.01	146+98	130.02	148+42	131	150+28	132	151+30	132.01	153+30	132.02	158+40
	83.3		40.5		7.7		9.7		109.6		14.8		5.2		13.8				35.4	

PIPELINE STATIONING

105+70 EXIT WETLAND WMA-15
105+73 ENTER WETLAND WMA-15
106+85 P.I. < 14°01'53" LT.
106+90 EXIT WETLAND WMA-15
108+60 TREE LINE CROSSING
109+47 TREE LINE CROSSING
110+65 TREE LINE CROSSING
111+56 TREE LINE CROSSING
112+22 P.I. < 22°25'45" LT.
112+24 P.I. < 3°28'56" LT.
113+80 P.I. < 4°04'01" LT.
114+38 P.I. < 6°06'32" RT.
116+82 P.I. < 12°08'44" RT.
117+35 P.I. < 11°58'59" RT.
119+33 PROPERTY LINE
119+39 TREE LINE CROSSING
125+06 POWER POLE 72' LT.
126+02 PROPERTY LINE
126+37 TREE LINE CROSSING
126+44 ℄ OF COLD SPRING ROAD
126+89 ℄ OF COLD SPRING ROAD (40' TIE TO POLE #22)
127+10 POWER LINE CROSSING
127+12 EDGE OF ROAD
127+43 ENTER WETLAND WMA-19
127+50 POWER POLE 14' RT.
127+55 UTILITY GUY WIRE 9 RT.
128+69 PROPERTY LINE
128+89 PROPERTY LINE
129+87 FENCE LINE CROSSING
130+19 EXIT WETLAND WMA-19
131+62 ENTER WETLAND WMA-18
131+69 P.I. < 4°24'54" RT.
134+47 TREE LINE CROSSING
134+67 EXIT WETLAND WMA-18
137+87 TREE LINE CROSSING
139+64 TREE LINE CROSSING
139+71 ENTER WETLAND WMA-16
140+27 WATER LINE CROSSING (2" PVC)
140+65 EXIT WETLAND WMA-16
141+13 ENTER WETLAND WMA-16
142+49 TREE LINE CROSSING
143+26 EXIT WETLAND WMA-16
143+35 EDGE OF ACCESS ROAD
143+43 ℄ OF PROPOSED TEMPORARY ACCESS ROAD #4
143+49 ENTER WETLAND WMA-16
143+50 P.I. < 4°25'25" RT.
143+50 EDGE OF ACCESS ROAD
144+95 TREE LINE CROSSING
146+98 PROPERTY LINE
149+24 POWER POLE 62' RT.
149+34 EXIT WETLAND WMA-16
149+42 PROPERTY LINE
149+64 ℄ OF COLD SPRING ROAD
149+69 POWER LINE CROSSING (76' TIE TO POLE #8)
149+78 EDGE OF ROAD
150+08 ENTER WETLAND WMA-20
150+38 P.I. < 49°52'12" RT.
150+67 EXISTING PIPELINE CROSSING
150+68 EXIT WETLAND WMA-20
151+34 P.I. < 49°08'11" LT.
153+15 ENTER WETLAND WMA-20
153+23 ℄ OF STREAM
153+26 EXIT WETLAND WMA-20
153+27 TOE OF BANK
153+30 24" CULVERT 9' LT. (STEEL PIPE)
153+32 ℄ OF STREAM
153+32 24" CULVERT 10' LT. (STEEL PIPE)
153+34 TOE OF BANK
153+36 ENTER WETLAND WMA-20
153+38 TOP OF BANK
153+75 EXIT WETLAND WMA-20
156+33 STONEWALL CROSSING
156+67 P.I. < 24°45'58" LT.
158+26 TREE LINE CROSSING

ALIGNMENT STRIP MAP



MATERIAL

COATING

DESIGN FACTOR

CLASS LOCATION

PROFILE

GENERAL NOTES

1. THE BEST MANAGEMENT PRACTICE (BMP) NUMBERS NOTED ABOVE CORRESPOND TO SPECIFIC DETAILS FOUND ON THE BEST MANAGEMENT PRACTICE DETAIL SHEETS. THE BMP DETAILS INCLUDE GENERAL LAYOUT, LOCATION, DIMENSIONS, CONSTRUCTION NOTES, MATERIALS, ETC. THAT SHOULD BE FOLLOWED DURING CONSTRUCTION OF THE PIPELINE.
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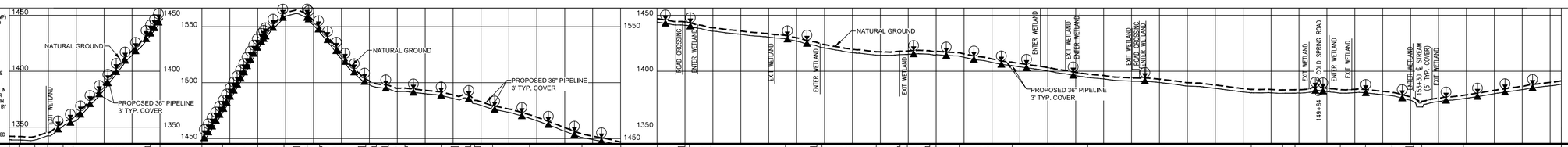

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PERMANENT SLOPE BREAKERS (ARROW INDICATES FLOW FLOW DIRECTION)

PERMANENT TRENCH BREAKER

*AT A MINIMUM, TRENCH BREAKERS AND SLOPE BREAKERS SHALL BE LOCATED WITHIN 50 FT. OF THE EDGE (BOTH SIDES) OF WETLANDS AND WATERBODIES. ACTUAL LOCATION SHALL BE DETERMINED BY THE ENVIRONMENTAL INSPECTOR AND CONTRACTOR.

PERMANENT TRENCH / SLOPE BREAKER SPACING

SLOPE (%)	SPACING (FT)
<5	125
5–10	100
>10–20	75
>20–35	50
>35	25

ENVIRONMENTAL

AVERAGE SLOPE

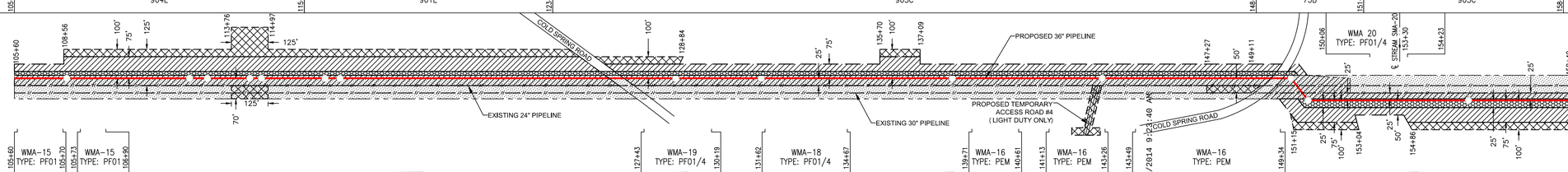
0%	3%	9%	20%	8%	32%	36%	38%	45%	30%	6%	12%	25%	30%	10%	3%	10%	0%	3%	7%	12%	27%	8%	5%	10%	5%	5%	3%	7%	3%	5%	9%	3%	2%	0%	1%	4%	2%	5%	4%	3%	1%	0%	3%	2%	3%	7%	17%	3%	4%
W																										R	W						W						W		R	W						W	S	W	

GENERAL E&S FIGURES: 19 20 29 30 31 34 41 65 81 82 83 84 96 110 118

SOIL TYPE

105+60	904E	115+10	901E	123+72	905C	148+11	75B	151+84	905C	158+40

WORKSPACE SCHEMATIC



LEGEND

- EXISTING PERMANENT EASEMENT
- PROPOSED PERMANENT EASEMENT
- TEMPORARY WORKSPACE
- ADDITIONAL TEMPORARY WORKSPACE (ATWS)
- LIMITS OF DISTURBANCE
- ℄ Proposed 36" Pipeline
- ℄ Existing Pipeline
- SF Silt Fence

L.L. NO.	OWNERSHIP	WORKSPACE INSETS
128		
128.02		
129		
130		
130.01		
130.02		
131		
132		
132.01		
132.02		

REFERENCE DRAWINGS

BMP GROUP LEGEND

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SOIL TYPE LEGEND

904E	Lyman-Tunbridge association, steep, very stony
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ISSUED FOR MEPA

NOTE: MAOP IS 880 PSIG, OPERATING 760 PSIG

SCALE

200 100 0 200 400

IMAGERY DATE: SPRING, 2009

REVISIONS

NO	PROJ ID	DESCRIPTION	DATE	BY	CK	APPR
1		ISSUED FOR MEPA	9/18/14	JMD	AP	RE
0		ISSUED FOR FERC	7/21/14	MS	BP	RG

AREA: AGAWAM | DIV.: 10
DRAFTER: MS | DATE: 06/27/14
DRAFT COORD: JD | DATE: 06/30/14

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

CONNECTICUT EXPANSION
MASSACHUSETTS LOOP 200-3
PROPOSED 36" NATURAL GAS PIPELINE
EROSION & SEDIMENTATION CONTROL PLAN
BERKSHIRE COUNTY, MASSACHUSETTS

DESIGN COORD: | DATE:
PROJECT COORD: | DATE:
OPER. APPR: | DATE:

SCALE: 1" = 200' | AFE: 67158

TO-T12-200-3-142B | 1

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PROTECTION EASEMENT

LINE LIST

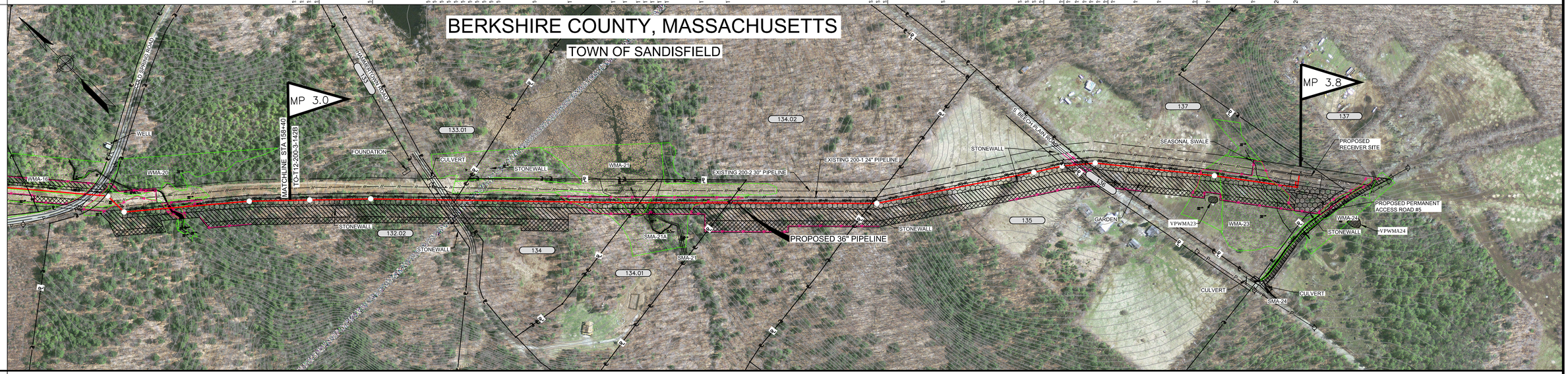
RODS

158+40	132.02	164+66	133	164+33	133.01	165+46	134	173+26	134.01	177+04	134.02	183+10	135	192+14	136	192+86	137	201+36
	37.9		4.1		0.8		47.3		22.9		36.7		54.8		4.4		51.5	

PIPELINE STATIONING

158+54 EXISTING PIPELINE CROSSING
158+92 EXISTING PIPELINE CROSSING
159+04 ℄ ROCK FENCE CROSSING
159+27 P.I. < 45°13'23" LT.
161+86 P.I. < 152°36" RT.
164+42 POWER POLE 63' LT.
164+61 TREE LINE CROSSING
164+66 PROPERTY LINE
164+94 EDGE OF ROAD
165+04 ℄ PIPELINE CROSSING (84" TIE TO POLE #51)
165+04 ℄ OF HAMMERTOWN ROAD
165+14 EDGE OF ROAD
165+29 TREE LINE CROSSING
165+33 PROPERTY LINE
165+46 PROPERTY LINE
165+55 POWER POLE 20' RT. (CATHODIC PROTECTION)
168+84 STONE / ROCK FENCE CROSSING
170+33 ENTER WETLAND WMA-21
172+17 TREE LINE CROSSING
172+57 EDGE OF WATER
173+24 ℄ OF STREAM SMA-21
173+26 PROPERTY LINE
173+27 TOP OF BANK
173+88 TREE LINE CROSSING
173+94 EDGE OF WATER
175+91 EXIT WETLAND WMA-21
177+04 PROPERTY LINE
183+10 PROPERTY LINE
183+12 STONE / ROCK FENCE CROSSING
183+32 P.I. < 112°45" LT.
186+22 TREE LINE CROSSING
189+54 TREE LINE CROSSING
189+70 STONE / ROCK FENCE CROSSING
189+86 TREE LINE CROSSING
190+10 P.I. < 109°56" LT.
191+33 P.I. < 79°00" RT.
191+69 STONE / ROCK FENCE CROSSING
192+14 EDGE OF R.O.W.
192+04 ℄ OF SOUTH BEECH PLAIN ROAD
192+15 EDGE OF ROAD
192+24 P.I. < 40°25'26" LT.
192+86 EDGE OF R.O.W.
194+21 FENCE LINE CROSSING
195+34 FENCE LINE CROSSING
196+70 P.I. < 152°07" RT.
197+19 ENTER WETLAND WMA-23
198+86 ℄ SEASONAL SWALE
200+36 EXIT WETLAND WMA-23
201+36 END STA.

ALIGNMENT STRIP MAP



MATERIAL

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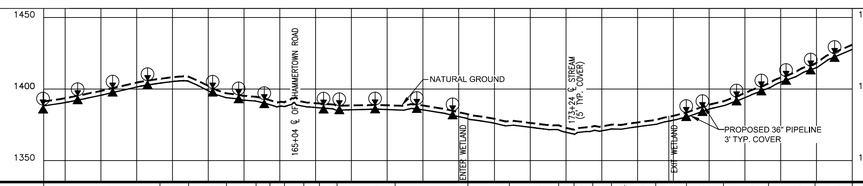

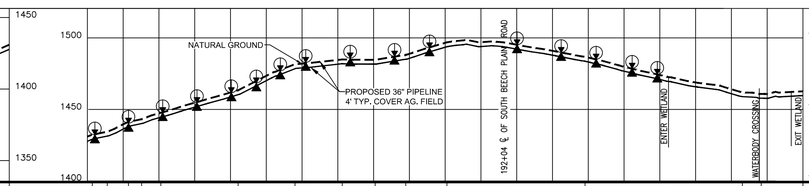

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PERMANENT TRENCH / SLOPE BREAKER SPACING	
SLOPE (%)	SPACING (FT)
<5	125
5–10	100
>10–20	75
>20–35	50
>35	25

ENVIRONMENTAL

AVERAGE SLOPE

5% | 2% | 11% | 4% | 8% | 5% | 20% | 3% | 10% | 1% | 6% | 3% | 8% | 25% | 5% | 1% | 4% | 7% | 8% | 10% | 12% | 15% | 5% | 13% | 5% | 10% | 8% | 12% | 3% | 1% | 4% | 8% | 5% | 7% | 1% | 7%

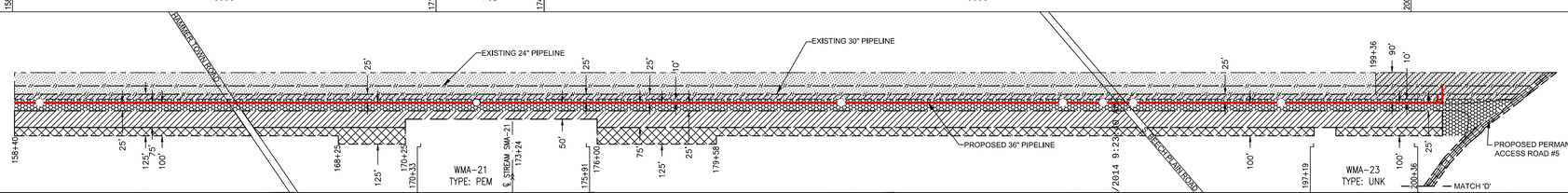
R | W | W | S | W

GENERAL E&S FIGURES: 19 20 29 30 31 34 41 65 81 82 83 84 96 110 118

SOIL TYPE

158+40 905C 171+11 75B 174+35 905C 200+36

WORKSPACE SCHEMATIC



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- PROPOSED PERMANENT EASEMENT
- TEMPORARY WORKSPACE
- ADDITIONAL TEMPORARY WORKSPACE (ATWS)
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- ℄ Existing Pipeline
- SF Silt Fence

L.L.NO.	OWNERSHIP
132.02	
133	
133.01	
134	
134.01	
134.02	
135	
136	
137	

WORKSPACE INSETS

REFERENCE DRAWINGS

BMP GROUP LEGEND

SYMBOL	BMP GROUP	ASSOCIATED BMP FIGURE NUMBERS
W	WETLANDS CROSSING	2,11,12,13,19,20,29,34,37,40,46,58A,90,91
S	WATERBODY CROSSING	1,2,5,6,7,19,20,30,31,36,37,38,39,41,44,63,80
R	ROAD CROSSING	3,15,49,50

SOIL TYPE LEGEND

905C	Peru-Marlow association, rolling, extremely stony
75B	Pillsbury loam, 0 to 8 percent slopes, extremely stony

ISSUED FOR MEPA

NOTE: MAOP IS 880 PSIG, OPERATING 760 PSIG

SCALE

200 100 0 200 400

IMAGERY DATE: SPRING, 2009

REVISIONS

NO	PROJ ID	DESCRIPTION	DATE	BY	CK	APPR
1		ISSUED FOR MEPA	9/18/14	JMD	AP	RE
0		ISSUED FOR FERC	7/21/14	MS	BP	RG

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AREA: AGAWAM | DIV.: 10
DRAFTER: MS | DATE: 06/27/14
DRAFT COORD: JD | DATE: 06/30/14

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

CONNECTICUT EXPANSION
MASSACHUSETTS LOOP 200-3
PROPOSED 36" NATURAL GAS PIPELINE
EROSION & SEDIMENTATION CONTROL PLAN
BERKSHIRE COUNTY, MASSACHUSETTS

DESIGN COORD:	DATE:	SCALE: 1" = 200'	AFE: 67158
PROJECT COORD:	DATE:		
OPER. APPR:	DATE:	TO-T12-200-3-142C	1

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TENNESSEE GAS PIPELINE COMPANY, L.L.C.



SILT FENCE DESIGN CRITERIA AND METHODOLOGY FOR THE ACCESS ROADWAYS

CONNECTICUT PIPELINE EXPANSION PROJECT

MASSACHUSETTS LOOP

Submitted by:

Tennessee Gas Pipeline Company, L.L.C.
1001 Louisiana St, Suite 1000
Houston, TX 77002

JULY 2014

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INTRODUCTION

The following description of silt fence design criteria and methodology was performed as part of a comprehensive erosion and sedimentation control design of the Connecticut Expansion Pipeline (Project) within Massachusetts State. Tennessee Gas Pipeline Company ("Tennessee") is filing an application for a certificate of public convenience and necessity with the Federal Energy Regulatory Commission ("Commission" or "FERC") for the Project in Albany County, New York, Berkshire and Hampden Counties, Massachusetts and Hartford County, Connecticut. The proposed Project involves the construction of two sections of new 36-inch pipeline looping totaling 1.4 miles in New York and 3.8 miles in Massachusetts, and one section of new 24-inch pipeline looping totaling 8.1 miles in Massachusetts and Connecticut. To the extent that it is practicable, feasible, and in compliance with existing law, Tennessee proposes to locate the pipeline loops within or adjacent to the right-of-way ("ROW") associated with its existing pipelines designated as the 200 and 300 Lines. Tennessee proposes to begin construction of the Project facilities in 2015 and to place the facilities in-service by November 2016.

DESIGN CRITERIA AND METHODOLOGY

In order to reduce runoff velocity and effect deposition of transported sediment load, both standard and reinforced silt fencing has been specified for use in the Massachusetts portion of the Tennessee Pipeline Construction areas.

As per Massachusetts Guideline of Erosion and Sediment Control for Urban and Suburban Areas (May 2003, pages 146-151), the design recommendations for 20" reinforced silt fence are as follows:

1. Depth

Depth of impounded water should not exceed 1.5 feet at any point

2. Drainage area

Limited to ¼ acre per 100 ft of fence, and no more than 1.5 acres in total; or in combination with a sediment basin on a larger site. Area is further restricted by slope steepness as shown in the following table:

Slope Steepness	Slope Steepness (%)	Maximum Slope Length (ft)
	30	30
5:1 or flatter	20	50
	10	100
	5	180
	2	250

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3. Location

Locate the fence at least 10 feet from the toe of steep slopes to provide sediment storage and access for cleanout The fence line should be nearly level through most of its length to impound a broad, temporary pool. The last 10 to 20 feet at each end of the fence should be swung slightly uphill (approximately 0.5 feet in elevation)to provide storage capacity.

As there are no Massachusetts State standards for silt fence specification where either maximum slope steepness or slope length is exceeded (as in noted in the above table), Tennessee specifies the use of reinforced silt fence and super silt fence with the following maximum allowable slope length (see standard environmental details at the end of this document):

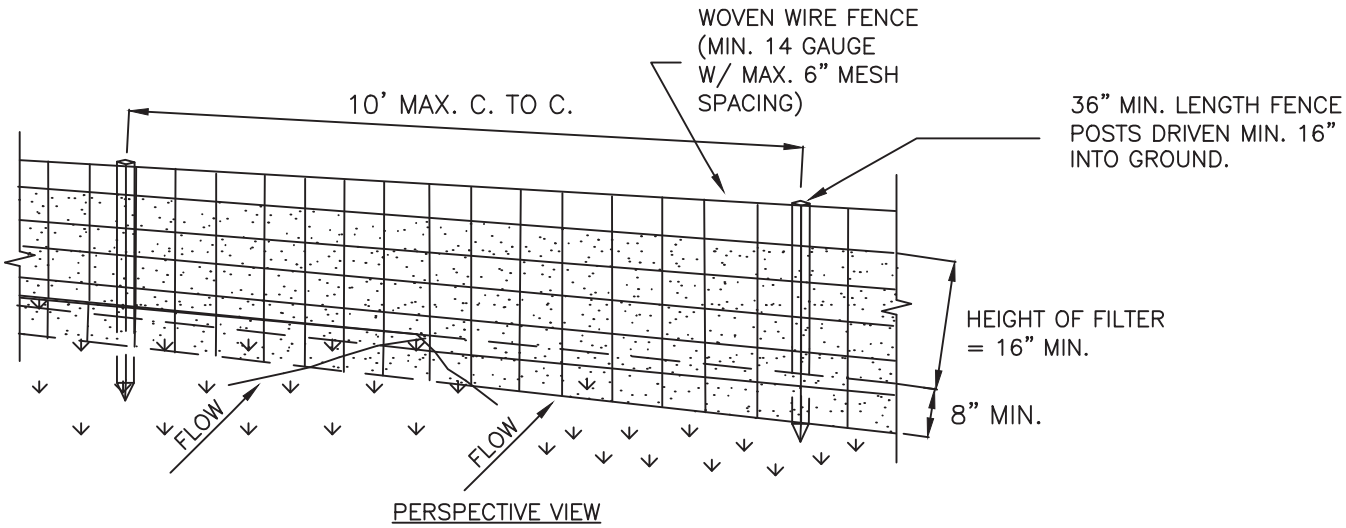
Maximum Slope Length (ft) Above Fence [1]		
Slope Steepness	**Slope Percent (%)**	**Super Silt Fence**
2:1	50	50
-	45	60
-	40	75
-	35	85
-	30	100
4:1	25	135
5:1	20	275
-	15	215
10:1	10	325
20:1	5	500
50:1	2	1000

[1]This table is based on the table 4.4 Maximum Slope Length for Silt Fence of the PA DEP Erosion and Sediment Pollution Control Manual, 2012, page 76

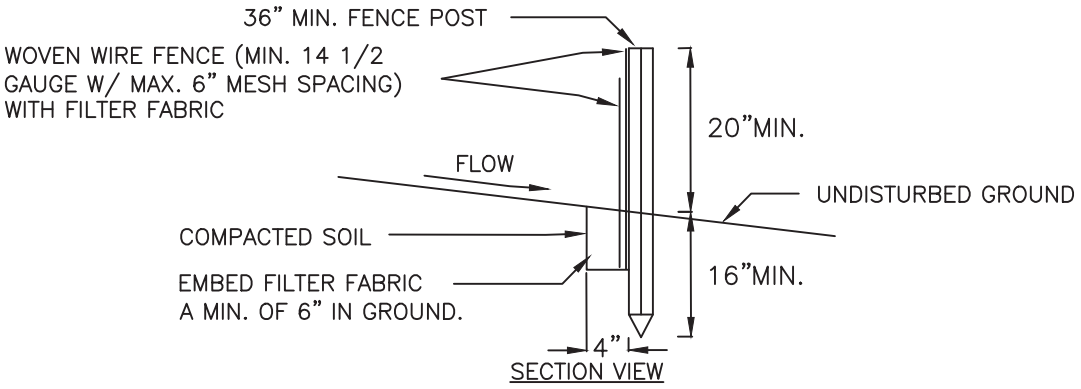
Locations where reinforced silt barrier slope steepness or slope length are exceeded (as noted in the above table), Tennessee will be utilizing a swale to intercept runoff up gradient of the construction areas, sized appropriately to either transfer flow to a nearby waterbody, if appropriate or directed via storm drainage pipe through the construction area and outletting in a preferred down gradient location.

Finally, Silt fence materials will be according to specifications as noted in the Best Management Practices (BMPs) for Construction Activities in Massachusetts.

SEDIMENT BARRIER TYPE AND LOCATION - MASSACHUSETTS ACCESS ROADS										
ACCESS ROAD TYPE AND NAME	SEDIEMNT BARRIER LOCATION (STA. TO STA.)	Length of Barrier (FT)	SEDIMENT BARRIER TYPE	ACTUAL SLOPE PERCENT ABOVE BARRIER (%)	ACTUAL SLOPE LENGTH ABOVE BARRIER (FT)	ALLOWABLE SLOPE LENGTH ABOVE BARRIER (FT)	REMAINING SLOPE LENGTH (FT)	PERCENTAGE OF SLOPE LENGTH REMAINING	RESULT	Comments
			-	-					-	
MA PAR-1	**1+00-3+35**	**235**	20 INCH SILT FENCE	2	10	100	90	90%	OK	Right of Baseline
MA TAR-2	**1+00-4+80**	**380**	SUPER SILT FENCE	8	110	325	215	66%	OK	
MA TAR-3	**1+50-4+00**	**250**	SUPER SILT FENCE	8	260	325	65	20%	OK	Equipmentt Pull Off Area, Rt of Baseline
	1+00-5+75	**475**	20 INCH SILT FENCE	2	10	100	90	90%	OK	Left of Baseline
	5+75-6+50	**75**	20 INCH SILT FENCE	2	80	100	20	20%	OK	Equipment Pull Off Area, Lt of Baseline
	6+50-7+50	**100**	20 INCH SILT FENCE	1	95	100	5	5%	OK	Equipment Pull Off Area, Lt of Baseline
	4+00-10+70	**670**	SUPER SILT FENCE	25	120	135	15	11%	OK	Right of Baseline
MA PAR-4	**1+00-2+80**	**180**	SUPER SILT FENCE	2	710	1000	290	29%	OK	Left of Baseline
MA PAR-4	**1+00-2+80**	**180**	SUPER SILT FENCE	2	10	1000	990	99%	OK	Right of Baseline
MA PAR-5	**1+00-7+70**	**670**	20 INCH SILT FENCE	2	20	100	80	80%	OK	Right of Baseline
MA PAR-5A	**10+50-11+50**	**100**	SUPER SILT FENCE	10	290	325	35	11%	OK	Left of Baseline
									-	
MA PIPEYARD	**-**	**1900**	SUPER SILT FENCE	4	480	500	20	4%	OK	
									-	
									-	



PERSPECTIVE VIEW



SECTION VIEW

CONSTRUCTION SPECIFICATIONS

1. WOVEN WIRE FENCE TO BE FASTENED SECURELY TO FENCE POSTS WITH WIRE TIES OR STAPLES. POSTS SHALL BE STEEL EITHER "T" OR "U" TYPE OR HARDWOOD.
2. FILTER CLOTH TO BE TO BE FASTENED SECURELY TO WOVEN WIRE FENCE WITH TIES SPACED EVERY 24" AT TOP AND MID SECTION. FENCE SHALL BE WOVEN WIRE, 14 GAUGE, 6" MAXIMUM MESH OPENING.
3. WHEN TWO SECTIONS OF FILTER FABRIC ADJOIN EACH OTHER THEY SHALL BE OVER–LAPPED BY SIX INCHES AND FOLDED. FILTER FABRIC SHALL BE EITHER FILTER X, MIRAFI 100X, STABILINKA T140N, OR APPROVED EQUIVALENT.
4. PREFABRICATED UNITS SHALL BE GEOFAB, ENVIROFENCE, OR APPROVED EQUIVALENT.
5. MAINTENANCE SHALL BE PERFORMED AS NEEDED AND MATERIAL REMOVED WHEN "BULGES" DEVELOP IN THE SILT FENCE.
6. MAXIMUM DRAINAGE AREA FOR OVERLAND FLOW TO A SILT FENCE SHALL NOT EXCEED 1/4 ACRE PER 100 FEET OF FENCE.
7. MAXIMUM ALLOWABLE SLOPE LENGTHS CONTRIBUTING RUNOFF TO SILT FENCE PLACED ON A SLOPE ARE AS FOLLOWS:

SLOPE STEEPNESS	MAXIMUM LENGTH (FT)
2:1	25
3:1	50
4:1	75
5:1 OR GREATER	100

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:		Op. Area:	
St.:		Co./Par.:	
Section:	Township:	Range:	
Dft:	Date:	Project ID:	
Chk:	Date:	Scale:	
Appr:	Date:	Filename:	

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
REINFORCED SILT FENCE

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

FIG. NO. 31

Sheet: 31 of 127
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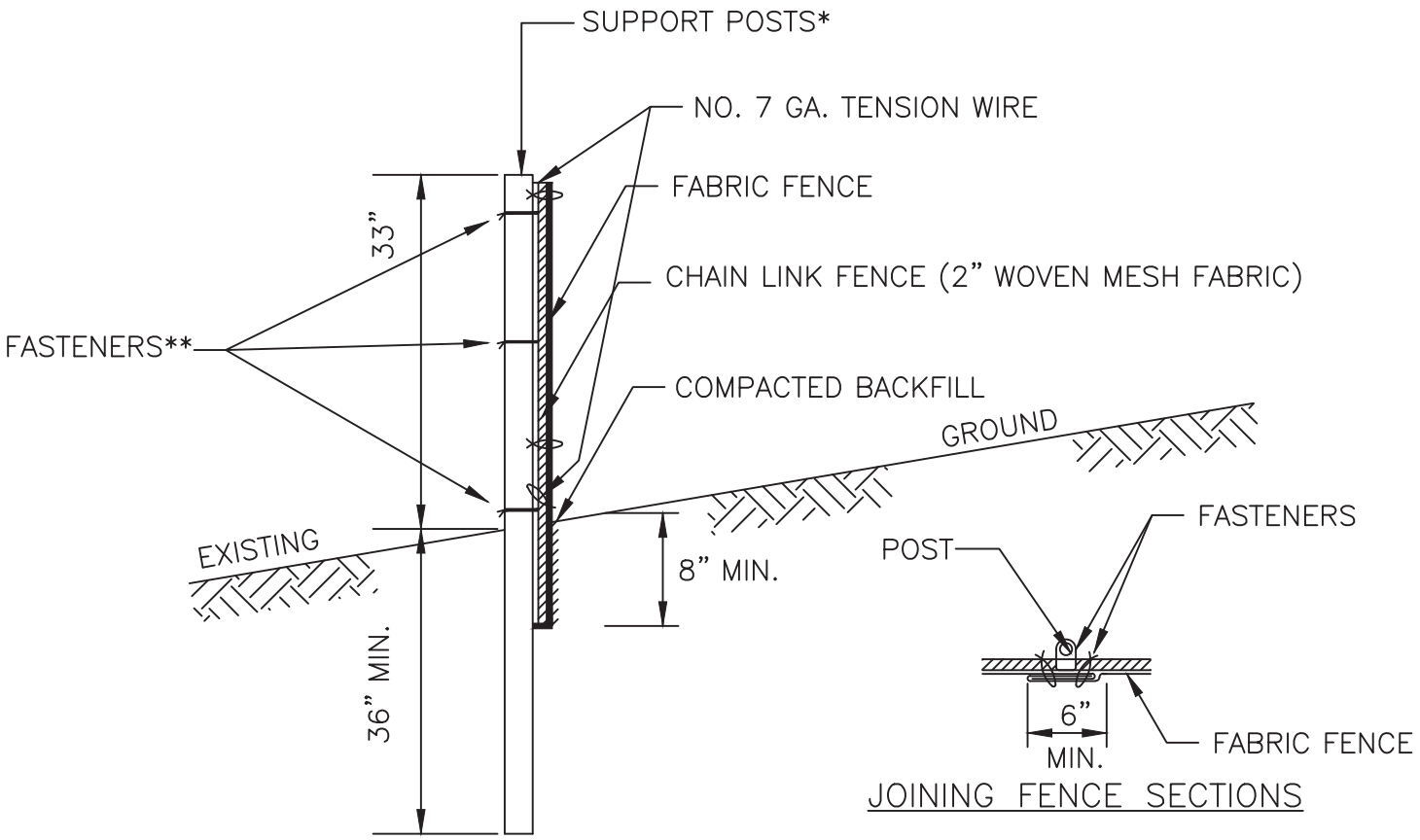
STANDARD CONSTRUCTION DETAIL #22
Super Filter Fabric Fence



* POSTS SPACED @ 10' MAX. USE 2 1/2" DIA. GALVANIZED OR ALUMINUM POSTS.

** CHAIN LINK TO POST FASTENERS SPACED @ 14" MAX. USE NO. 6 GA. ALUMINUM WIRE OR NO. 9 GALVANIZED STEEL PRE-FORMED CLIPS. CHAIN LINK TO TENSION WIRE FASTENERS SPACED @ 60" MAX. USE NO. 10 GA. GALVANIZED STEEL WIRE. FABRIC TO CHAIN FASTENERS SPACED @ 24" MAX. C TO C.

NO. 7 GA. TENSION WIRE INSTALLED HORIZONTALLY AT TOP AND BOTTOM OF CHAIN-LINK FENCE.

FILTER FABRIC FENCE MUST BE PLACED AT EXISTING LEVEL GRADE. BOTH ENDS OF THE BARRIER MUST BE EXTENDED AT LEAST 8 FEET UPSLOPE AT 45 DEGREES TO THE MAIN BARRIER ALIGNMENT.

SEDIMENT MUST BE REMOVED WHEN ACCUMULATIONS REACH 1/2 THE ABOVE GROUND HEIGHT OF THE FENCE.

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft:	Date:	Project ID:
Chk:	Date:	Scale:
Appr:	Date:	Filename:

TENNESSEE GAS PIPELINE, LLC.
STANDARD ENVIRONMENTAL DETAIL
CONNECTICUT EXPANSION PROJECT
SUPER SILT FENCE (1)

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

FIG. NO. 32

Sheet: 32 of 127

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APPENDIX E

Access Road Hydraulic Report

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TENNESSEE GAS PIPELINE COMPANY, L.L.C.



HYDROLOGIC AND HYDRAULIC CALCULATIONS FOR ACCESS ROADS ALONG THE

CONNECTICUT PIPELINE EXPANSION PROJECT

MASSACHUSETTS LOOP

Submitted by:

Tennessee Gas Pipeline Company, L.L.C.
1001 Louisiana St, Suite 1000
Houston, TX 77002

JULY 2014

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INTRODUCTION

The attached hydrologic and hydraulic calculations were performed for all field surveyed waterbodies crossed by the Connecticut Pipeline Extension (Project) Berkshire County in Massachusetts. The Project would consist of installing approximately 13.3 miles of pipeline looping: 1.4 Miles of 36-inch Pipeline Loop in Albany County, New York ("NY Loop") 3.8 Miles of 36-inch Pipeline Loop in Berkshire County, Massachusetts ("MA Loop"). 8.15 Miles of 24-inch Pipeline Loop in Hampden County, Massachusetts and Hartford County, Connecticut ("CT Loop)".

The primary objective of the attached calculations was to evaluated the amount of runoff due to the construction of permanent access roadways to the pipeline, and to size flume pipes at each waterbody crossing to convey, at a minimum, normal flow safely under the access roads. A typical flume installation will consist of sand bag cofferdams placed at the upstream and downstream limits of the construction workspace and the installation of the pipe specified in the design.

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DESIGN CRITERIA AND METHODOLOGY

The following design criteria and methodology was used to perform the calculations:

1. **Hydrologic Methodology**

Hydrologic calculations were performed using a combination of the Rational Method, the NRCS (SCS) Peak Flow Method, USGS StreamStats, and USGS StreamStats with HydroCAD v.10.0. The specific method used to calculate the design flows for each waterbody varied based on parameters such as the watershed size, waterbody slope, basin elevation, and ground cover type (e.g. pasture, forest, urban).

a. Rational Method: Q=CIA

- Q = flow (cubic feet per second - cfs)
  C = runoff coefficient
  A = drainage area (acres – ac)
  I = rainfall intensity (inches per hour – in/hr)
- This method was used for drainage areas up to 50 acres in size
- NOAA Technical Memorandum NWS Hydro-35 was used to determine "I" in the Massachusetts County of Berkshire.
- The following Runoff Coefficients were used:

Cover Type	Slope Range (%)	Hydrologic Soil Group*	Runoff Coefficient
Pasture	0% - 6%	D	0.20
Forest	0% – 20 %	D	0.32
Forest	> 20 %	D	0.38

*Hydrologic Soil Group D was used for a conservative approach.

- Time of Concentrations were calculated using the following:
  - **Sheet Flow:**
    Manning's Kinematic Solution
    Maximum (max) sheet flow length of 150ft

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- **Shallow Concentrated Flow**
  The travel time for shallow concentrated flow was calculated by dividing the travel path length by a calculated velocity. The velocity for specific cover types were calculated using Manning's equation.

- **Channel Flow**
  As upstream channel morphology is not constant, the travel time for Channel flow was calculated by assuming a channel velocity of 15.00 ft/s and applying it to the shallow concentrated flow formula.

b. NRCS (SCS) Peak Flow Method:

The computer program HydroCAD, Version 10.0, was used to determine the peak flow discharges for the watershed. HydroCAD is a program which employs TR-20 methodology which uses the unit-hydrograph runoff procedure. As with TR-20, the HydroCAD peak flow discharges are dependent upon parameters such as watershed size, the curve number for a given watershed, time of concentration, available flood storage, rainfall storm type, rainfall intensity and storm duration.

- This method was used for drainage areas over acres and up to 960 acres (1.5 square miles) in size.
- The following curve numbers were used:

Cover Type	Hydrologic Soil Group*	Curve Number (CN)
Woods	B	55
Woods	C	70
Woods	D	66
Brush	D	79
Urban	D	98

- The depths were used in conjunction with a 24-hour storm duration.
- The Time of Concentration was calculated using the same methodology used for the Rational Method.

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c. USGS StreamStats for Massachusetts

StreamStats is a Web-based tool developed by the USGS and Environmental Systems Research Institute, Inc. (ESRI). This map-based Web application was designed to make it easy for users to obtain stream flow statistics, drainage-basin characteristics, and other information for user-selected sites. StreamStats utilizes previously published information from gaging stations and previously gathered basin characteristics to develop stream flow statistics utilizing the appropriate regression equations to compute the stream flows. The StreamStats flows will only be utilized where the drainage area falls within the acceptable ranges for Mean/Base-Flow or for Peak Flow. Drainage areas outside the acceptable ranges generate flows that are based on extrapolations with unknown errors.

d. Design Frequency:

The design frequency utilized in the design varied based on the U.S. Weather Bureau Technical Paper 40. A 2-year design, a 5-year, and a 10-year maximum design storm were utilized for all watershed classifications. Average daily flow calculations were also performed for larger watersheds where the 2- and 5-year storms resulted in flows that cannot be completely passed within the designed pipes and it is unlikely that a 2-year or 5-year storm event will occur during the crossing.

2. Hydraulic Calculations

The temporary flume pipes were sized using the Federal Highway Administration (FHWA) HY-8 computer program. HY-8 is a culvert analysis program that automates the design methods described in HDS No. 5, “Hydraulic Design of Highway Culverts”.

3. Summary and Results

The post construction hydrology of the access road areas are not significantly altered by the construction of the access roadways. The flows, summarized in the table below, are not significantly higher due to the construction of the access roadways and will not negatively impact the surrounding areas. See attached table on the next page, for flume pipe and stream crossing details.

MA PAR-01

	Pre-Development Flow (cfs)	Post-Development Flow (cfs)	Difference (cfs)	Difference (%)
2-Year	0.58	0.66	0.08	13.8
5-Year	0.72	0.81	0.09	12.5
10-Year	0.85	0.96	0.11	12.9

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MA PAR-04

	Pre-Development Flow (cfs)	Post-Development Flow (cfs)	Difference (cfs)	Difference (%)
2-Year	0.30	0.32	0.02	6.7
5-Year	0.37	0.40	0.03	8.1
10-Year	0.44	0.47	0.03	6.8

MA PAR-05

	Pre-Development Flow (cfs)	Post-Development Flow (cfs)	Difference (cfs)	Difference (%)
2-Year	4.56	4.68	0.12	2.6
5-Year	5.62	5.77	0.15	2.7
10-Year	6.65	6.83	0.18	2.7

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Table X.X
Waterbodies Associated with the Connecticut Expansion Project – Massachusetts Loop

Waterbody ID	Waterbody Name (where applicable)[a]	Approximate Milepost[b]	Latitude	Longitude	Town / County	Quadrangle	Water Crossing Length[d] (feet)	Crossing Method[hi]	Pipe Size (inches)	Pipe Length (feet)	Number of Pipes	Design Flow - 2 Year Storm (CFS)	Pipe Inv. In	Pipe In. Out	Top of Coffer Dam Elevation	Comment
Waterbodies Associated with Pipeline Facilities																
SMA-14	Spectacle Pond Brook	1.9	42.1574	-73.12128	Sandisfield / Berkshire	Otis	21	II		Streamstats		732				Site Specific Design required. Contractor to provide engineer with means and methods for approval
SMA-20	Unnamed tributary to Clam River	2.92	42.1497	-73.10583	Sandisfield / Berkshire	Otis	11	II	36	80	2	52.06	1373.59	1369.26	1377.98	
Waterbodies Associated with Access Roads																
	N/A															

N/A = Not Applicable

a: Unnamed tributary: waterbody is not mapped as a tributary on available GIS datalayers; tributary name was identified based on review of USGS topographical mapping.

b: MP = milepost; MP provided for access roads indicate the point at which the access road meets the proposed pipeline.

c: P = perennial; I = intermittent

d: 0 = waterbody is not crossed but is in workspace. For minor waterbodies less than 3 feet in width delineated in the survey area and shown as a single line feature on the Project alignment sheets, an assumed 3 foot width has been used for this analysis.

e: MI = Minor (<10 feet); I = Intermediate (10 - 100 feet); MA = Major (>100 feet).

f: All surface waters in the Farmington River Basin are designated Class B, unless otherwise specified. Water quality classifications were identified through a desktop review of available GIS data layers and published literature.

g: Construction Windows for fisheries are based on MADFW state fishery classification restrictions. Potential timing restrictions reflect dates during which construction activities may occur and are subject to MADFW review. Tennessee will adhere to the MADFW fishery timing restriction during construction; state fishery timing restrictions are designed by the state to protect the resources during the time period that the state has determined is critical.

h: I = Conventional, Wet Crossing Method; II = Dry Crossing Method including Flume and Dam and Pump. Intermittent streams containing discernable flow at the time of construction will be crossed using a dry crossing method.

i: Tennessee will implement a dry-crossing construction technique on all waterbody crossings with discernable flow at the time of construction unless an alternative crossing method is approved by MADEP and the USACE.

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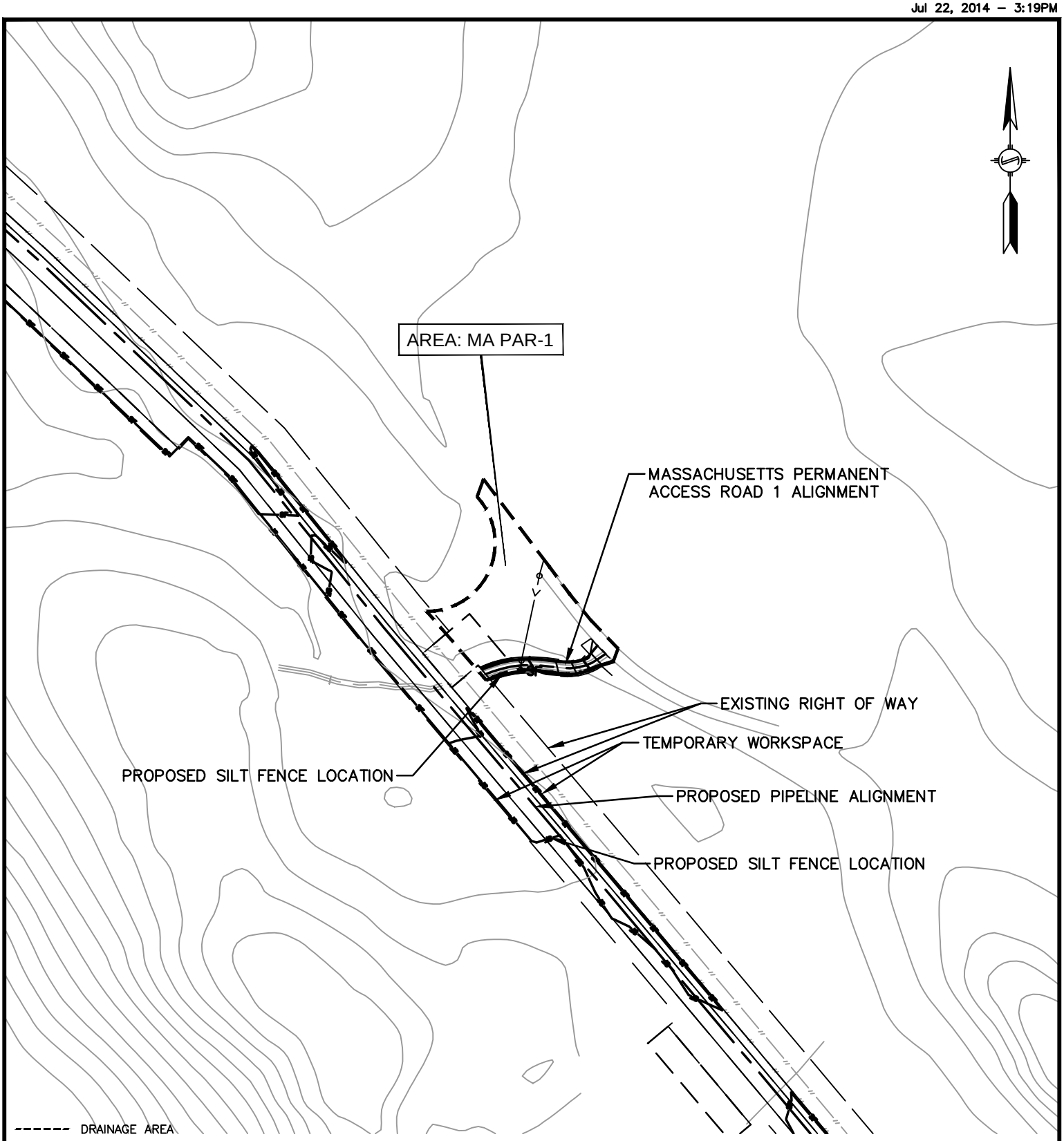

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:		Op. Area:	
St.: MASSACHUSETTS		Co./Par.:	
Section:	Township: SANDISFIELD	Range:	
Dft: JMS	Date: 07/08/14	Project ID:	
Chk: RG	Date: 7/21/14	Scale:	
Appr: –	Date: –	Filename:	

CONNECTICUT EXPANSION
MASSACHUSETTS LOOP
PROPOSED NATURAL GAS PIPELINE
TOWN OF SANDISFIELD
BERKSHIRE COUNTY, MASSACHUSETTS

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

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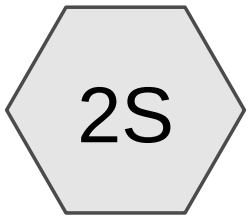
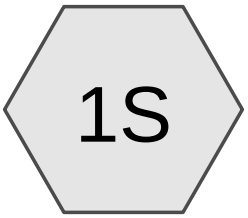


MA PAR-1 PRE



MA PAR-1 POST

Subcat Reach Pond Link

Routing Diagram for C-ENG-14C4781MA-PAR01
Prepared by BL Companies, Printed 7/20/2014
HydroCAD® 10.00 s/n 01334 © 2013 HydroCAD Software Solutions LLC

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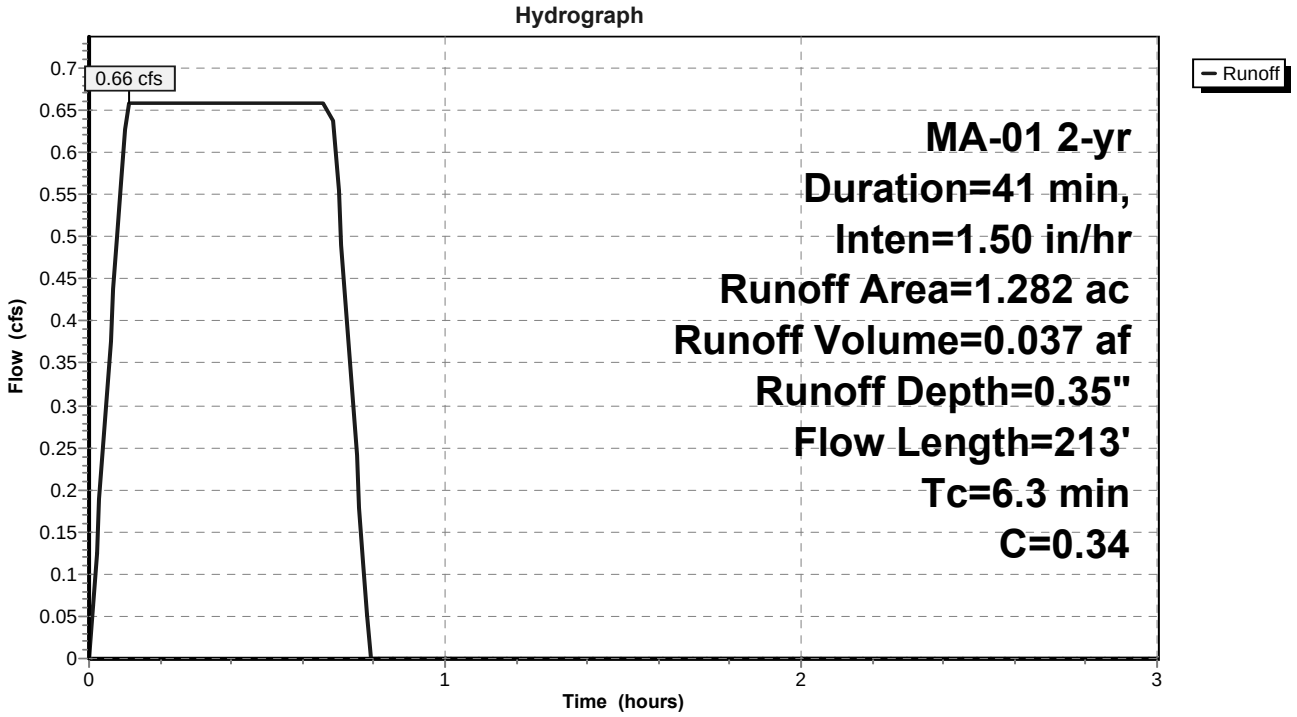
Subcatchment 1S: MA PAR-1 POST



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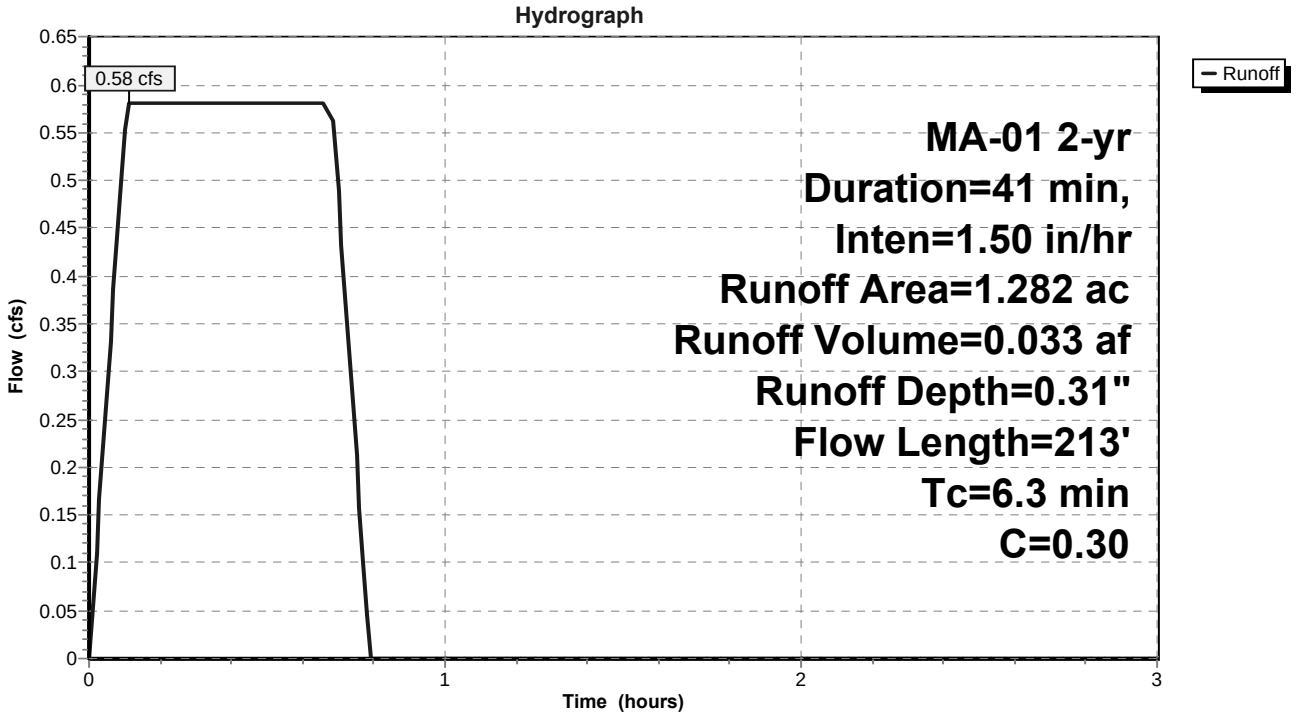
Subcatchment 2S: MA PAR-1 PRE



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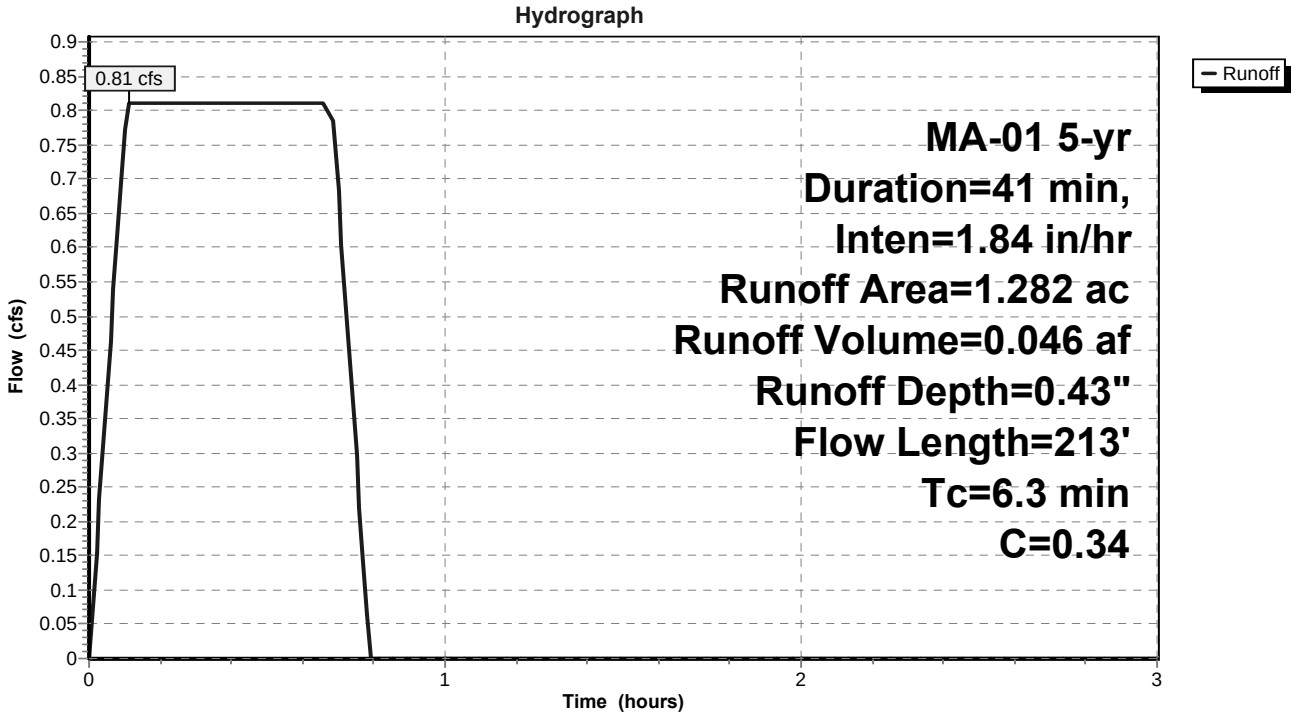

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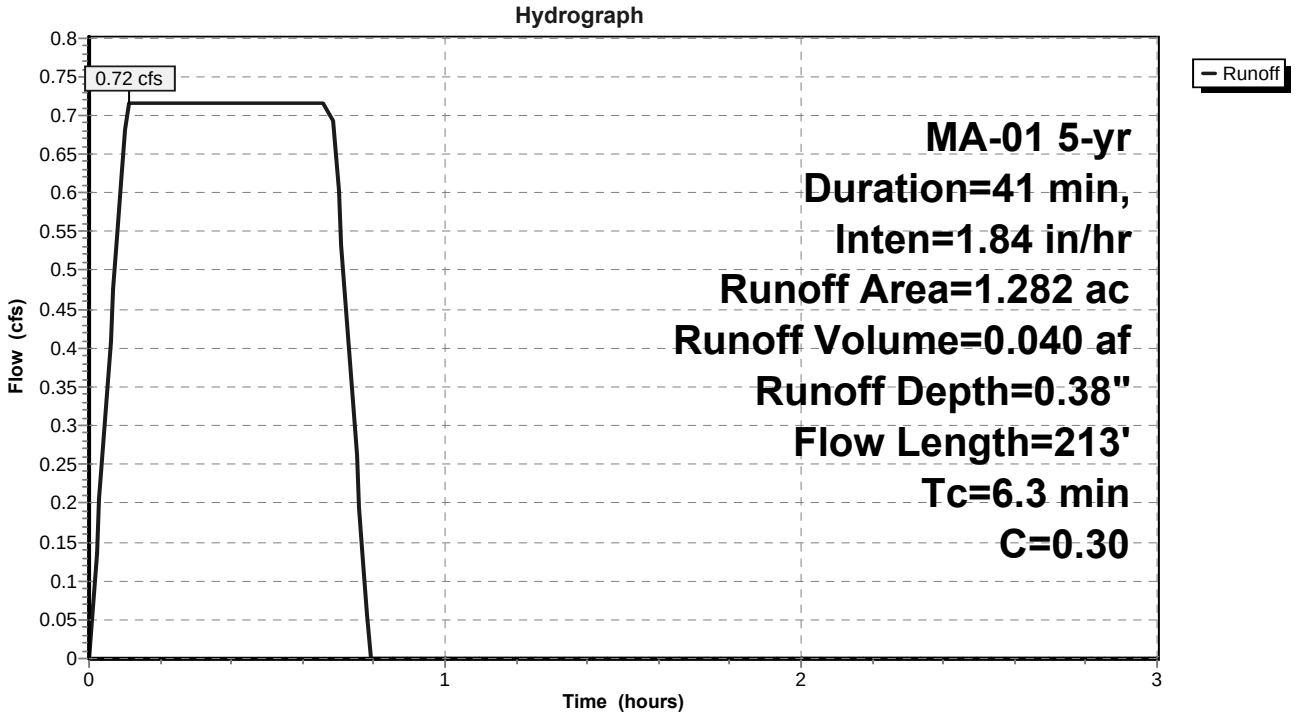
Subcatchment 2S: MA PAR-1 PRE



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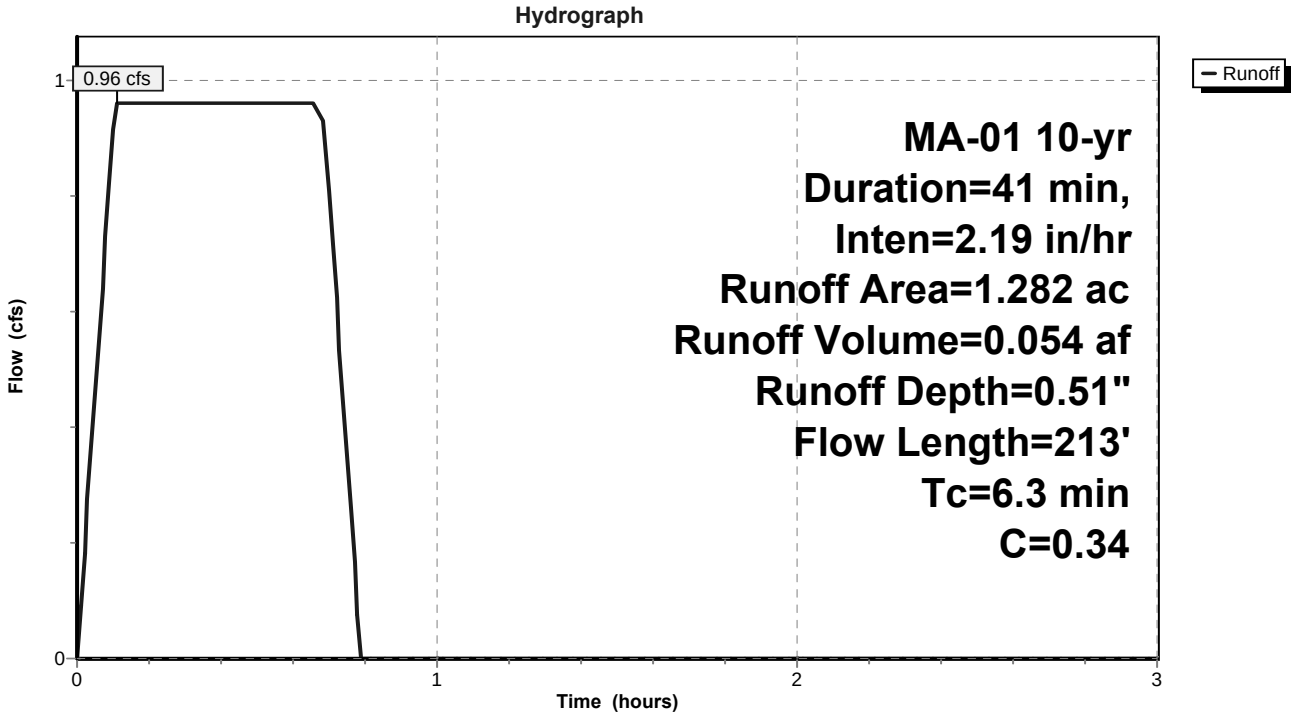

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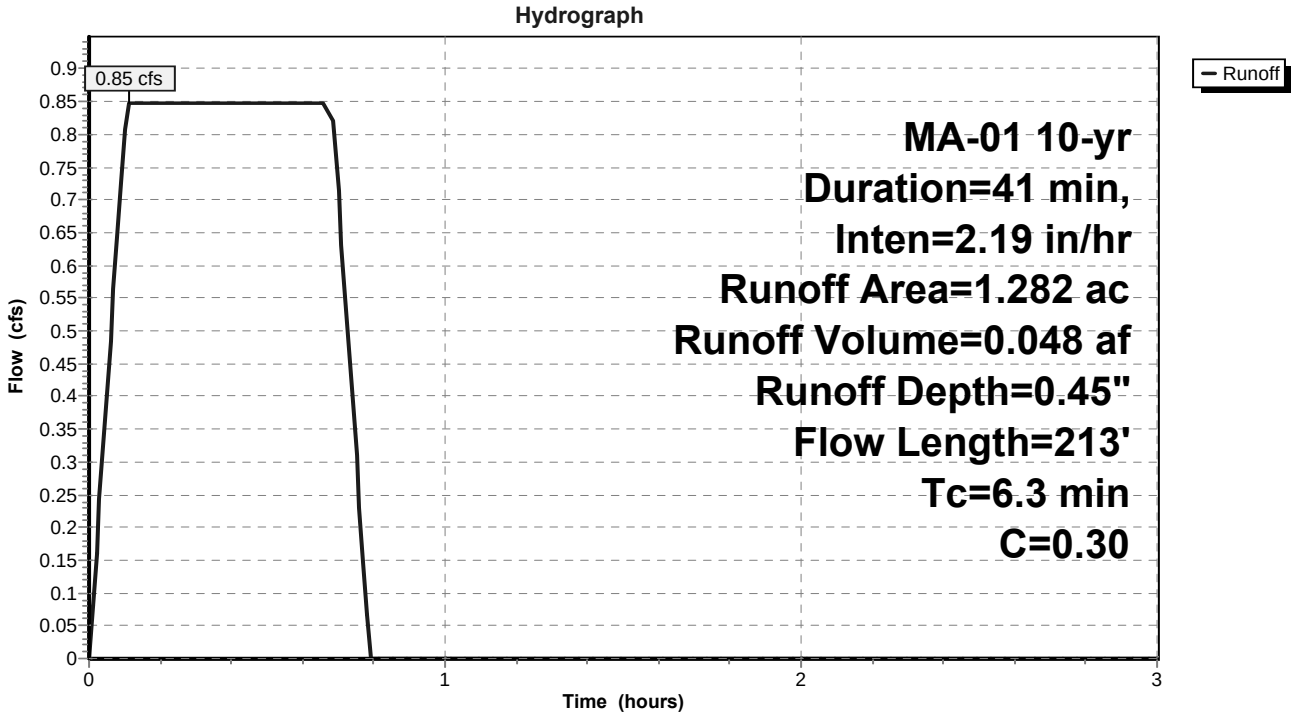

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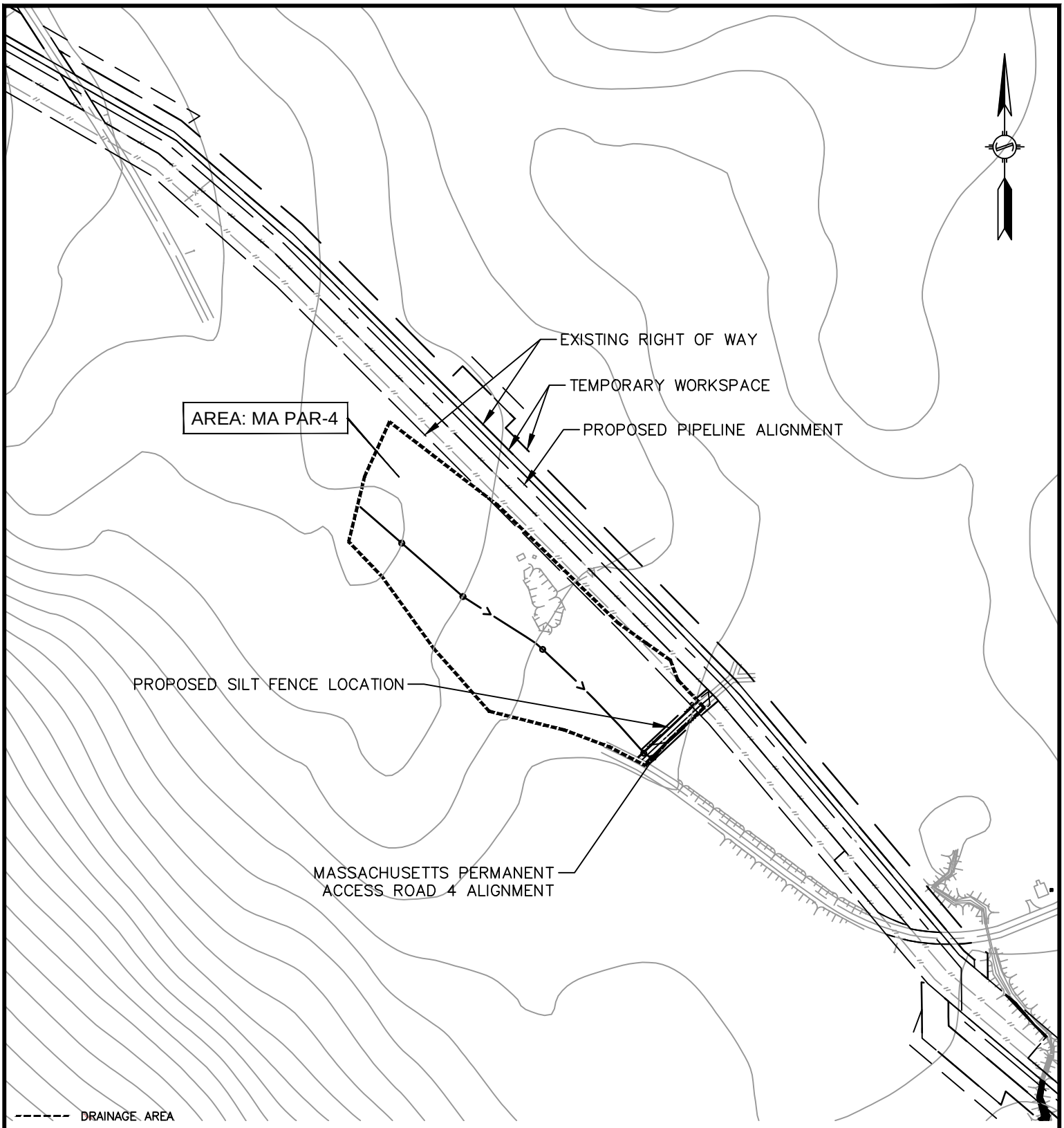

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:	Op. Area:	
St.:	Co./Par.:	
Section:	Township:	Range:
Dft: JMS	Date: 07/08/14	Project ID:
Chk: –	Date: –	Scale:
Appr: –	Date: –	Filename:

CONNECTICUT EXPANSION
MASSACHUSETTS LOOP
PROPOSED NATURAL GAS PIPELINE
TOWN OF SANDISFIELD
BERKSHIRE COUNTY, MASSACHUSETTS

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

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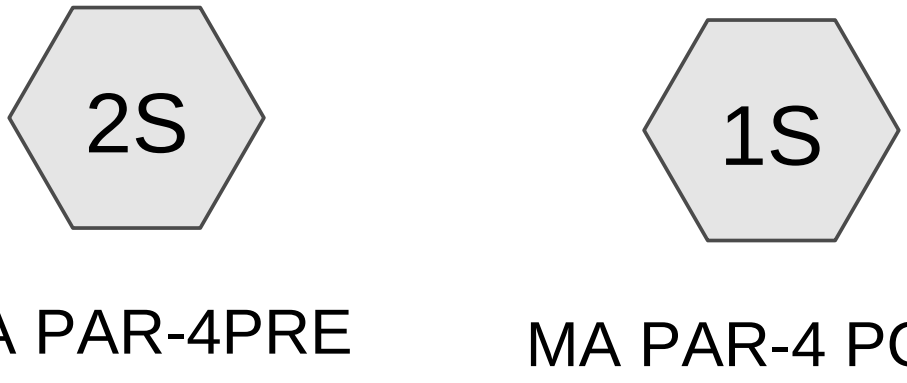

Subcat Reach Pond Link

Routing Diagram for C-ENG-14C4781MA-PAR04
Prepared by BL Companies, Printed 7/22/2014
HydroCAD® 10.00 s/n 01334 © 2013 HydroCAD Software Solutions LLC

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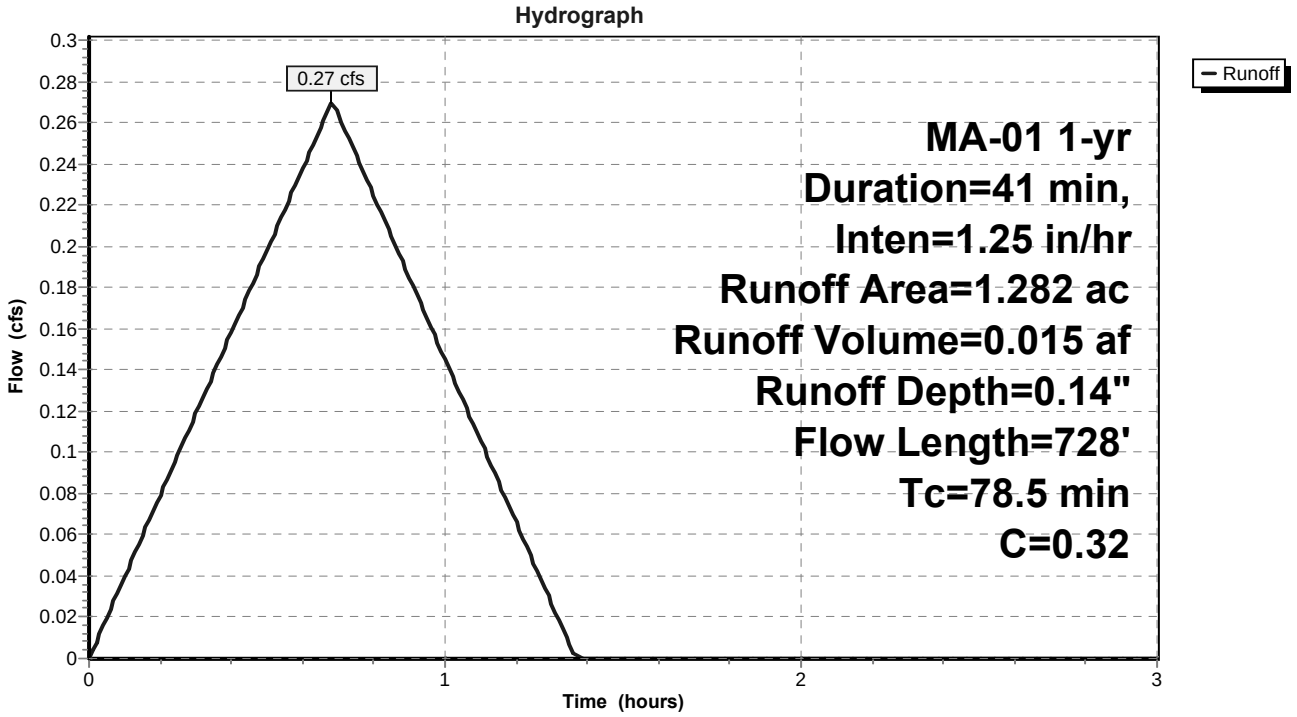

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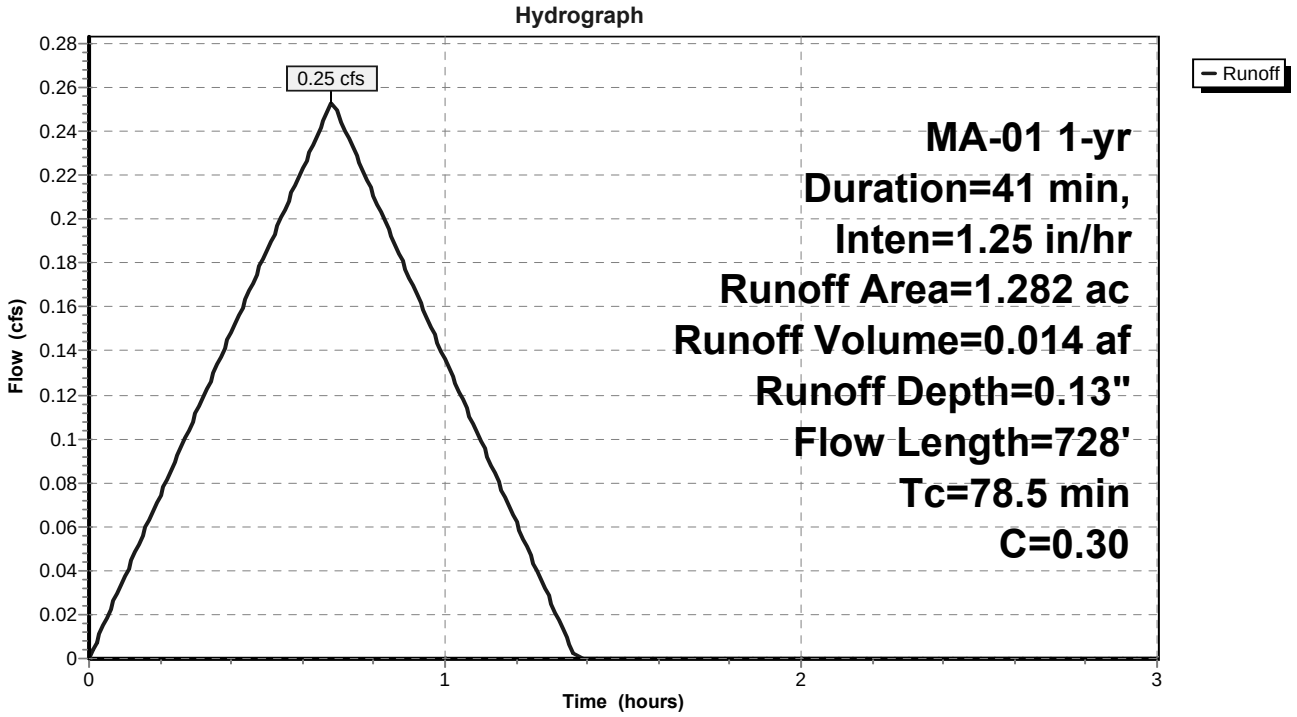

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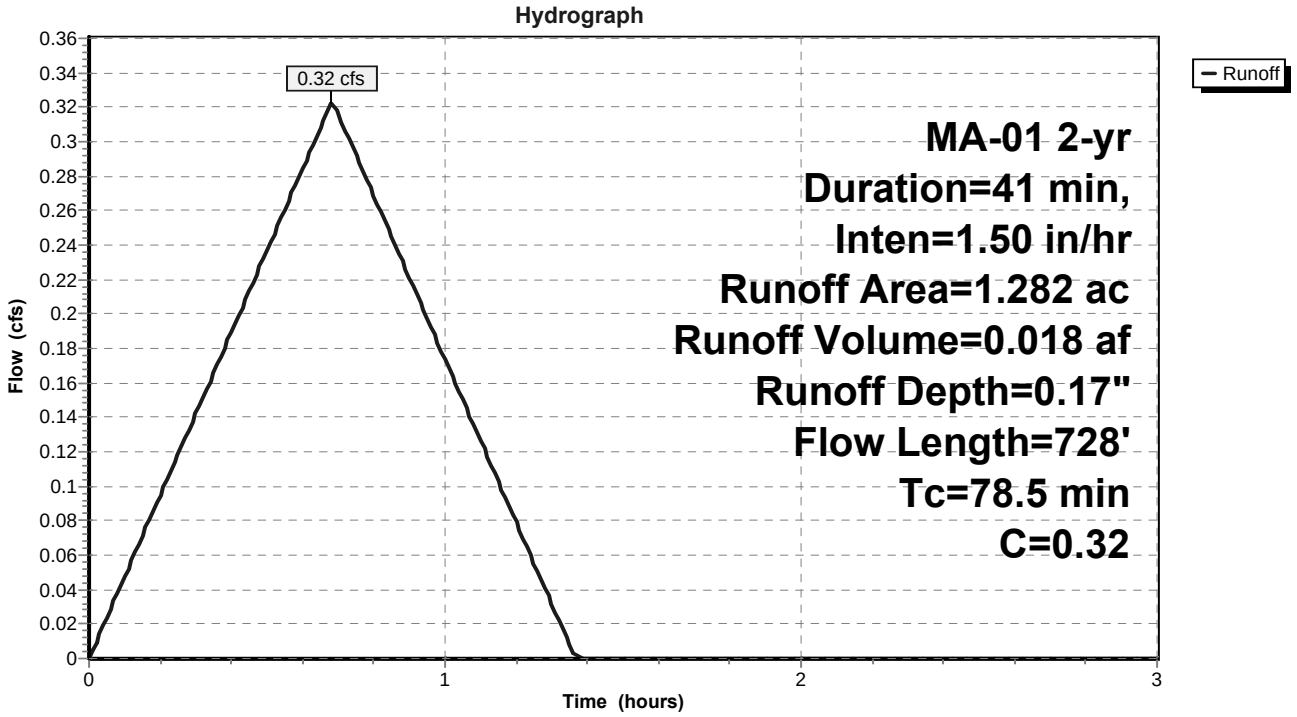

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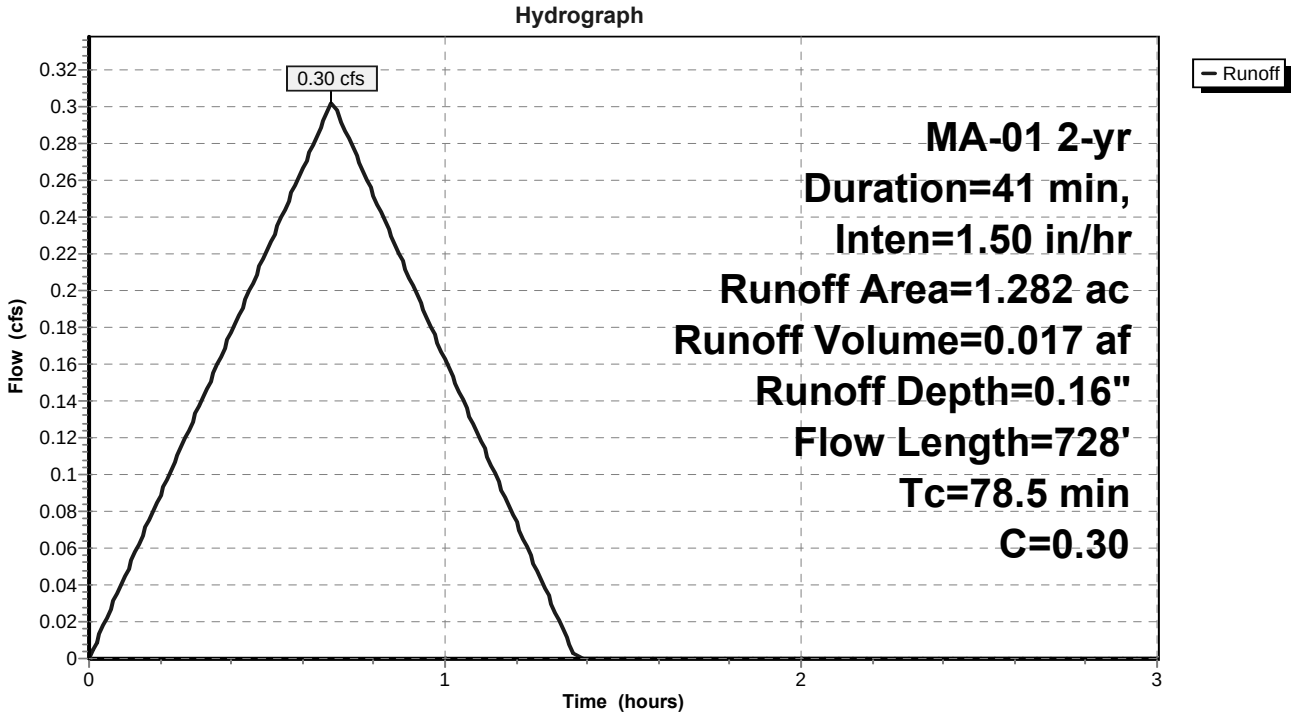

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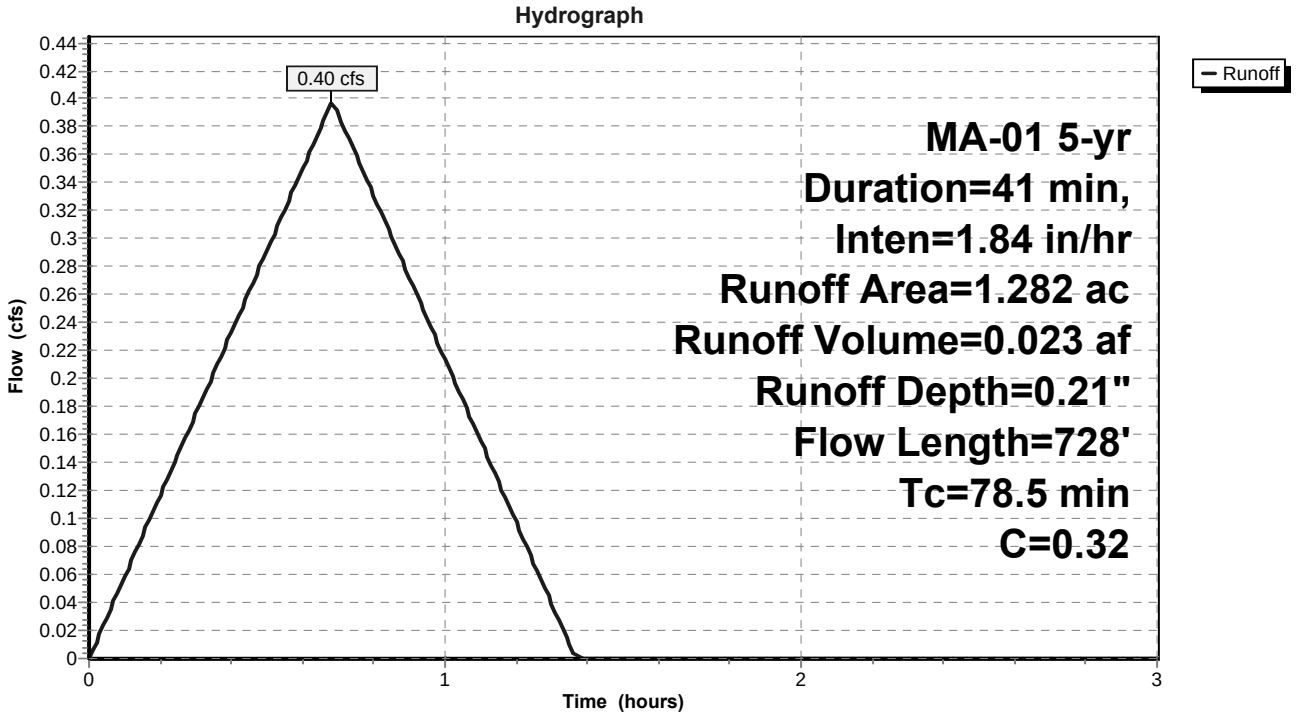

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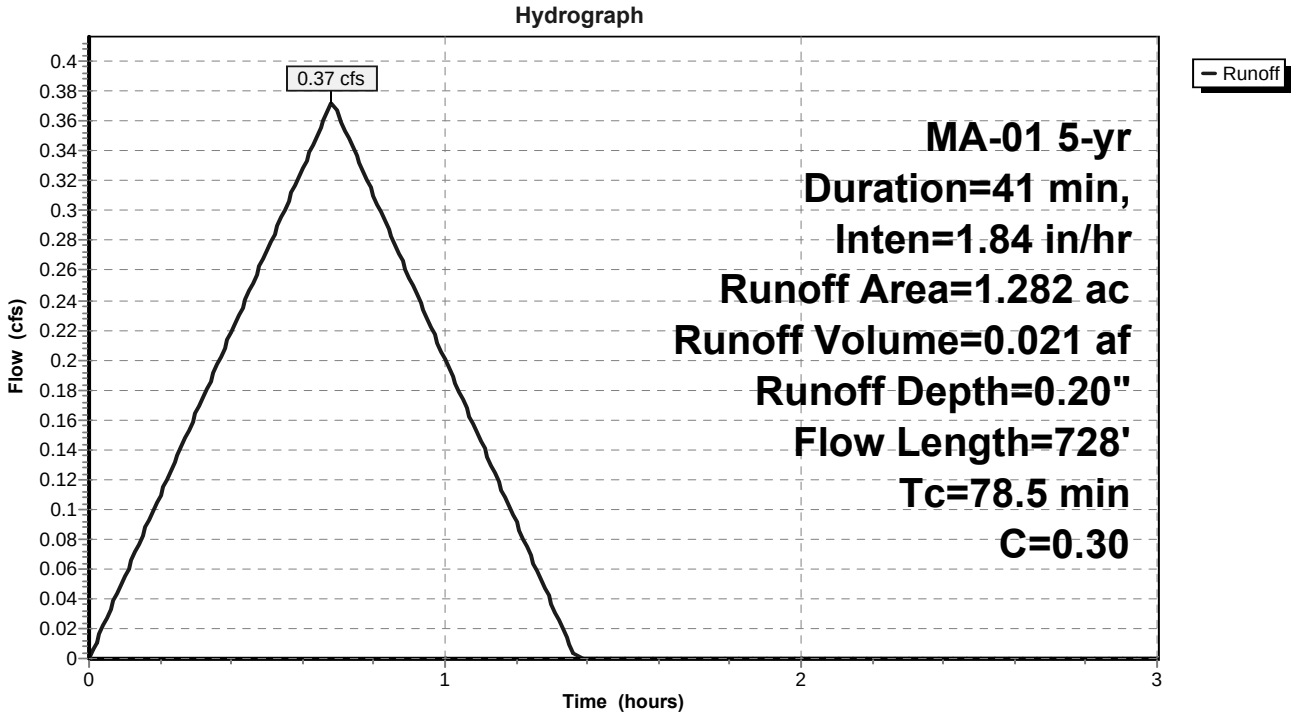

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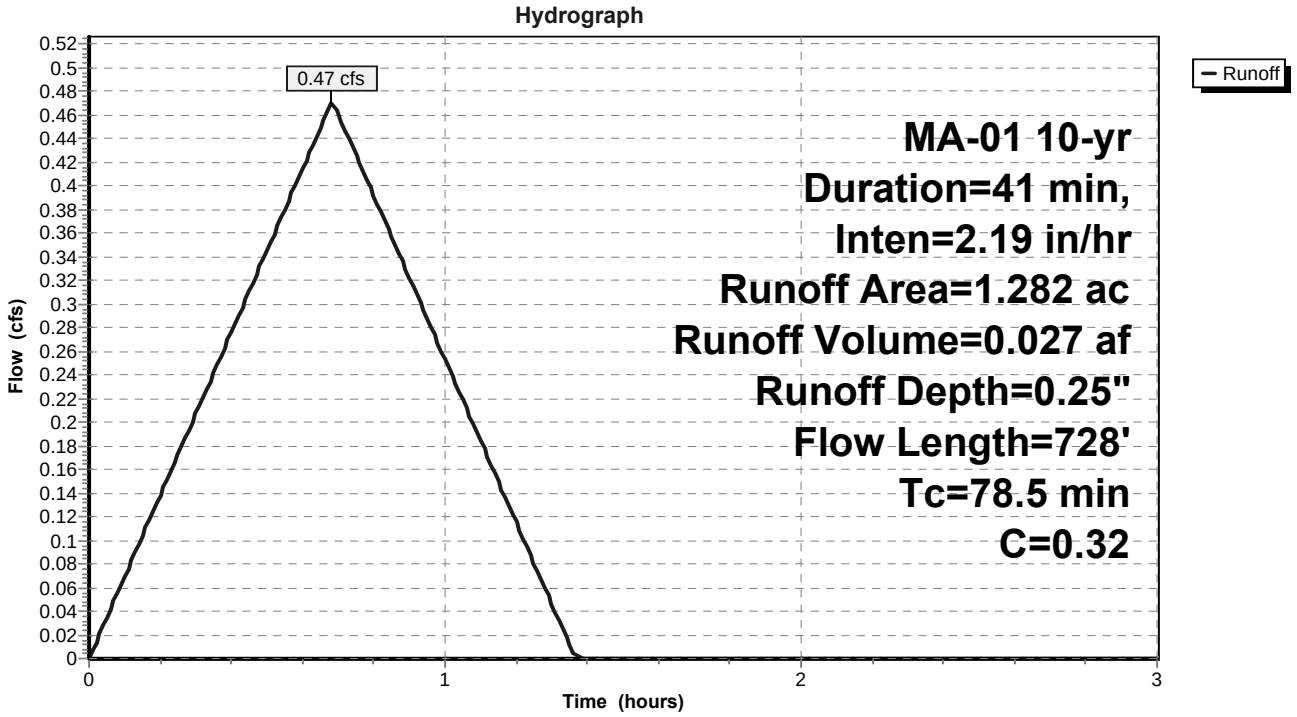

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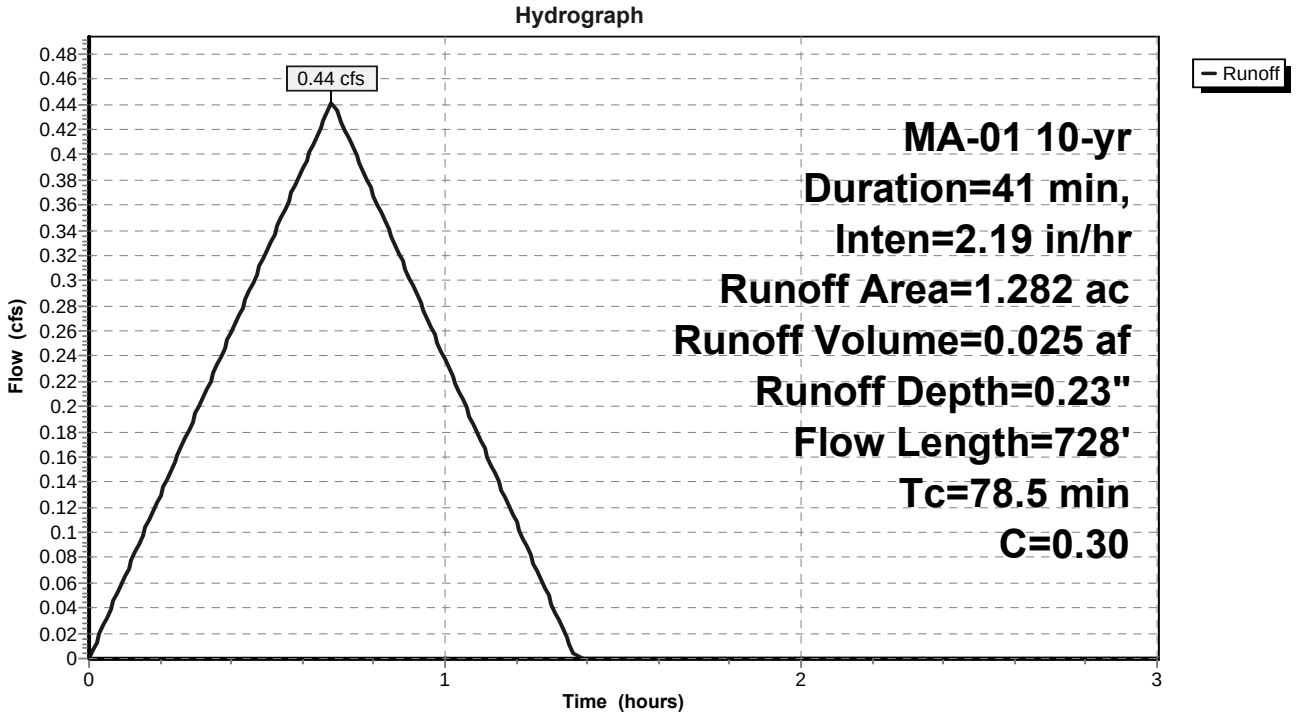

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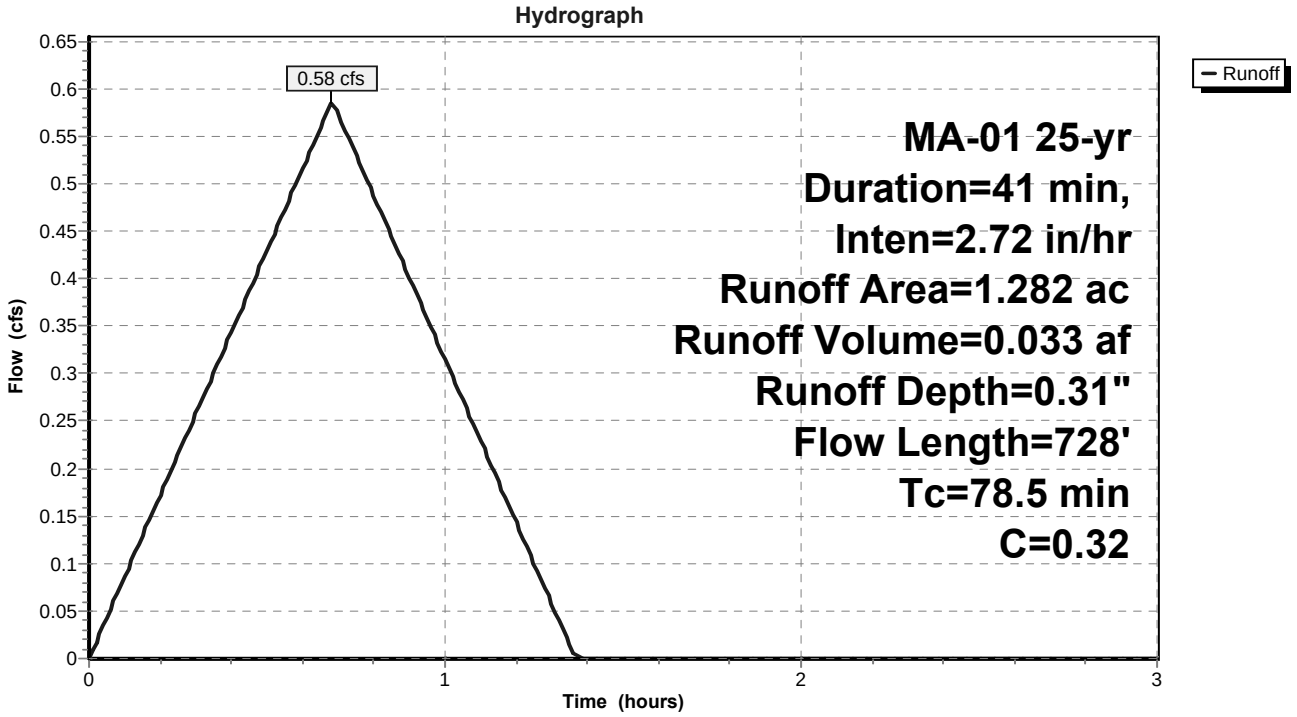

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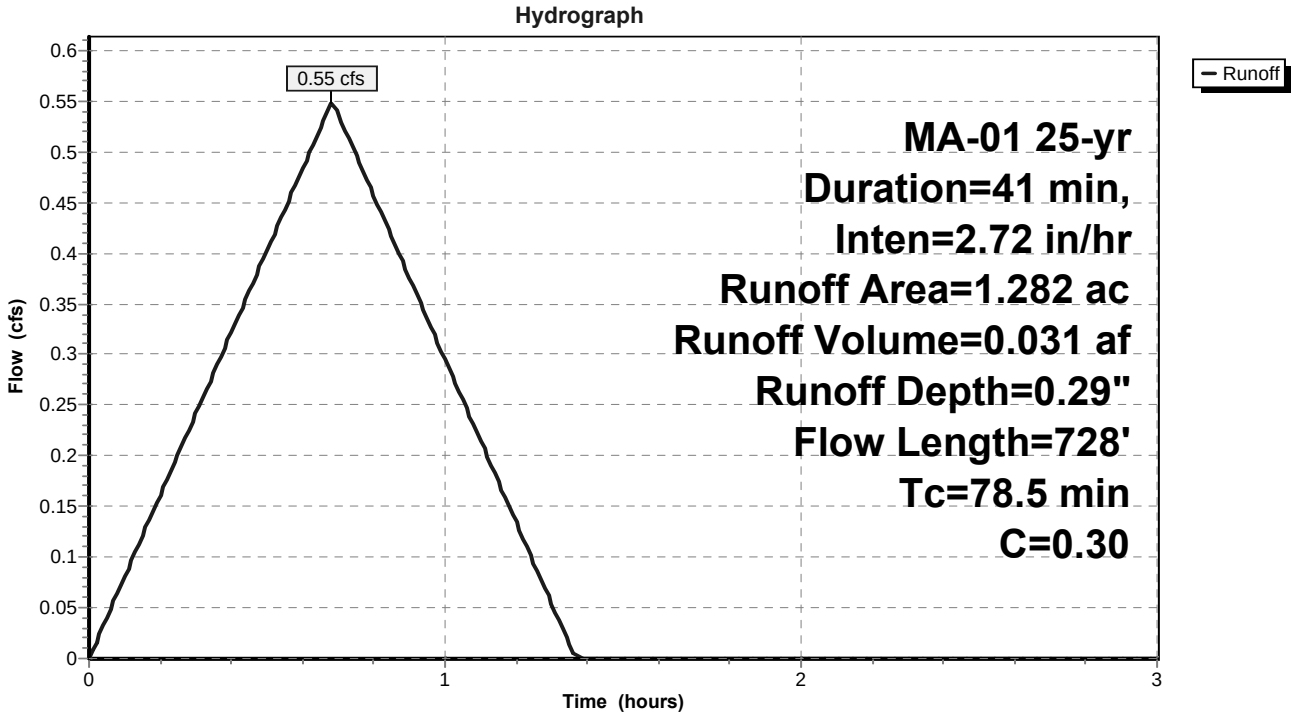

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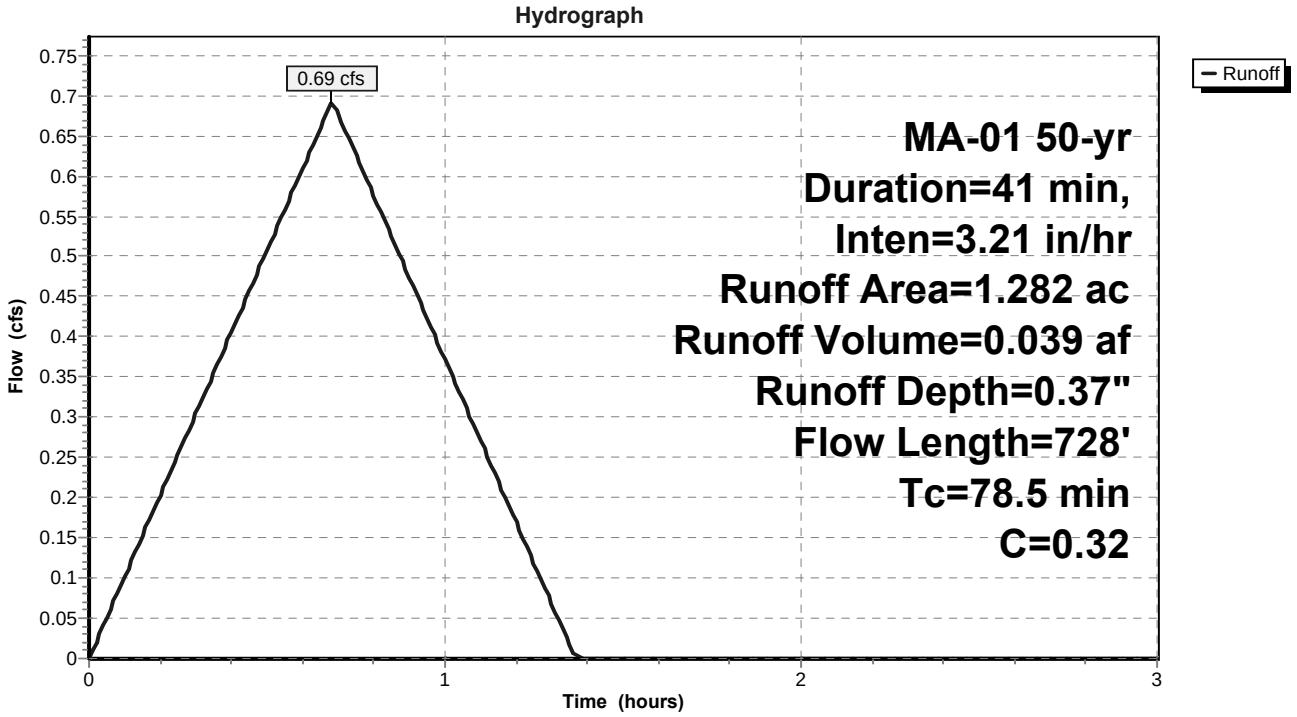

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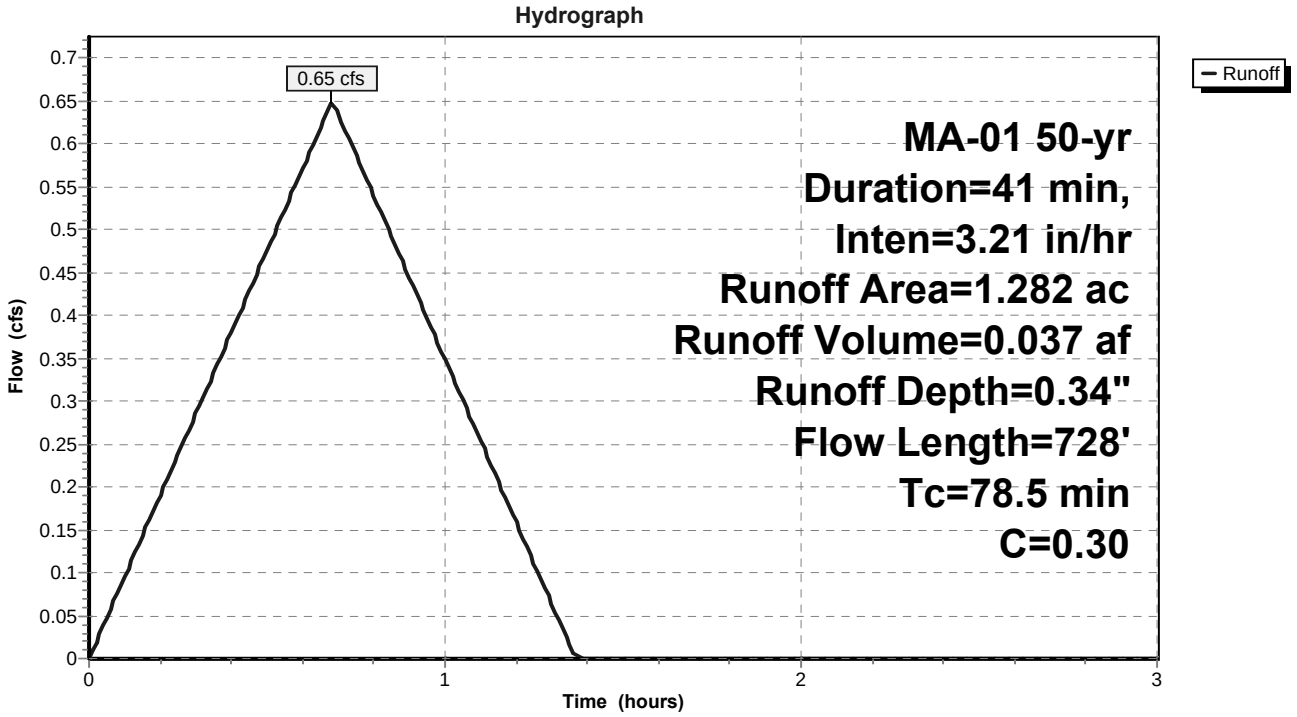

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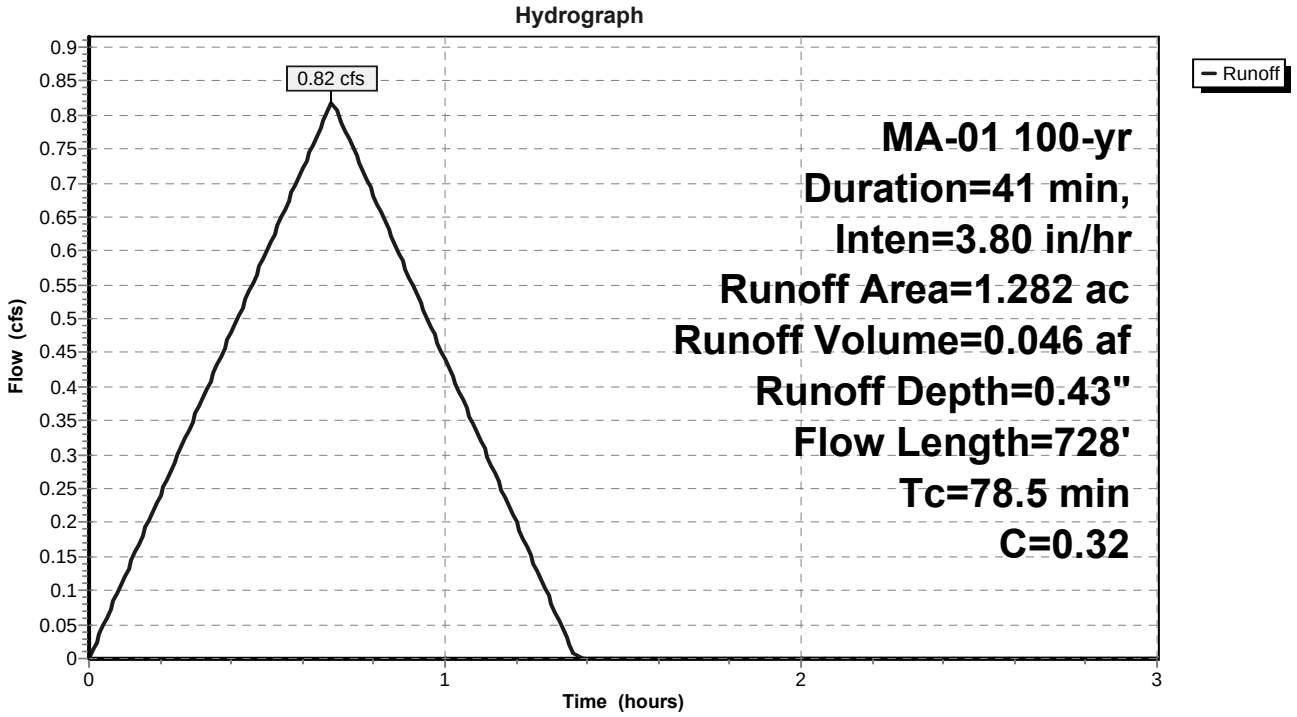

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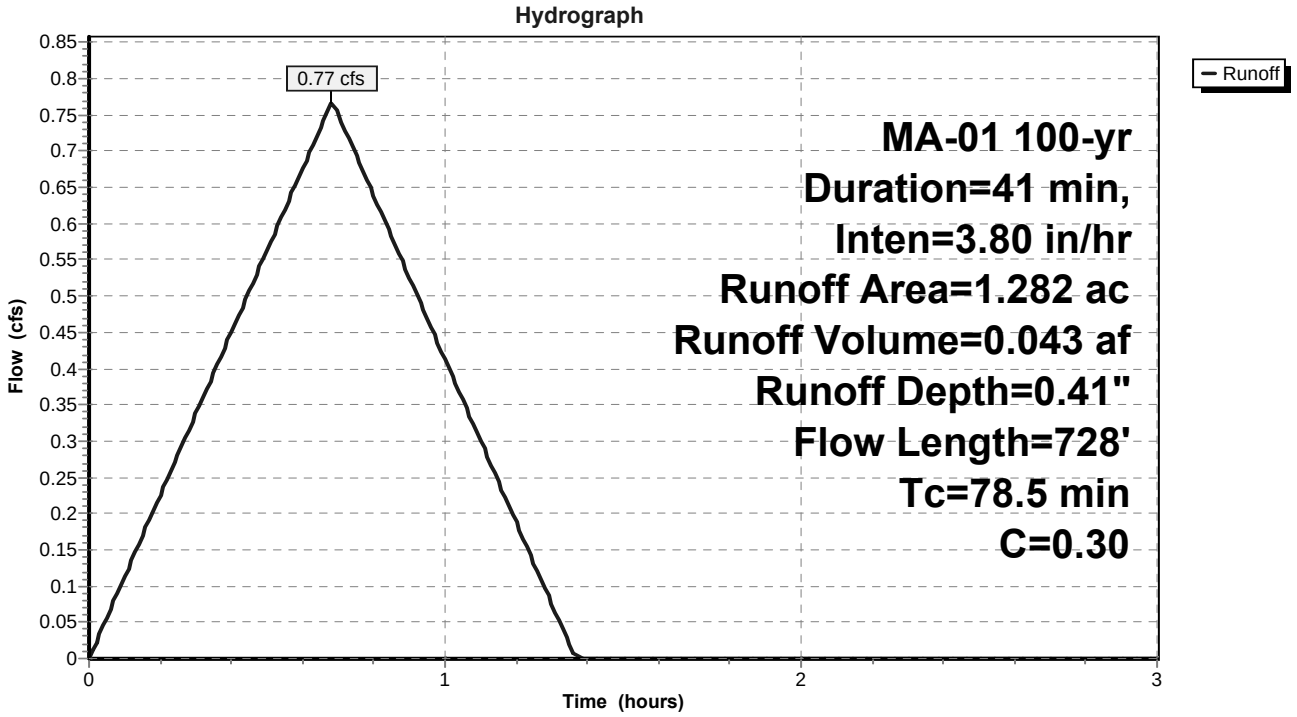

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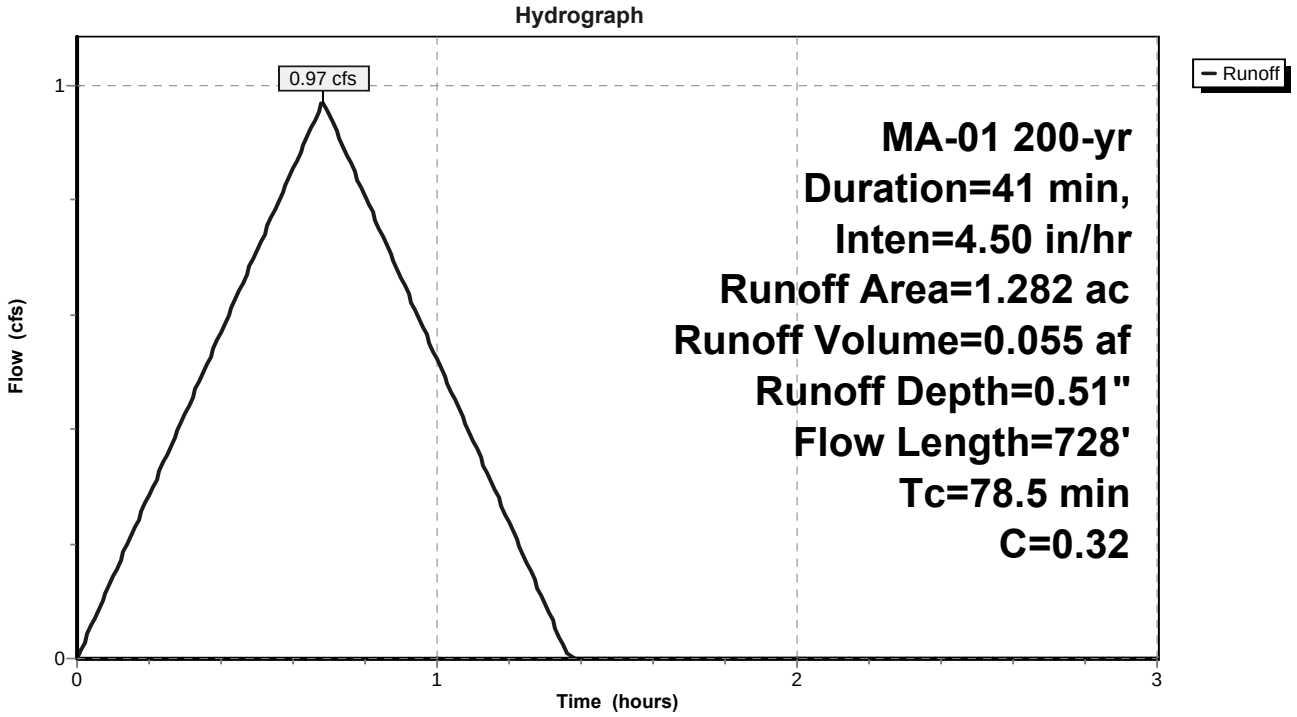

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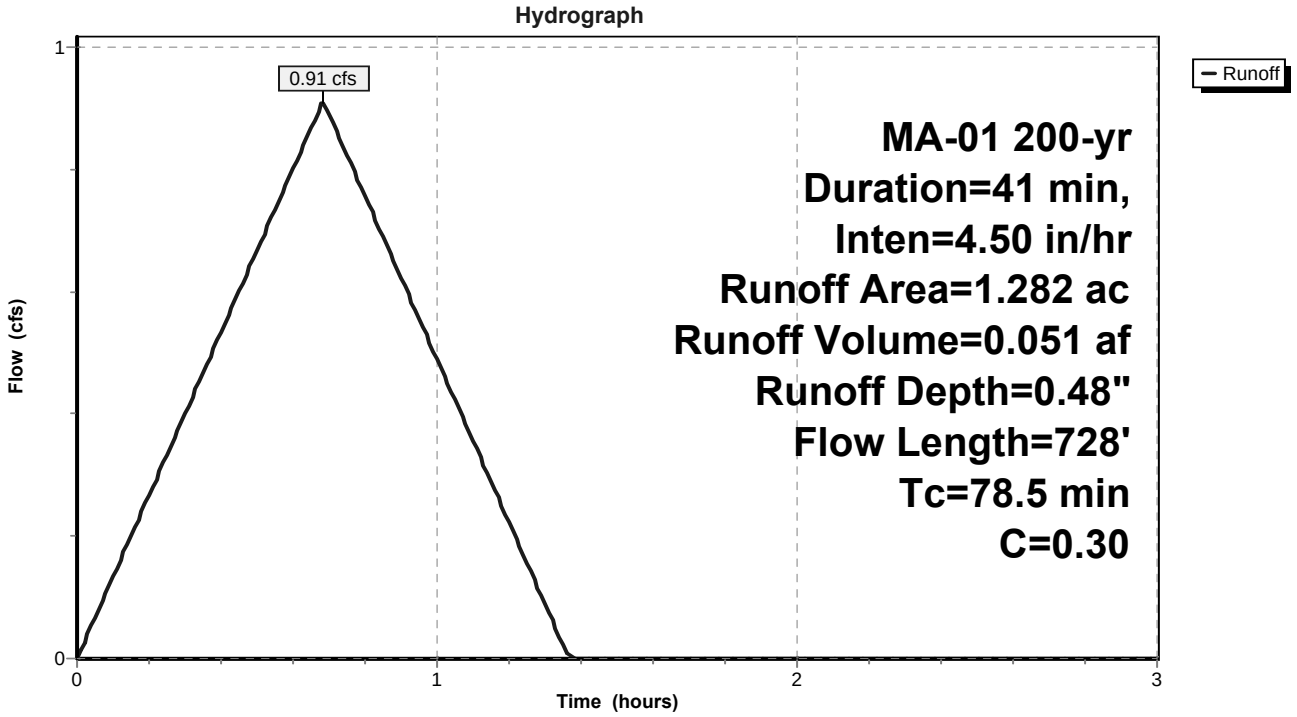

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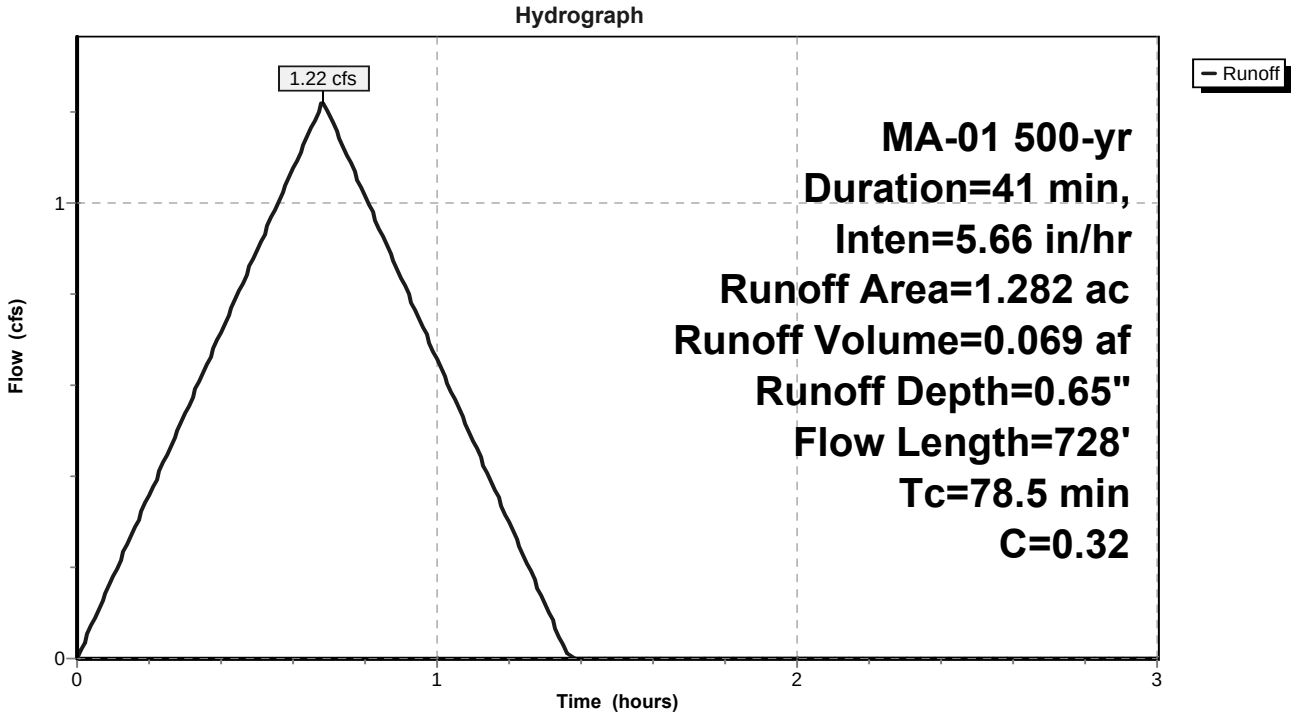

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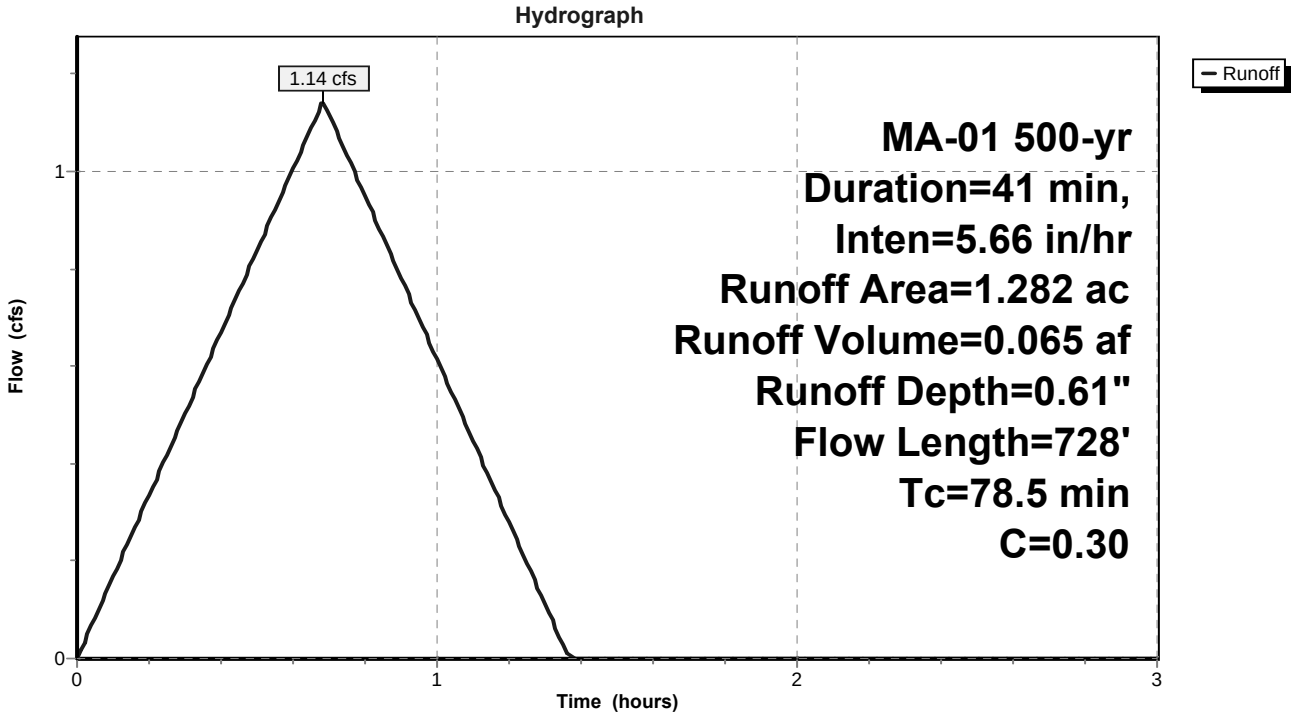

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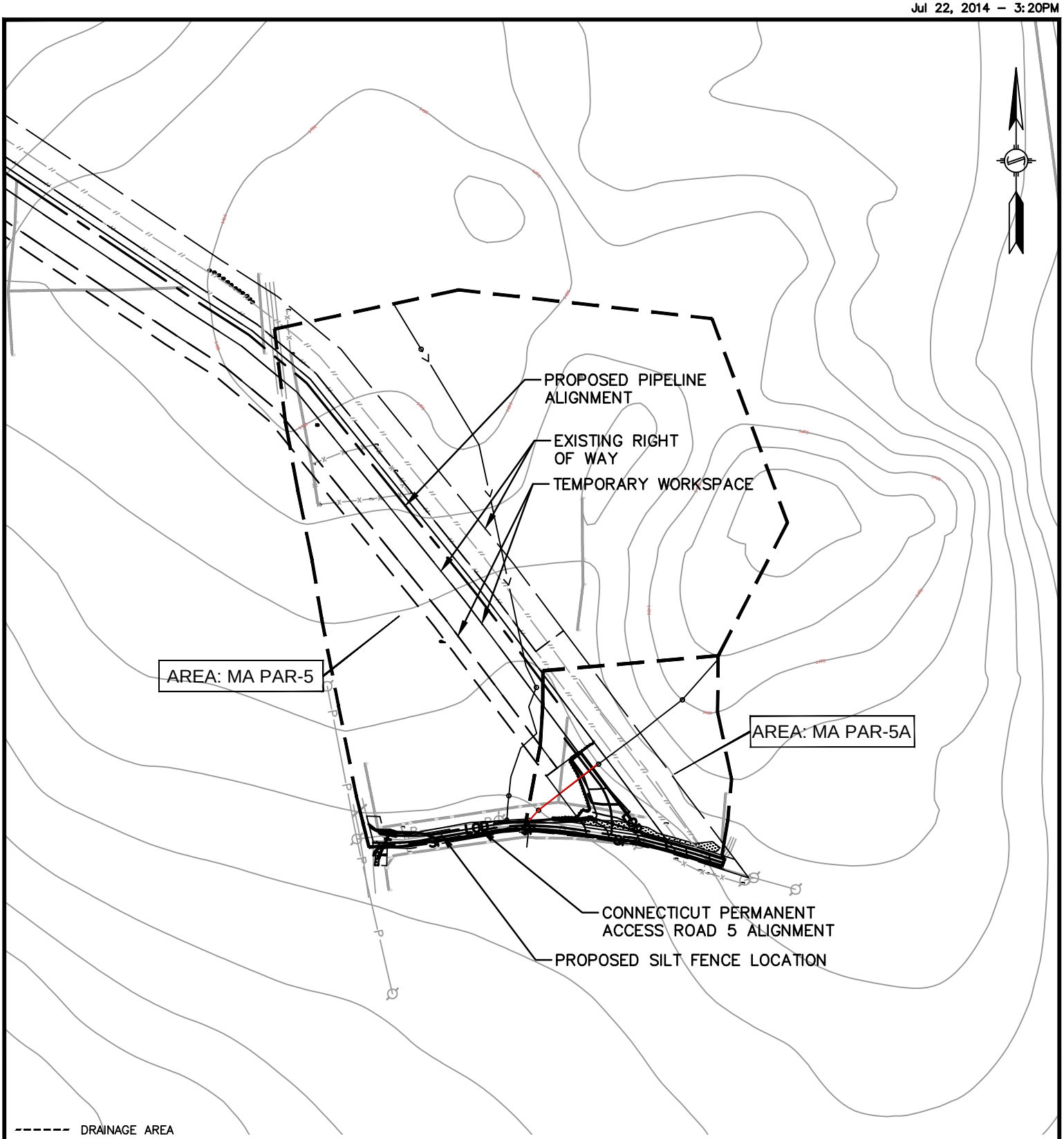

DRAINAGE AREA

TIME OF CONCENTRATION

150 CONTOUR (5' INTERVAL)

0 250

SCALE IN FEET

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division:		Op. Area:	
St.: MASSACHUSETTS		Co./Par.:	
Section:	Township: SANDISFIELD	Range:	
Dft: JMS	Date: 07/08/14	Project ID:	
Chk: RG	Date: 7/21/14	Scale:	
Appr: –	Date: –	Filename:	

CONNECTICUT EXPANSION
MASSACHUSETTS LOOP
PROPOSED NATURAL GAS PIPELINE
TOWN OF SANDISFIELD
BERKSHIRE COUNTY, MASSACHUSETTS

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

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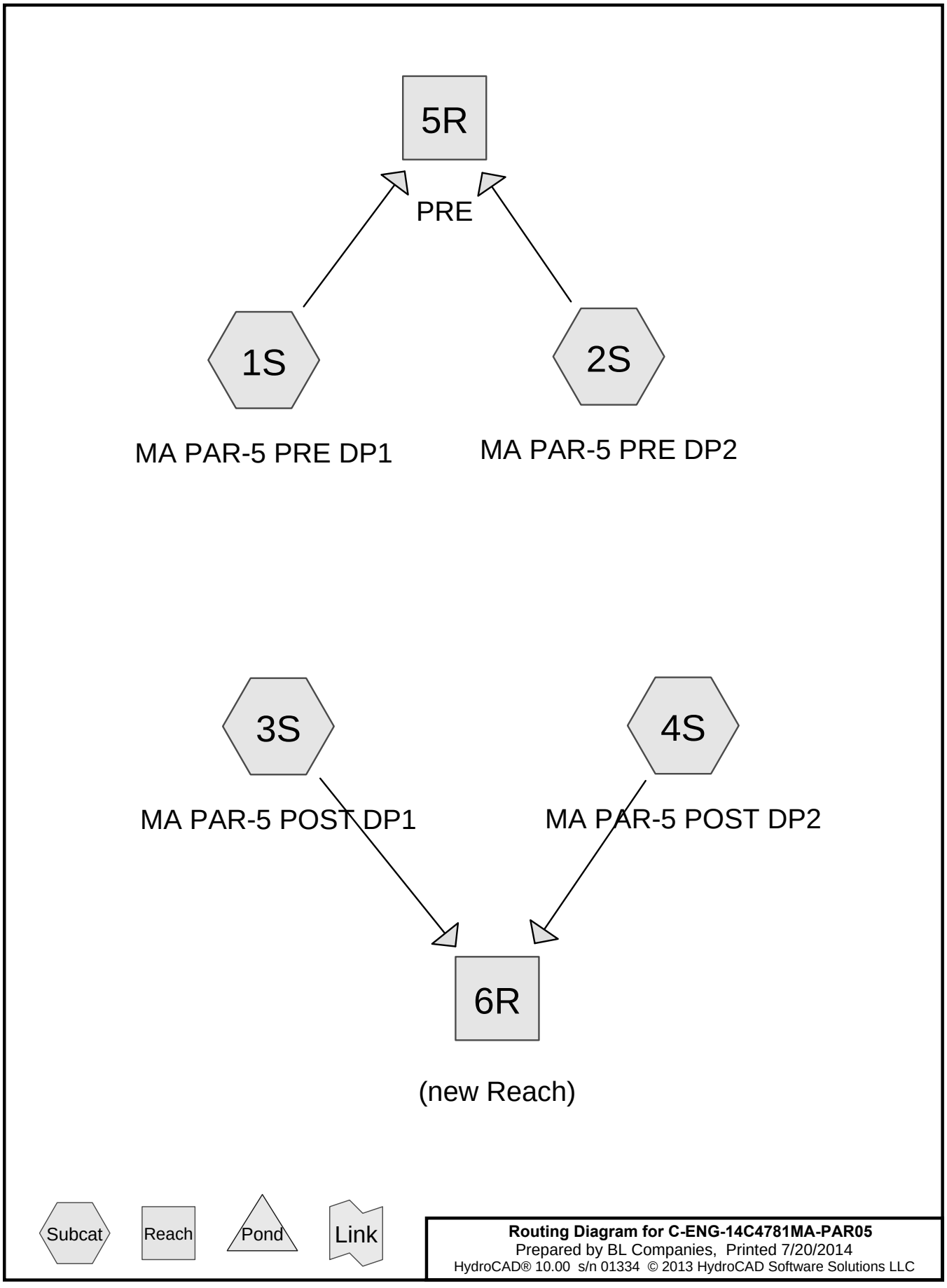

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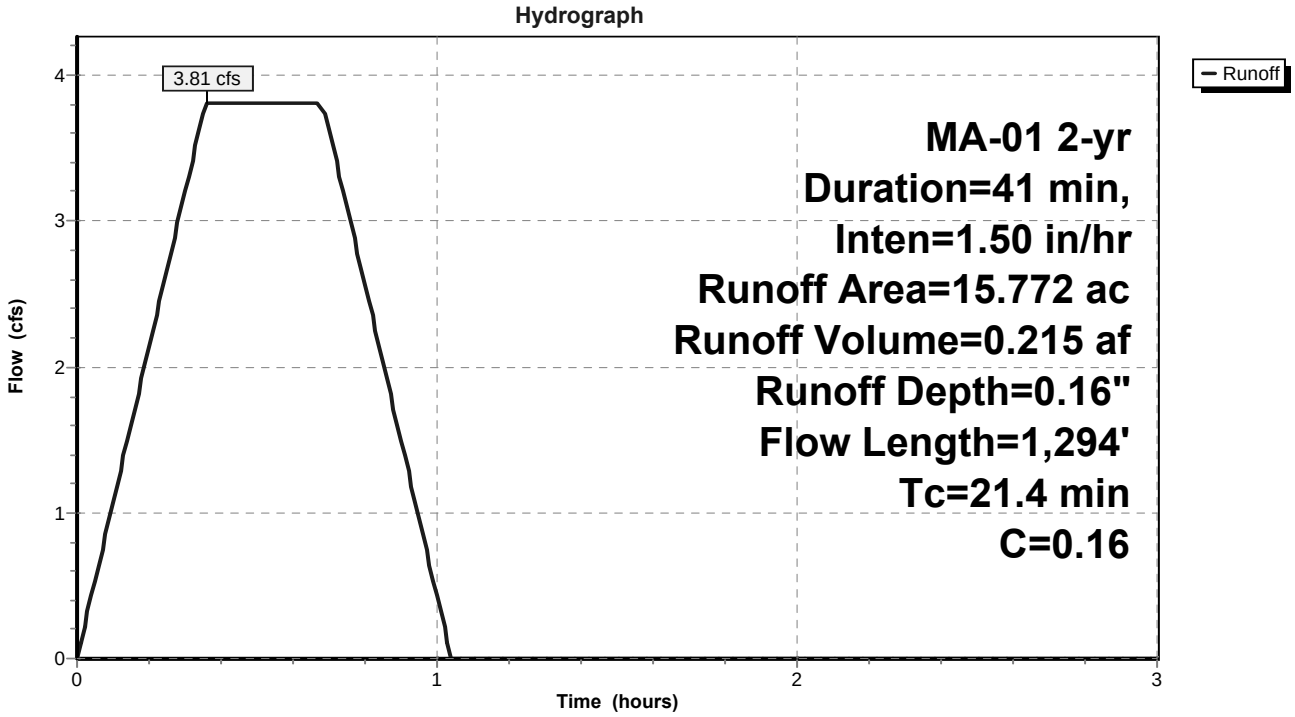

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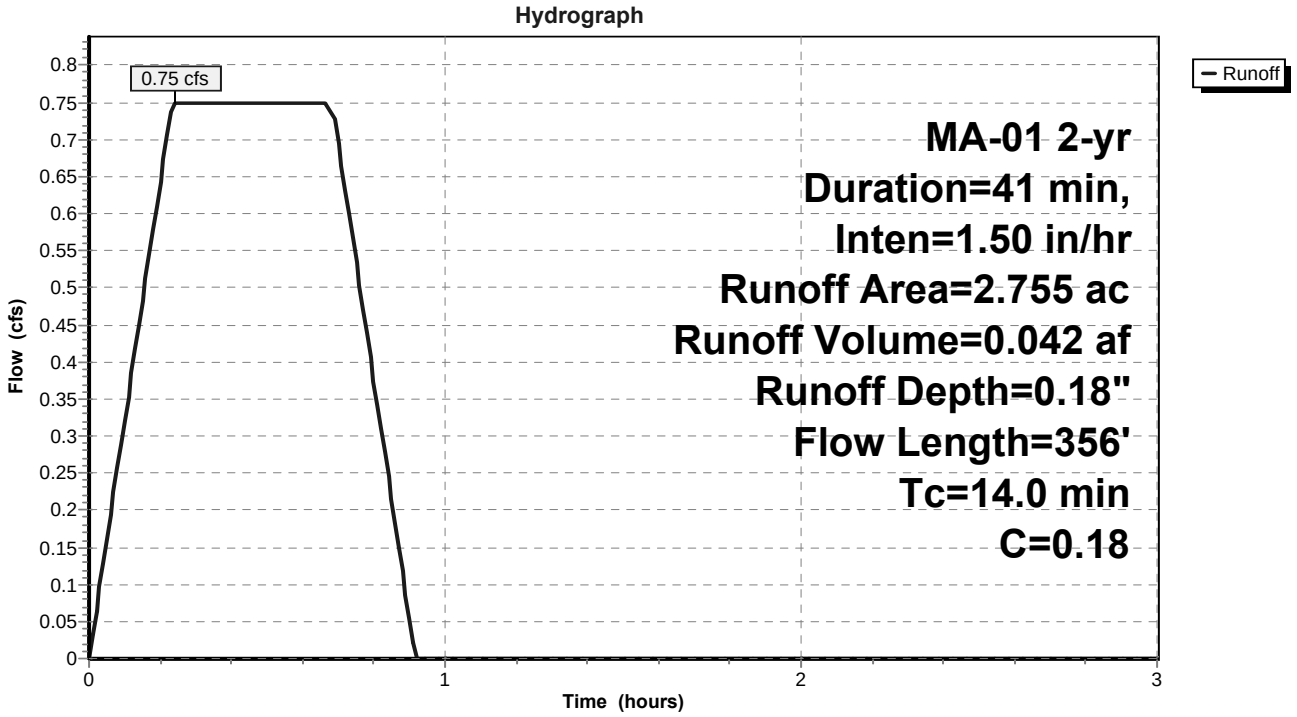

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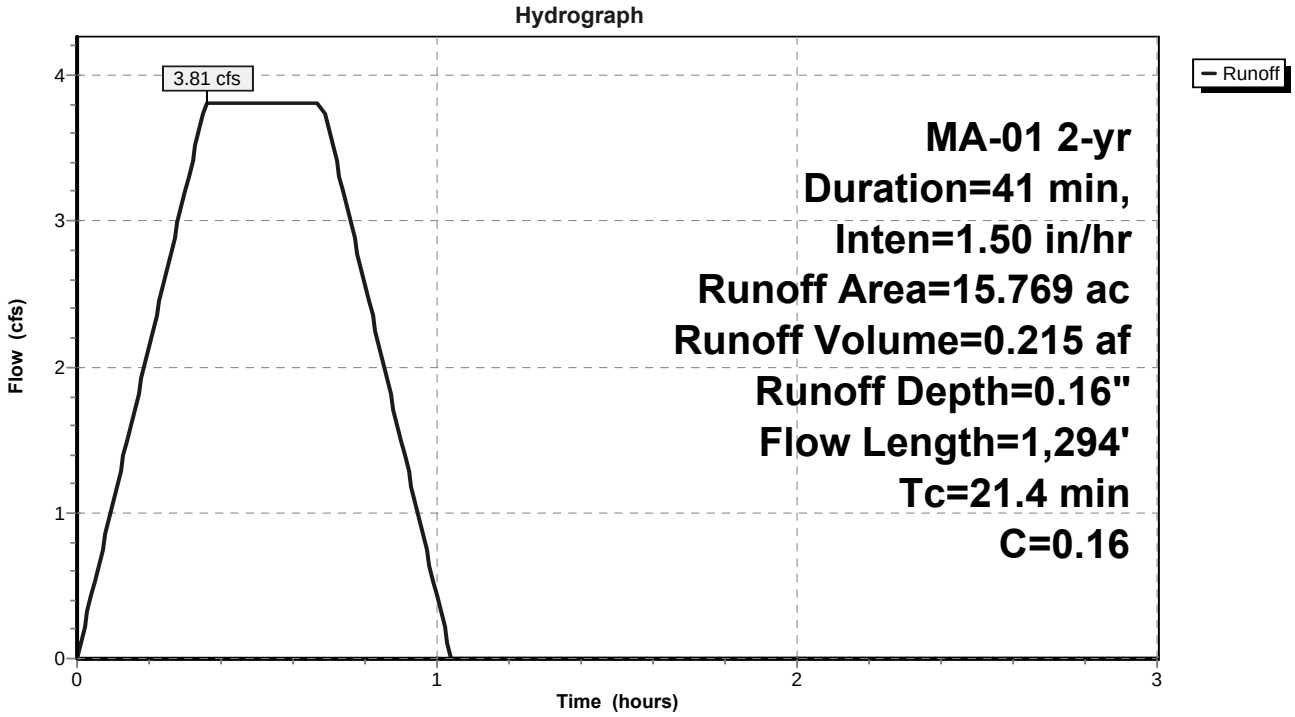

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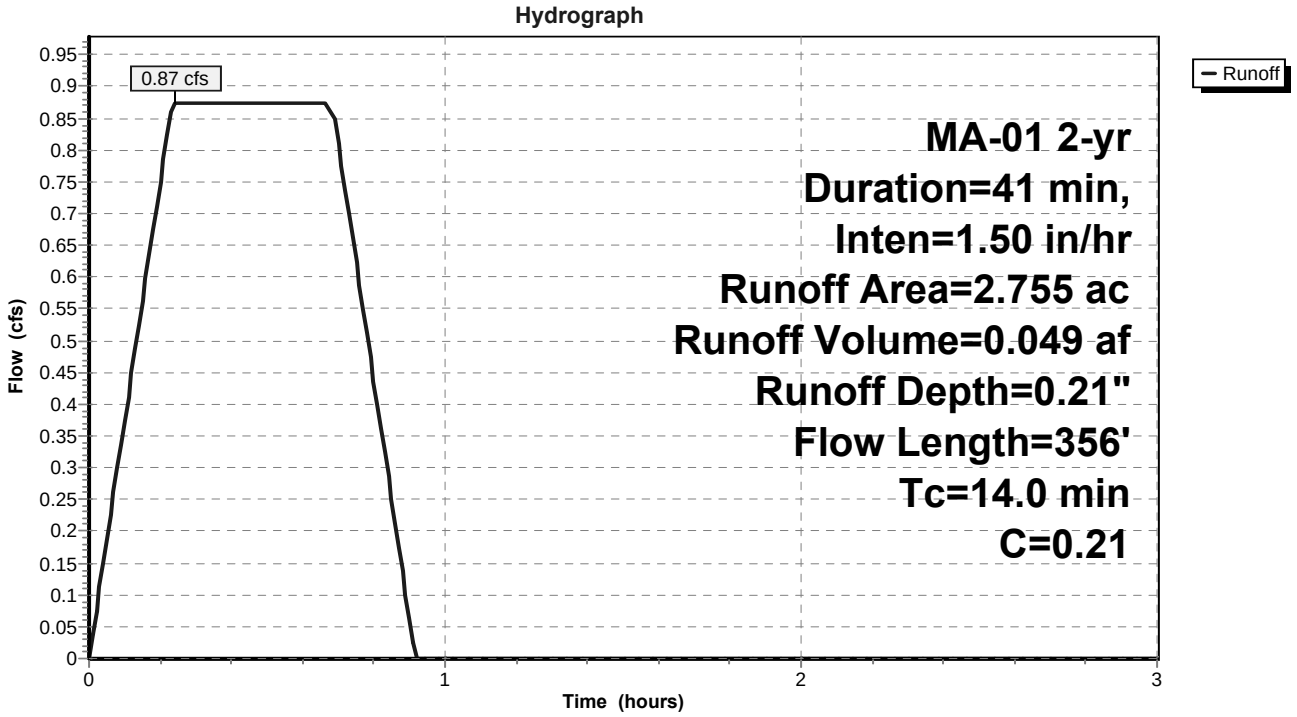

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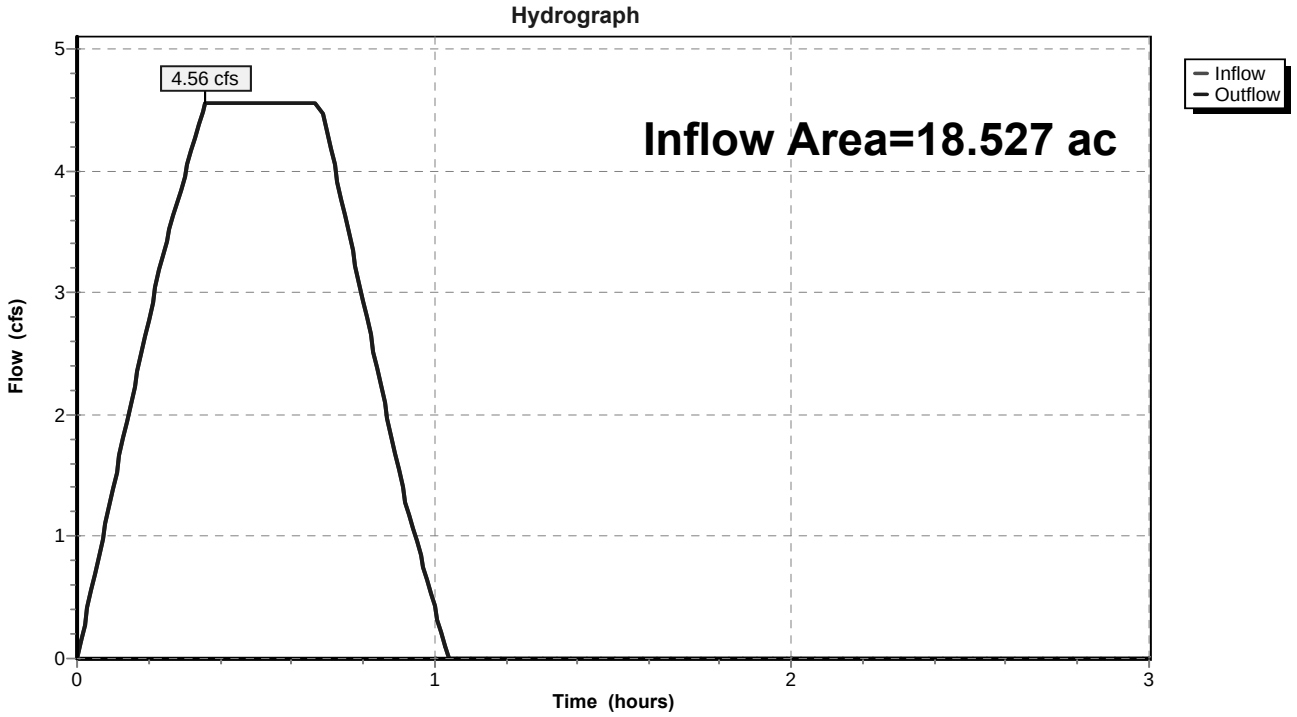

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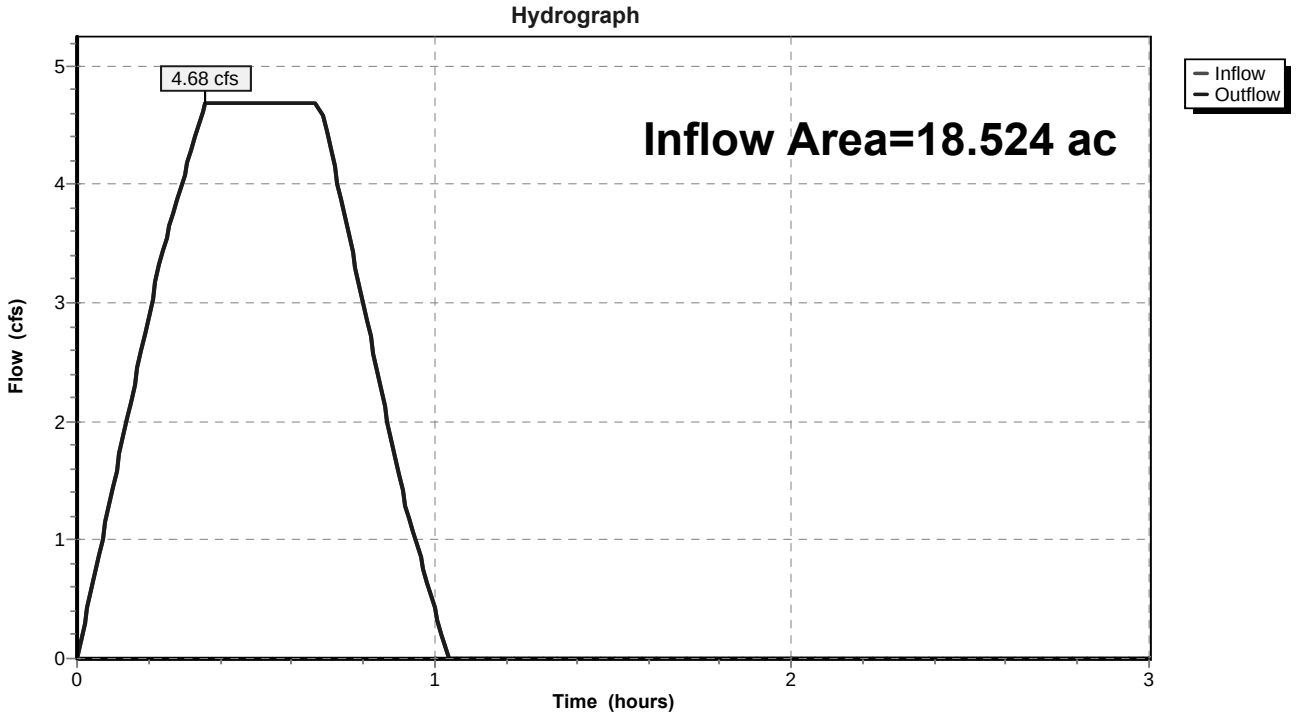

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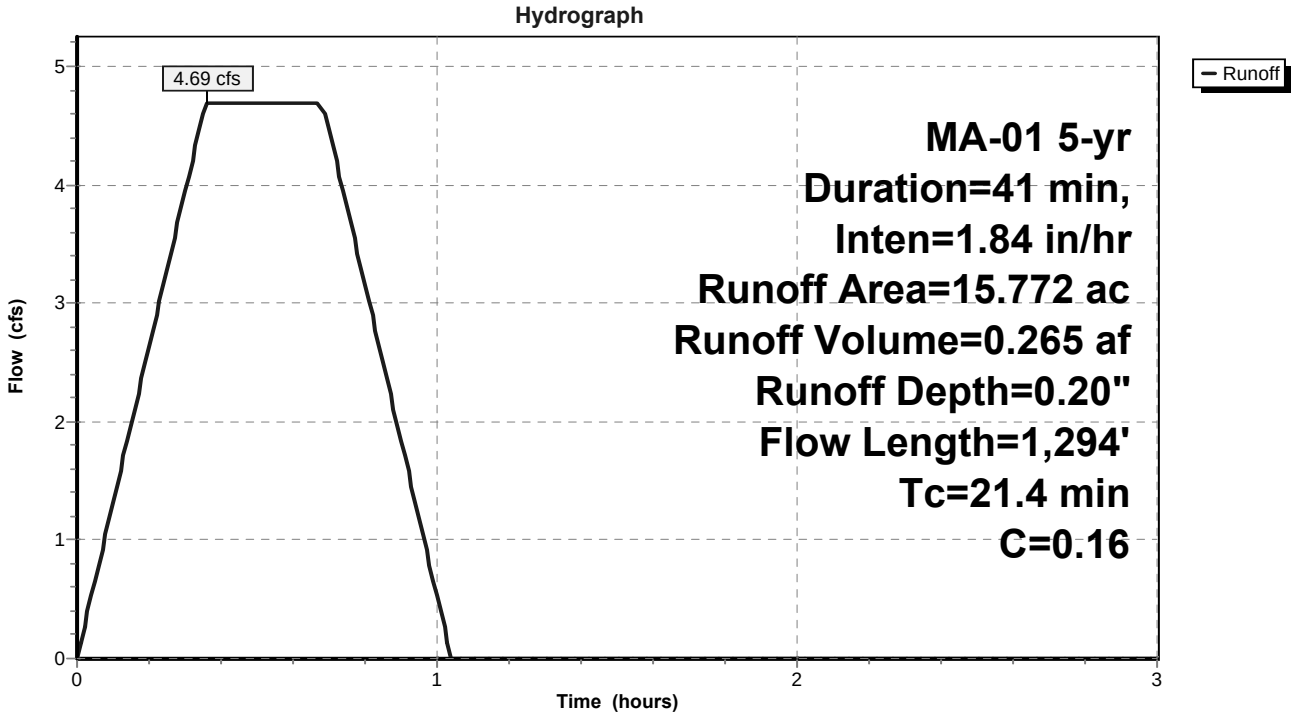

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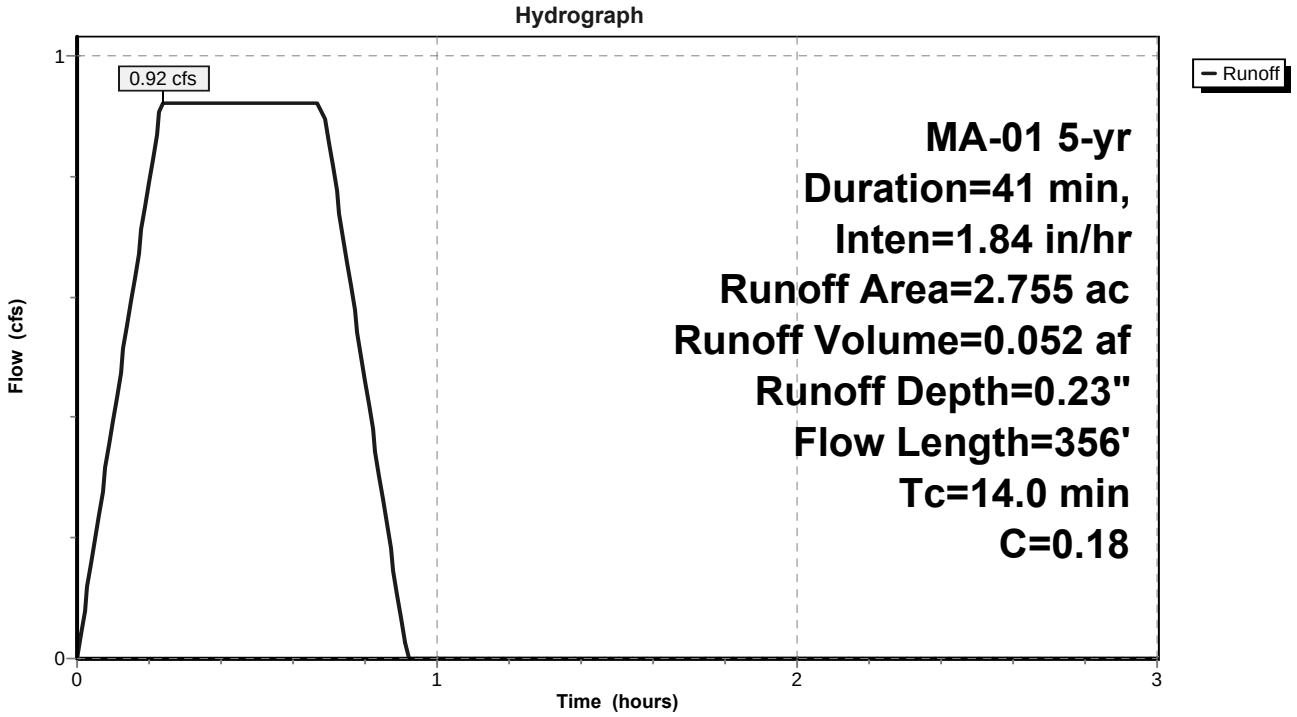

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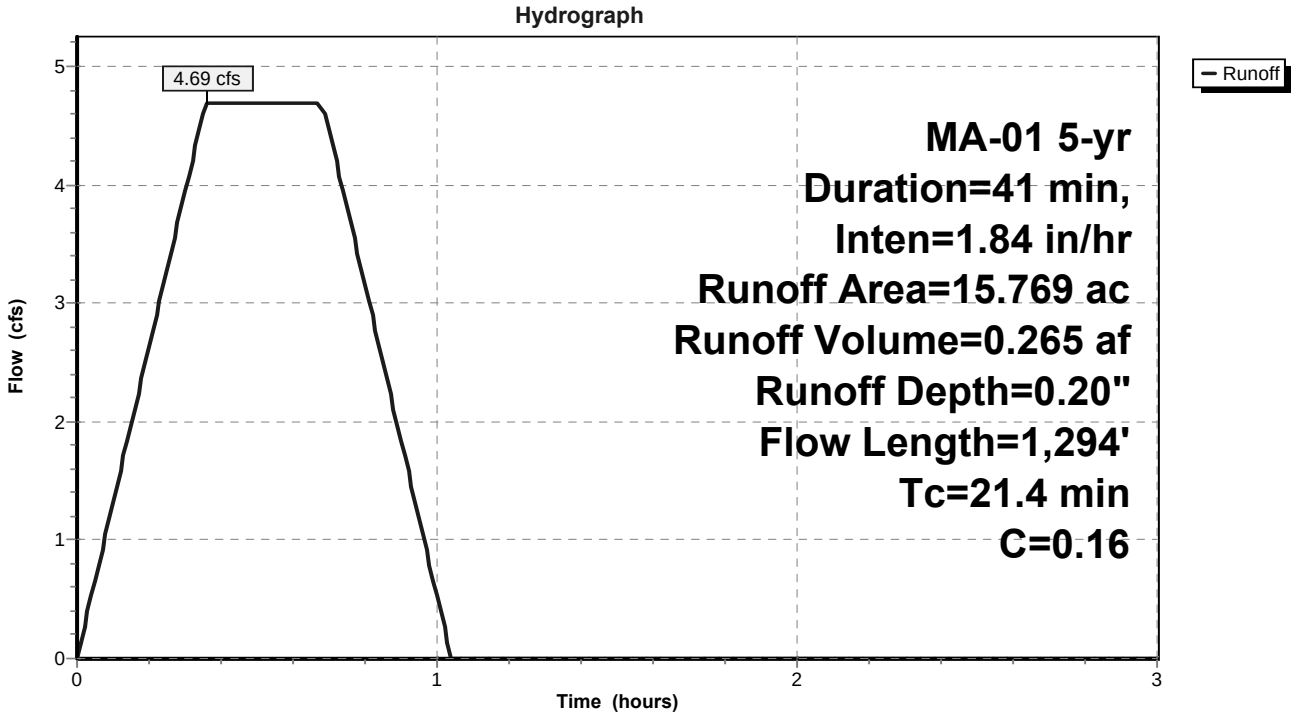

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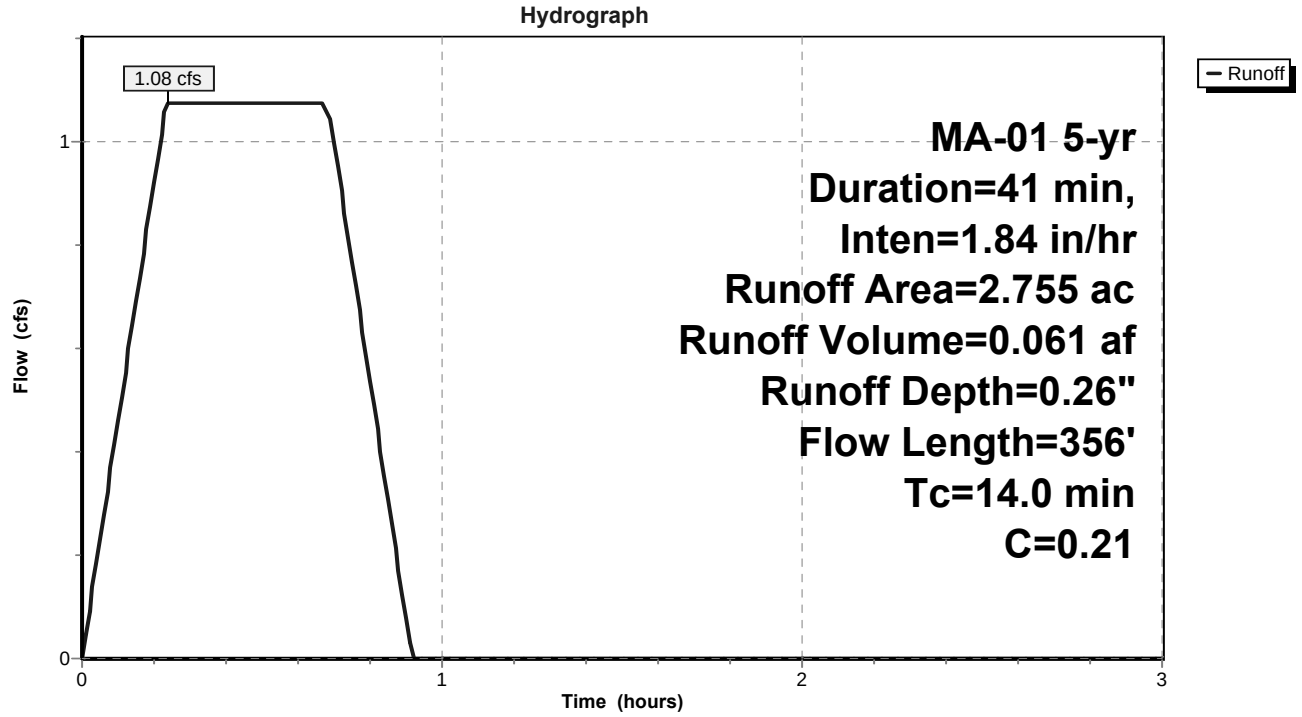

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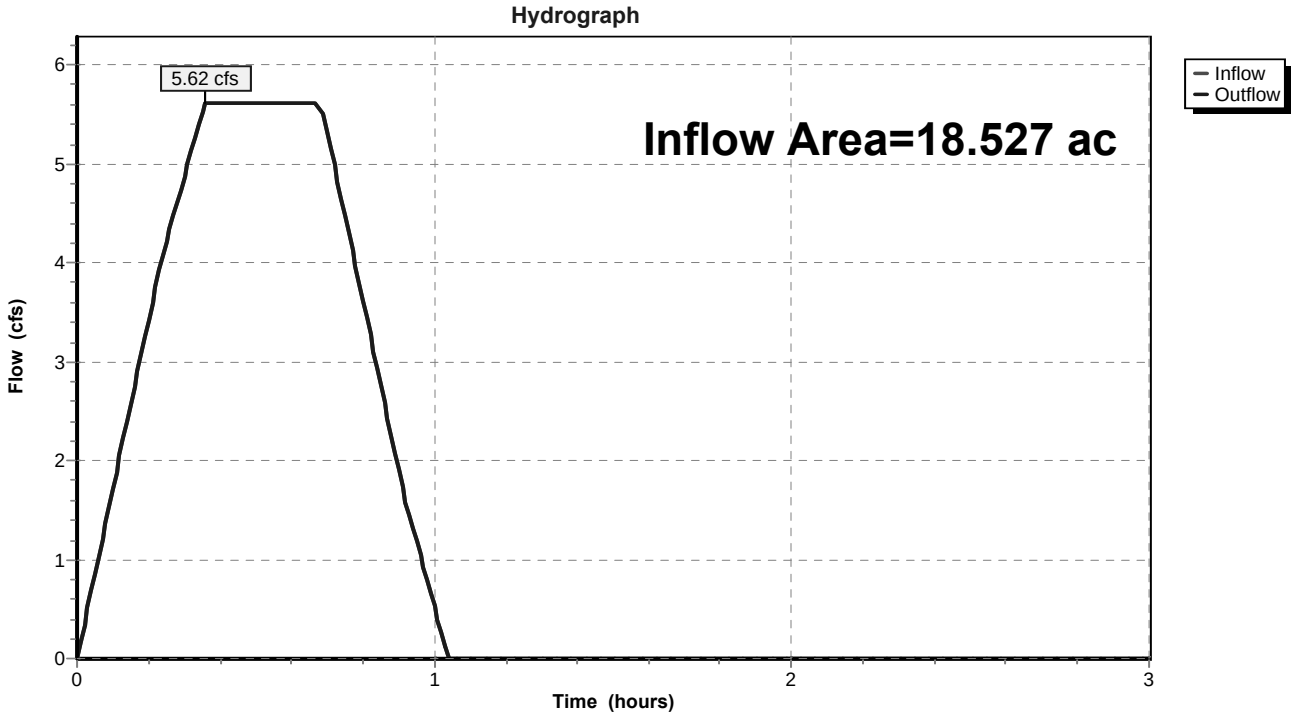

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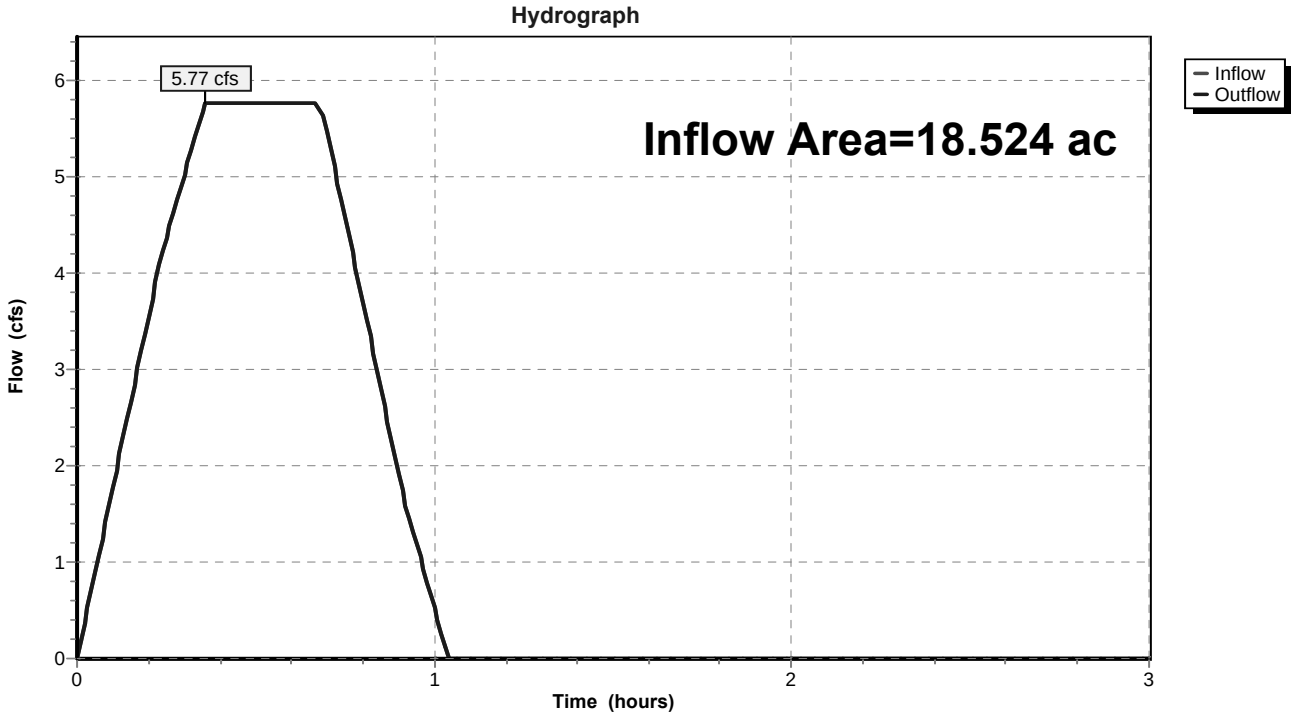

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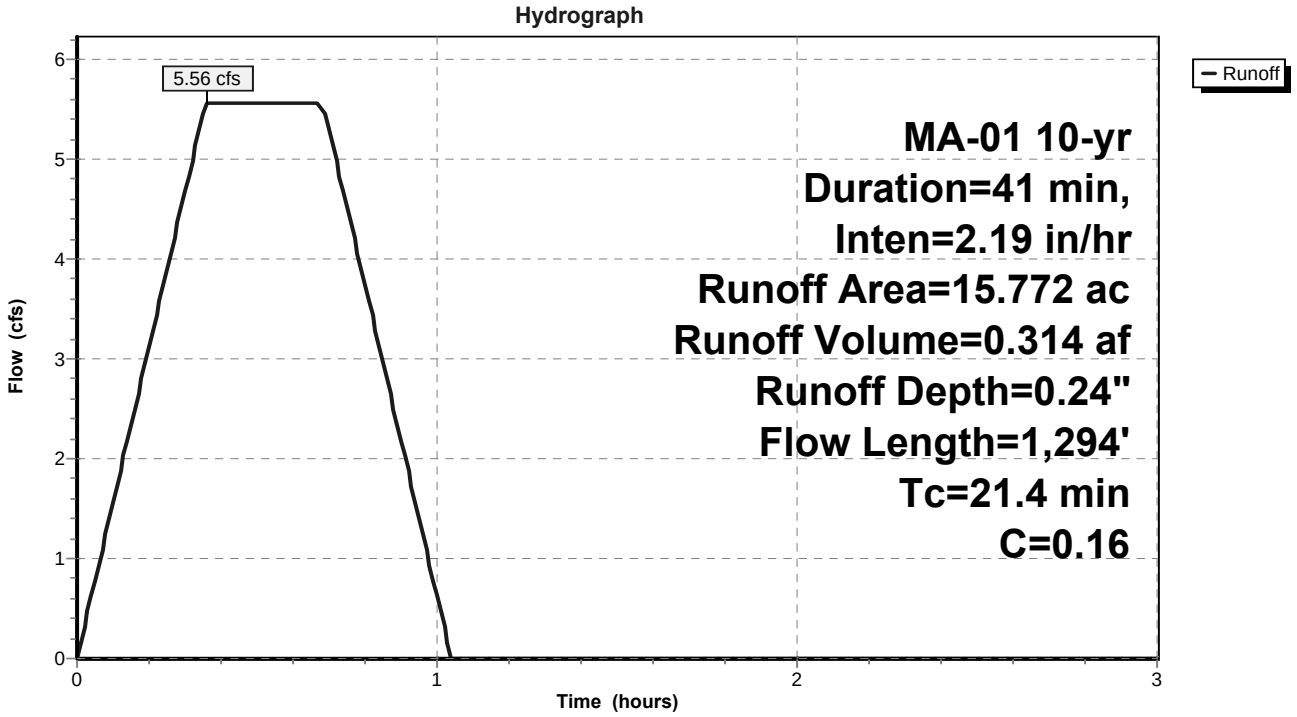

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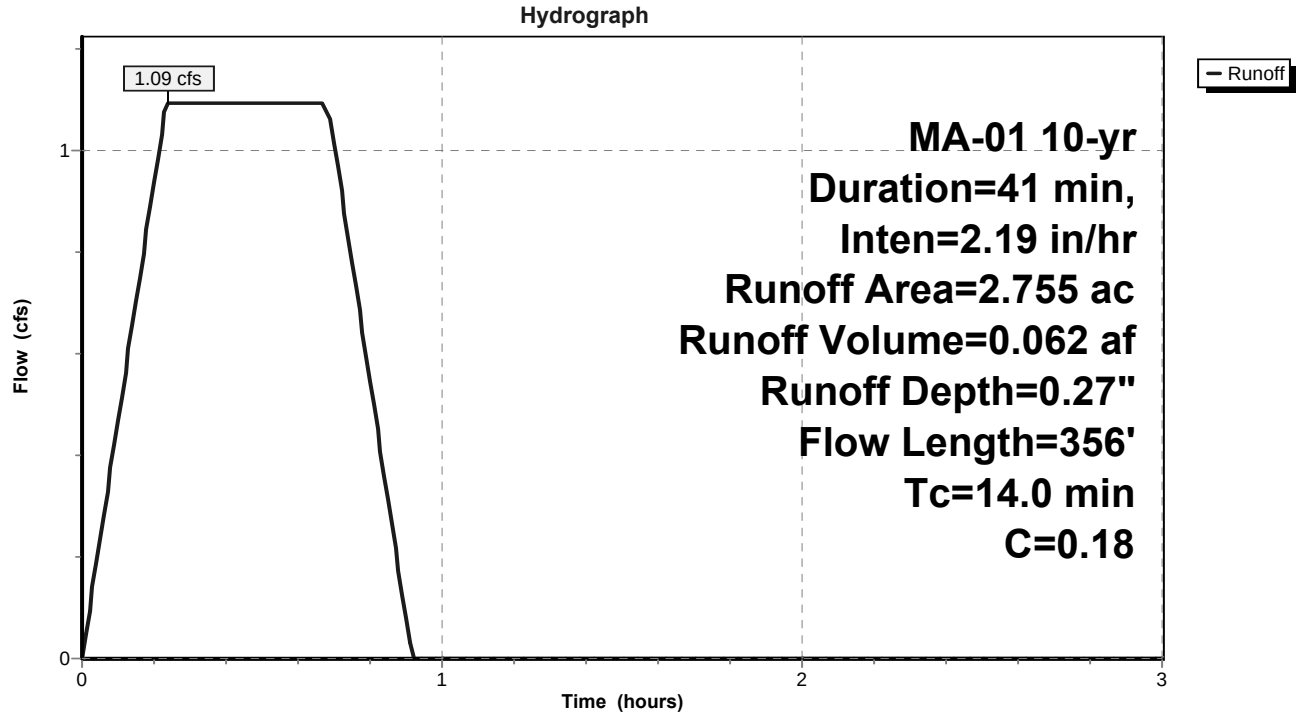

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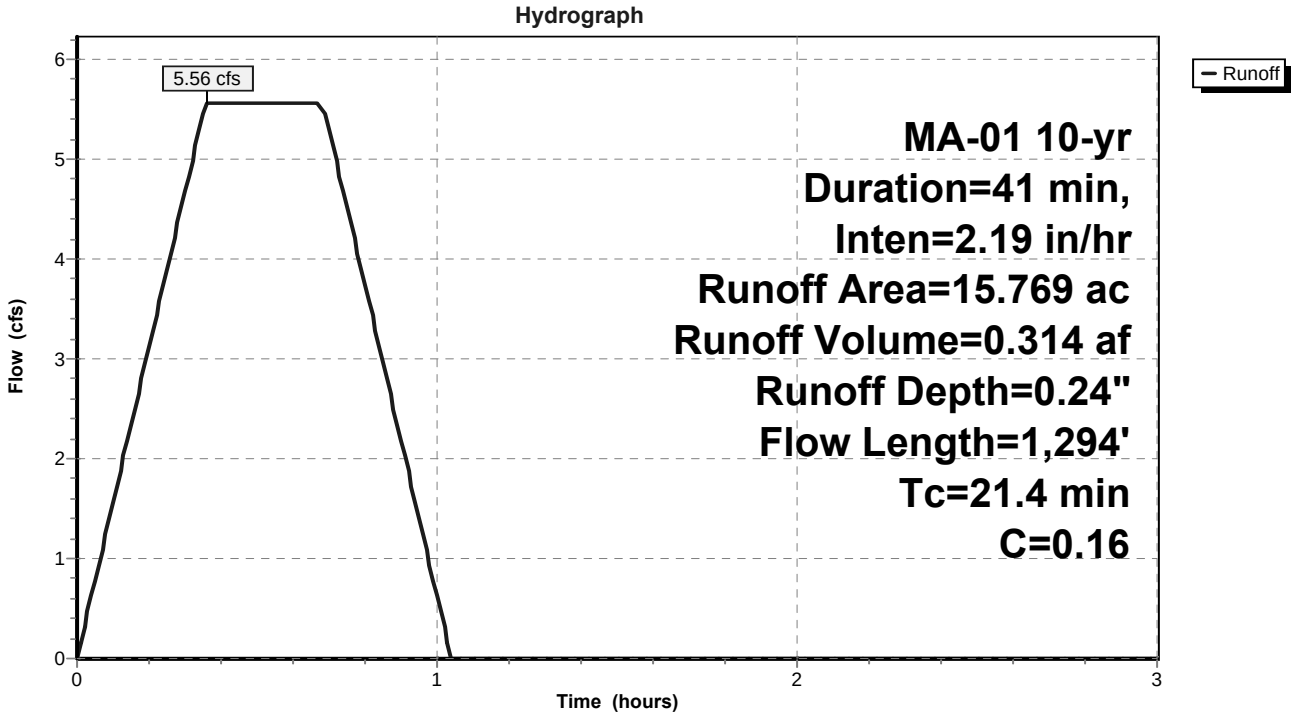

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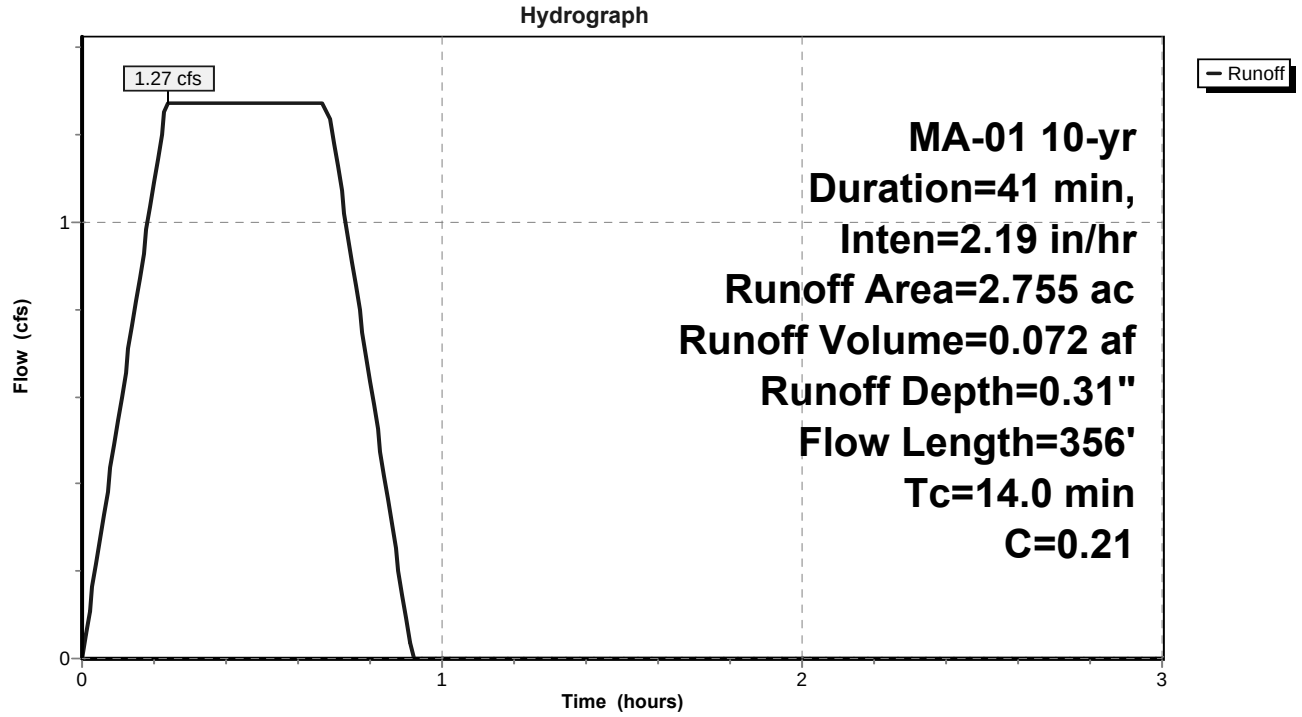

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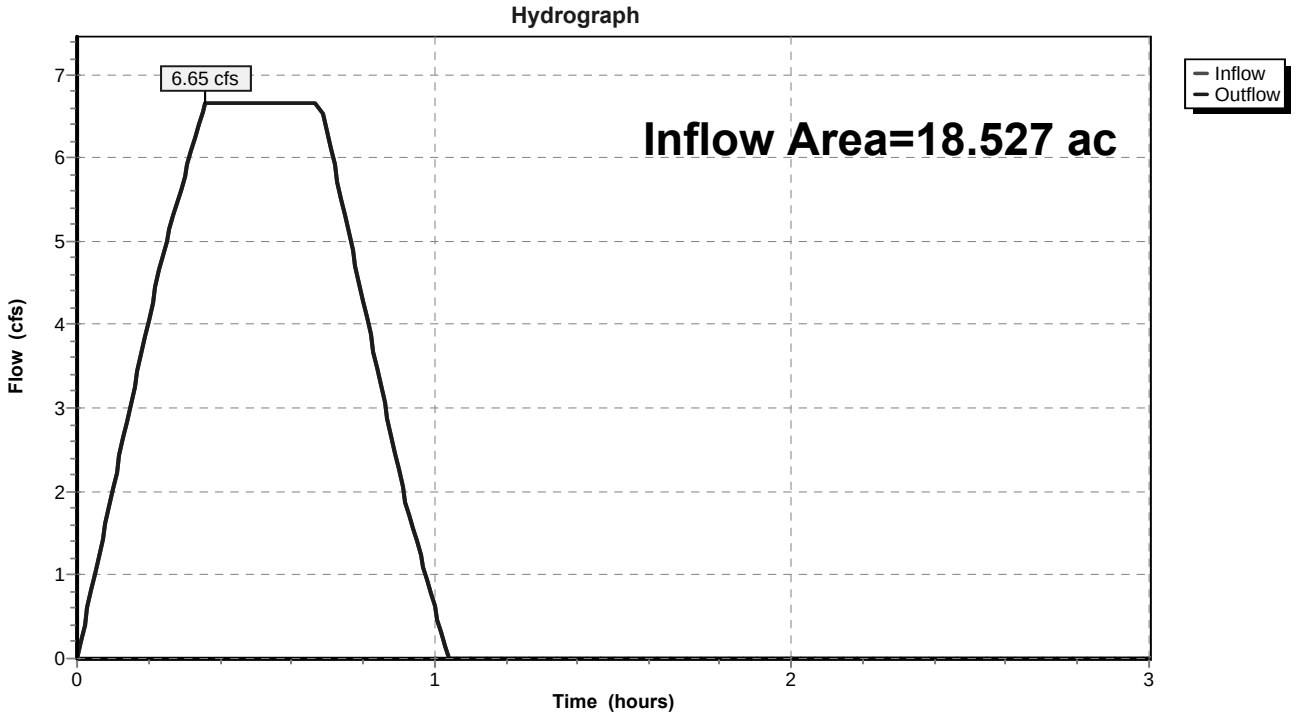

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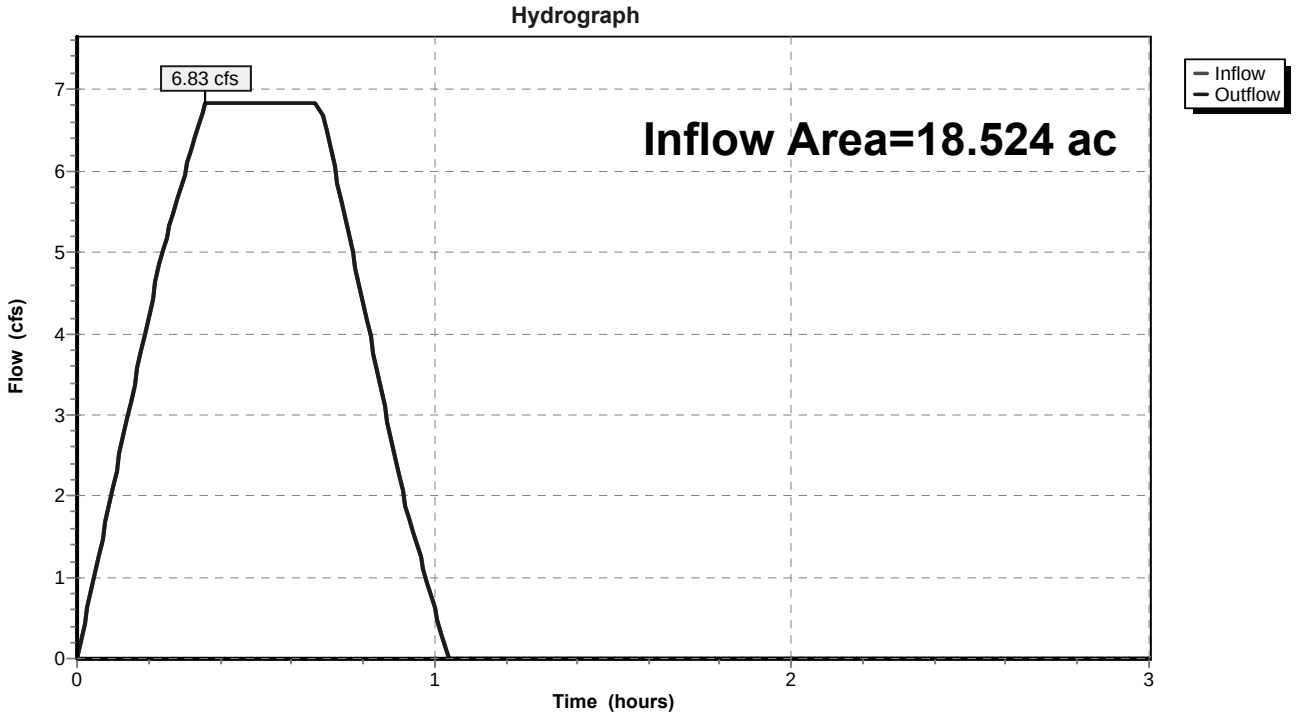

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APPENDIX F

- Spill Prevention and Response Procedures
- Traffic and Transportation Management Plan
- Waste Management Plan
- Blasting Plan
- Unanticipated Discovery Plan

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

APPENDIX F

Spill Prevention and Response Procedures

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

CONNECTICUT EXPANSION PROJECT
SPILL PREVENTION AND RESPONSE PROCEDURES

TABLE OF CONTENTS

1. PREVENTATIVE MEASURES 1

1.1 TRAINING 1
1.2 EQUIPMENT INSPECTION/MAINTENANCE 1
1.3 REFUELING 2
1.4 STORAGE 3
1.5 PERSONNEL SUPPORT 4

2. IMPACT MINIMIZATION MEASURES 4

3. SUGGESTED EQUIPMENT LIST 7

3.1 TERRESTRIAL CONSTRUCTION 7
3.1.1 Fuels and Lubricating Oil Storage 7
3.1.2 Routine Refueling and Maintenance 7
3.1.3 Equipment Failure 8
3.2 WATERBODY AND WETLAND CROSSINGS 8

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

SPILL PREVENTION AND RESPONSE PROCEDURES

1. PREVENTATIVE MEASURES

The Spill Prevention and Response Procedures ("SPRP") provides preventative and mitigative measures to be employed by Tennessee Gas Pipeline Company, L.L.C ("Company") during construction of the Project. Methods listed in this section are based on approved spill controls plans that the Company has used successfully in the past and are established to minimize the environmental impact associated with spills or releases at fuel, lubricant, or hazardous materials storage areas, during normal upland construction and refueling activities, and during special refueling activities within 100 feet of perennial stream banks, wetland boundaries, or within municipal watersheds. The Project's on-site Environmental Inspector ("EI") is responsible for ensuring that the Company's Contractors implement the measures and procedures outlined in this SPRP. The responsibilities of these inspectors are described in the Federal Energy Regulation Commission ("FERC") Upland and Erosion Control, Revegetation, and Maintenance Plan ("Plan") and Wetland and Waterbody Construction and Mitigation Procedures ("Procedures").

1.1 TRAINING

The Contractor will instruct personnel on the operation and maintenance of equipment to prevent the accidental discharge or spill of fuel, oil, and lubricants. Personnel will also be made aware of the pollution control laws, rules, and regulations applicable to their work.

Spill prevention briefings with the construction crew will be scheduled and conducted by the Contractor to insure adequate understanding of spill prevention measures. These briefings will highlight:

- precautionary measures to prevent spills;
- sources of spills, such as equipment failure or malfunction;
- standard operating procedures in case of a spill;
- equipment, materials, and supplies available for clean-up of a spill; and
- a list of known spill events.

A spill is an un-permitted release of product, raw materials, or chemicals outside any secondary containment and into the environment. Spills can occur as a result of leaks, accidents, or third party incidents.

1.2 EQUIPMENT INSPECTION/MAINTENANCE

The Contractor will inspect and maintain equipment that must be fueled and/or lubricated according to a strict schedule. The Contractor will submit to the Company for approval written documentation of the methods used and work performed.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

All containers, valves, pipelines, and hoses will be examined regularly to assess their general condition. The examination will identify any signs of deterioration that could cause a spill and signs of leaks, such as accumulated fluids. All leaks will be promptly corrected and/or repaired.

1.3 REFUELING

(1) The Contractor will insure that fuel trucks transporting fuel to on-site equipment travel only on approved access roads; all equipment parked overnight and/or fueled at least 100 feet from a waterbody or in an upland area, equipment refueled and lubricated within the right-of-way ("ROW"), compressor station yard, meter station site, or fee property and at least 100 feet away from all waterbodies and wetlands with the following exceptions:

- The EI finds, in advance, that no reasonable alternative is available and the Contractor and Company have taken appropriate steps (including secondary containment structures) to prevent spills and provide for prompt cleanup in the event of a spill;
- Areas such as rugged terrain or steep slopes where movement of equipment to refueling stations would cause excessive disturbance to the ROW or workspace;
- Areas where removing equipment from a wetland for servicing would increase adverse impacts to the wetland;
- Sites where moving equipment to refueling stations from pre-fabricated equipment pads is impracticable or where there is a barrier from the waterbody/wetland (i.e., road or railroad);
- Locations where the waterbody or wetland is located adjacent to a road crossing, compressor station yard, or meter station site (from which the equipment can be serviced); and
- Refueling of immobile equipment including, but not limited to, bending and boring machines, air compressors, padding machines, and hydro-test fill pumps. Pumps operating within 100 feet of a waterbody or wetland boundary utilize appropriate secondary containment systems to prevent spills.

In these areas, auxiliary fuel tanks will be used to reduce the frequency of refueling operations and in no case will refueling take place within 100 feet of any known potable water wells.

(2) The Contractor will assure that all refueling is done pursuant to the following conditions:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

- Impact minimization measures and equipment will be sufficient to prevent discharged fluids from leaving the ROW, compressor station yard, meter station site, or workspace or reaching wetlands or waterbodies, and be readily available for use. These will include some combination of the following:

  a. dikes, berms or retaining walls sufficiently impervious to contain spilled oil;
  b. sorbent and barrier materials in quantities determined by the Contractor to be sufficient to capture the largest reasonably foreseeable spill;
  c. drums or containers suitable for holding and transporting contaminated materials;
  d. curbing;
  e. culverts, gutters, or other drainage systems;
  f. weirs, booms, or other barriers;
  g. spill diversion or retention ponds; and
  h. sumps and collection systems.

- All spills will be cleaned up immediately. Containment equipment will not be used for storing contaminated material.

(3) Concrete coating activities shall not be performed within 100 feet of a wetland or waterbody boundary, unless the location is an existing industrial site designated for such use. These activities can occur closer only if the EI determines that there is no reasonable alternative, and the project sponsor and its contractors have taken appropriate steps (including secondary containment structures) to prevent spills and provide for prompt cleanup in the event of a spill.

(4) The Contractor will prepare for approval by the Company a list of the type, quantity, and the storage location of containment and clean up equipment to be used during construction.

1.4 STORAGE

Storage containment areas will not have drains, unless such drains lead to a containment area or vessel where the entire spill can be recovered. The Contractor will ensure bulk storage of hazardous materials, including chemicals, fuels, and lubricating oils will have appropriate secondary containment systems.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

1.5 PERSONNEL SUPPORT

Prior to construction, the ROW inspector or agent shall identify and prepare a written inventory of water wells within 150 feet of the construction site. The Construction ROW Agent will notify the authorities of all potable water supply intakes located within three miles downstream of any crossings a minimum of one week prior to construction.

2. IMPACT MINIMIZATION MEASURES

Containment is the immediate priority in the case of a spill. A spill will be contained on the Company's property, ROW, compressor station yard, meter station site, or workspace, if possible. Clean up procedures will begin immediately after a spill is contained. In no case will containment equipment be used to store contaminated material.

Project operations will be structured in a manner that provides for the prompt and effective cleanup of spills of fuel and other hazardous materials. The Contractor will ensure the follow measures:

- construction crew (including cleanup crews) has on hand sufficient supplies of absorbent and barrier materials to allow the rapid containment and recovery of spilled materials and knows the procedure for reporting spills and unanticipated discovers of contaminate;
- construction crew has on hand sufficient tools and material to stop leaks;
- names and telephone numbers for all local, state, and federal agencies (including, if necessary, the U. S. Coast Guard and the National Response Center) that must be notified of a spill; and follow the requirements of those agencies in cleaning up the spill, in excavating and disposing of soils or other materials contaminated by a spill, and in collecting and disposing of waste generated during spill cleanup.

Immediately report any spill or release of the following materials *regardless of location* (on-property or off-property) to the EI for notification to the appropriate Company representative as indicated below:

- Oil or petroleum products;
- Hazardous substances or hazardous wastes;
- Chemicals;
- Unplanned natural gas (flaring or venting); and,
- Asbestos-containing materials.

The following contacts are currently assigned to the Project and are subject to change (call in the

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

order listed until someone is reached):

Tennessee Area Offices

Albany Area Operations Supervisor (New York):

Sandisfield Area Operations Supervisor (Massachusetts):

Agawam Area Operations Supervisor (Massachusetts):

East Granby Area Operations Supervisor (Connecticut):

New York Area Environmental Coordinator:

Massachusetts Area Environmental Coordinator:

Connecticut Area Environmental Coordinator

Albany Area Manager:

Sandisfield Area Manager:

East Granby Area Manager:

Kinder Morgan Corporation Houston Office (Houston, Texas)

General Dept. Number:

Environmental Project Manager:

Environmental Project Manager:

Department Manager:

Department Director:

If a spill enters a body of water, the Contractor will immediately take samples upstream and downstream from point of entry and refrigerate samples. If advised, additional analysis will be completed and/or additional samples will be gathered.

If the EI agrees and the Contractor determines that a spill is small enough such that the construction crew can safely handle it, the crew will use construction equipment to containerize all spilled material, contaminated soil, and sorbent material in a manner consistent with the spilled materials' characterization.

If the EI agrees and the Contractor determines that a spill can not be adequately excavated and disposed of by the construction crew alone, the Contractor will contact waste containment specialists. The Contractor will ensure that all excavated wastes are transported to a Company approved disposal facility licensed to accept such wastes. Wastes will not be transported to a company facility (i.e., compressor station, meter station, etc.) unless the Field Environmental Coordinator approves it in writing.

The Contractor will prepare a Construction Site Spill Report form to be given to the Company that

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

includes:

a. the date, time and location of the occurrence or discovery of the occurrence;

b. a description or identity of the material spilled;

c. an estimate of the quantity spilled;

d. the circumstances that caused the spill (e.g., equipment failure);

e. a list of waterbodies affected or potentially affected by the spill;

f. a statement verifying whether a sheen is present;

g. the size of the affected area;

h. an estimate of the depth that the material has reached in water or on soil;

i. a determination of whether the spill will migrate off of the Company's property or the ROW or workspace;

j. a determination of whether the spill is under control;

k. a statement verifying that clean-up has begun and a description of the methods being used to clean up the spill;

l. the names of the people observing the spill (with their affiliations) and the extent of injuries, if any;

m. the Field "Report of Spill" form.

The Company shall ensure that the Contractor's spill report is complete and shall forward it to the Field Environmental Coordinator. The Contractor shall follow the *"Contractor's Environmental Guidelines - Waste Disposal and Spill Notification"* procedures regarding all required regulatory notifications, subject to Company's prior approval, and for obtaining any necessary state and local licenses, permits, or other authorizations associated with the Project, except as otherwise provided in the scope of work. Contractor is responsible for knowing what state and local environmental authorizations are necessary for the specific job at hand. Any above-mentioned permits, clearances or authorizations obtained by Contractor shall be furnished to Company.

The following releases require immediate (within 1 hour of discovery) notification to the National Response Center ("NRC"):

(1) Any petroleum product released into streams, rivers, lakes, or dry washes;

(2) A release that exceeds the reportable quantity ("RQ") of any CERCLA hazardous substances in any 24-hour period which is not fully contained;

(3) A release of a hazardous substance or hazardous waste which occurs during transportation; and,

(4) A release of hazardous waste which contains a RQ of a hazardous substance.

- The National Response Center (1-800-424-8802) will be notified immediately if spills occur above threshold levels (Clean Water Act, 40 CFR 110.10) into surface waters and/or wetlands.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

3. SUGGESTED EQUIPMENT LIST

Section 1.3 of these procedures states that the Contractor will prepare a list of the type, quantity, and location of storage or containment and clean up equipment to be used on the construction site. The list will include the procedures and impact minimization measures to be used in response to a spill. The Contractor's choice of impact minimization measures and equipment will be tailored to meet the characteristics of the affected terrain as well as the types and amounts of material that could potentially be spilled. The types of equipment that the Company expects to use to control spills at terrestrial sites and wetlands are described in the FERC's Plan.

3.1 TERRESTRIAL CONSTRUCTION

General equipment that the Contractor will use for spill containment and cleanup on terrestrial areas includes:

- sorbents (pillows, socks, and wipe sheets) for containment and pick up of spilled liquids;
- commercially available spill kits (or the functional equivalent thereof) that are prepackaged, self-contained spill kits containing a variety of sorbents for small to large spills;
- structures such as gutters, culverts, and dikes for immediate spill containment;
- shovels, backhoes, etc., for excavating contaminated materials;
- sumps and collection systems; and
- drums, barrels, and temporary storage bags to clean up and transport contaminated materials.

3.1.1 Fuels and Lubricating Oil Storage

The Contractor will implement special measures to prevent spills in areas where trucks carrying fuel and where oil barrels are loaded. Containment equipment will be kept close to tanks and barrels to minimize spill response time, and will include absorbent pads or mats. The quantity and capabilities of the mats will be sufficient to capture the largest foreseeable spill, given ROW or workspace characteristics and crankcase and other fuel vessel capacities.

3.1.2 Routine Refueling and Maintenance

Absorbent pads and mats will be placed on the ground beneath equipment before refueling and maintenance. Equipment that will be stored on site for routine refueling and maintenance includes small sorbent kits (or their functional equivalent).

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

3.1.3 Equipment Failure

Kits with the capacity of absorbing up to five gallons of liquid can fit beneath the operator's seat on construction equipment for use in an equipment failure.

3.2 WATERBODY AND WETLAND CROSSINGS

For each wetland and waterbody crossed, the equipment listed below will be available in addition to that needed for terrestrial construction. This equipment will be stored close to the water or wetland to minimize response time, and will include:

- oil containment booms and the related equipment needed for rapid deployment, and
- equipment to remove oils from water, such as oleophilic and hydrophobic absorbent booms and mats, and/or mechanical skimmers.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

APPENDIX F

Traffic and Transportation Management Plan

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Traffic and Transportation Management Plan



CT Expansion-Massachusetts Pipeline Loop

MEPA DEIR
Certificate Application

SEPT. 2014

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Section **Page**

1.0 CT Expansion Pipeline 1
1.1 Introduction…..... 1
1.2 Traffic Impacts 1
1.3 Construction Impacts 2
1.4 Construction Traffic 4

2.0 Transportation Related to Construction 6
2.1 Construction Spread..... 6
2.2 Pipe Yards..... 6

3.0 Permits Related to Construction 6
3.1 Massachusetts..... 6
3.2 Conclusion…..... 7

Appendix A: Traffic Management Details..... A-1

Appendix B: Project Overview Map..... B-1

List of Tables

Table 1.2-1 Road Crossings
Table 1.3-1 Road Crossing Details
Table 1.4-1 Permanent and Temporary Access Roads
Table 2.1-1 Construction Spreads
Table 2.2-1 Contractor Yards
Table 2.2-2 Pipe Yards
Table 3.1-1 Permits Related to Roads Associated-MA

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

List of Abbreviations and Acronyms

CR	County Road
CS	compressor station
CY	construction yard
DEIR	Draft Environmental Impact Report
DOT	Department of Transportation
Hwy	Highway
I	Interstate
MP	milepost
mph	miles per hour
MassDOT	Massachusetts Department of Transportation
MAOP	maximum allowable operating pressure
MEPA	Massachusetts Environmental Policy Act
Project	CT Expansion Pipeline
ROW	right-of-way
RFCYP	Route from Construction Yard to Pipeline
RTCY	Route to Construction Yard
SR	State Route
MAOP	maximum allowable operating pressure
PAR	permanent access road
TAR	temporary access road
MA	Massachusetts

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

1.1 Introduction

Tennessee Gas Pipeline Company, LLC, a Kinder Morgan Company (KMI), is filing an application for a Draft Environmental Impact Report (DEIR) Certificate (Certificate) with the Massachusetts Environmental Policy Act (MEPA) for the proposed Massachusetts Loop of the CT Expansion Pipeline (Project). The Project will provide new natural gas transportation capacity through a proposed looping pipeline located in Massachusetts.

The pipeline loop will consist of approximately 3.8 miles of 36-inch diameter pipeline in Massachusetts, with a maximum allowable operating pressure (MAOP) of 880 pounds per square inch gauge (psig). However, to maintain compliance with American National Standards Institute (ANSI) 600 specifications, pipeline and pipeline appurtenances at high gas temperatures, the pipeline will have respective maximum operating pressures (MOP) of 760psig.

The pipeline loop will be co-located within or adjacent to an existing KMI right of way for approximately 3.8 miles. The pipeline will be designed in accordance with Title 49 Code of Federal Regulations (CFR), Part 192 (U.S. Department of Transportation [USDOT]), Project specifications and standards, and other applicable safety and environmental regulations. The Massachusetts pipeline alignment is located in the town of Sandisfield in Berkshire County, Massachusetts.

The purpose of this Traffic and Transportation Management Plan (Traffic Plan) is to describe how the Project will use, improve, and maintain roads during construction. This involved the evaluation potential impacts of construction on the traffic due to ingress and egress at contractor yards, and rail yards, and access roads. The Traffic Plan also describes how the Project will implement material and equipment access to the right of way from public road ways to permanent and temporary access roads.

1.2 Traffic Impacts

The road network in the towns of Sandisfield and Monterrey within the vicinity of the Project area is a mostly a local road system generally characterized by paved two-lane roads and interspersed by interstates and 4 lane state highways. There will be temporary impacts to these roads due to pipeline crossings and construction traffic. These impacts will be within the bounds of approval by federal and state agencies, local permits, and guidelines, and as permitted by local landowners. Permits relating to roads associated with the CT Expansion Project will be acquired. The breakdown of road crossings by County and State is listed in Table 1.2-1.

1.2-1 Road Crossings

Road Crossings	County /City/Private Road Crossings	City, State
COLD SPRING ROAD (1)	CITY	Sandisfield,MA
COLD SPRING ROAD (2)	CITY	Sandisfield,MA
HAMMERTOWN ROAD	CITY	Sandisfield,MA
SOUTH BEECH PLAIN	CITY	Sandisfield,MA

1.3 Construction Impacts

Construction of the pipeline will require crossing paved and unpaved roads with varying levels of traffic. Roads will be crossed with either a conventional bore crossing or open cut method. Provisions will be made for alternating one-way traffic, detours, or other measures to permit traffic flow during construction. Massachusetts Department of Transportation standards for Traffic Management are expected to be used for this project can be found in Appendix A. If traffic cannot be maintained through the work area by some means a detour will be developed. In the interest of public safety, the contractor will coordinate any road closures with federal, state, and local emergency responders (law enforcement, fire, and medical). The pipeline will be buried to the depth required by applicable road crossing permits and approvals and will be designed to withstand anticipated external loadings. The number of various types of road crossings is provided in Table 1.3-1.

1.3-1 Road Crossing Details

STREET NAME	SPEED LIMIT	STATE	County	Town	Pavement Type	Crossing Method	Drawing M.P.	Road Type
COLD SPRING ROAD 1	25	MA	BERKSHIRE	Sandisfield	ASPHALT	BORE	2.4	Local/Rural
COLD SPRING ROAD 2	25	MA	BERKSHIRE	Sandisfield	ASPHALT	BORE	2.8	Local/Rural
HAMMERTOWN RD	25	MA	BERKSHIRE	Sandisfield	DIRT	OPEN CUT	3.1	Local/Rural
SOUTH BEECH PLAIN	25	MA	BERKSHIRE	Sandisfield	DIRT	OPEN CUT	3.6	Local/Rural

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

1.4 Construction Traffic

The pipeline loop will temporarily increase traffic on the road network due to construction employees commuting to and from work and trucks transporting equipment. Construction employees will likely be located within a 20-mile radius of the Project route and commute to and from the designated contractor staging yard location. It is expected that during the construction phase, 21,120’ of pipe in addition to equipment will be mobilized to support construction of the pipeline. These vehicles will be used to transport equipment operators, welders, foremen, and miscellaneous workers. Some of these vehicles will report to the contractor staging yard before proceeding to the ROW. Vehicles will be making trips throughout the day from staging areas and yards to the ROW to facilitate construction. To access the ROW for construction and maintenance, temporary and permanent access roads will be used. The list of Permanent and Temporary Access roads can be found in Table 1.4-1

1.4-1 Permanent and Temporary Access Roads

ACCESS ROAD ID	MILE POST	COUNTY	Town	Length (feet)	Road Type	Width	Affected Area (acres)	Justification
MA-1	0.77	BERKSHIRE	Sandisfield	231	Existing dirt road	20	0.19	PERMANENT ACCESS FOR OPERATIONS ACTIVITES
MA-2	1.37	BERKSHIRE	Sandisfield	356	Existing dirt road	20	0.27	TEMPORARY ACCESS FOR CONSTRUCTION ACTIVITIES
MA-3	1.73	BERKSHIRE	Sandisfield	901	Existing dirt road	20	0.66	TEMPORARY ACCESS FOR CONSTRUCTION
MA-4	2.73	BERKSHIRE	Sandisfield	181	Existing dirt road	20	0.12	PERMANENT ACCESS FOR OPERATIONS ACTIVITIES
MA-5	3.81	BERKSHIRE	Sandisfield	708	Existing paved road	20	0.43	PERMANENT ACCESS FOR CONSTRUCTION ACTIVITIES AND OPERATIONAL AND MAINTENANCE ACTIVITES FOR PIG RECEIVER

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

2.0 Transportation Related to Construction

2.1 Construction Spread

The pipeline loop will be covered in one construction spread spanning the 3.8 mile length of the pipeline. The spread will be located in the town of Sandisfield in Berkshire County, Massachusetts. This spread will use 40' pipe joints across a length of 21,120' which will equate to 528 joints. During construction due to the size of diameter of the pipe joints the contractor will only be able to haul 3 joints per truck which equates to 176 truckloads. The vehicle weights empty and loaded:

Empty Truck and Trailer – 31,000 lbs. to 33,000 lbs.
Loaded Truck and Trailer cannot exceed 80,000 lbs. by law

The actual hauling weight of 3 joints of .375WT & .500WT pipe will range from 16,000 lbs. to 19,000 lbs.

2.2 Pipe Yard

All pipes will be unloaded and stored at the Tyringham pipe yard. Pipe will be transported by truck from the yard to the ROW. Based on the location of the pipe yard and the proposed permanent and temporary access roads Monterey Road between the pipe yard and the right of way will have the heaviest traffic flow as it will be the starting and ending point for all transport of equipment and material.

2.2-1 Pipe Yard

Yard Name	City	County	State	Affected Area (acres)
Tyringham	Monterey	Berkshire	Massachusetts	3.52

3.0 PERMITS RELATED TO CONSTRUCTION

3.1 Massachusetts

The pipeline loop is located in Berkshire County, Massachusetts and will be subject to the regulations and permits requirements at the federal, state, county and local level Construction of the pipeline will have a footprint in the towns of Sandisfield and Monterey. Townships have their own sets of permits that must be followed. In most cases the county will defer permit approval for hauling or construction down to the local

level in cases of non-county or state roads. Listed below is the contact information for the county and state agencies involved with the construction of the CT Expansion pipeline loop in Massachusetts

3.1-1 PERMITS RELATING TO ROADS ASSOCIATED-MA

COUNTY, STATE	REQUIREMENTS
Town of Sandisfield **66 Sandisfield Road / P.O. Box 90, Sandisfield, MA 01255**	Local permits will have to be obtained through the Town of Sandisfield.
Massachusetts Dept. of Transportation 10 Park Plaza, Suite 4160 Boston, MA 02116	Special Hauling Permit: There is no fee for a Special Hauling Permit for vehicles that are under the following restrictions: -12' 0" Wide Load Banner & Flags (see Additional Requirements below) -13' 6" Height -99,000 lbs. Max -100' Long (Up to 80' long no escort is needed, see Additional Requirements below) If your vehicle exceeds the above restrictions, there is a $350.00 fee for the permit and you may require a State Police escort. A copy of a check payable to MassDOT must accompany the application.

3.2 Conclusion

In adhering to the rules and regulations set forth by federal, state, and local governing agencies, the contractor will manage the construction and traffic impacts related to the pipeline. At the completion of the Project, the contractor will restore all roads back to their original status, unless directed otherwise in writing by KMI, the landowner, or land management agency.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

APPENDIX A-TRAFFIC MANAGEMENT DETAILS

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

NOTES:

1. ALL TEMPORARY TRAFFIC CONTROL WORK SHALL CONFORM TO THE LATEST EDITION OF THE "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" (MUTCD) AND ALL REVISIONS, UNLESS SUPERCEDED BY THESE PLANS.
2. ALL SIGN LEGENDS, BORDERS, AND MOUNTING SHALL BE IN ACCORDANCE WITH THE MUTCD.
3. TEMPORARY CONSTRUCTION SIGNING AND ALL OTHER TRAFFIC CONTROL DEVICES SHALL BE IN PLACE PRIOR TO THE START OF ANY WORK.
4. TEMPORARY CONSTRUCTION SIGNING, BARRICADES, AND ALL OTHER NECESSARY WORK ZONE TRAFFIC CONTROL DEVICES SHALL BE REMOVED FROM THE HIGHWAY OR COVERED WHEN THEY ARE NOT REQUIRED FOR CONTROL OF TRAFFIC.
5. SIGNS AND SIGN SUPPORTS LOCATED ON OR NEAR THE TRAVELED WAY, CHANNELIZING DEVICES, BARRIERS, AND CRASH ATTENUATORS MUST PASS THE CRITERIA SET FORTH IN NCHRP REPORT 350, "RECOMMENDED PROCEDURES FOR THE SAFETY PERFORMANCE EVALUATION OF HIGHWAY FEATURES" AND/OR "MANUAL FOR ASSESSING SAFETY HARDWARE" (MASH).
6. CONTRACTORS SHALL NOTIFY EACH ABUTTER AT LEAST 24 HOURS IN ADVANCE OF THE START OF ANY WORK THAT WILL REQUIRE THE TEMPORARY CLOSURE OF ACCESS, SUCH AS CONDUIT INSTALLATION, EXISTING PAVEMENT EXCAVATION, TEMPORARY DRIVEWAY PAVEMENT PLACEMENT, AND SIMILAR OPERATIONS.
7. THE FIRST FIVE PLASTIC DRUMS OF A TAPER SHALL BE MOUNTED WITH TYPE A LIGHTS.
8. THE ADVISORY SPEED LIMIT, IF REQUIRED, SHALL BE DETERMINED BY THE ENGINEER.
9. DISTANCES ARE A GUIDE AND MAY BE ADJUSTED IN THE FIELD BY THE ENGINEER.
10. MAXIMUM SPACING OF TRAFFIC DEVICES IN A TAPER (DRUMS OR CONES) IS EQUAL IN FEET TO THE SPEED LIMIT IN MPH.
11. MINIMUM LANE WIDTH IS TO BE 11 FEET (3.3m) UNLESS OTHERWISE SHOWN. MINIMUM LANE WIDTH TO BE MEASURED FROM THE EDGE OF DRUMS OR MEDIAN BARRIER.
12. ALL SIGNS SHALL BE MOUNTED ON THEIR OWN STANDARD SIGN SUPPORTS.

LEGEND:

- REFLECTORIZED PLASTIC DRUM OR 36" CONE
- P/F POLICE/FLAGGER DETAIL
- TYPE III BARRICADE
- CHANGEABLE MESSAGE SIGN
- ARROW BOARD
- WORK ZONE
- DIRECTION OF TRAFFIC
- IMPACT ATTENUATOR
- MEDIAN BARRIER
- MEDIAN BARRIER WITH WARNING LIGHTS
- WORK VEHICLE
- TRUCK MOUNTED ATTENUATOR
- TRAFFIC OR PEDESTRIAN SIGNAL
- SIGN

THE IDEAL CAPACITY OF A MAJOR HIGHWAY IS GENERALLY CONSIDERED TO BE 1900 PASSENGER CARS PER HOUR PER LANE (PCPHPL). IN WORK ZONES ON A MULTI–LANE DIVIDED HIGHWAY, THE FOLLOWING VOLUME GUIDELINES HAVE BEEN SUGGESTED:

MEASURED AVERAGE WORK ZONE CAPACITIES

NUMBER OF LANES		NUMBER OF STUDIES	AVERAGE CAPACITY	
NORMAL (EXISTING)	OPEN (TO TRAFFIC)		VPH	VPHPL
3	1	7	1,170	1,170
2	1	8	1,340	1,340
5	2	8	2,740	1,370
4	2	4	2,960	1,480
3	2	9	2,980	1,490
4	3	4	4,560	1,520

Source: Dudek, C., Notes on Work Zone Capacity and Level of Service. Texas Transportation Institute, Texas A&M University, College Station, Texas (1984)

BY OBTAINING HOURLY TRAFFIC COUNTS FOR A PARTICULAR ROADWAY (WITH A MINIMUM OF A 48–HOUR AUTOMATIC TRAFFIC RECORDER (ATR) COUNT), THIS WILL HELP TO DETERMINE AT WHAT TIMES OF THE DAY OR NIGHT A CERTAIN NUMBER OF LANES MAY BE CLOSED.

MassDOT Massachusetts Department of Transportation Highway Division

Notes for Traffic Management

FIGURE GEN-1

GENERAL GUIDELINES

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

SUGGESTED WORK ZONE WARNING SIGN SPACING

ROAD TYPE	DISTANCE BETWEEN SIGNS **		
	A	B	C
LOCAL OR LOW VOLUME ROADWAYS*	350 (100)	350 (100)	350 (100)
MOST OTHER ROADWAYS*	500 (150)	500 (150)	500 (150)
FREEWAYS AND EXPRESSWAYS*	1,000 (300)	1,500 (450)	2,640 (800)

* ROAD TYPE TO BE DETERMINED BY MASSDOT OFFICE OF TRANSPORTATION PLANNING.

** DISTANCES ARE SHOWN IN FEET (METERS). THE COLUMN HEADINGS A, B, AND C ARE THE DIMENSIONS SHOWN IN THE DETAIL/ TYPICAL SETUP FIGURES. THE A DIMENSION IS THE DISTANCE FROM THE TRANSITION OR POINT OF RESTRICTION TO THE FIRST SIGN. THE B DIMENSION IS THE DISTANCE BETWEEN THE FIRST AND SECOND SIGNS. THE C DIMENSION IS THE DISTANCE BETWEEN THE SECOND AND THIRD SIGNS. (THE "THIRD" SIGN IS THE FIRST ONE TYPICALLY ENCOUNTERED BY A DRIVER APPROACHING A TEMPORARY TRAFFIC CONTROL (TTC) ZONE.)

THE "THIRD" SIGN ABOVE IS TYPICALLY REFERRED TO AS AN "ADVANCE WARNING" SIGN ON THE TTCP SETUPS. THESE ADVANCE WARNING SIGNS ARE LOCATED PRIOR TO THE PROJECT LIMITS ON ALL APPROACHES (i.e. THE W20-1 SERIES (ROAD WORK XX FT) SIGNS), AND USUALLY REMAIN FOR THE DURATION OF THE PROJECT. ADDITIONAL SIGNS (i.e. "RIGHT LANE CLOSED 1 MILE" AND "LEFT LANE CLOSED 1 MILE") HAVE BEEN SHOWN IN SOME FIGURES AS EXAMPLES OF REINFORCEMENT SIGN PLACEMENT BUT ARE USED IN RARE OCCASIONS.

THE FIRST AND SECOND WARNING SIGNS ABOVE ARE REFERRED TO AS THE OPERATIONAL (DAY-TO-DAY) WORK ZONE SIGNS AND MAY BE MOVED DEPENDING ON WHERE THE SPECIFIC ROADWAY WORK FOR THAT DAY IS LOCATED.

R2-10a SIGNS SHALL BE PLACED BETWEEN THE SECOND AND THIRD SIGNS AS DESCRIBED ABOVE.

R2-10a, R2-10e, AND W20-1 SERIES SIGNS ARE TO BE INCLUDED ON ALL DETAILS/TYPICAL SETUPS.

Based on: Table 6C-1 MUTCD LATEST EDITION

STOPPING SIGHT DISTANCE AS A FUNCTION OF SPEED

SPEED* (km/h)	DISTANCE (m)
30	35
40	50
50	65
60	85
70	105
80	130
90	160
100	185
110	220
120	250

SPEED* (mph)	DISTANCE (ft)
20	115
25	155
30	200
35	250
40	305
45	360
50	425
55	495
60	570
65	645
70	730
75	820

*POSTED SPEED, OFF-PEAK 85TH-PERCENTILE SPEED PRIOR TO WORK STARTING, OR THE ANTICIPATED OPERATING SPEED

THESE VALUES MAY BE USED TO DETERMINE THE LENGTH OF LONGITUDINAL BUFFER SPACES.

THE DISTANCES IN THE ABOVE CHART REPRESENT THE MINIMAL VALUES FOR BUFFER SPACING.

Source: Table 6C-2 MUTCD LATEST EDITION

MassDOT Massachusetts Department of Transportation Highway Division

Notes for Traffic Management

FIGURE GEN-2

NOTES ON WORK ZONE DISTANCES

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CONVENTIONAL ROADWAY– A STREET OR HIGHWAY OTHER THAN A LOW–VOLUME ROAD, EXPRESSWAY, OR FREEWAY.

EXPRESSWAY– A DIVIDED HIGHWAY WITH PARTIAL CONTROL OF ACCESS.

FREEWAY– A DIVIDED HIGHWAY WITH FULL CONTROL OF ACCESS.

LOW–VOLUME ROAD– A FACILITY LYING OUTSIDE OF BUILT–UP AREAS OF CITIES, TOWNS, AND COMMUNITIES, AND IT SHALL HAVE A TRAFFIC VOLUME OF LESS THAN 400 AADT. IT SHALL NOT BE A FREEWAY, EXPRESSWAY, INTERCHANGE RAMP, FREEWAY SERVICE ROAD OR A ROAD ON A DESIGNATED STATE HIGHWAY SYSTEM.

Source: MUTCD LATEST EDITION

TAPER LENGTH CRITERIA FOR TEMPORARY TRAFFIC CONTROL ZONES

TYPE OF TAPER	TAPER LENGTH (L)*
MERGING TAPER	AT LEAST L
SHIFTING TAPER	AT LEAST 0.5L
SHOULDER TAPER	AT LEAST 0.33L
ONE–LANE, TWO–WAY TRAFFIC TAPER	50 FT MIN.(15 m) 100 FT(30 m) MAX.
DOWNSTREAM TAPER	50 FT MIN.(15 m) 100 FT MAX.(30 m) PER LANE

Source: Table 6C–3 MUTCD LATEST EDITION

FORMULAS FOR DETERMINING TAPER LENGTHS

SPEED LIMIT (S)	TAPER LENGTH (L) FEET
40 MPH OR LESS	$L = \frac{WS^2}{60}$
45 MPH OR MORE	$L = WS$

SPEED LIMIT (S)	TAPER LENGTH (L) Meters
60 KM/H OR LESS	$L = \frac{WS^2}{155}$
70 KM/H OR MORE	$L = \frac{WS}{1.6}$

WHERE: L = TAPER LENGTH IN FEET (METERS)

W = WIDTH OF OFFSET IN FEET (METERS)

S = POSTED SPEED LIMIT, OR OFF–PEAK 85TH–PERCENTILE SPEED PRIOR TO WORK STARTING, OR THE ANTICAPATED OPERATING SPEED IN MPH (KM/H)

Source: Table 6C–4 MUTCD LATEST EDITION

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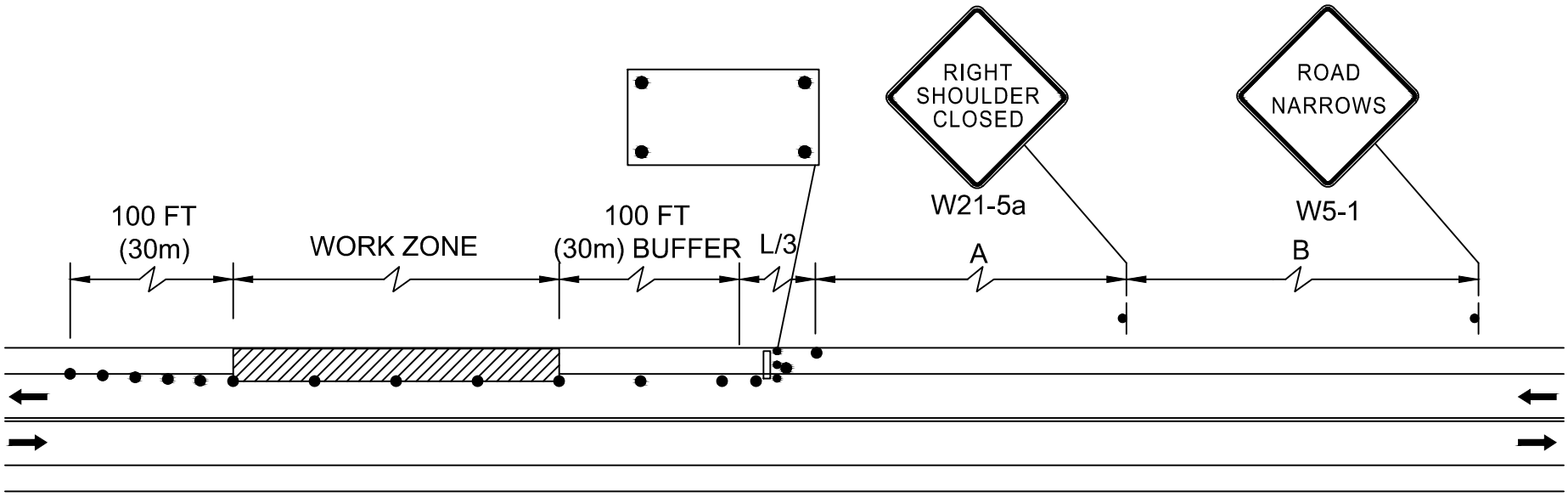

MassDOT
Massachusetts Department of Transportation
Highway Division

Standard
Details and Drawings
for the
Development of
Temporary Traffic Control Plans

FIGURE TLR-1

TWO LANE ROAD
SHOULDER CLOSED

NOT TO SCALE

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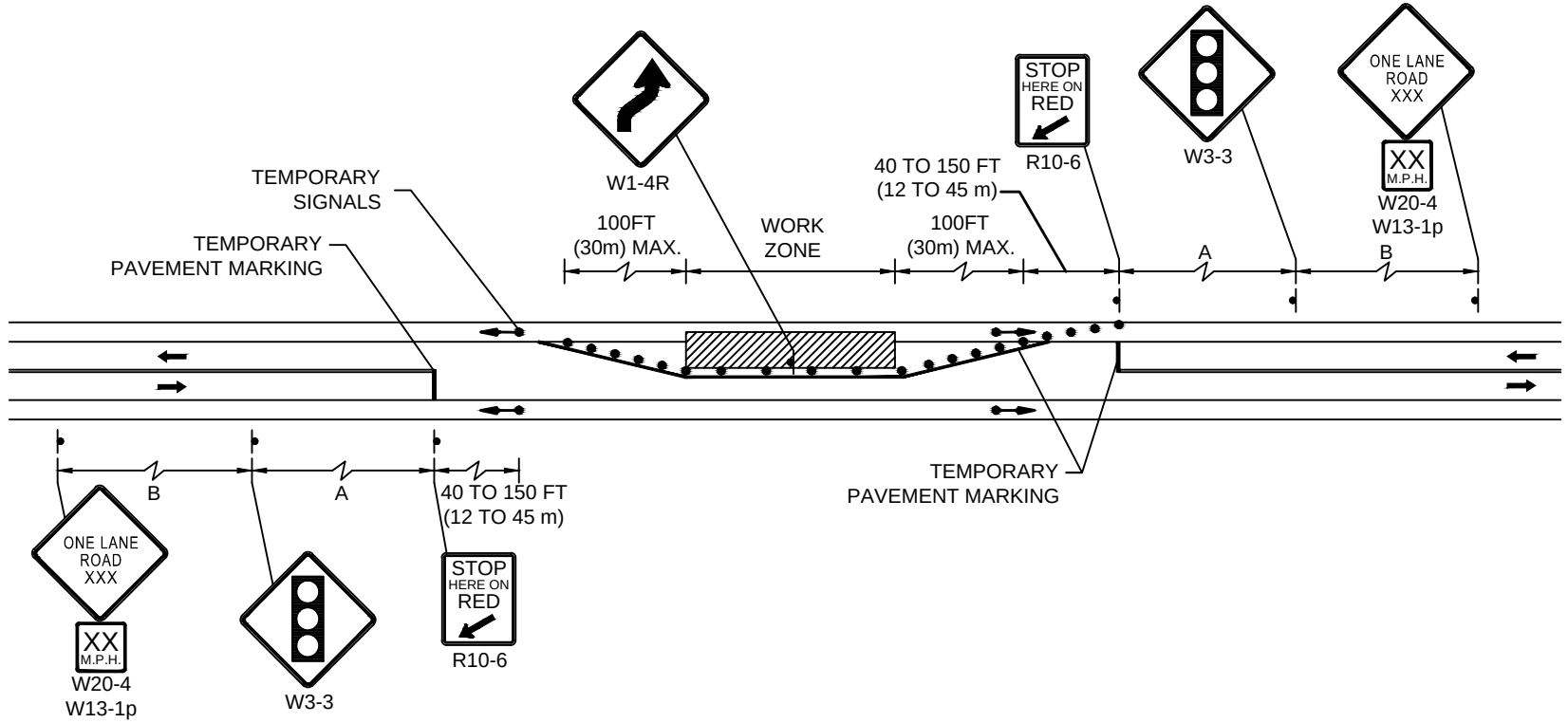

Standard
Details and Drawings
for the
Development of
Temporary Traffic Control Plans

FIGURE TLR-4

TWO LANE ROAD
ONE LANE ALTERNATING TRAFFIC WITH
TEMPORARY SIGNAL

NOT TO SCALE

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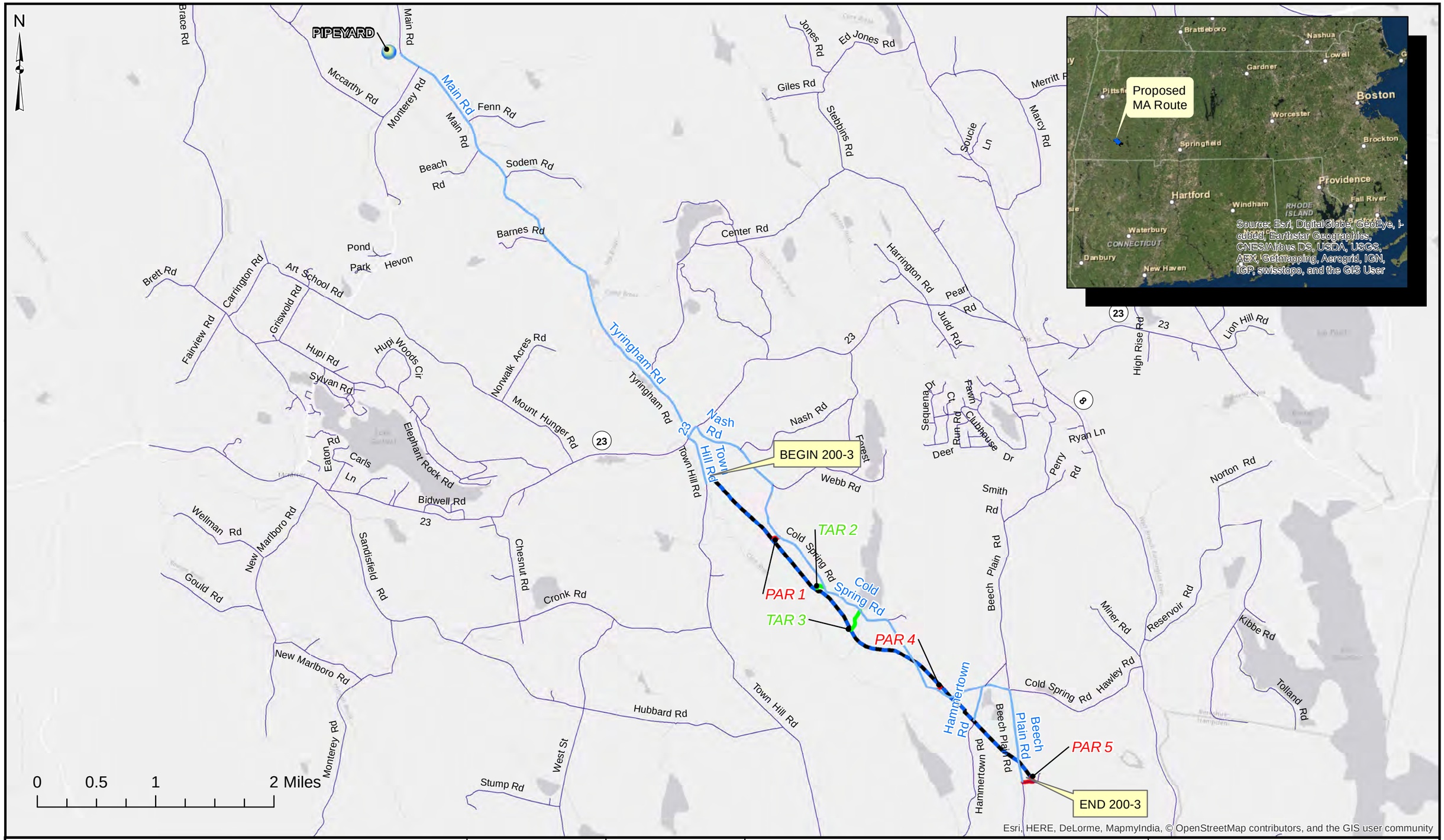
APPENDIX B- PROJECT OVERVIEW MAP



Proposed MA Route
Proposed Pipeyard
Permanent Access Road
Temporary Access Road
Other Road
Project Road

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.
REVISIONS					

DIVISION:		OP AREA:
STATE: MASSACHUSETTS		CO./PAR.: BERKSHIRE
SECTION:	TOWNSHIP:	RANGE:
DFT: JMD	DATE: 8/28/14	SCALE: 1"=4000'
CHK:	DATE:	FILENAME:
APPR:	DATE:	

CT EXPANSION PROJECT

TRANSPORTATION ROUTE MAP

PROPOSED MA LOOP 200-3

FOR INFORMATION ONLY

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

MAP BOOKS

SHEET:
TYPE:
REV.

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APPENDIX F

Waste Management Plan

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

CONNECTICUT EXPANSION PROJECT
WASTE MANAGEMENT PLAN

TABLE OF CONTENTS

1. WASTE IDENTIFICATION AND CHARACTERIZATION 1

1.1 IDENTIFYING WASTES 1

1.2 WASTE CHARACTERIZATION 1

2. WASTE TYPES 2

2.1 HAZARDOUS WASTE 2

2.2 NON-HAZARDOUS WASTE 4

2.3 SPECIAL WASTE (ASBESTOS & PCB) 5

2.3.1 Asbestos/ACM 5

2.3.2 PCB Waste 7

2.4 UNIVERSAL WASTE 8

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

WASTE MANAGEMENT PLAN

The following information is to be used as a contractor's guidance tool when generating wastes for Tennessee Gas Pipeline Company, L.L.C.'s ("Company") Connecticut Expansion Project ("Project") and to assist the contractor in developing a waste management plan, which must be submitted to the Company before the Project begins.

1. Waste Identification and Characterization

1.1 Identifying Wastes

Wastes may be grouped into four categories, each requiring different forms of disposal: hazardous waste, non-hazardous waste, special waste, and universal waste.

- **Hazardous wastes** - Wastes that meet one of the criteria of ignitable, corrosive, reactive, toxic, or is specifically listed as hazardous waste by regulation. These wastes require special handling and disposal.

- **Non-hazardous wastes** - Wastes that do not fall into the other categories. This includes general trash.

- **Special wastes** - Wastes that do not meet the criteria for hazardous wastes, but may present special hazards or require special handling. Examples of special wastes are asbestos, polychlorinated biphenyls ("PCBs"), radioactive waste, and naturally occurring radioactive material ("NORM"). It's important to note that some states have their own classification of special wastes.

- **Universal wastes** - To reduce the amount of hazardous waste in municipal solid waste streams, the Environmental Protection Agency ("EPA") and many states recognize batteries, thermostats and lamps, e.g., fluorescent light bulbs, as "universal" and thus allow easier handling of these wastes.

1.2 Waste Characterization

The Environmental Inspector ("EI") shall coordinate with the Field Environmental Representative to determine if waste profiles exist for wastes generated during construction. If the classification of a waste is unknown, the waste must be characterized using test results or knowledge of the process generating the waste to determine the proper handling requirements for that waste. The EI shall coordinate with the Field Environmental Representative and Contractor to determine the type of waste and the party responsible for proper disposal. The information below is used to characterize a waste.

- Source of the waste.

- Material Safety Data Sheets ("MSDS") for materials comprising the waste.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

- Laboratory results from waste testing, as applicable.

Contact the Field Environmental Representative for waste characterization and sampling instructions if no existing waste profile exists.

Prior to waste characterization, a number of general guidelines shall also be adhered to when handling or storing wastes.

- Ensure that the Contractor's Environmental Guidelines in the contract are followed.
- Ensure that the Contractor provides a list to the EI of all hazardous materials or potential contaminants that are to be used or stored on the Project site.
- DO NOT bury any waste with the exception of stumps, rocks, or boulders as approved within the Federal Energy Regulatory Commission's Upland Erosion Control, Revegetation and Maintenance Plan (the "Plan", May 2013 version) and the Commission's Wetland and Waterbody Construction and Mitigation Procedures (the "Procedures", May 2013 version).
- Never mix any waste awaiting characterization with other wastes.
- Never ship any waste unless it has been characterized.
- Never ship any hazardous waste from the job site to a compressor station without prior approval from the Field Environmental Representative and compressor station.
- Ship wastes along with the required manifests only to company-approved facilities.
- Never ship drums of waste to a compressor station without prior approval from the Field Environmental Representative and the compressor station.

2. Waste Types

2.1 Hazardous Waste

Common wastes include, but are not limited to: pipeline sludge, spent pigs, sandblast abrasive (depending on type and use), paint thinner, and solvents.

The following procedures apply to storage of waste determined to be hazardous for all classes of generators:

- Store hazardous wastes using the Department of Transportation ("DOT") approved containers, a frac tank (bulk liquid wastes), a covered steel roll-off

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

container with a poly-liner (bulk solid wastes like contaminated soil), or on a thick poly-liner and provide the area with a poly-liner cover and temporary containment berm (bulk solid wastes).

- When using DOT-approved containers, be sure the containers are kept closed or sealed (except when waste is being added), maintained in good condition (not damaged, leaking or corroded) and store compatible substances that will not react with the hazardous waste. For example, store acidic wastes in plastic or plastic-lined containers rather than steel containers.

- Label hazardous waste containers (drums, tanks, roll-off containers) with a hazardous waste label as soon as any hazardous waste is placed into the container. Use a waterproof pen to complete the following information on the label:

  - Generator name, address, and phone number.
  - Generator EPA identification number.
  - Description of waste (contact the Field Environmental Representative to obtain a waste description).
  - The 4-digit EPA waste code (the Field Environmental Representative will provide EPA waste codes).
  - Accumulation date (the date the waste was added to the container, if not from satellite storage, or the date it was brought to the waste storage area from a satellite accumulation area).

- Label waste piles with a weatherproof sign identifying the waste and the date the waste pile was started. Waste piles are to be placed on poly-liner, covered to protect them from weather, and surround with barricade tape.

- Store hazardous waste in a designated hazardous waste storage area (or in a designated satellite accumulation area) that is covered or protected from the weather; has an impermeable floor, surrounded by curbing or use spill pallets; and is more than 50 feet away from the facility property line if ignitable or reactive hazardous waste is stored in the area.

<u>Manage the hazardous waste storage areas as follows:</u>

- Identify as hazardous and non-hazardous waste appropriately.

- Arrange the containers by waste type, keeping similar hazardous wastes together.

- Separate any incompatible waste by a dike, berm, wall, or other containment device.

- Turn containers so labels may be read easily and ensure that enough isle space is left between drums to inspect for leaks and to gain access to respond to spills or fire.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

- Handle waste containers carefully to prevent rupture or leaks, and protect containers from extreme temperatures.

- Large Quantity Generators and in some states Small Quantity Generators must have a contingency plan, make weekly inspections of hazardous wastes, and provide specific training to personnel.

- Hazardous waste can only be disposed at approved facilities. Contact the Field Environmental Representative for a list of approved facilities.

2.2 Non-Hazardous Waste

Common wastes include, but are not limited to: oily rock/soil, oily rags, sandblast abrasive (depending on type and use), and general trash/garbage.

- Turn containers so labels may be read easily.

- Non-hazardous waste is waste that has not been found to be hazardous through testing or by generator knowledge but has special transportation and disposal requirements, which may include State permitting and approvals.

- Store non-hazardous wastes using one of the following methods:

    - In DOT-approved containers.
    - In a frac tank (bulk liquid wastes).
    - In a covered steel roll-off container with a poly-liner (e.g., bulk solid wastes like contaminated soil or used sandblasting abrasive).
    - On a thick poly-liner and provide the area with a poly-liner cover and temporary containment berm (bulk solid wastes).

- When using DOT-approved containers, be sure the containers are:

    - Kept closed or sealed (except when waste is being added).
    - In good condition (not damaged, leaking or corroded).

- Label non-hazardous waste containers (drums, tanks, roll-off containers) with a non-hazardous waste label identifying the contents as soon as waste is placed into the container.

- Store non-hazardous waste segregated from hazardous waste storage or satellite accumulation areas.

- Non-hazardous waste can only be disposed at approved facilities. Contact the Field Environmental Representative for a list of approved facilities.

Some States allow sandblast sand to be left in the ditch if sandblasting bare pipe only.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Contact the Project Environmental Coordinator to verify if this type of activity may occur.

2.3 Special Waste (Asbestos and PCB)

Common wastes include, but are not limited to: asbestos or asbestos containing material ("ACM") and PCBs.

2.3.1 Asbestos/ACM

Check with the Project Environmental Coordinator to determine if there are any additional state-specific requirements that may apply.

- Store in double, six-mil thick plastic bags, or single bags in DOT approved drums.
- When placing asbestos into waste containers, do the following:
  - Make sure that the asbestos is thoroughly wet before closing the container for the final time.
  - Gloves and other solids can be added before sealing.
  - Seal all containers by securing the drum lids or by wrapping the neck of plastic bags with duct tape.
  - Store containers in an area where the waste is secure and not easily disturbed.
  - For accumulation containers, each item must be individually wrapped and placed in drum.
- Mark or label the container with the information indicated below:
  - The letters "RQ" for reportable quantity, if the waste contains one pound or more of friable asbestos.
  - The word "Waste".
  - The word "Asbestos" and the identification number for asbestos "NA2212".
  - The facility name and address.
  - A warning label stating "DANGER; CONTAINS ASBESTOS FIBERS; AVOID CREATING DUST; CANCER AND LUNG DISEASE HAZARD".
- Ship asbestos waste to a Company-approved disposal facility. Contact the Field Environmental Representative for a list of approved facilities.
- Pipe coated with non-friable asbestos can be sold and transported to a scrap dealer or individual buyer. Written notification to the dealer or buyer must include a disclosure and release document that indicates that the pipe is coated with an asbestos-containing material. The Company has a specific document for this

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

purpose that contains the appropriate language. Contact the Field Environmental Representative for details on transferring pipe coated with non-friable asbestos.

- Do the following when preparing sections of pipe coated with friable asbestos-containing material for transportation to a Company-approved disposal facility:

  - Pipe joints must be less than 40 feet long for transportation by trailer (also verify whether or not a specific pipe length is required by the disposal company).
  - Pipe joints must be less than 20 feet long for transportation in a roll-off box.
  - Wrap ends of pipe with polyvinyl and duct tape or place in sealed roll-off container.
  - A manifest is required for transportation to a disposal facility.
  - Provide State environmental or health department registration, if applicable.

- Use either Company vehicles or contract vehicles that meet DOT requirements to transport asbestos waste. If the amount of asbestos-containing material being transported is 1,000 pounds or more, a commercial drivers license with hazardous materials endorsement is required.

- Ensure that the vehicle transporting regulated asbestos-containing material (friable) from the facility is marked with signs warning of asbestos danger while the vehicle is being loaded or unloaded. The sign should read “DANGER; ASBESTOS DUST HAZARD; CANCER AND LUNG DISEASE HAZARD; AUTHORIZED PERSONNEL ONLY”.

- Inspect all containers before and after unloading/loading to ensure:

  - All drum tops are secured.
  - Duct tape has been placed around the necks of all bags and there are no punctures. Place additional bags over the outside of any punctured bags and secure the necks of the new bags with duct tape.
  - All containers are properly labeled.

- The type of shipping papers required depends on the applicable state. A waste shipping record must be completed for each shipment. Check with the Project Environmental Coordinator to determine if there are any additional state-specific requirements that may apply.

- Make sure shipping papers are completed as follows:

  - Check the “RQ” column on the shipping paper or mark “RQ” before the shipping name if the shipment contains one pound or more of friable asbestos.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

- DOT shipping name is “Waste Asbestos” or, if the asbestos waste is mixed with a binder, filler, or other material, “Waste Asbestos Mixture”.
- Hazard Class Identification Number is “Class 9”.
- North American Identification Number is “NA2212”.
- Packing group is “PG III”.

- Never dispose of asbestos-containing wastes by placing it in a container with other trash, by burying, using as fill material, or leaving in a pipe excavation ditch.

- Dispose of asbestos-containing wastes as soon as practical at a disposal facility that is permitted to accept asbestos. Contact the Field Environmental Representative for a list of approved disposal sites for asbestos-containing wastes.

2.3.2 PCB Waste

In some states, PCB wastes are hazardous wastes and all hazardous waste requirements must be followed in addition to those listed in this procedure. **Check with the Project Environmental Coordinator to determine if there are any additional state-specific requirements that may apply.**

- PCB wastes may be stored for 30 days without any special storage requirements.

- PCB wastes may be stored up to one year within an EPA-defined storage area. Contact the Project Environmental Coordinator for assistance on setting up a PCB waste storage area.

- As a minimum, store liquid PCB wastes in DOT-approved containers or on pallets with containment designed to capture any drips or leaks.

- Protect storage containers or equipment from weather.

- Mark PCB wastes with the proper PCB label before being placed into storage. The basic PCB label is 6”x6”, white or yellow, which can be reduced as small as 2”x2”.

- Mark all PCB wastes with the date that the item was removed from service or the date that the waste was generated and enter this information on the PCB waste log. Mark the storage area with a sign.

- Company vehicles can only be used to transport PCB wastes from a Company location where the waste was generated to another Company location where the waste will be stored. Placards are required if transporting:

  - More than 99.4 pounds of PCB waste in containers
  - One or more PCB transformers with 500 ppm or more PCBs.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

- Check containers before and after loading to make sure that they are in good condition, are not leaking, and that all covers are secured.

- A hazardous waste manifest must accompany each shipment of PCB waste.

- Contact the Project Environmental Coordinator for a list of Company approved PCB disposal facilities. Dispose all PCB wastes at an approved facility.

- Once the PCB waste has been shipped to an approved disposal facility, the owner or operator of the disposal facility shall send the manifest and acknowledgement of receipt to the generator identified on the manifest which accompanied the shipment of PCB waste within 30 days of the date the disposal facility received the waste. If an acknowledgement of receipt is not received with the manifest, the generator shall confirm by telephone by the close of business that the disposal facility received the manifested waste and document the acknowledgement in the PCB log. The disposal facility should also send a Certificate of Disposal within 30 days of actual disposal of the waste.

2.4 Universal Waste

Common wastes include, but are not limited to: batteries, thermostats, and fluorescent light bulbs.

- If any universal waste is generated during construction, contact the Field Environmental Representative for storage and disposal instructions.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

APPENDIX F

Blasting Plan

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Tennessee Gas Pipeline Company, L.L.C. a Kinder Morgan company	TITLE: Connecticut Expansion Project Blasting Plan	SPEC NO.	REV. NO. 0
		SHEET NO. 1 of 13	
		DATE July, 2014	
		JOB NO. TGP-001	

TENNESSEE GAS PIPELINE COMPANY, L.L.C

CONNECTICUT EXPANSION PROJECT

BLASTING PLAN

July 2014

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

BLASTING PLAN

TABLE OF CONTENTS

1.0 INTRODUCTION..... 3
2.0 OBJECTIVE 3
3.0 GENERAL REQUIREMENTS..... 3
4.0 PRE-BLASTING REQUIREMENTS..... 4
5.0 SITE-SPECIFIC BLASTING PLANS..... 4
6.0 MONITORING..... 6
7.0 LIMITS ON PEAK PARTICLE VELOCITY..... 6
8.0 SAFETY..... 7
8.1 PROTECTION OF ABOVEGROUND AND UNDERGROUND STRUCTURES 7
8.2 PROTECTION OF PERSONNEL..... 9
8.3 PROTECTION OF THREATENED AND ENDANGERED SPECIES..... 11
8.4 LIGHTNING HAZARD.....11
10.0 STORAGE REQUIREMENTS..... 12

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

1.0 INTRODUCTION

This Blasting Plan outlines the procedures and safety measures that the Contractor will adhere to while implementing blasting activities along the pipeline right-of-way during the Connecticut Expansion Project (the "Project"). The Contractor will be required to submit a Blasting Specification Plan to Tennessee Gas Pipeline Company, L.L.C. ("Tennessee") that is consistent with the provisions of this Blasting Plan. The Contractor's plan, when approved by Tennessee, will be incorporated into the Contractor's scope of work.

2.0 OBJECTIVE

This Blasting Plan is intended to identify blasting procedures, including safety, use, storage, and transportation of explosives that are consistent with minimum safety requirements as defined by applicable Federal regulations (e.g., Title 27 CFR 181 - Commerce in Explosives; Title 49 CFR 177 - Carriage by Public Highway; Title 29 CFR 1926.900 et seq. Sub-part U - Safety and Health Regulations for Construction - Blasting and Use of Explosives; Title 29 CFR 1910.109 – Explosives and Blasting Agents (OSHA); 29 CFR 1926.900-General Provisions and sections 901, 902 and 904-911), applicable state and local regulations, and Kinder Morgan Construction Specifications For Land Pipeline Construction. Additionally this plan is intended to address environmental aspects of blasting activities and to identify areas of concern along the proposed pipeline loop segments.

3.0 GENERAL REQUIREMENTS

Blasting operations shall be conducted by or under the direct and constant supervision of personnel legally licensed and certified to perform such activities in the jurisdiction where blasting occurs. Prior to any blasting activities, the contractor shall provide Tennessee with appropriate information documenting the experience, licenses, and permits associated with all blasting personnel.

Blasting-related operations, including obtaining, transporting, storing, handling, loading, detonating, and disposing of blasting material; drilling; and ground-motion monitoring, shall comply with all applicable federal, state, and local regulations, permit conditions and the construction contract.

Blasting for grade or trench excavation shall be used where deemed necessary by a construction expert after examination of the site and in other locations only after other reasonable means of excavation have been used and are unsuccessful in achieving the required results. Tennessee may specify locations (e.g., foreign line crossings, near structures) where consolidated rock shall be removed by approved mechanical equipment such as rock-trenching machines, rock saws, hydraulic rams, or jack hammers in lieu of blasting.

Before blasting, a site-specific Blasting Specification Plan must be submitted by the Contractor to Tennessee for approval. Tennessee will contract a third party engineer with

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

expertise in blasting operations to review the site-specific blasting plan. The engineer will analyze the data to determine the combined stress level of each affected pipeline and will make recommendations and/or forward approval to Tennessee before blasting may commence.

Special blasting controls will be required where dry waterbody crossings are specified. The type of explosive, size of charges, sequence of firing, etc. will be selected to minimize shock wave stresses on aquatic life adjacent to the blasting area. In addition to the use of matting to control fly rock, where specified, the Contractor will furnish the necessary labor and equipment to employ air bubble curtains.

Tennessee will contract a third party inspector that will be present during construction and blasting activities to monitor the Contractor and their blasting operations. Approval is required to proceed prior to each blast. Approval does not relieve the Contractor from responsibility or liability.

4.0 PRE-BLASTING REQUIREMENTS

Prior to the initiation of blasting operations, the Contractor shall comply with the following:

- The Contractor will obtain all required federal, state, and local permits relating to the transportation, storage, handling, loading, and detonation of explosives.
- The Contractor shall place all necessary "one calls" 48 hours prior to construction where one-call systems are in place.
- The Contractor shall be responsible for the protection of all existing underground facilities.
- Before performing any work on, or accessing the right-of-way, the Contractor shall verify to Tennessee that all property owners have been notified of the impending construction and blasting activities.
- The Contractor shall submit to the Tennessee representative its site-specific Blasting Plan for approval prior to execution of any blasting activity.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

5.0 SITE-SPECIFIC BLASTING PLANS

For each area determined to require blasting, a site-specific blasting plan will be created. The Contractor's site-specific blasting plan shall include at a minimum the following information:

- Blaster's name, company, copy of license, and statement of qualifications; seismograph company, names, equipment and sensor location;
- Site location (milepost and stationing), applicable alignment sheet number(s), and associated rock type and geological structure (solid, layered, or fractured);
- Copies of all required federal, state, and local permits;
- Methods and materials including explosive type, product name and size, weight per unit, and density; stemming material; tamping method; blasting sequence; use of non-electrical initiation systems for all blasting operations; magazine type and locations and security for storage of explosives and detonating caps;
- Site dimensions including explosive depth, distribution, and maximum charge and weight per delay; hole depth, diameter, pattern, and number of holes per delay;
- Dates and hours of conducting blasting, distance and orientation to nearest aboveground and underground structures; schedule identifying when blasting would occur within each waterbody greater than 10 feet wide, or within any designated coldwater fishery; and
- Blasting procedures for:
  - Storing, handling, transporting, loading, and firing explosives;
  - Prevention of misfires, flyrock, fire prevention, noise, and stray current accidental-detonation;
  - Signs, flagmen, and warning signals prior to each blast;
  - Those locations where the pipeline route:
    - Parallels or crosses an electrical transmission corridor, cable or pipeline;
    - Parallels or crosses a highway or road;
    - Is within or adjacent to forested areas;
    - Approaches within 200 feet of a water well or spring; or
    - Approaches within 1,000 feet of any residence, building or occupied structure;

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

- o Local notification;
- o Inspections after each blast; and
- o Disposal of waste blasting material.

6.0 MONITORING

During blasting operations Tennessee will contract a third party blasting inspector to monitor operations in the following manner:

- The third party blasting monitor shall provide seismographic equipment to measure the peak particle velocity ("PPV") of all blasts in the vertical, horizontal, and longitudinal directions. Seismic monitoring can only be discontinued if, a) the blasting schedule and blasting performance consistently produce PPVs at the pipeline that are lower than the maximum allowable limit and, b) a Tennessee representative provides written authorization.

- The third party blasting monitor shall measure the PPV at the adjacent pipeline, at any water wells, potable springs and at any above ground structures within 200 feet of the blasting.

- The third party blasting monitor shall complete a Blasting Log Record immediately after each blast and submit a copy to a Tennessee representative.

7.0 LIMITS ON PEAK PARTICLE VELOCITY

Any proposed blast shall be monitored to ensure that the peak particle velocity shall not exceed the specified maximum velocities. Maximum velocities are: 4 inches per second measured adjacent to an underground pipeline and for any aboveground or underground structure.

For all aboveground facilities within 200 feet of the blasting, the third party blasting monitor shall provide additional seismograph equipment to determine the PPV at the aboveground facility. If the measured PPV at an existing pipeline or other structure exceeds the above limits, the contractor shall stop blasting activities immediately and notify Tennessee. The Blasting Plan must be modified to reduce the PPV prior to any further blasting.

The frequency caused by the detonation of explosive charge shall not drop below 25 hertz without the review and approval of the designated Tennessee Blasting Representative.

The minimum time delay between the detonation of charges shall be 8 milliseconds.

All blasting activity occurring with within 300 feet of high pressure pipelines will require seismological surveillance (peak particle velocity and frequency) for every blast unless

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

otherwise agreed upon following the review of the blasting plan. Pipelines affected by blasting are to be leak surveyed in the affected area following the completion of the blasting operation.

Note: Limits on PPV for surface structures are based on studies which established the limits at which plaster in homes will crack. The primary purpose of the limit is to prevent damage to homes. The Tennessee Environmental Inspector may increase the limit for other structures such as steel transmission line towers, as appropriate. The designated Tennessee Blasting Representative may approve higher velocities for given site-specific conditions in advance.

8.0 SAFETY

8.1 Protection of Aboveground and Underground Structures

Where blasting is determined to be required, Tennessee will identify any municipal water mains proposed for crossing and will consult the local water authority. Reports of identified crossings will include location by milepost, owner, and status and results of contacts with the water authority.

The Contractor will exercise control to prevent damage to aboveground and underground structures including buildings, pipelines, utilities, springs, and water wells. The Contractor will implement the following procedures:

- If blasting occurs within 200 feet of identified water well or potable springs, Tennessee will hire a third party blasting monitor to conduct water flow performance and water quality testing before blasting. If the water well or spring is damaged, the well or spring will be repaired or otherwise restored or the well owner will be compensated for damages. Tennessee will provide an alternative potable water supply to the landowner until repairs occur. Locations of water wells or systems within 200 feet of the construction work area are indicated on Tennessee's construction alignment sheets.

- If blasting occurs within 200 feet of any aboveground structures, the Contractor and Tennessee third party blasting monitor will inspect structures before and after blasting. In the unlikely event that damage occurs to the aboveground structure, the owner will be compensated.

- The contractor shall be responsible for the ultimate resolution of all damage claims resulting from blasting. Such liability is not restricted by the 200-foot inspection requirement cited above.

- Blasting will not be allowed within 15 feet of an existing pipeline, unless specifically authorized by Tennessee.

- Holes that have contained explosive material shall not be re-drilled. Holes

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

shall not be drilled where danger exists of intersecting another hole containing explosive material.

- Blasting mats or padding shall be used on all shots where necessary to prevent scattering of loose rock outside of the approved construction workspace areas and to prevent damage to nearby structures and overhead utilities.

- Blasting shall not begin until occupants of nearby buildings, residences, places of business, places of public gathering, and farmers have been notified by the contractor sufficiently in advance to protect personnel, property, and livestock. The contractor shall notify all such parties at least 48 hours prior to blasting.

- Blasting in or near environmentally sensitive areas such as streams and wildlife areas may include additional restrictions.

- All blasting shall be subject to the following limitations.

  - Maximum PPV of 4 inches per second in any of three mutually perpendicular axes, measured at the lesser distance of the nearest facility or the edge of the permanent easement.
  - Maximum drill size shall be 2.5 inches unless approved by Tennessee.
  - Maximum quantity of explosive per delay shall be governed by the recorded measurements as influenced by work site conditions.
  - Explosive agents and ignition methods shall be approved by Tennessee. Ammonium Nitrate Fuel Oil and other free flowing explosives and blasting agents are not acceptable and shall not be used.
  - Drill holes shall not be left loaded overnight.
  - Good stemming material is to be used in all holes.

- The drilling pattern shall be set in a manner to achieve smaller rock fragmentation (maximum 1 foot in diameter) to use as much as possible of the blasted rock as backfill material after the pipe has been padded in accordance with the specifications. The Contractor shall submit the proposed drilling pattern to Tennessee for approval prior to implementation.

- Under pipeline crossings and all other areas where drilling and blasting is required within 15 feet of existing natural gas facilities:

  - Drill holes shall be reduced to a maximum of 2 inches or less in diameter.
  - The number of holes shot at one time shall be limited to three unless otherwise approved by Tennessee.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

o Appropriate delay between charges to attain desired fragmentation.

8.2 Protection of Personnel

The Contractor shall include in its procedures all federal, state, county and local safety requirements for blasting. The Contractor's procedures shall address, as a minimum, the following requirements:

- Only authorized, qualified, and experienced personnel shall handle explosives.
- No explosive materials shall be located where they may be exposed to flame, excessive heat, sparks, or impact. Smoking, firearms, matches, open flames, and heat- and spark-producing devices shall be prohibited in or near explosive magazines or while explosives are being handled, transported, or used.
- A code of blasting signals shall be established, posted in conspicuous places and utilized during blasting operations. Employee training shall be conducted on the use and implementation of the code.
- The Contractor shall use every reasonable precaution including, but not limited to, visual and audible warning signals, warning signs, flag person, and barricades to ensure personnel safety.
- Warning signs, with lettering a minimum of 4 inches in height on a contrasting background, will be erected and maintained at all approaches to the blast area.
- Flaggers will be stationed on all roadways passing within 1,000 feet of the blast area to stop all traffic during blasting operations.
- All personnel not involved in the actual detonation shall stand back at least 1,000 feet and workers involved in the actual detonation shall stand back at least 650 feet from the time the blast signal is given until the "ALL CLEAR" has been sounded.
- No loaded holes shall be left unattended or unprotected. No explosives or blasting agent shall be abandoned.
- In the case of a misfire, the blaster shall provide proper safeguards for personnel until the misfire has been re-blasted or safely removed.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

- The exposed areas of the blast will be matted wherever practicable. In cases where such a procedure is not deemed to be feasible, the Contractor will submit an alternative procedure for review by Tennessee and the site in question must be visited and examined by a Tennessee representative before any approval is granted.

- Tennessee may employ two-way radios for communication between vehicles and office facilities. The contractor shall advise Tennessee and other pipeline contractors of any need to cease use of such equipment during blasting activities.

- All loading and blasting activity shall cease and personnel in and around the blast area will retreat to a position of safety during the approach and progress of an electrical storm irrespective of the type of explosives or initiation system used. **THIS IS A MAJOR SAFETY PRECAUTION AND WILL ALWAYS BE OBSERVED.** All explosive materials, all electrical initiation systems, and all non-electric initiation systems are susceptible to premature initiation by lightning.

- Previous blast areas must be inspected to verify the absence of misfires. No drilling may commence until such inspection occurs. If a misfire occurs adjacent to a hole to be drilled, the misfire will be cleared by the blaster using whatever techniques are called for by the situation prior to commencement of drilling. If a misfire occurs at some distance from the drilling area, drilling may be stopped while clearing preparations are underway. When the misfire is to be cleared by re-shooting, drilling will be shutdown and personnel evacuated to a place of safety prior to detonation.

- All transportation of explosives will be conducted in accordance with applicable federal, state, and local laws and regulations. Vehicles used to transport explosives shall be in proper working condition and equipped with tight wooden or non-sparking metal floor and sides. If explosives are carried in an open-bodied truck, they will be covered with a waterproof and flame-resistant tarpaulin. Wiring will be fully insulated to prevent short-circuiting and at least two fire extinguishers will be carried. The truck will be plainly marked to identify its cargo so that the public may be adequately warned. Metal, flammable, or corrosive substances will not be transported in the same vehicle with explosives. There will be no smoking and unauthorized or unnecessary personnel will not be allowed in the vehicle. Competent, qualified personnel will load and unload explosives into or from the vehicle.

  No sparking metal tools will be used to open kegs or wooden cases of explosives. Metallic slitters will be used to open fiberboard cases, provided the metallic slitter does not come in contact with the metallic fasteners of the case. There will be no smoking, no matches, no open lights, or other fire or flame nearby while handling or using explosives. Explosives will not be

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

placed where they are subject to flame, excessive heat, sparks, or impact. Partial cases or packages of explosives will be re-closed after use. No explosives will be carried in the pockets or clothing of personnel. The wires of an electric blasting cap shall not be tampered with in any way. Wires will not be uncoiled. The use of electric blasting caps will not be permitted during dust storms or near any other source of large charges of static electricity. Uncoiling of the wires or use of electric caps will not be permitted near radio-frequency transmitters. The firing circuit will be completely insulated from the ground or other conductors.

- No blast will be fired without a positive signal from the person in charge. This person will have made certain that all surplus explosives are in a safe place; all persons, vehicles, and/or boats are at a safe distance; and adequate warning has been given. Adequate warning of a blast will consist of but not be limited to the following:

  - Notification to nearby homeowners and local agencies if necessary;
  - Stop vehicular and/or pedestrian traffic near the blast site; and
  - Signal given by an air horn, whistle or similar device using standard warning signals.

- Only authorized and necessary personnel will be present where explosives are being handled or used.

- Condition of the hole will be checked with a wooden tamping pole prior to loading. Surplus explosives will not be stacked near working areas during loading. Detonating fans will be cut from spool before loading the balance of charge into the hole. No explosives will be forced into a bore hole past an obstruction. Loading will be done by a blaster holding a valid license or by personnel under his direct supervision.

- Should fly-rock leave the right-of-way even after all necessary precautions have been taken, it shall be collected immediately and disposed of at approved disposal sites. This work shall not be left to the cleanup crew.

8.3 Protection of Threatened and Endangered Species

- Tennessee will consult with state and federal agencies regarding areas proposed for blasting where sensitive habitats or species are known to occur. Areas identified as containing sensitive habitats or species, as directed by the appropriate agencies, will be staked and flagged. A qualified Project biologist will survey the proposed blasting zone identified by the pipeline contractor immediately in advance of any drilling or blasting. Areas will be checked before and after blasting for the presence of sensitive species, and disturbance to species and habitats will be resolved in accordance with guidance provided by the appropriate agencies.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

8.4 Lightning Hazard

- A risk of accidental detonation caused by lightning strikes exists at any time the workplace is experiencing an electrical storm and there are loaded holes on site. If this hazard is judged to exist by the Tennessee representative, work shall discontinue at all operations and workers will be moved to secure positions away from the loaded holes. Furthermore, workers shall not return to the work site until the storm has passed and the Tennessee representative has indicated it is clear to return.

- Tennessee's Contractor shall have on site approved lightning detectors (model SD-2508 manufactured by Electronics Div. of S.D.I. International, Model 350 manufactured by Thomas Instruments Inc., Skyscan Lighting Detector manufactured by Skyscan Technologies or equivalent) capable of measuring the degree of electrical activity as a storm approaches, and the distance to the storm front from the instrument on the right-of-way.

9.0 STORAGE REQUIREMENTS

- All explosives, blasting agents, and initiation devices shall be stored in locked magazines that have been located, constructed, approved, and licensed in accordance with local, state, and federal regulations.

- The storage of explosives, blasting agents and initiation devices is not permitted on the ROW and will only be stored at approved staging areas or construction yards.

- Magazines shall be dry, well-ventilated, reasonably cool (painting of the exterior with a reflective color), bullet and fire resistant, and kept clean.

- Initiation devices shall not be stored in the same box, container, or magazine with other explosives. Explosives, blasting agents or initiation devices shall not be stored in wet or damp areas; near oil, gasoline, cleaning solvents; near sources of heat radiators, steam pipes, stoves, etc. No metal or metal tools shall be stored in the magazine. There shall be no smoking, matches, open lights, or other fire or flame inside or within 50 feet of storage magazines or explosive materials. The loading and unloading of explosive materials into or out of the magazine shall be done in a business-like manner with no loitering, horseplay, or prank playing.

- Magazines shall be kept locked at all times unless explosives are being delivered or removed by authorized personnel. Admittance shall be restricted to the magazine keeper, blasting supervisor, or licensed blaster. Magazine construction shall meet the requirements of Bureau of Alcohol, Tobacco and Fire Arms (ATF) P5400.7

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

"Explosives Law and Regulations" and be in accordance with local, state, or federal regulations and the Blaster's Handbook.

- Accurate and current records shall be kept of the explosive material inventory to ensure that oldest stocks are utilized first, satisfy regulatory requirements and for immediate notification of any loss or theft. Magazine records shall reflect the quantity of explosions removed, the amount returned, and the net quantity used at the blasting site.

- When explosive materials are taken from the storage magazine, they shall be kept in the original containers until used. Small quantities of explosive materials may be placed in day boxes, powder chests or detonator boxes. Any explosive material not used at the blast site shall be returned to the storage magazine and replaced in the original container as soon as possible.

- Magazine locations shall be in accordance with local, state, or federal regulations. Where no regulations apply, magazines shall be located in accordance with the latest edition of the 175th Anniversary Edition of the Blaster's Handbook and ATF P5400-7 Explosives Law and Regulations.

- Magazines shall be marked in minimum 3-inch high letters with the words “DANGER – EXPLOSIVES” prominently displayed on all sides and roof.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

APPENDIX F

Unanticipated Discovery Plan

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

PROCEDURES GUIDING THE DISCOVERY OF UNANTICIPATED HISTORIC PROPERTIES AND HUMAN REMAINS: POST-REVIEW DISCOVERIES (36 CFR 800.13)

CONNECTICUT EXPANSION PROJECT

New York, Connecticut, and Massachusetts

FERC Docket Nos. CP14-___-000

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20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

TABLE OF CONTENTS PAGE

INTRODUCTION **1**

STANDARDS/GUIDELINES AND LAWS/REGULATIONS FOR UNANTICIPATED HISTORIC PROPERTIES AND HUMAN REMAINS 1
Federal ***1***
New York ***2***
Connecticut ***2***
Massachusetts ***2***
Native American Tribes ***2***
CONSULTATION WITH CONSULTING PARTIES AND NATIVE AMERICAN GROUPS 2
UNANTICIPATED ARCHAEOLOGICAL DISCOVERY PROTOCOL 3
Cultural Resources Training ***3***
Notification Procedures ***3***
UNANTICIPATED DISCOVERY OF HUMAN REMAINS PROTOCOL 4
PROVISIONS FOR SITE SECURITY 6
PUBLIC OUTREACH 7

FEDERAL AGENCY CONTACTS **8**

MEDICAL EXAMINER AND POLICE CONTACTS **8**

NEW YORK 8
CONNECTICUT 8
MASSACHUSETTS 8
STATE POLICE 8

STATE HISTORIC PRESERVATION OFFICE CONTACTS **9**

NEW YORK SHPO 9
CONNECTICUT SHPO AND OSA 9
MASSACHUSETTS SHPO 9

STATE TRIBAL REPRESENTATIVE CONTACTS **10**

CONNECTICUT INDIAN AFFAIRS COUNCIL 10
MASSACHUSETTS COMMISSION ON INDIAN AFFAIRS 10

FEDERALLY RECOGNIZED TRIBAL CONTACTS **10**

DELAWARE NATION OF OKLAHOMA 10
DELAWARE TRIBE OF INDIANS 10
MASHANTUCKET PEQUOT TRIBAL NATION 10
MASHPEE WAMPANOAG INDIAN TRIBE 11
MOHEGAN INDIAN TRIBE 11
NARRAGANSETT INDIAN TRIBE 11
SAINT REGIS MOHAWK TRIBE 11
STOCKBRIDGE-MUNSEE COMMUNITY BAND OF MOHICAN INDIANS 11
WAMPANOAG TRIBE OF GAY HEAD (AQUINNAH) 12

ATTACHMENTS

APPENDIX A. **NEW YORK SHPO'S HUMAN REMAINS PROTOCOL**

APPENDIX B. **MASSACHUSETTS SHPO'S *KNOW HOW #4: WHAT TO DO WHEN HUMAN BURIALS ARE ACCIDENTALLY UNCOVERED***

APPENDIX C. **CONNECTICUT GENERAL STATUTES, CHAPTER 184A, SECTION 10-388 NATIVE AMERICAN CULTURES, POLICY CONCERNING ARCHAEOLOGICAL INVESTIGATIONS: HUMAN BURIALS**

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

INTRODUCTION

Tennessee Gas Pipeline Company, L.L.C. (Tennessee) is committed to the protection and preservation of cultural resources, in accordance with federal and state legislation, and is continuing that commitment as part of the proposed Connecticut Expansion Project (Project). Tennessee recognizes that despite intensive cultural resource field investigations that are typically performed prior to project construction, or a determination that a particular area exhibits low archaeological sensitivity, it is nonetheless possible that potentially significant archaeological resources could be discovered during project construction or maintenance activities, particularly during excavation. Tennessee also recognizes the requirement for compliance with federal, state, and municipal/city laws and regulations regarding the treatment of human remains, if any are discovered.

The procedures guiding the unanticipated discovery of cultural resources and human remains detailed herein (Procedures) were developed on behalf of Tennessee and in consultation with the New York State Office of Parks, Recreation, and Historic Preservation, the Connecticut Department of Economic and Community Development, and the Massachusetts Historical Commission, offices of the State Historic Preservation Officers (SHPO). These Procedures summarize the approach that Tennessee will use to address unanticipated discoveries of archaeological resources during construction activities within the Connecticut Expansion Project area of potential effect (APE).

The purpose of archaeological investigations during the planning of natural gas pipeline projects is to determine the presence or absence of historic properties within a project area. These archaeological investigations are conducted in accordance with standards set forth in the Federal Energy Regulatory Commission (FERC) Office of Pipeline Regulation's *Guidelines for Reporting on Cultural Resources Investigations* (2002), pursuant to 18 CFR 157.206 and Appendix II of Subpart F, which require actions taken under sections 3 and 7 of the Natural Gas Act (Part 380, Appendix A) to comply with the National Environmental Policy Act of 1969 (NEPA) and Section 106 of the National Historic Preservation Act of 1966 (16 USC 470f), as amended (1976, 1980, 1992, 1999), and implementing regulations of the Advisory Council on Historic Preservation (ACHP) (36 CFR 800), specifically, those procedures regarding "post-review discoveries" as outlined in 36 CFR 800.13. All work is undertaken pursuant to the *Secretary of the Interior Standards for Archaeology and Historic Preservation* (48 Federal Regulations 44716-42 [1983]) and the applicable laws and regulations pertaining to the cultural resources and human remains of New York, Connecticut, and Massachusetts.

These Procedures have been developed in consultation with the New York, Connecticut, and Massachusetts SHPOs, as well as the Connecticut Office of the State Archaeologist (OSA), and will be followed in the event any archaeological resources and/or human remains are encountered during construction of the Project. The stipulations of the Procedures as set forth below are in accordance with the current standards and guidelines elaborated in the following standards/guidelines and laws/regulations:

Standards/Guidelines and Laws/Regulations for Unanticipated Historic Properties and Human Remains

Federal

- Section 106 of the National Historic Preservation Act of 1966, as amended (16 USC 470f);

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

- Secretary of the Interior's Standards for Archeology and Historic Preservation (48 CFR 44716-42);

- Advisory Council on Historic Preservation (ACHP): *Policy Statement Regarding Treatment of Burial Sites, Human Remains, and Funerary Objects*, Advisory Council February 23, 2007); and

- FERC Office of Pipeline Regulation: *Guidelines for Reporting on Cultural Resources Investigations* (2002).

New York

- New York Archaeological Council *Standards for Cultural Resource Investigations and the Curation of Archaeological Collections in New York State* (1994);

- New York SHPO: *Phase I Archaeological Report Format Requirements* (2005); and

- New York SHPO: *Human Remains Discovery Protocol* (November 28, 2008) (see Appendix B).

Connecticut

- Connecticut SHPO: *Environmental Review Primer for Connecticut's Archaeological Resources* (1987); and

  Connecticut General Statutes, Sections 10a-112, 10-321, 10-383, 10-384, 10-382, 10-386, 10-387, and 10-388 et seq., 19a-315b, 22a-15 through 22a-19, 22a-1 et seq., and 7-147.

Massachusetts

- Massachusetts SHPO: *Know How #4 What to do when Human Burials are Uncovered* (no date); and

- Massachusetts General Laws, Chapter 38, Sections 6B & 6C; Chapter 9, Sections 26-27C (950 CMR 70-71); Chapter 7, Section 38A; Chapter 114, Section 17; all as amended.

Native American Tribes

- Narragansett Indian Archeological/Anthropological Committee (NIAAC): *Standards and Guidelines for Archeological Survey* (1994).

Consultation with Consulting Parties and Native American Groups

As part of the Project, Tennessee and FERC have initiated contact with the New York, Connecticut, and Massachusetts SHPOs, various consulting parties, and federally recognized and non-federally recognized Native American groups. All contact information for SHPOs, consulting parties, and Native American groups is included in Appendix A. In the event any archaeological resources and/or human remains are encountered during construction of the Project, Tennessee (or its contractor) and Tennessee's Cultural Resources Manager (CRM) will contact the relevant parties.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Unanticipated Archaeological Discovery Protocol

Cultural Resources Training

The identification of archaeological resources requires basic training in order to recognize potential sites. Tennessee requires that its employees and contractors have a basic understanding of the nature of cultural resources. As a result, all inspectors and construction contractor personnel will be given basic training in cultural resource site recognition. The Procedures will be included in all relevant construction contractor documents.

The purpose of this training will be to review Tennessee's commitments regarding cultural resources compliance and to provide an overview of the general cultural history of the various Project areas, so that both Tennessee and construction personnel will be aware of the kinds of archaeological resources that may be encountered in the field. In addition, the training program will emphasize the exact procedures to be followed, as outlined in these Procedures, regarding actions to be taken and notification required in the event of a significant site discovery, such as a discovery of human remains, during construction.

The training will be designed to ensure that Tennessee personnel and construction contractors understand the extent of the archaeological survey program that has been performed for the Project and are fully aware of the distinction between sites that has been located and "cleared" under the cultural resource program (i.e., determined to be non-significant after different levels of investigation or sites that have already undergone data recovery) and new discoveries during the construction process.

Notification Procedures

Tennessee is committed to the protection and preservation of cultural resources, in accordance with federal and state legislation. Tennessee recognizes that – despite the intensive cultural resource field investigations that are typically performed prior to project construction – it is nonetheless possible that previously unknown cultural resource sites could be discovered during the project construction process, particularly during excavation activities. Tennessee recognizes the requirement for strict compliance with federal and state regulations and guidelines regarding the treatment of human remains, if any are discovered. The following details the plan that will be followed in the event that new cultural resource sites or human remains are discovered during the construction process.

The protocol to follow in the advent of an unanticipated discovery contains the following steps:

- The Contractor will immediately notify the Tennessee Chief Inspector of an unanticipated discovery.

- The Chief Inspector will direct a *Stop Work* order to the Contractor's Site Foreman to flag or fence off the archaeological discovery location and direct the Contractor to take measures to ensure site security. Any discovery made on a weekend or overnight hours will be protected until all appropriate parties are notified of the discovery. The Contractor will not restart work in the area of the find until the Chief Inspector has granted clearance.

- The Chief Inspector will indicate the location and date of the discovery on the project plans and will notify the CRM, who will undertake a site visit or otherwise coordinate an on-site archaeological consultation.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

- The CRM will conduct a preliminary assessment of the find to determine if it is a potentially significant archaeological site.

- If the find is determined by the CRM to not be a potentially significant archaeological site, the Chief Inspector will notify the Contractor's Work Foreman to resume work.

- If the CRM determines the find is a potentially significant archaeological site, Tennessee will immediately notify FERC and the relevant SHPO (or SHPO's designee[1]) of the find; notifications will be made by Tennessee within 4-hours.

- Tennessee will direct the CRM to begin a more detailed assessment of the find's significance and the potential project effects. The CRM will dispatch an archaeological team to the site to determine the nature and extent of the archaeological deposits; Tennessee and the CRM will ensure that the team has full access to the required site area and be accommodated by the Contractor to complete this investigation in the most expeditious manner possible.

- The CRM will notify Tennessee and FERC of the team's findings and recommendations, whether the remains are assessed not to be significant and request approval for construction to proceed, or describe a proposed scope of work for evaluating the significance of the find and evaluating project effects.

- The CRM will convey this information to the relevant SHPO, as well as Native American tribes and relevant consulting parties; at the discretion of the CRM and either of the SHPOs, a meeting may be held to discuss options and recommendations.

- If the resource is determined to be a significant archaeological resource and it is threatened by further project development, the CRM, at the direction of FERC and in consultation with SHPO, Native American tribes, and relevant consulting parties, will develop a site mitigation plan.

- Upon direction by FERC, the appropriate SHPO, and Tennessee, the CRM will implement the archaeological mitigation plan.

- A meeting or site visit may be held with FERC, Tennessee, appropriate SHPO, the CRM, and other appropriate parties once the field investigation for site mitigation has been completed to review the work accomplished.

- Duration of any work stoppages will be contingent upon the significance of the identified archaeological resource(s) and consultation with FERC, Tennessee, appropriate SHPO, the CRM, and other appropriate parties to determine the appropriate measures to avoid, minimize, or mitigate any adverse effects to the site.

Unanticipated Discovery of Human Remains Protocol

This protocol is specifically designed for circumstances where human remains are encountered during the construction of the Project.

[1] In Connecticut, the Office of the State Archaeologist (OSA) will be contacted before SHPO in the event of an unanticipated discovery.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Tennessee and its contractors will treat any human remains encountered during the Project in a manner guided by the policy statement adopted by the ACHP: see *Policy Statement Regarding Treatment of Burial Sites, Human Remains, and Funerary Objects*, Advisory Council February 23, 2007), and by the relevant state laws and guidelines. The ACHP policy statement recommends that, when burial sites, human remains, or funerary objects will be or are likely to be encountered in the course of Section 106 review, a federal agency should adhere to the following principles:

Principle 1: Participants in the Section 106 process should treat all burial sites, human remains, and funerary objects with dignity and respect.

Principle 2: Only through consultation, which is the early and meaningful exchange of information, can a federal agency make an informed and defensible decision about the treatment of burial sites, human remains, and funerary objects.

Principle 3: Native Americans are descendants of original occupants of this country. Accordingly, in making decisions, federal agencies should be informed by and utilize the special expertise of Indian tribes and Native Hawaiian organizations in the documentation and treatment of their ancestors.

Principle 4: Burial sites, human remains, and funerary objects should not be knowingly disturbed unless absolutely necessary, and only after the federal agency has consulted and fully considered avoidance of impact and whether it is feasible to preserve them in place.

Principle 5: When human remains or funerary objects must be disinterred, they should be removed carefully, respectfully, and in a manner developed in consultation.

Principle 6: The federal agency is ultimately responsible for making decisions regarding avoidance of impact to or treatment of burial sites, human remains, and funerary objects. In reaching its decisions, the federal agency must comply with applicable federal, tribal, state, or local laws.

Principle 7: Through consultation, federal agencies should develop and implement plans for the treatment of burial sites, human remains, and funerary objects that may be encountered.

Principle 8: In cases where the disposition of human remains and funerary objects is not legally prescribed, federal agencies should proceed following a hierarchy that begins with the rights of lineal descendants, and if none, then the descendant community, which may include Indian tribes and Native Hawaiian organizations.

Tennessee and its contractors will use the following Procedures in the event that human remains are discovered during construction of the Project:

- The Contractor will immediately notify the Chief Inspector of an unanticipated discovery.

- The Chief Inspector will direct a *Stop Work* order to the Contractor's Site Foreman to flag or fence off the archaeological discovery location and direct the Contractor to take measures to ensure site security. Any discovery made on a weekend or overnight hours will be protected until all appropriate parties are notified of the discovery. The Contractor will not restart work in the area of the find until the Chief Inspector has granted clearance.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

- The Chief Inspector will indicate the location and date of the discovery on the project plans and notify Tennessee and FERC.

- At all times human remains must be treated with the utmost dignity and respect. Human remains and/or associated artifacts will be left in place and not disturbed. No skeletal remains or materials associated with the remains will be collected or removed until appropriate consultation has taken place and a plan of action has been developed.

- Tennessee will immediately notify FERC and the relevant SHPO of the find, as well as the CRM, the local police, and appropriate county/city Medical Examiner's Office.

- Tennessee will provide an opportunity for local law enforcement and, if necessary, a representative of the Coroner's Office, to visit and inspect the site to determine whether the site constitutes a crime scene.

- If it is declared a criminal matter, the CRM will have no further involvement and the decision to declare it a *Cleared Site* for construction will be made by the appropriate legal authorities.

- If the find is determined not to be a criminal matter, Tennessee will comprehensively evaluate the potential to avoid and/or minimize the Project's effects to the human remains. If no feasible avoidance plan can be developed to allow the human remains to stay in place, Tennessee and the CRM will develop a site-specific disinterment/re-interment plan.

    - If human remains are determined to be Native American, the remains will be left in place and protected from further disturbance until a site-specific work plan for their avoidance or removal can be generated. Please note that avoidance is the preferred choice of the SHPO and Indian Nations. The CRM will contact SHPO and appropriate Indian Nations to develop a plan of action that is consistent with the Native American Graves Protection and Repatriation Act (NAGPRA) guidance and applicable laws in New Jersey and New York.

    - If human remains are determined to be non-Native American, the remains will be left in place and protected from further disturbance until a site-specific work plan for their avoidance or removal can be generated. Please note that avoidance is the preferred choice of the SHPO. Consultation with the SHPO and other appropriate parties will be required to determine a plan of action.

Provisions for Site Security

Provisions must be made to secure any area containing, or suspected of containing, human remains from unauthorized entry to the site. To this end, the Plan stipulates that security fencing with locked gates be erected at the site once the presence of human remains has been ascertained and the dimensions of the cemetery within the APE have been established. The area to be fenced will be large enough to stage and complete the disinterment project. To ensure security during off-hours, a private security firm will be hired for the time during which burials are still present at the site; once they have been completely removed, the security fencing will be removed and the security patrols will be terminated.

Security will also be extended to the excavation and removal of the human remains. Temporary work shelters will be erected over individual (or small groups of) graves while they are in the process of being

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

excavated and their remains removed. The shelters will permit adequate interior work space, but will prevent any outside persons from viewing the remains or the disinterment process. The shelters will also permit the disinterment team to work in most if not all weather conditions.

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FEDERAL AGENCY CONTACTS

Federal Energy Regulatory Commission
Office of Energy Projects
825 N. Capitol Street, N.E.
Washington, DC 20426
Contact: OEP/DG2E/Gas Branch 2
Environmental Project Manager TBD
Tel: TBD
Email: TBD

Archaeologist TBD
Tel: TBD
Email: TBD

MEDICAL EXAMINER AND POLICE CONTACTS

New York

Albany County Coroner
Harold J. Joyce Albany County Office Building
112 State Street, 7th Floor
Albany, New York 12207
Contact: Chief Medical Examiner
Tel: (518) 445-7604

Connecticut

Connecticut Office of the Chief Medical Examiner
11 Shuttle Road
Farmington, Connecticut 06032
Contact: James R. Gill, MD, Chief Medical Examiner
Tel: (860) 679-3980

Massachusetts

Massachusetts Office of the Chief Medical Examiner
720 Albany Street
Boston, Massachusetts 02118
Contact: Henry M. Nields, MD, Chief Medical Examiner
Tel: (617) 267-6767

State Police

Appropriate State Police Barracks
Contact: Tel: 911

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

STATE HISTORIC PRESERVATION OFFICE CONTACTS

New York SHPO

New York State Office of Parks, Recreation, and Historic Preservation
Peebles Island State Park
P.O. Box 189
Waterford, New York 12188
Contact: Dan Bagrow, Historic Preservation Specialist
Tel: (518) 237-8643 x3254
Email: dan.bagrow@parks.ny.gov

Connecticut SHPO and OSA

Connecticut Department of Economic and Community Development
One Constitution Plaza, 2nd Floor
Hartford, Connecticut 06103
Contact: Stacy Vairo, Deputy SHPO
Tel: (860) 256-2727
Email: stacy.vairo@ct.gov

Catherine Labadia, SHPO Staff Archaeologist
Tel: (860) 256-2764
Email: Catherine.Labadia@ct.gov

Connecticut Office of the State Archaeologist
Connecticut Archaeology Center
2019 Hillside Road, Unit 1023
Storrs, Connecticut 06269
Contact: Nicholas Bellantoni, State Archaeologist
Tel: (860) 486-5248
Email: nicholas.bellantoni@uconn.edu

Massachusetts SHPO

Massachusetts Historical Commission
220 Morrissey Boulevard
Boston, Massachusetts 02125
Contact: Brona Simon, State Archaeologist and SHPO
Tel: (617) 727-8470

Jonathan Patton, Archaeologist/Preservation Planner
Tel: (617) 727-8470, ext. 384
Email: jonathan.patton2@state.ma.us

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

STATE TRIBAL REPRESENTATIVE CONTACTS

Connecticut Indian Affairs Council

Connecticut Department of Environmental Protection
79 Elm Street
Hartford, Connecticut 06106
Contact: Edward Sarabia, Indian Affairs Coordinator
Tel: (860) 424-3066

Massachusetts Commission on Indian Affairs

100 Cambridge Street, Suite 300
Boston, Massachusetts 02114
Contact: John A. Peters, Jr., Executive Director
Tel: (617) 573-1292

FEDERALLY RECOGNIZED TRIBAL CONTACTS

Delaware Nation of Oklahoma

P.O. Box 825
Anadarko, Oklahoma 73005
Contact: Tamara Francis, NAGPRA/Cultural Preservation Director
Tel: (405) 247-2448

Delaware Tribe of Indians

1417 West Street
Emporia, Kansas 66801
Contact: Brice Obermeyer, Tribal Historic Preservation Office
Tel: (918) 335-7026

Mashantucket Pequot Tribal Nation

Natural Resources Protection & Regulatory Affairs
550 Trolley Line Boulevard, P.O. Box 3202
Mashantucket, Connecticut 06338
Contact: Kathleen Knowles, Tribal Historic Preservation Officer
Tel: (860) 396-6887
Email: kknowles@mptn-nsn.gov

Kevin McBride, Mashantucket Pequot Museum and Research Center
Tel: (860) 396-6814
Email: kmcbride@mptn-nsn.gov

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Mashpee Wampanoag Indian Tribe

766 Falmouth Road
Madaket Place Office A3
Mashpee, Massachusetts 02649
Contact: Ramona Peters, Tribal Historic Preservation Officer
Tel: (508) 477-6186
Email: rpeters@mwtribe.com

Mohegan Indian Tribe

13 Crow Hill Road
Uncasville, Connecticut 06382
Contact: James Quinn, Tribal Historic Preservation Officer/Archaeology Department Manager
Tel: (860) 862-6893
Email: jquinn@moheganmail.com

Narragansett Indian Tribe

Narragansett Indian Longhouse
4425D South County Trail
Charlestown, Rhode Island 02813
Contact: John Brown, III, Tribal Historic Preservation Officer
Tel: (401) 539-1190
Email: jb@nithpo.com

Doug Harris, Preservationist for Ceremonial Landscapes
Tel: (401) 474-5907 or (413) 325-7691
Email: dhnithpo@gmail.com

Saint Regis Mohawk Tribe

412 State Route 37
Akwesane, New York 13655
Contact: Arnold Printup, Jr., Tribal Historic Preservation Officer
Tel: (518) 358-2272 ext. 164

Stockbridge-Munsee Community Band of Mohican Indians

P.O. Box 70
N8754 MoNeConNuck Road
Bowler, Wisconsin 54416
Contact: Sherry White, Tribal Historic Preservation Officer
Tel: (715) 793-3970
Email: sherry.white@mohican-nsn.gov

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Wampanoag Tribe of Gay Head (Aquinnah)

20 Black Brook Road
Aquinnah, Massachusetts 02535
Contact: Bettina M. Washington, Tribal Historic Preservation Officer
Tel: (508) 645-9265, ext. 175
Email: bettina@wampanoagtribe.net

Mark Andrews, Tribal Cultural Resource Monitor
Tel: (508) 645-9265
Email: mark@wampanoagtribe.net

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

APPENDIX A

NEW YORK SHPO'S HUMAN REMAINS PROTOCOL

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

State Historic Preservation Office/ New York State Office of Parks, Recreation and Historic Preservation Human Remains Discovery Protocol (November 28, 2008)

In the event that human remains are encountered during construction or archaeological investigations, the New York State Historic Preservation Office (SHPO) recommends that the following protocol is implemented:

- At all times human remains must be treated with the utmost dignity and respect. Should human remains be encountered work in the general area of the discovery will stop immediately and the location will be immediately secured and protected from damage and disturbance.

- Human remains or associated artifacts will be left in place and not disturbed. No skeletal remains or materials associated with the remains will be collected or removed until appropriate consultation has taken place and a plan of action has been developed.

- The county coroner/medical examiner, local law enforcement, the SHPO, the appropriate Indian Nations, and the involved agency will be notified immediately. The coroner and local law enforcement will make the official ruling on the nature of the remains, being either forensic or archaeological.

- If human remains are determined to be Native American, the remains will be left in place and protected from further disturbance until a plan for their avoidance or removal can be generated. Please note that avoidance is the preferred choice of the SHPO and the Indian Nations. The involved agency will consult SHPO and appropriate Indian Nations to develop a plan of action that is consistent with the Native American Graves Protection and Repatriation Act (NAGPRA) guidance.

- If human remains are determined to be non-Native American, the remains will be left in place and protected from further disturbance until a plan for their avoidance or removal can be generated. Please note that avoidance is the preferred choice of the SHPO. Consultation with the SHPO and other appropriate parties will be required to determine a plan of action.

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APPENDIX B

MASSACHUSETTS SHPO'S *KNOW HOW #4: WHAT TO DO WHEN HUMAN BURIALS ARE ACCIDENTALLY UNCOVERED*

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KnowHow #4

INFORMATION AND ASSISTANCE FROM THE MASSACHUSETTS HISTORICAL COMMISSION

What to Do When Human Burials are Accidentally Uncovered

1. Why are bones sometimes found?

In Massachusetts, many unmarked graves exist without gravestones, fences, tombstones, or other surface indications of their presence. These are chiefly the graves of prehistoric and historic Indians, which may never have been marked at all; and graves which had been identified at one time in the past, but the markings are no longer visible. As a result, bones are often found during ordinary ground disturbance activities such as the construction of new homes, utilities, or roads; in the agricultural or industrial use of a site; or the excavation of sand or gravel borrow. Bones are also sometimes found eroding out of areas exposed by natural erosion, floodwater scouring, or sand dune formation.

A new law has been enacted which establishes procedures to follow when human bones are accidentally discovered.

2. Who is involved?

Private citizens, State and Local Police, Medical Examiners, State Archaeologist, and the Commission on Indian Affairs.

3. What should you do if you discover bones?

Do not touch or disturb the bones. Notify the state or local police and the regional medical examiner about the discovery and location.

4. What does the Medical Examiner do?

The Medical Examiner investigates the discovery to determine whether the bones are human, and whether they are recent or more than 100 years old. If the bones are less than 100 years old, a criminal investigation may be warranted. If the bones are more than 100 years old, the Medical Examiner then notifies the State Archaeologist, who immediately conducts an archaeological investigation of the site. Throughout these investigations, the police authorities must insure that the site is protected from further damage.

5. What does the State Archaeologist do?

The State Archaeologist investigates the site to determine the age, cultural association and identity of the burial. If the State Archaeologist determines that the burial is that of a Native American, the Commission on Indian Affairs is notified. The State Archaeologist consults with the landowner to determine whether the burial can remain undisturbed. In the case of development projects, the owner and State Archaeologist discuss whether there are prudent and feasible steps the owner can take to protect the burial. If it is impossible to avoid future harm to the burial, the State Archaeologist removes the remains.

6. What does the Commission on Indian Affairs do?

The archaeological investigation of Indian burials is monitored by the Commission on Indian Affairs to insure that the remains are treated respectfully.

> Please remember: Once bones or artifacts are removed from the site, valuable information concerning the identity and age of the human remains is lost. Therefore, it is important not to disturb the site in any way until the State Archaeologist can conduct an investigation and record the discovery.

BIBLIOGRAPHY

Massachusetts General Laws, Chapter 38, section 6B; Chapter 9, sections 26A & 27C; Chapter 7, section 38A; Chapter 114, section 17; as amended by Chapter 659 of the Acts of 1983 and Chapter 386 of the Acts of 1989.

For Further Information:

Please contact the State Archaeologist at the Massachusetts Historical Commission.

William Francis Galvin
Secretary of the Commonwealth
Chairman, Massachusetts Historical Commission
Massachusetts Archives Building, 220 Morrissey Boulevard, Boston, MA 02125
Phone: (617) 727-8470 Fax: (617) 727-5128 TDD: 1-800-392-6090
Website: www.magnet.state.ma.us/sec/mhc

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APPENDIX C

CONNECTICUT GENERAL STATUTES, CHAPTER 184A, SECTION 10-388 NATIVE AMERICAN CULTURES, POLICY CONCERNING ARCHAEOLOGICAL INVESTIGATIONS: HUMAN BURIALS

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Connecticut General Statues, Chapter 184a, Section 10-388
Native American Cultures, Policy Concerning Archaeological Investigations: Human Burials

Sec. 10-388. Human burials. (a) Any person who knows or reasonably believes that any human burials or human skeletal remains are being or about to be disturbed, destroyed, defaced, removed or exposed shall immediately notify the Chief Medical Examiner and State Archaeologist of such fact. If human burials or human skeletal remains are encountered during construction or agricultural, archaeological or other activity that might alter, destroy or otherwise impair the integrity of such burials or remains, the activity shall cease and not resume unless authorized by the Chief Medical Examiner and the State Archaeologist provided such authorization shall be made within five days of completion of the investigation of the Chief Medical Examiner pursuant to subsection (b) of this section.

(b) After notification under subsection (a) of this section, the Chief Medical Examiner shall determine if the remains represent a human death required to be investigated under section 19a-406. After completion of his investigation, if the Chief Medical Examiner determines that the remains may be the remains of a Native American or were found in the subsurface and buried for more than fifty years, the Chief Medical Examiner shall notify the State Archaeologist of such fact. The State Archaeologist, upon such notification, shall in consultation with the Department of Economic and Community Development, the Native American Heritage Advisory Council, established under section 10-382, the Commissioner of Energy and Environmental Protection, and the landowner determine, within seventy-two hours, if the site where such remains were discovered can be preserved in situ and protected by a preservation restriction as defined in section 47-42a.

(c) If in situ preservation is not prudent and feasible or not agreed to by the landowner, the State Archaeologist, upon consultation with the landowner and, if appropriate, the Native American Heritage Advisory Council, the Department of Economic and Community Development, and the Commissioner of Energy and Environmental Protection shall, if feasible, provide for removal and reburial of the remains at another location or for additional archaeological investigations and scientific analysis prior to reburial. Any excavation and recovery of remains by the State Archaeologist shall be completed not more than five business days after notification by the Chief Medical Examiner under this section unless the landowner consents to additional days.

(d) Human skeletal remains discovered during archaeological investigation shall be excavated under the supervision of the State Archaeologist, pursuant to a written agreement between the State Archaeologist and the holder of the permit specifying the excavation, methods to be used and data to be collected. Due care shall be exercised during excavation, subsequent transport and storage of skeletal remains to insure that the sacred meanings of the remains for Native Americans are respected and protected.

(e) The provisions of this section shall not be construed to require the owner of private lands on which human skeletal remains are found to pay the costs of excavation, removal analysis or reburial of such remains.

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APPENDIX G

- Hydrostatic Test Water Withdrawal Detail
- Tyringham Pipeyard Storage Layout
- Natural Heritage Endangered Species Program Project Review Checklist Filing

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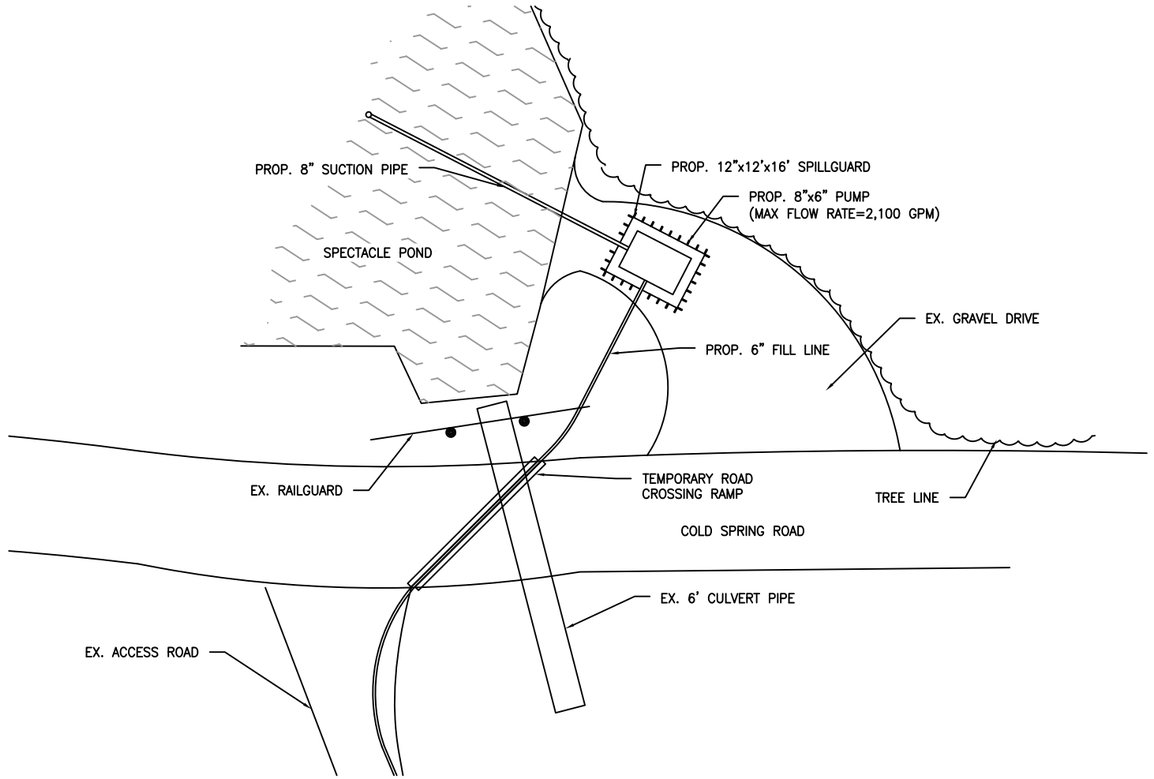
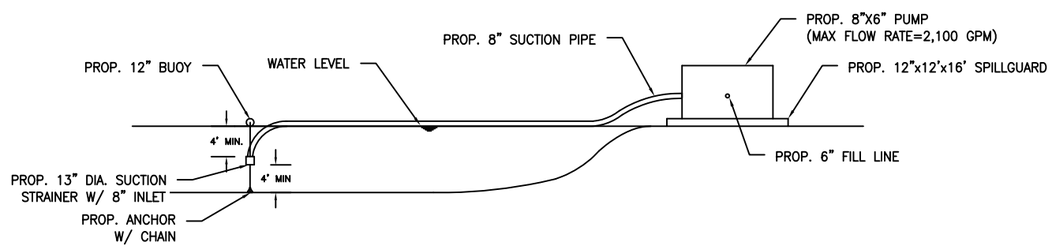
APPENDIX G

Hydrostatic Test Water Withdrawal Detail



PLAN VIEW
SCALE= 1"=30'



PROFILE VIEW
SCALE= 1"=20'

APPLICATION NO.:

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division: Op. Area.:
State: MA Co./Par.: BERKSHIRE
Section: Township: Range:
Dft: Date:
Chk: Date:
Appr: Date:
Scale: AS NOTED
Filename:

CONNECTICUT EXPANSION
MASSACHUSETTS LOOP 200-3
PROPOSED 36" NATURAL GAS PIPELINE
PROPOSED INTAKE STRUCTURE FOR HYDROSTATIC TESTING

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

Sheet: 1 of 1
Type:

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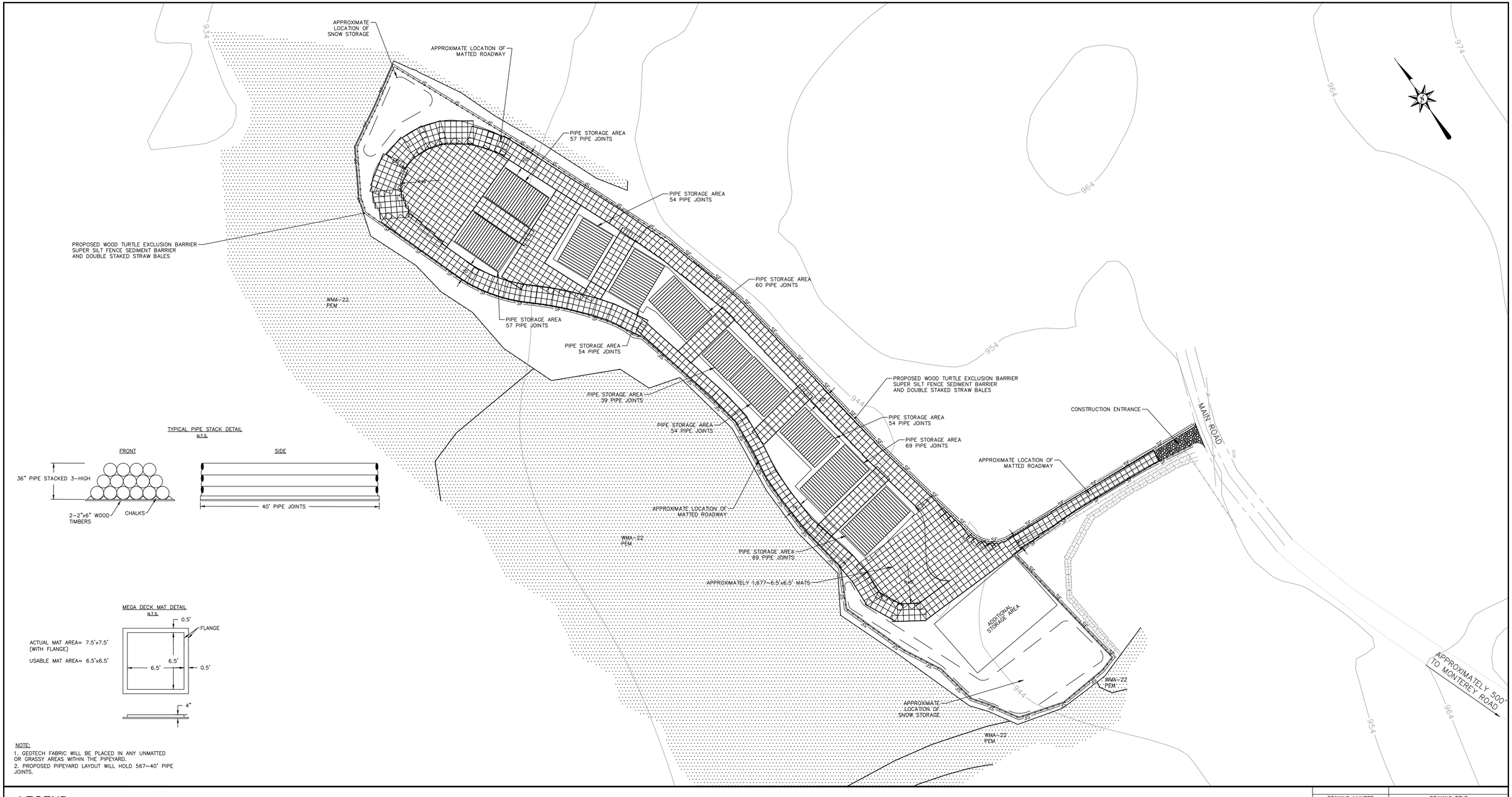
APPENDIX G

Tyringham Pipeyard Storage Layout



TYPICAL PIPE STACK DETAIL
N.T.S.

MEGA DECK MAT DETAIL
N.T.S.

NOTE:
1. GEOTECH FABRIC WILL BE PLACED IN ANY UNMATTED OR GRASSY AREAS WITHIN THE PIPEYARD.
2. PROPOSED PIPEYARD LAYOUT WILL HOLD 567~40' PIPE JOINTS.

LEGEND

- EXISTING PERMANENT EASEMENT NOT FOR CONSTRUCTION
- EXISTING PERMANENT EASEMENT FOR CONSTRUCTION
- PROPOSED PERMANENT EASEMENT
- TEMPORARY WORKSPACE
- ADDITIONAL TEMPORARY WORKSPACE (ATWS)
- PROPOSED PIPELINE
- EXISTING PIPELINE
- PROPERTY LINE
- STRUCTURE
- SNOW STORAGE
- ELEC CABLE
- FENCE
- TREE LINE
- FIBER OPTIC LINE
- POWER LINES
- TELEPHONE CABLE
- TELEPHONE LINE
- CABLE LINE
- SILT FENCE
- DOUBLE STAKED STRAW BALES

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GRAPHIC SCALE
50 25 0 50
SCALE IN FEET

DRAWING NUMBER	DRAWING TITLE
	REFERENCE DRAWINGS

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.
REVISIONS					

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

CONNECTICUT EXPANSION PROJECT
MASSACHUSETTS LOOP 200-3
PROPOSED 36" NATURAL GAS PIPELINE
PIPEYARD PLAN ON MAIN ROAD
TENNESSEE GAS PIPELINE COMPANY, LLC
BERKSHIRE COUNTY, MASSACHUSETTS

Division:		Op. Area:	
State: MA		Co./Par.:	BERKSHIRE
Section:	Township:	Range:	
Drafter: JS	Date: 7/15/2014	Project ID:	Type:
Chk'd: JB	Date: 7/20/2014	Scale: 1"=50'	
Appr: DK	Date: 7/20/2014	Filename: SK14C4781MA09_Pipeyards-MAT_LAYOUT_revised.dwg	
		Sheet: 1 of 1	Rev. A

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

APPENDIX G

Natural Heritage Endangered Species Program Project Review Checklist Filing

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500 Enterprise Drive
Suite 1A
Rocky Hill, CT 06067-3913

860 263 5800 tel
860 263 5777 fax

September 15, 2014

Ms. Everose Schlüter, PhD
Senior Endangered Species Review Biologist
Natural Heritage & Endangered Species Program
MA Division of Fisheries and Wildlife
1 Rabbit Hill Road
Westborough, MA 01581

Subject: MESA Project Review Checklist Filing
MA NHESP Tracking No.:13-32620
Tennessee Gas Pipeline Company, L.L.C.
Connecticut Expansion Project
Agawam, Sandisfield and Tyringham, MA

Dear Ms. Schlüter,

As you know, the Tennessee Gas Pipeline Company, L.L.C. ("Tennessee") is in the process of designing and permitting the Connecticut Expansion Project (the "Project"). Two components of the Project are located in Priority Habitat ("PH") and Estimated Habitat ("EH") and are subject to the jurisdiction of the Massachusetts Endangered Species Act ("MESA"). Accordingly, Tennessee is submitting this Project Review Checklist and supporting materials for your review. A check for the filing fee, in the amount of three hundred dollars, is enclosed herein.

Project Overview

Tennessee has operated pipelines in Massachusetts as part of its interstate pipeline network for more than 60 years and is now proposing the Project to expand that pipeline network to serve an existing demand for natural gas in the service area. This Project will involve construction of pipelines and related facilities in three states – New York, Connecticut and Massachusetts. In Massachusetts, the Project consists of approximately 3.8 miles of new 36-inch outside diameter ("OD") pipeline, collocated within or adjacent to Tennessee's existing "200 Line" right-of-way ("ROW") in Sandisfield, Massachusetts, and 0.11 miles of 24-inch OD pipeline collocated within or adjacent to Tennessee's "300 Line" ROW in Agawam, Massachusetts. Tennessee is proposing to utilize a pipe yard in Tyringham, MA, at which it will store equipment and material in support of construction. In addition, Tennessee is proposing to use Lower Spectacle Pond in Sandisfield as the water source for the required hydrostatic testing of the pipeline, once built.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Tennessee has filed its application for a Certificate of Public Convenience and Necessity (the "Certificate") from the Federal Energy Regulatory Commission ("FERC") for the Project. Upon completion, the Project will increase delivery capability to New York, Connecticut and southern Massachusetts by approximately 72.1 million dekatherms per day by looping the existing pipeline.

The Project is needed to meet the current demand for increased natural gas in the region and is not related to or contingent upon other potential projects or expansions by Tennessee in Massachusetts. Tennessee has evaluated alternative routes to serve the increased demand for the area served by the existing pipeline network, and is proposing the route that minimizes impacts to the environment and has made every effort to utilize the existing ROW.

General Regulatory Overview

In addition to the Massachusetts Environmental Policy Act ("MEPA"), MESA and other state environmental protection regulatory programs, the Project is ultimately subject to the jurisdiction of FERC which also requires a comprehensive environmental review process under the National Environmental Policy Act ("NEPA"). As part of its FERC application, Tennessee submitted an Environmental Report ("ER") that provides detailed information regarding existing conditions, potential project-related impacts and proposed impact avoidance and minimization measures for a number of environmental resources including land use, wetlands, threatened and endangered species, soils, geology and vegetation. After reviewing the ER, FERC will prepare an Environmental Assessment ("EA") that will include proposed conditions to ensure the continued protection of the resources present within the Project alignment.

The Project is also subject to the jurisdiction of the United States Army Corps of Engineers ("USACE"), a 401 Water Quality Certification from Massachusetts Department of Environmental Protection ("MA DEP") and the Wetlands Protection Act, administered jointly by MADEP and the Agawam, Tyringham and Sandisfield Conservation Commissions. Each of these agencies will be reviewing the Project relative to compliance with applicable standards and regulations for work within wetlands and waterways.

A portion of the proposed work will occur on lands controlled by the MA Department of Conservation and Recreation ("DCR"). Therefore, Tennessee will be seeking Article 97 legislation for work on state lands. Tennessee is actively working with the DCR to minimize impacts on state lands and ensure appropriate mitigation. In addition, the FERC environmental review process will ensure that the interests of the DCR are included in the EA.

Tennessee is currently in the process of preparing the various permit applications and will continue to coordinate with each agency relative to its review process.

Massachusetts Endangered Species Act

According to the MA NHESP, two components of the Project are located in PH and EH. The MESA Project Review Checklist, included in Attachment 1, either provides requisite

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

information or indicates where within this submittal it can be found. The two Project components which occur with PH and EH are the proposed pipe yard in Tyringham, located in PH 1454 and EH 8 and the proposed water withdrawal site in Sandisfield (Lower Spectacle Pond), located in PH 702 and EH 602. Site loci for both areas are included in Attachment 2.

Project activities occurring within these areas are subject to the jurisdiction of MESA. A discussion of the proposed activities, a summary of anticipated impacts and proposed mitigation measures for each site is included below. Due to the relatively minor impacts associated with the proposed activities and the proposed timing of mitigation measures, Tennessee believes it can avoid a "Take" under MESA. In addition, the June 30, 2014 letter from the MA NHESP to the MA Executive Office of Environmental Affairs (Attachment 3) indicated the proposed actions at the two subject sites could be conditioned to avoid a prohibited "Take" of state-listed species. The letter also requested additional information, which was provided at the July 15, 2014 pre-filing consultation meeting between MA NHESP and Tennessee's environmental consultant (AECOM). Additional information is provided below.

Tyringham Pipe Yard

According to the MA NHESP, the proposed pipe yard site may provide habitat for three state-listed species. Table One presents this information.

Table One. State-listed Species Potentially associated with the Tyringham Pipe Yard

Common Name	Scientific Name	State Status
Sedge Wren	*Cistothorus platensis*	Endangered
American Bittern	*Botaurus lentiginosus*	Endangered
Wood Turtle[1]	*Glyptemys insculpta*	Species of Special Concern

1 Only a portion of the proposed pipe yard is mapped as habitat for this species.

Sedge Wren

The sedge wren is small and secretive. It prefers to breed in short grass and sedge marshes, with the nest often constructed in rushes, sedges or grasses within one to two feet of muddy ground or shallow water. This species has been documented as breeding in highly transitory habitats and tends to utilize differing patches of habitat on a nearly annual basis. Sedge wrens eat a variety of invertebrates. Therefore, if present in the area, it is possible that this species could potentially utilize the area proposed for the pipe yard for foraging. Existing conditions in the active, upland, hayfield, where the pipe yard would be located, are unlikely to provide suitable nest sites for this species.

During the July 15 pre-filing consultation meeting, MA NHESP expressed some concern regarding the potential for sedge wrens to nest within the proposed pipe yard and

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

requested Tennessee render the entire site unsuitable habitat for this species prior to its return to western Massachusetts from its over-wintering locations. In response to that request, within the entire pipe yard footprint, Tennessee is committed to either placing construction matting or a geotextile fabric over all vegetated areas prior to May 1, 2015. If this is not possible, and matting and/or geotextile fabric is scheduled for installation after May 1, 2015, Tennessee will have said activities monitored by a biologist to ensure no negative impacts to the species. Installation of the construction matting and geotextile fabric will render the entire pipe yard unsuitable for the sedge wren, thereby eliminating the possibility of interfering with the nesting and/or foraging activity of this bird species.

American Bittern

The American bittern breeds and stalks its prey in freshwater marshes with tall vegetation. Due to its cryptic coloration and secretive behavior, this species is very difficult to locate visually. Often the American bittern's presence is known only because of its distinctive call. This species would not typically utilize an upland hay field for nesting or foraging. Hop Brook is located to the north, west and south of the proposed pipe yard. This low gradient, perennial stream is associated with extensive wet meadow, marsh and scrub/shrub wetland habitats. These latter areas would serve as the primary habitat for any American bitterns that may occur in the area. Therefore, Tennessee does not anticipate negatively impacting this species or its habitat.

MA NHESP agreed with this assessment during the July 15, 2014 pre-filing consultation meeting.

Wood Turtle

The wood turtle prefers low gradient streams with sandy bottoms and associated riparian habitats. This species spends a considerable amount of time on land in mixed deciduous forests, floodplains, hay fields, and wetlands of various types, where it forages for food and creates its nests. Nesting typically takes place in areas with sandy/gravelly soils with some aspect of southern exposure. Based upon the existing conditions observed at the proposed pipe yard and the presence of Hop Brook and associated riparian areas nearby, it is possible that wood turtles could, at times, utilize the area for foraging. However, no nesting activity would be expected to occur there because much of the soils present are not suitable and the hay field is heavily vegetated.

Tennessee plans to use 3.50 acres of active hay field as a pipe yard to store equipment and materials in support of construction. The entire pipe yard is within uplands and no wetland areas will be impacted by the use of the pipe yard. Additionally, no woody vegetation will need to be cleared to accommodate the pipe yard. A photograph of the proposed pipe yard is included in Attachment 4.

In later winter or very early spring 2015 (prior to April 15), Tennessee anticipates placing construction mats and/or geotextile fabric over the entire 3.50 acre proposed pipe yard and associated access road, while simultaneously installing a perimeter of properly dug in silt fencing and double staked straw bales. Details of the mats which may be used are included herein as Attachment 5. A final decision on the exact matting has not been made

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

at this time. Mat placement would take place prior to sedge wrens returning to the area for the pending breeding season and prior to wood turtles emerging from Hop Brook after over-wintering. A drawing depicting the anticipated layout of the pipe yard is included in this submittal as Attachment 6.

The construction mats and silt fencing would remain in place for approximately one year and would be removed some time during the late winter or early spring of 2016. The hay field would then presumably be put back into regular production for the 2016 growing season. Using this approach, both the sedge wren and the wood turtle would be excluded from using the area for one season.

Given that the proposed pipe yard area is on the edge of the PH mapping, is limited in scope and there is an abundance of hay fields in the immediate area, it is AECOM's opinion that the local populations of sedge wren and wood turtle would not be negatively affected by being temporary exclusion from the area for one season. There is an abundance of more suitable habitat for both species associated with Hop Brook in Tyringham Valley. In our opinion, given the proposed mitigation measures, Tennessee would avoid a "Take" of these species under MESA.

Lower Spectacle Pond Water Withdrawal Location, Sandisfield

According to the MA NHESP, Lower Spectacle Pond provides habitat for the umber shadowdragon (*Neurocordulia obsoleta*). This species is listed as a species of special concern pursuant to MESA. Umber shadowdragons prefer sparsely vegetated lakes and sections of rivers of various sizes. This species does well in man-made habitats such as sections of impounded rivers and reservoirs. The species has a flight period from mid-May through mid-August.

In compliance with United States Department of Transportation specifications, Tennessee will conduct hydrostatic testing on all segments of the pipeline prior to placing it in service. Tennessee anticipates using water from Lower Spectacle Pond for hydrostatic pressure testing and plans on accessing the pond from an existing boat ramp off of Cold Spring Road. A photograph of the proposed withdrawal area is included in Attachment 4.

Tennessee is proposing to place a pump on the boat ramp in a secondary containment structure to avoid the potential for a fuel and/or oil spill. A spill kit containing materials designed to contain a release would be kept on site for the duration of the withdrawal process. A suction hose would be attached to the pump with a dissipation device (screen) attached to the end, to avoid the entrainment of fish and other wildlife. The intake and screen will be suspended in the water column and elevated off the bottom by attaching an anchor on the bottom and a float on the water surface, to avoid the withdrawal of mud and sediment from the bottom. The anchor, float and intake would all be connected by a length of chain. A figure depicting the proposed methodology for water withdrawal is included herein as Attachment 7.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

The process of installing the elevated/suspended intake hose and screen will be done from a small boat and/or on foot. Therefore, the process is anticipated to avoid disturbing insect larvae, including any odonate larvae which may be present, by largely avoiding impacts to the bottom substrate. Timing of the withdrawal (fall) would avoid the flight period of the umber shadowdragon, further reducing any chance of negative impacts to this listed species.

Lower Spectacle Pond has a surface area of approximately 70 acres. The proposed withdrawal volume for hydrostatic test water is approximately 1,025,00 gallons or 3 acre-feet. To complete the withdrawal in the proposed 8 hour timeframe, the withdrawal rate would need to be approximately 2,000 gallons per minute. The overall effect on Lower Spectacle Pond from the proposed withdrawal would be a reduction in depth of approximately 0.04 feet over the entire pond and is not anticipated to have a discernible impact on local wildlife or human users.

Upon completion of the hydrostatic tests, the test water will be discharged to an upland area through a dewatering structure consisting of an energy dissipation device and water filtration structure. The discharge rate of the test water will be regulated using valves and energy dissipation devices to reduce the potential for erosion. This clean test water (no chemical additives are used during testing) will only be discharged into areas where adequate vegetation is present, adjacent to the construction ROW. All discharge activities will be monitored through the duration of the activity to ensure proper function of the structures utilized and to prevent erosion and sedimentation from occurring as a result of dewatering activities. Hydrostatic test water discharge is anticipated to occur over an 8 hour period, similar to the fill rate. Tennessee anticipates that test water will infiltrate into the ground and move as sheet flow across well vegetated areas before reaching surface waters downstream. Tennessee does not anticipate that this limited quantity of water would impact downstream areas and will monitor and slow the discharge rate, if necessary, to prevent any downstream impacts from the discharge. Environmental impacts from withdrawal and discharge of test water will be minimized by utilizing the measures outlined in FERC's Plan & Procedures and Tennessee's Construction BMP's as well as by complying with all applicable permit requirements.

Summary

Due to the relatively minor impacts associated with the proposed activities and the proposed timing of mitigation measures, Tennessee believes it can avoid a "Take" under MESA. In addition, the June 30, 2014 letter from the MA NHESP to the MA Executive Office of Environmental Affairs indicated the proposed actions at the two subject sites could be conditioned to avoid a prohibited "Take" of state-listed species. This opinion was reiterated at the July 15 pre-filing consultation meeting between the MA NHESP and AECOM.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Should you have any questions regarding any of the materials submitted herein, please contact Tim O'Sullivan, at 978-621-6756 or via email at tim.osullivan@aecom.com.

Tennessee appreciates your continued attention to this Project.

Sincerely,



Timothy O'Sullivan MS, PWS
Wetland and Wildlife Biologist
tim.osullivan@aecom.com

Attachment 1, MESA Project Review Checklist

Attachment 2, Tyringham Pipe Yard and Lower Spectacle Pond, U.S.G.S. Site Loci

Attachment 3, June 30, 2014 MA NHESP Letter to MEPA

Attachment 4, Site Photographs

Attachment 5, MEGADECK Product Specifications

Attachment 6, Tyringham Pipe Yard Anticipated Layout

Attachment 7, Lower Spectacle Pond Anticipated Water Intake Design

Attachment 8, Project Location Information

Attachment 9, Assessor Figures

Attachment 10, Property Owner Information

Attachment 11, Project Description

Attachment 12, Tyringham Pipe Yard, Owner Authorization Letter

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Attachment 1, MESA Project Review Checklist

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

MESA PROJECT REVIEW CHECKLIST

Massachusetts Endangered Species Act M.G.L. c. 131A and Regulations (321 CMR 10.00)

Massachusetts Division of Fisheries & Wildlife
Natural Heritage & Endangered Species Program

~~~~ CONTACT INFORMATION ~~~~

If you already completed your Notice of Intent- Form 3, you can send page 1 of the NOI in place of questions 1 through 4 in this section

1. **Project Location:**

Please see Attachment 8

Street Address/Location | City/Town | Zip Code

Assessors Map/Plat Number | Parcel /Lot Number

2. **Applicant:**

Suzan	Lacey	Tennessee Gas Pipeline Co., LLC
First Name	Last Name	Company
1001 Louisiana Street		
Mailing Address		
Houston	Texas	77002
City/Town	State	Zip Code
713-420-6360	713-420-5649	suzan_lacey@kindermorgan.com
Phone Number	Fax Number	Email address

3. **Property owner (if different from applicant):**

Please see Attachments 9 and 10

First Name | Last Name | Company

Mailing Address

City/Town | State | Zip Code

Phone Number | Fax Number | Email address

4. **Representative (if any):**

AECOM

Company

Timothy	O'Sullivan	
Contact Person First Name	Contact Person Last Name	
500 Enterprise Drive, Suite 1A		
Mailing Address		
Rocky Hill	CT	06067-3913
City/Town	State	Zip Code
978-621-6756	860-263-5777	tim.osullivan@aecom.com
Phone Number	Fax Number	Email address

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

~~~~ADDITIONAL INFORMATION ~~~~

1. Will this project require a filing with the Conservation Commission and/or DEP? ☐ No ☑ Yes
2. Will this project meet any threshold for a MA Environmental Policy Act (MEPA) filing (excluding rare species, 301 CMR 11.03 (2))? ☐ No ☑ Yes
3. Has this project previously been issued a NHESP Tracking Number (either by previous NOI Submittal or MESA Information Request Form)? ☐ No ☑ Yes

If Yes - Tracking No. 13-32620

~~~~PROJECT DESCRIPTION (attach separate sheet, as needed) ~~~~

Please note, certain projects or activities are exempt from review, see 321 CMR 10.14. The MESA does not allow project segmentation. Your filing must reflect all anticipated work associated with the proposed project (CMR 321 10.16).

Please see cover letter and Attachment 11

~~~~INCLUDE THE FOLLOWING INFORMATION ~~~~

The NHESP will notify the applicant within 30 days if the materials submitted do not satisfy requirements for a filing and request submission of any missing materials (321 CMR 10.18(1)).

ALL Applicants must submit:

- ☑ USGS map (1:24,000 or 1:25,000) with property boundary clearly outlined
- ☑ Project plans for entire site (including wetland Resource Areas, showing existing and proposed conditions, existing and proposed tree/vegetation clearing line, and clearly demarcated limits of work)
- ☑ Assessor's map or right-of-way plan of site
- ☑ Project description
- ☑ Statement/proof that applicant is the Record Owner or that applicant is a person authorized in writing by the record owner to submit this filing
- ☑ Photographs representative of the site

Projects altering* 10 or more acres, must also submit:

- ☐ A vegetation cover type map of the site
- ☐ Project plans showing Priority Habitat boundaries

The NHESP may request additional information, such as, but not limited to, species and habitat surveys, wetland reports, soil map and reports, and stormwater management reports (321 CMR 10.16).

*Alteration: Any physical alteration of land, soils, drainage or destruction of plant life, see "Project or Activity" (321 CMR 10.02).

~~~~ FILING FEES ~~~~

See Fee Schedule below

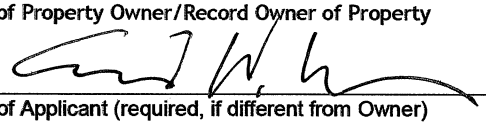
a. Total MESA Fee Paid $300.00 b. Acreage of Disturbance* 3.50 acres c. Total Site Acreage N/A

~~~~ REQUIRED SIGNATURES ~~~~

I hereby certify under the penalties of perjury that the foregoing MESA filing and accompanying plans, documents, and supporting data are true and complete to the best of my knowledge.

See Attachment 12

Signature of Property Owner/Record Owner of Property — Date



9/10/2014

Signature of Applicant (required, if different from Owner) — Date

Please send form, required information, and filing fee (payable to "Comm. of MA - NHESP") to:

Regulatory Review
Natural Heritage & Endangered Species Program
100 Hartwell Street, Suite 230
West Boylston, MA 01583

Natural Heritage & Endangered Species Program
Massachusetts Division of Fisheries & Wildlife

Questions regarding this form should be directed according to the county that the property is located:

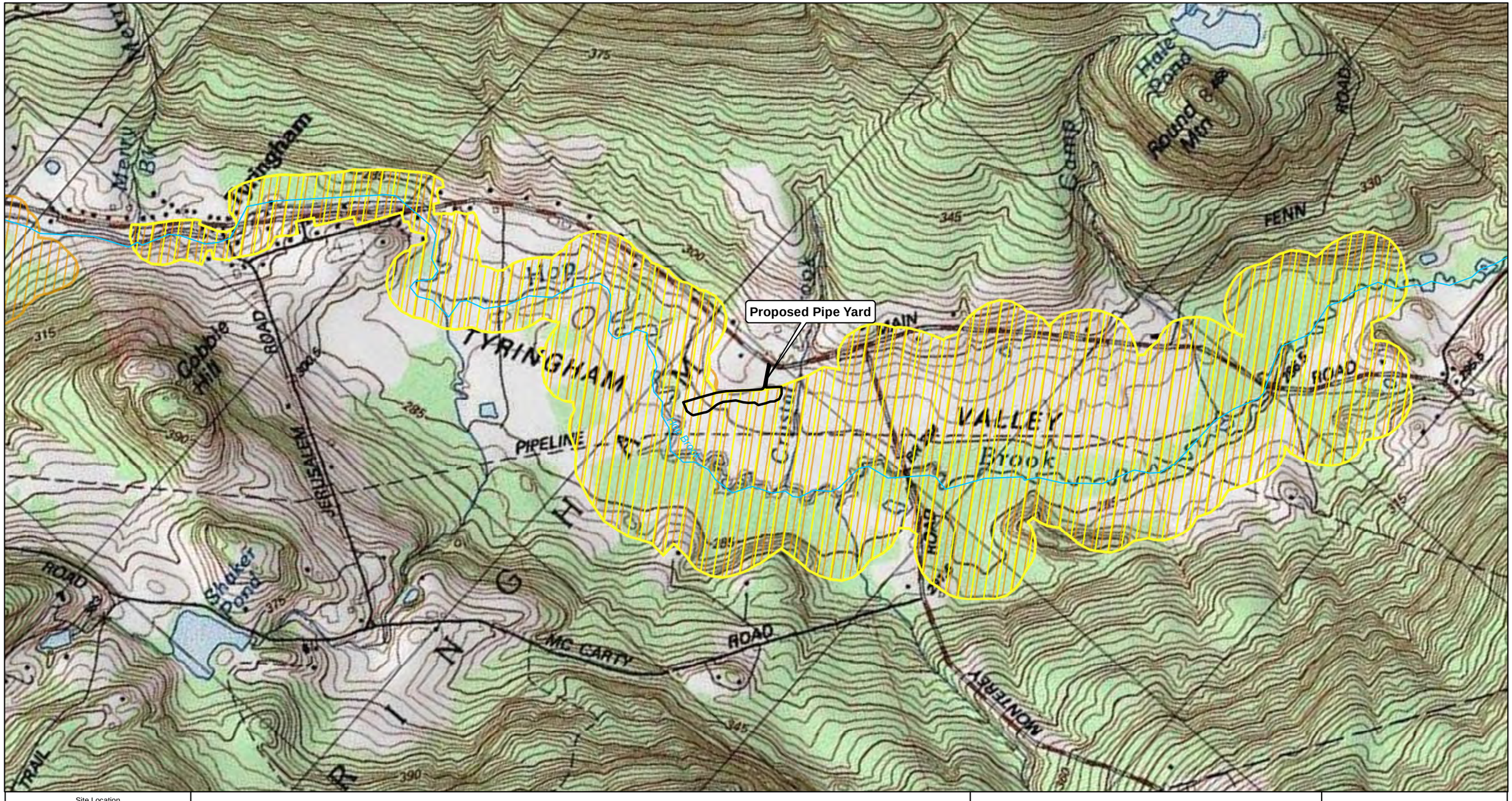
Berkshire, Essex, Franklin, Hampshire, Hampden, Middlesex & Worcester Counties call: 508-389-6361
Barnstable, Bristol, Dukes, Nantucket, Norfolk, Plymouth & Suffolk Counties call: 508-389-6385

PROJECT REVIEWS 321 CMR 10.18			
Project Definition	**Project Criteria**	**Fee**	**Response Time**
Simple	Less than 5 acres of disturbance*	$ 300.00	60 days from determination of complete filing
Intermediate *(Moderate)*	5 to 20 acres of disturbance*	$ 1800.00	60 days from determination of complete filing
Complex	More than 20 acres of disturbance* or project requires wetlands variance	$ 4000.00	60 days from determination of complete filing
Linear	Projects greater than 1 mile in length.	$ 4000.00 per Priority Habitat intersected	60 days from determination of complete filing

* Disturbance means direct physical disturbance of the land surface or waterbody, soil and/or vegetation, if only a portion of the project site is located within Priority Habitat, indicate total area of disturbance for site as a whole.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Attachment 2, Tyringham Pipe Yard and Lower Spectacle Pond, U.S.G.S. Site Loci



Site Location



Legend

- Proposed Project Centerline
- Access Roads
- NHESP 2013 Estimated Habitats of Rare Wildlife
- NHESP 2009 Priority Habitats of Rare Species
- Pipeyards

N W E S

Tennessee Gas Pipeline Company

CT Expansion Project

Proposed Pipe Yard

MA NHESP Areas

0 500 1,000 2,000 Feet

1 inch = 1,000 feet

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

Figure 1

September 8, 2014

Path: Y:\Projects\Tennessee_Gas\CT_Expansion_Project\Maps\MESA\CT_Expansion_MA_NHESP.mxd



Site Location



Legend

- Proposed Project Centerline
- Access Roads
- NHESP 2013 Estimated Habitats of Rare Wildlife
- NHESP 2009 Priority Habitats of Rare Species
- Pipeyards

N E S W

Tennessee Gas Pipeline Company

CT Expansion Project

Proposed Water Withdrawal Location

MA NHESP Areas

0 500 1,000 2,000 Feet

1 inch = 1,000 feet

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

Figure 2

September 8, 2014

Path: Y:\Projects\Tennessee_Gas\CT_Expansion_Project\Maps\MESA\CT_Expansion_MA_NHESP.mxd

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Attachment 3, June 30, 2014 MA NHESP Letter to MEPA

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Commonwealth of Massachusetts

Division of Fisheries & Wildlife

MassWildlife

Wayne F. MacCallum, *Director*

June 30, 2014

Secretary Maeve Vallely Bartlett
Executive Office of Environmental Affairs
Attention: MEPA Office, Alex Strysky, EEA No. 15205
100 Cambridge St.
Boston, Massachusetts 02114

Project Name:	Connecticut Expansion Project
Proponent:	Tennessee Gas Pipeline Company, LLC
Location:	Agawam, Sandisfield, Tyringham
Document Reviewed:	Expanded Environmental Notification Form (EENF)
Project Description:	3.8 miles of new pipeline
NHESP Tracking No.	13-32620

Dear Secretary Bartlett:

The Natural Heritage & Endangered Species Program (NHESP) of the Massachusetts Division of Fisheries & Wildlife (Division) has reviewed the Expanded Environmental Notification Form (EENF) for the Connecticut Expansion Project and would like to offer the following comments.

There are two potential areas associated with this project located within *Priority Habitat* and *Estimated Habitat* as indicated in the 13th Edition of the *MA Natural Heritage Atlas* and therefore the project requires review through a direct filing with NHESP for compliance with the Massachusetts Endangered Species Act (MESA 321 CMR 10.00) and its implementing regulations (MESA, 321 CMR 10.00). Review of the NHESP database indicates that the proposed pipeline corridor is located within mapped habitat for the Umber Shadowdragon (*Neurocordulia obsoleta)*, a dragonfly listed as "Special Concern" pursuant to the MESA. The proposed pipeyard in Tyringham is mapped for Sedge Wren (*Cistothorus platensis*) and American Bittern (*Botaurus lentiginosus*); both birds are listed as "Endangered" pursuant to the MESA. Additionally, portions of this pipeyard area are mapped for the Wood Turtle (*Glyptemys insculpta*), a species listed as "Special Concern" pursuant to the MESA. Based on the preliminary information included in the EENF, it appears that the proposed activities (including the proposed hydrostatic pressure testing) could be conditioned to avoid a prohibited "take" of state-listed species. However, more detailed information on the limit of work, especially associated with the pipeyard, should be included in the MESA filing for review. The Division anticipates being able to resolve any outstanding state-listed species issues through the MESA review process.

The Division will not render a final decision until the MEPA review process and associated public and agency comment period is completed, and until all required MESA filing materials are submitted by the proponent to the Division. As our MESA review is ongoing, no alteration to the soil, surface, or vegetation and no work associated with the proposed project shall occur on the property until the Division has made a final determination. If you have any questions or need additional information, please contact Eve Schlüter, Ph.D., Senior Endangered Species Review Biologist, at (508) 389-6346 or eve.schluter@state.ma.us.

Division of Fisheries and Wildlife
Temporary Correspondence: 100 Hartwell Street, Suite 230, West Boylston, MA 01583
Permanent: Field Headquarters, North Drive, Westborough, MA 01581 (508) 389-6300 Fax (508) 389-7890
An Agency of the Department of Fish and Game

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

FISHERIES COMMENTS

The Clam River itself is a coldwater fisheries resource. Fisheries surveys have yielded: Blacknose Dace (*Rhinichthys atratulus*), native Brook Trout (*Salvelinus fontinalis*), Brown Bullhead (*Ameiurus nebulosus*), reproducing Brown Trout (*Salmo trutta*), Common Shiner (*Notropis cornutus*), Creek Chub (*Semotilus atromaculatus*), Cutlips Minnow (*Exoglossum maxillingua*), Longnose Dace (*Rhinicthys cataractae*), Pumpkinseed (*Lepomis gibbosus*), Slimy Sculpin (*Cottus cognatus*), Smallmouth Bass (*Micropterus dolomieu*), Tessellated Darter (*Etheostoma olmstedi*), White Sucker (*Catastomus commersoni*) and Yellow Perch (*Perca flavescens*). Additionally, the river is annually stocked in the spring with Brook Trout, Brown Trout, Rainbow Trout (*Oncorhynchus mykiss*) and/or Tiger Trout (*Salmo trutta x Salvelinus fontinalis*). Coldwater fisheries resources are highly susceptible to changes in water quality and/or quantity such as siltation and run-off, water level fluctuations, loss of riparian habitat, stream fragmentation and alterations of the temperature regime. Therefore, the project must not in any way diminish the ability of the river to support coldwater fish species.

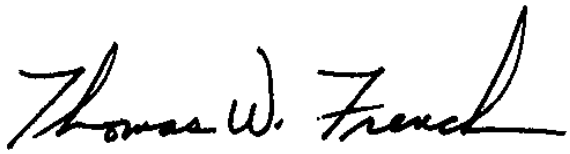
The Fisheries Section currently does not have fisheries survey information for the unnamed tributaries to the Clam River. However, surveys conducted by the Division have shown the importance of coldwater tributaries in helping maintain the coldwater status of their receiving waters. Until fisheries surveys are conducted, these unnamed tributaries should be treated as coldwater.

Fisheries surveys of Spectacle Pond Brook have yielded: Bluegill (*Lepomis macrochirus*), Brown Bullhead (*Ameiurus nebulosus*) and Largemouth Bass (*Micropterus salmoides*).

Lower Spectacle Pond contains a warmwater fishery. Fisheries surveys have yielded: Bluegill (*Lepomis macrochirus*), Brown Bullhead (*Ameiurus nebulosus*), Chain Pickerel (*Esox niger*), Golden Shiner (*Notemigonus crysoleucas*), Largemouth Bass (*Micropterus salmoides*), Pumpkinseed (*Lepomis gibbosus*) and Yellow Perch (*Perca flavescens*).

If you have any questions regarding fisheries information, please contact Rich Hartley, Fisheries Biologist, at (508) 389-6330 or richard.hartley@state.ma.us.

Sincerely,



Thomas W. French, Ph.D.
Assistant Director

cc: Mark Gardella, AECOM
Agawam Board of Selectmen
Agawam Conservation Commission
Agawam Planning Department
Sandisfield Board of Selectmen
Sandisfield Conservation Commission
Sandisfield Planning Department
Tyringham Board of Selectmen
Tyringham Conservation Commission
Tyringham Planning Department
DEP Western Regional Office, MEPA Coordinator

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Attachment 4, Site Photographs

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM



Portion of Proposed Pipe Yard, Facing NW, Tyringham, MA



Proposed Water Withdrawal Location, Facing SW, Sandisfield, MA

Lower Spectacle Pond

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Attachment 5, MEGADECK Product Specifications

MEGADECK®

MEGADECK PRODUCT SPECIFICATIONS



Mat Size

Full Size Mat (consists of two half mats permanently bolted together):
Actual: 4.2672m / 14ft (L) x 2.286m / 7.5ft (W) x 10.795cm / 4in (D)
Usable (due to flange): 3.9624m / 13ft (L) x 1.812m / 6.5ft (W) x 10.795cm / 4cm (D)

Half Size Mat:
Actual: 2.286m / 7.5ft (L) x 2.286m / 7.5ft (W) x 10.795cm / 4in (D)
Usable (due to flange): 1.812m / 6.5ft (L) x 1.812m / 6.5ft (W) x 10.795cm / 4cm (D)

Weight

1,050 lbs / 476.272 kg

Colors

Beige. Custom colors available.

Mat Design

Each MegaDeck mat is molded from a single piece of HDPE, with special proprietary fillers and additives that provide additional strength, rigidity, and impact resistance.

Mat sections incorporate a weight-saving ribbed interior structure that provides tremendous weight-bearing capacity, while allowing for sections to be easily handled by a standard forklift.

A solid HDPE plate is bolted to the top of each mat to close off the ribbed interior and to provide a water seal that prevents dirt, water, and debris from penetrating the mat. Each MegaDeck top section is sealed with a specialized gasket that handles mat flexure and other everyday abuses.

MegaDeck mats incorporate flanges on both sides that allow mats to connect to adjacent panels. Flanges are solid HDPE for added durability. Each flange incorporates a heavy radius design, providing additional strength and shear resistance. Once nested into adjacent panels, the solid HDPE flange system provides rigidity and strength.

Each mat may be reconfigured into 7.5' x 7.5' (2.286 m x 2.286 m) (half mats) at the user's request, allowing for greater layout flexibility. Half sections may be used to create straight edges as desired and allow for more options in site design and transportability.

Material Composition

Each MegaDeck mat is manufactured using the highest quality virgin HDPE, with special impact modifiers and fillers to accommodate thermal expansion, incorporate UV resistance, and to provide tremendous strength. An anti-static (static dissipative) additive is molded into each mat, to allow for use in environments where static could pose a problem.

Connection System

MegaDeck sections may be interconnected using MegaDeck's proprietary connection system. This connection system consists of a self aligning locking mechanism that connects the overlapping flange from adjacent mats, allowing sections to bear tremendous weights. An ultra-secure connection between your MegaDeck panels is achieved with a simple twist of a standard hex key. All lock components are made from heavy-duty cast aluminum that will not rust, break, or corrode.








Surface Traction Design

Each mat incorporates our low-profile "pedestrian" design that provides traction and slip resistance in the field. The pattern is designed to be easily cleaned and to function well with mud, sand, dirt, and other common on-site substances such as oil and grease. This design provides good traction for pedestrians, vehicles, and all types of rolling equipment, including dozers and other tracked vehicles.

Packing and Loading

Mats may be loaded into standard ISO containers and are specially designed to maximize volume in containers for overseas transport. Mats are easily loaded onto BOTH flat bed and enclosed van trucks, allowing maximum flexibility in transport.

U.S. standard truck: 42 mats – 3 stacks each, 14 mats high
40ft ISO shipping container: 42 mats – 2 stacks each, 17 full mats high + 1 stack, 16 half mats high
20ft ISO shipping container: - 18 mats - 1 stack, 18 full mats high

Cleaning Method

Sections may be cleaned with a standard industrial grade pressure washer, brushes, and ordinary cleaning solutions. MegaDeck mats are easy to maintain and to clean and will not absorb water or other contaminants.

Inventory & Tracking

All mats have unique serial numbers for inventory control and tracking.

Optional RFID chips are available for each mat and are incorporated into the core of the mat during the manufacturing process. Simply specify if you are interested in tracking your mats using a computerize inventory control and tracking system.

Offered by: NEW SOUTH ACCESS & ENVIRONMENTAL SOLUTIONS

281 Old Jackson Road Madison, MS 39110
Toll-free: 866.922.6287 (MATS) Direct: 601.859.7472 Fax: 601.859.7462
http://www.newsouthmat.com

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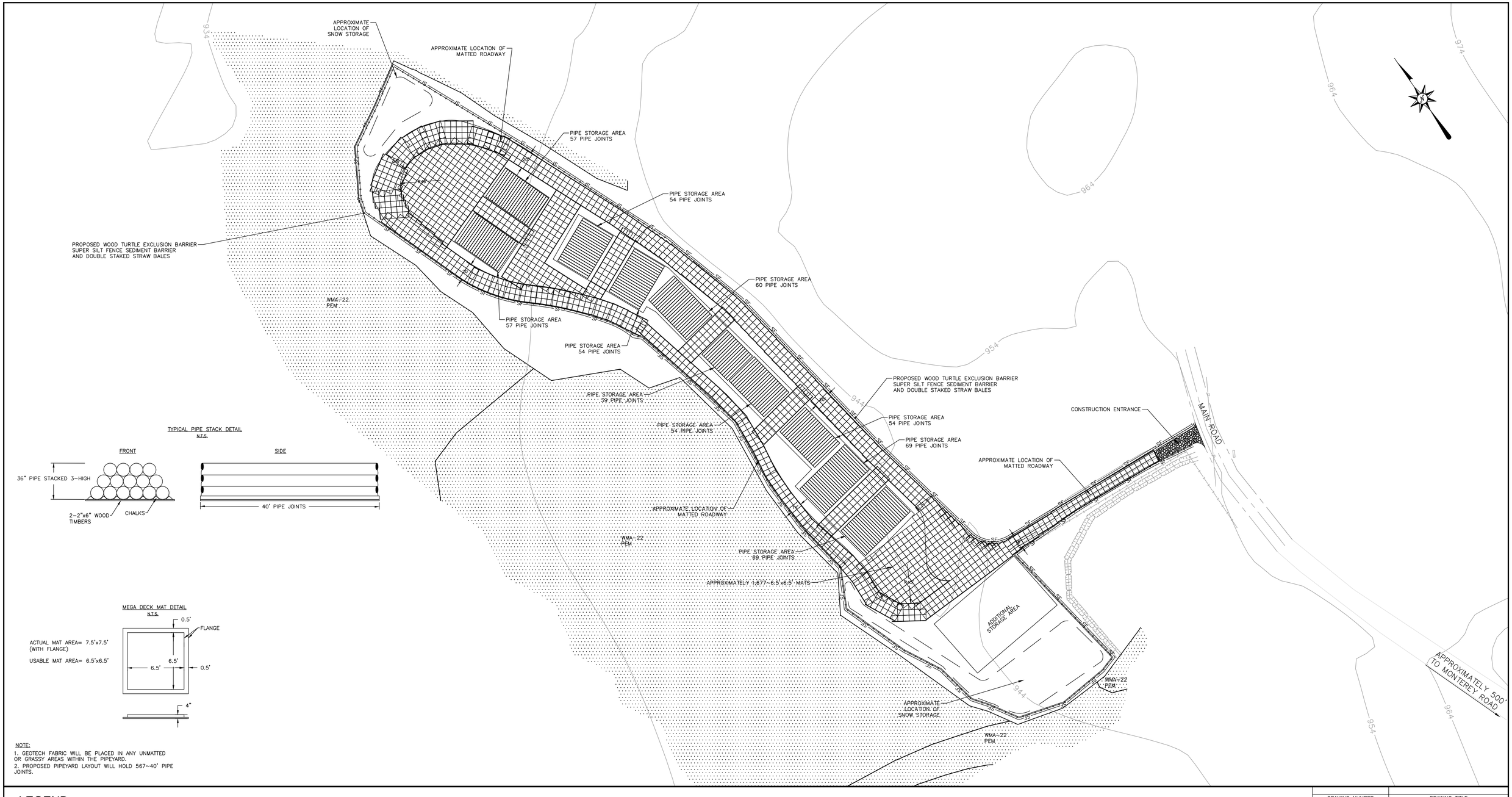
Attachment 6, Tyringham Pipe Yard Anticipated Layout



TYPICAL PIPE STACK DETAIL
N.T.S.

MEGA DECK MAT DETAIL
N.T.S.

NOTE:
1. GEOTECH FABRIC WILL BE PLACED IN ANY UNMATTED OR GRASSY AREAS WITHIN THE PIPEYARD.
2. PROPOSED PIPEYARD LAYOUT WILL HOLD 567~40' PIPE JOINTS.

LEGEND

- EXISTING PERMANENT EASEMENT NOT FOR CONSTRUCTION
- EXISTING PERMANENT EASEMENT FOR CONSTRUCTION
- PROPOSED PERMANENT EASEMENT
- TEMPORARY WORKSPACE
- ADDITIONAL TEMPORARY WORKSPACE (ATWS)
- PROPOSED PIPELINE
- EXISTING PIPELINE
- PROPERTY LINE
- STRUCTURE
- SNOW STORAGE
- ELEC CABLE
- FENCE
- TREE LINE
- FIBER OPTIC LINE
- POWER LINES
- TELEPHONE CABLE
- TELEPHONE LINE
- CABLE LINE
- SILT FENCE
- DOUBLE STAKED STRAW BALES

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GRAPHIC SCALE
50 25 0 50
SCALE IN FEET

DRAWING NUMBER	DRAWING TITLE
	REFERENCE DRAWINGS

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.
REVISIONS					

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

CONNECTICUT EXPANSION PROJECT
MASSACHUSETTS LOOP 200-3
PROPOSED 36" NATURAL GAS PIPELINE
PIPEYARD PLAN ON MAIN ROAD
TENNESSEE GAS PIPELINE COMPANY, LLC
BERKSHIRE COUNTY, MASSACHUSETTS

Division:		Op. Area:	
State: MA		Co./Par.:	BERKSHIRE
Section:	Township:	Range:	
Drafter: JS	Date: 7/15/2014	Project ID:	Type:
Chk'd: JB	Date: 7/20/2014	Scale: 1"=50'	
Appr: DK	Date: 7/20/2014	Filename: SK14C4781MA09_Pipeyards-MAT_LAYOUT_revised.dwg	
		Sheet: 1 of 1	Rev. A

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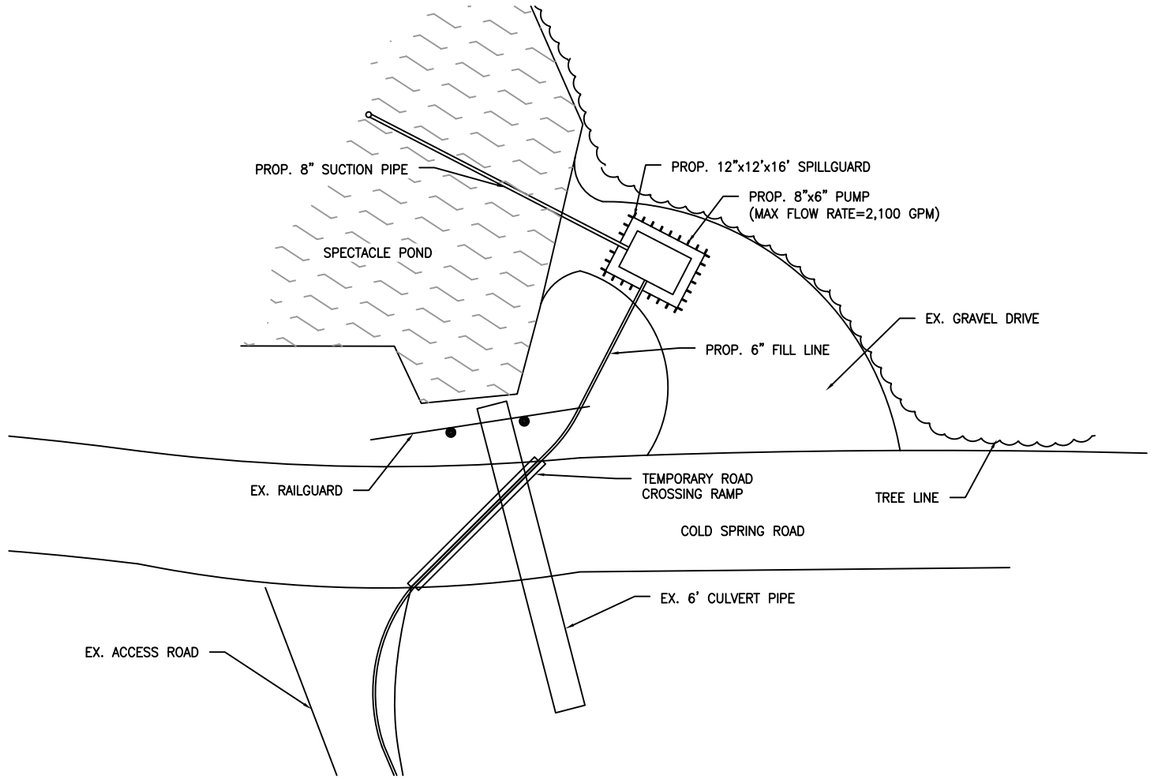
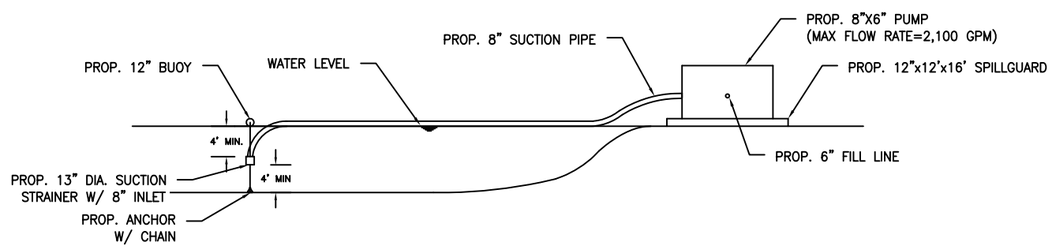
Attachment 7, Lower Spectacle Pond Anticipated Water Intake Design



PLAN VIEW
SCALE= 1"=30'



PROFILE VIEW
SCALE= 1"=20'

APPLICATION NO.:

NO.	DATE	BY	DESCRIPTION	PROJ. ID	APPR.

REVISIONS

Division: Op. Area.:
State: MA Co./Par.: BERKSHIRE
Section: Township: Range:
Dft: Date:
Chk: Date:
Appr: Date:
Scale: AS NOTED
Filename:

CONNECTICUT EXPANSION
MASSACHUSETTS LOOP 200-3
PROPOSED 36" NATURAL GAS PIPELINE
PROPOSED INTAKE STRUCTURE FOR HYDROSTATIC TESTING

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

Sheet: 1 of 1
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Attachment 8, Project Location Information

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

Project Location

Two components of the Project are located in PH and EH. The proposed pipe yard in Tyringham is located in PH 1454 and EH 8 and the proposed water withdrawal site (Lower Spectacle Pond) in Sandisfield, is located in PH 702 and EH 602.

Specific project location information is included below. Assessor information on aerial photograph base mapping is included in Attachment 9.

Proposed Pipe Yard, Tyringham

Street Address: 0 Main Road
Town: Tyringham
Zip Code: 01264
Assessors Map/Plat Number: 407
Parcel/Lot Number: 46

Proposed Water Withdrawal Site, Lower Spectacle Pond, Sandisfield

Street Address: Cold Spring Road
Town: Sandisfield
Zip Code: 01255
Assessors Map/Plat Number: 405
Parcel/Lot Number: 02

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Attachment 9, Assessor Figures

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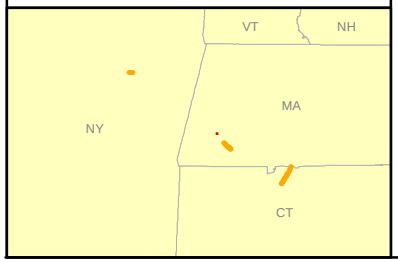
Site Location



Legend

- Mileposts
- Proposed Project Centerline
- Existing Pipeline Centerline
- Pipeyard
- Property Lines (Map-Parcel)

N
W E
S

Tennessee Gas Pipeline Company, L.L.C.

Connecticut Expansion Project

Proposed Pipeyard

Property Lines

1 inch = 150 feet

0 75 150 300 Feet

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

Figure 1

September 2014

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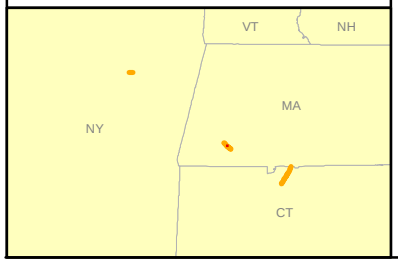
Site Location



Legend

- Mileposts
- Proposed Project Centerline
- Existing Pipeline Centerline
- Pipeyard
- Property Lines (Map-Parcel)

N
W E
S

Tennessee Gas Pipeline Company, L.L.C.

Connecticut Expansion Project

Proposed Water Withdrawal Location

Property Lines

1 inch = 150 feet

0 75 150 300 Feet

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

Figure 2

September 2014

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Attachment 10, Property Owner Information

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

Property Owner Information

Proposed Pipe Yard, Tyringham

Owner: Charles E. Slater, Jr.
Mailing Address for Owner: PO Box 418, Main Road
Town: Tyringham
State: Massachusetts
Zip Code: 01264
Cell Phone: 413-429-1710

Proposed Water Withdrawal Site, Lower Spectacle Pond, Sandisfield

Owner: MA Department of Conservation and Recreation
Contact: Kevin Whalen, Director of Operations
Street Address: 251 Causeway Street, Suite 900
City: Boston
State: Massachusetts
Zip Code: 02114
Office Phone: 617-626-1250

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Attachment 11, Project Description

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

Project Description

The Connecticut Expansion Project will involve construction of pipelines and related facilities in three states – New York, Connecticut and Massachusetts. In Massachusetts, the Project consists of approximately 3.8 miles of new 36-inch outside diameter ("OD") pipeline, co-located within or adjacent to Tennessee's existing "200 Line" right-of-way ("ROW") in Sandisfield, Massachusetts, and 0.11 miles of 24-inch OD pipeline co-located within or adjacent to Tennessee's "300 Line" ROW in Agawam, Massachusetts. Tennessee is proposing to utilize a pipe yard in Tyringham, MA, at which it will store equipment and material in support of construction. Tennessee is also proposing to use Lower Spectacle Pond in Sandisfield as a source of hydrostatic testing water.

The Project is needed to meet the current demand for increased natural gas in the region and is not related to or contingent upon other potential projects or expansions by Tennessee in Massachusetts. Tennessee has evaluated alternative routes to serve the increased demand for the area served by the existing pipeline network, and is proposing the route that minimizes impacts to the environment and has made every effort to utilize the existing ROW.

Two components of the Project are located in PH and EH. The proposed pipe yard in Tyringham is located in PH 1454 and EH 8 and the proposed water withdrawal site in Sandisfield is located in PH 702 and EH 602.

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Attachment 12, Tyringham Pipe Yard, Owner Authorization Letter

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

June 12, 2014

Charles E. Slater, Jr.
PO Box 418
Main Road
Tyringham, MA 01264

RE: Tennessee Gas Pipeline Company, LLC
MA- Proposed Pipe Yard
Berkshire Co. Tyringham
PL 258-200

Yours: Main Road

Dear Mr. Slater:

Tennessee Gas Pipeline Company, LLC (TGP) has received our State Threatened & Endangered Species (T&E) consultations from Massachusetts National Heritage & Endangered Species Program (MANHESP) for the proposed pipe yard on your property located on Main Road, Tyringham, Massachusetts. MANHESP has identified three state listed species including wood turtles, American bittern and marsh wren located in or near the field we intend to use during construction. Since the proposed pipe yard is located in state identified Priority Habitat, TGP will need to submit a MESA Checklist form and propose mitigation to MANHESP to avoid impacting these listed species..

The proposed mitigation will involve the installation of silt fence (barrier fence) in late winter (February 2016) along the wetland edge (lower side of the pipe yard) to prevent wood turtles from leaving the wetland and entering the field in the spring during the time we will be utilizing the field. In addition, TGP proposes to install wooden mats in the work area at the same time as installing the silt fence to prevent the identified birds species from utilizing the field later in the spring for nesting as well as to prevent rutting and damage to the field. If you agree with the timing of these activities we will propose this mitigation to the MANHESP.

As the landowner, TGP is requesting your permission to act on your behalf with the required consultations and filings with MANHESP. Should additional site visits be required, TGP will be certain to provide notice prior to entering the property. Please contact Robert Winter at (518) 542-3177 should you have any additional questions. Thank you for your time and cooperation on this matter.

By signing this letter I, Charles E. Slater, Jr. consent to TGP representing me during the MANHESP process.

Signature: Charles E Slater Jr

Print Name: Charles E. Slater, Jr.
(Grantor)

Signature: Robert Winter

Print Name: ROBERT WINTER
(Witness)

PHONE: 413-243-3237

CELL: 413-429-1710

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APPENDIX H

- Land Deed for Audubon Property Transfer

5

2007 00194293
Bk: 1780 Pg: 322 Doc: TAKE
Page: 1 of 5 06/29/2007 03:16 PM

Property address: Spectacle Farm
Cold Spring Road
Sandisfield

ORDER OF TAKING

The Commonwealth of Massachusetts, acting by and through its Commissioner of the Department of Conservation and Recreation, with a business address of 251 Causeway Street, Boston, Suffolk County, Massachusetts 02114, by virtue of the authority conferred by Sections 3 and 3A of Chapter 132A of the Massachusetts General Laws, as amended, does hereby take in fee in accordance with Chapter 79 of the General Laws, in perpetuity and for the purposes set forth in Article 97 of the Amendments to the Massachusetts Constitution and for conservation and recreation purposes, the land and the buildings situated thereon located in the Town of Sandisfield, Berkshire County, Commonwealth of Massachusetts, containing 903.7 acres, more or less, being known as "Spectacle Farm" and shown on a four sheet plan of land prepared by Foresight Land Services of Pittsfield, Massachusetts, dated May, 1993, and August, 1993, certified by John M. Campetti, RLS, on April 1, 1995, and recorded in the Berkshire South District Registry of Deeds in File D-D17 (hereinafter "Plan").

SUPPOSED OWNERS	:	Spectacle Pond LLC, a Massachusetts limited liability company and Massachusetts Audubon Society, Inc., a Massachusetts non-profit corporation and Owners Unknown
AWARD	:	Five Million Two Hundred Thousand Dollars ($5,200,000)

Included in the taking are the rights of way reserved in a deed from Marvin A. Rowley *et al.*, to Ronald E. Myers, *et ux*, dated January 9, 1965, recorded with said Registry of Deeds in Book 346, Page 32.

Included in the taking are rights to the centerline of Cold Spring Road (also called Old Beach Plain highway); Oil Mill Road or Old Oil Mill Road, so-called; Webb Road, so-called, and any other public ways abutting the Premises as provided in Section 58 of Chapter 183 of the General Laws, together with all right, title or interest the Supposed Owners may have to the water or the land under water of Spectacle Pond, also known as Lower Spectacle Pond, or the Clam River.

Trees and structures located upon the premises hereby taken are also included in the taking.

Excepted from the rights herein taken by the Commonwealth are all easements for wires, pipes, conduits, poles and other appurtenances for the conveyance of water, sewage, gas, oil, electricity, telephone and other data or intelligence communication now lawfully in or upon the premises hereby taken, and, in particular, pipeline easements granted in a deed of William H. Rowley *et al.*, to Northeastern Gas Transmission Company dated April 20, 1951, recorded with said Registry of Deeds in Book 295, Page 286; in a deed of William H. Rowley *et al.*, to Tennessee Gas Pipeline Company dated November 18, 1974, recorded in Book 470, Page 168, as amended by instrument recorded in Book 1170, Page 56; and spring rights granted in deed of Frank E. Hawley to William S. Bolt dated March 2, 1916, recorded in Book 215, Page 301, to the extent these rights are in force and applicable.

Also excepted is an easement in gross reserved in the deed of Thelma Kennedy, *et al.*, to Massachusetts Audubon Society, Inc., dated September 7, 2006, recorded with said Registry of Deeds in Book 1722, Page 55, as conditioned in said deed, not intending by this exception to limit the right of the Commonwealth to demolish any or all buildings on the Premises.

Meaning and intending to take and hereby taking all and same property described in a deed from Thelma Kennedy *et al.*, to Massachusetts Audubon Society, Inc., dated September 7, 2006, recorded with said Registry of Deeds in Book 1722, Page 52, and deed from Margaret Hawley *et al.*, to Spectacle Pond LLC dated January 31, 2007, recorded with said Registry of Deeds in Book 1749, Page 131, including all of the Premises as shown within the bounds portrayed on the Plan referred to above, including the shaded "Area of Conflict" shown on the Plan.

For damages sustained by reason of the aforesaid taking, and in accordance with the provisions of Chapter 79, Section 6, of the General Laws, as amended, awards have been made. The right is reserved to amend the award or to increase the amount of damages to be paid at any time prior to payment thereof for good cause shown.

All names of owners herein given, although supposed to be correct, are stated only as a matter of opinion and belief.

IN WITNESS WHEREOF, the Commonwealth of Massachusetts has caused these presents to be executed in its name and behalf by Richard K. Sullivan, Jr., its Commissioner of the Department of Conservation and Recreation, hereunto duly authorized and who does hereto set his hand and seal this 25TH day of June, 2007.

THE COMMONWEALTH OF MASSACHUSETTS
Department of Conservation and Recreation

By: _____
Richard K. Sullivan, Jr., Commissioner

COMMONWEALTH OF MASSACHUSETTS

Suffolk County, ss:

On this 25TH day of June, 2007, before me, the undersigned Notary Public, personally appeared Richard K. Sullivan, Jr., Commissioner of the Department of Conservation and Recreation, who proved to me through satisfactory evidence of identification, being my personal knowledge of his identity, to be the person whose name is signed on the preceding Order of Taking against 903.7 acres of land in Sandisfield, Massachusetts, and who acknowledged to me that he signed it voluntarily for its stated purpose.

_____
Notary public:

My commission expires:

THOMAS J. LAROSA
Notary Public
COMMONWEALTH OF MASSACHUSETTS
My Commission Expires May 29, 2009

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COMMONWEALTH OF MASSACHUSETTS
TOWN OF SANDISFIELD

At a regularly scheduled meeting of the Board of Selectmen for the Town of Sandisfield held on the 4th day of June, 2007, on motion duly made and seconded, it was:

VOTED: To approve the exercise of the power of eminent domain by the Commissioner of the Department of Conservation and Recreation acting pursuant to and in accordance with Sections 3 and 3A of Chapter 132A of the General Laws to acquire the fee or partial interests in approximately 900+/- acres of land located on both sides of Cold Spring Road in the Town of Sandisfield, said land now or formerly owned by Massachusetts Audubon Society, Inc., and Spectacle Pond LLC.

I, Dolores Harasyko, do hereby certify that I am the Clerk of the Board of Selectmen in the Town of Sandisfield and that, at meeting of said Board, duly called and held at the Town Hall Annex, 66 Sandisfield Road, Sandisfield, Massachusetts on June 4, 2007, a quorum present and voting, the Board of Selectmen did vote as set forth above.

ATTEST
A true copy:

Clerk: Dolores Harasyko (seal)
Dolores Harasyko

Date: June 14, 2007

Massachusetts
Department of Conservation and Recreation

STEWARDSHIP COUNCIL

Whereas, General Laws chapter 132A, § 3, authorizes the Commissioner of the Department of Conservation and Recreation to acquire land by eminent domain within the State Parks District, subject to the approval of the Stewardship Council as provided in §3A of said Chapter;

Whereas, the Commissioner seeks to acquire by eminent domain the fee or other interests in all or portions of a tract of land located on both sides of Cold Spring Road in the Town of Sandisfield, Berkshire County, containing 900 acres, more or less, and now or formerly owned by the Massachusetts Audubon Society, Inc., and Spectacle Pond LLC;

Whereas, the property has been sought by the Department for more than fifteen years due to its significant natural, historic, scenic and recreational resources and attributes, and because it abuts other facilities under the care and control of the Department; and

Whereas, eminent domain authority will allow the Department to proceed with an acquisition in FY07, while critical funding is available;

Therefore, we, the Stewardship Council, or a majority thereof, having discussed the taking in open meeting, hereby approve the Commissioner's use of the power of eminent domain to acquire the parcel of land described above, NOT TO EXCEED A TOTAL COST FOR ALL ACQUISITIONS OF $5,400,000.

Signed this 7TH day of June, 2007.

Stewardship Council for the Department of Conservation and Recreation

Julian Ackerman, Middlesex County

RECUSED
~~*Laura Johnson, Middlesex County*~~

Richard Cross, Middlesex County

Henry Lee, Norfolk County

Christina Crowley, Plymouth County

John Natoli, Suffolk County

Michael Dutton, Dukes County

Robert Russell, Bristol County

Whitney Hatch, Essex County

Daniel Wolf, Barnstable County

ATTEST: BERKSHIRE SOUTH Wanda M. Beckwith REGISTER
WANDA M. BECKWITH

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APPENDIX I

- Alternatives Mapping for the Department of Conservation and Recreation Property

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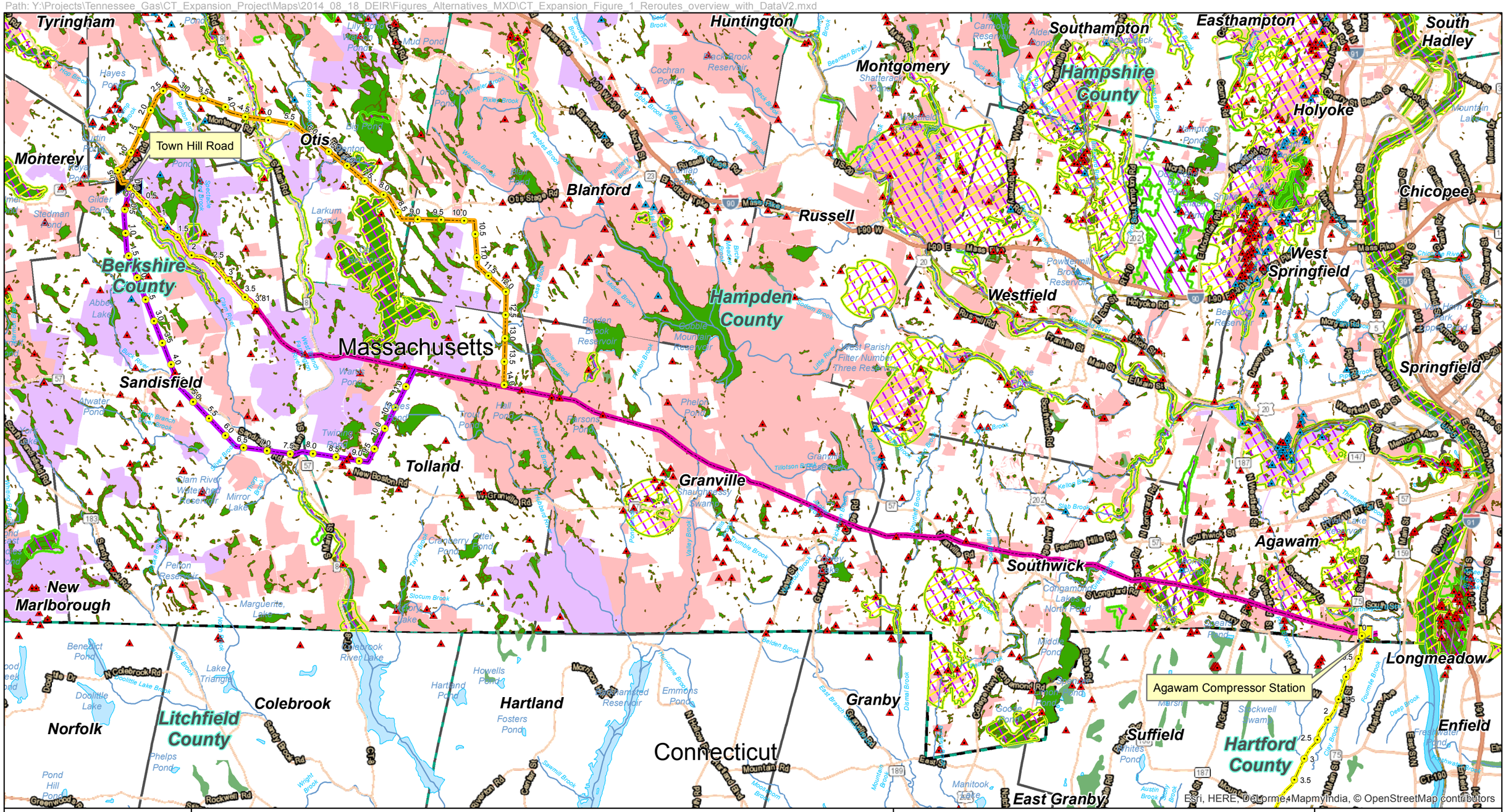

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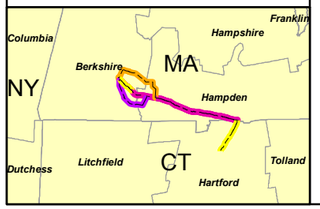

Legend

- Alternative Route 1 - 14 Miles
- Alternative Route 2 - 11.4 Miles
- Existing TGP 200 System
- Preferred Proposed Project Centerline
- Town Boundary
- County Boundary
- Mileposts
- Potential Vernal Pool
- Certified Vernal Pool
- NHESP Estimated Habitats of Rare Wildlife
- NHESP Priority Habitats of Rare Species
- DEP Wetlands
- Protected and Recreational Open Spaces
- DCR Parcels
- Lake or Pond
- Swamp/Marsh
- Stream or River
- USA Named Streams and Rivers

N W E S

Tennessee Gas Pipeline Company, L.L.C.

Connecticut Expansion Project

Alternative Routes 1 and 2

0 2 4 Miles

1 inch equals 2 miles

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

Figure 1
August 2014
Page 1 of 1

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

APPENDIX J

- Wetland Protection Act Resource Area Mapping
- Shallow Depth to Bedrock and Stone Wall Mapping
- FEMA Mapping

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APPENDIX J

Wetland Protection Act Resource Area Mapping

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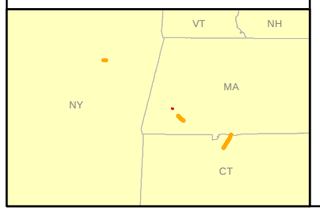

Legend

- Mileposts
- Proposed Project Centerline
- Access Roads
- County Boundary
- Town Boundary
- Workspace
- Pipeyard
- Streams
- Wetland Lines
- Waterbodies
- Bordering Vegetated Wetlands
- Riverfront Area
- BLSF
- Property Formerly Owned by Audubon

N E W S

Tennessee Gas Pipeline Company

CT Expansion Project

Massachusetts WPA Resource Areas

0 100 200 400 Feet

1 inch = 200 feet

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

September 2014

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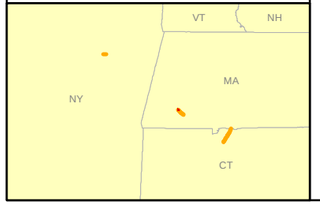

Legend

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N E W S

Tennessee Gas Pipeline Company

CT Expansion Project

Massachusetts WPA Resource Areas

0 100 200 400 Feet

1 inch = 200 feet

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

September 2014

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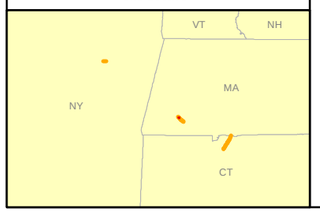

Legend

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N E W S

Tennessee Gas Pipeline Company

CT Expansion Project

Massachusetts WPA Resource Areas

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a Kinder Morgan company

September 2014

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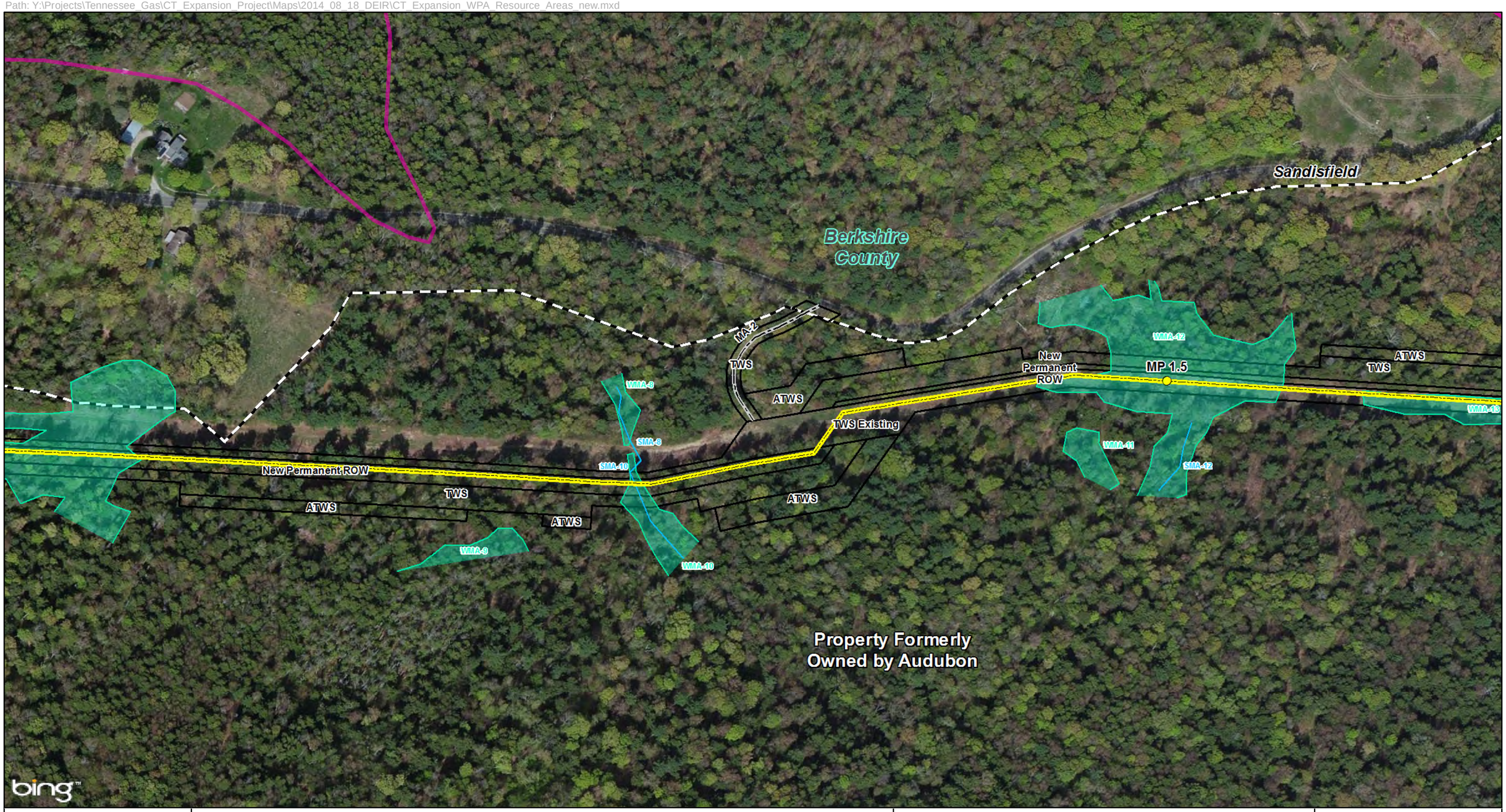

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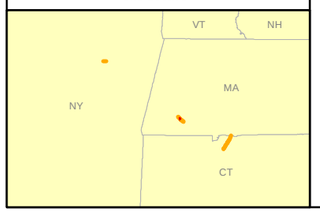

Legend

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- Property Formerly Owned by Audubon

N E W S

Tennessee Gas Pipeline Company

CT Expansion Project

Massachusetts WPA Resource Areas

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1 inch = 200 feet

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

September 2014

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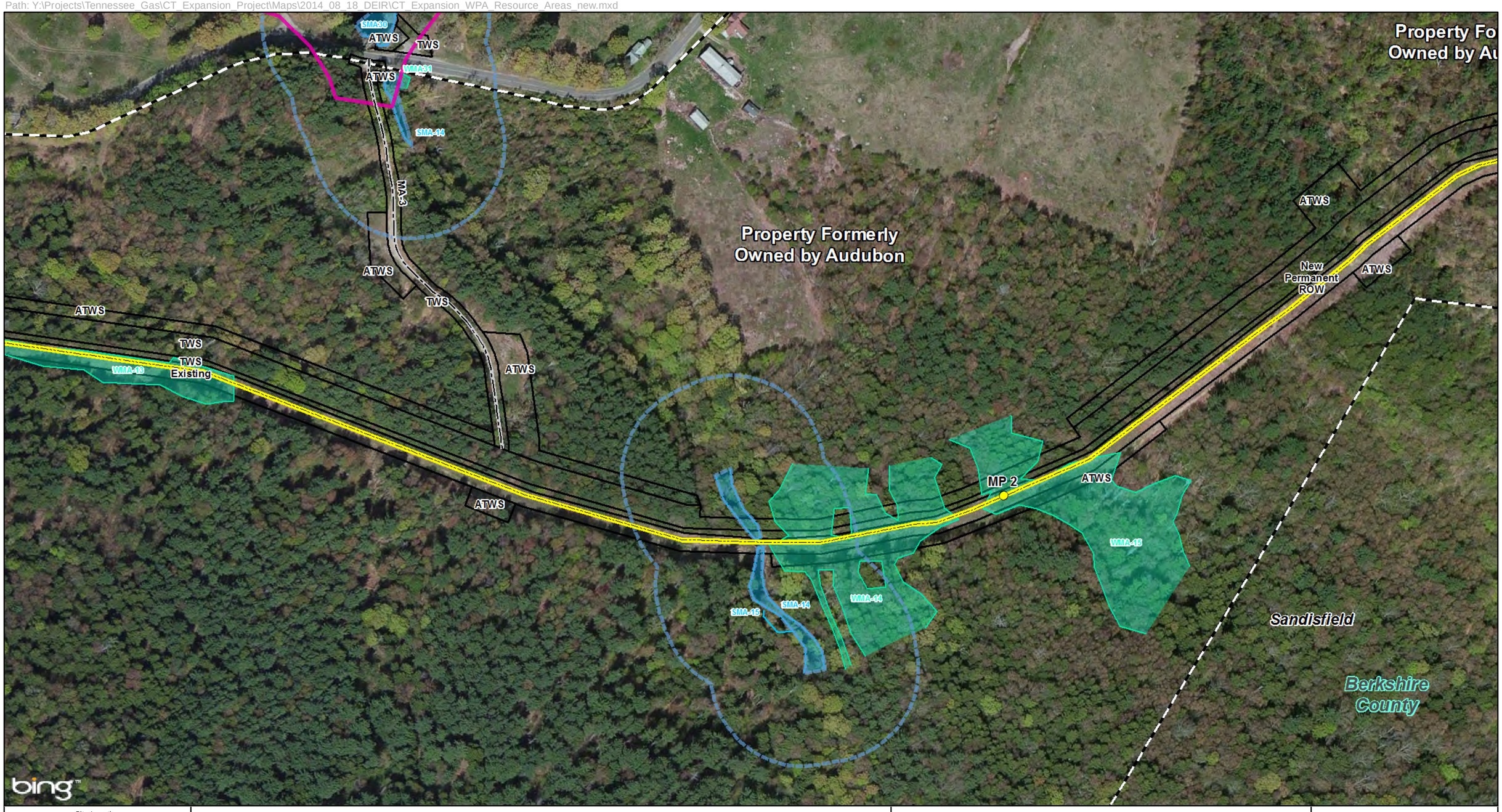

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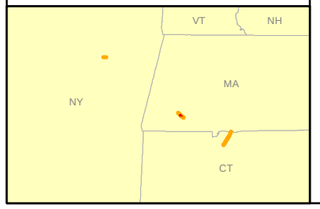

Legend

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- Access Roads
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- Streams
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- Riverfront Area
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- Property Formerly Owned by Audubon

N E W S

Tennessee Gas Pipeline Company

CT Expansion Project

Massachusetts WPA Resource Areas

0 100 200 400 Feet

1 inch = 200 feet

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

September 2014

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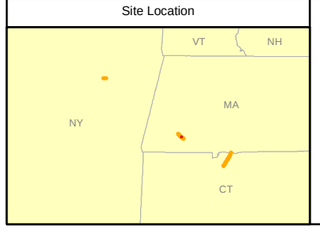

Legend

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- Wetland Lines
- Waterbodies
- Bordering Vegetated Wetlands
- Riverfront Area
- BLSF
- Property Formerly Owned by Audubon

N E W S

Tennessee Gas Pipeline Company

CT Expansion Project

Massachusetts WPA Resource Areas

0 100 200 400 Feet

1 inch = 200 feet

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

September 2014

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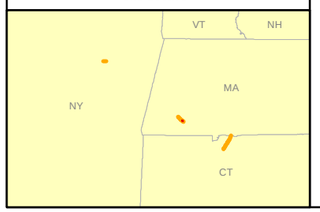

Legend

- Mileposts
- Proposed Project Centerline
- Access Roads
- County Boundary
- Town Boundary
- Workspace
- Pipeyard
- Streams
- Wetland Lines
- Waterbodies
- Bordering Vegetated Wetlands
- Riverfront Area
- BLSF
- Property Formerly Owned by Audubon

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Tennessee Gas Pipeline Company

CT Expansion Project

Massachusetts WPA Resource Areas

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1 inch = 200 feet

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

September 2014

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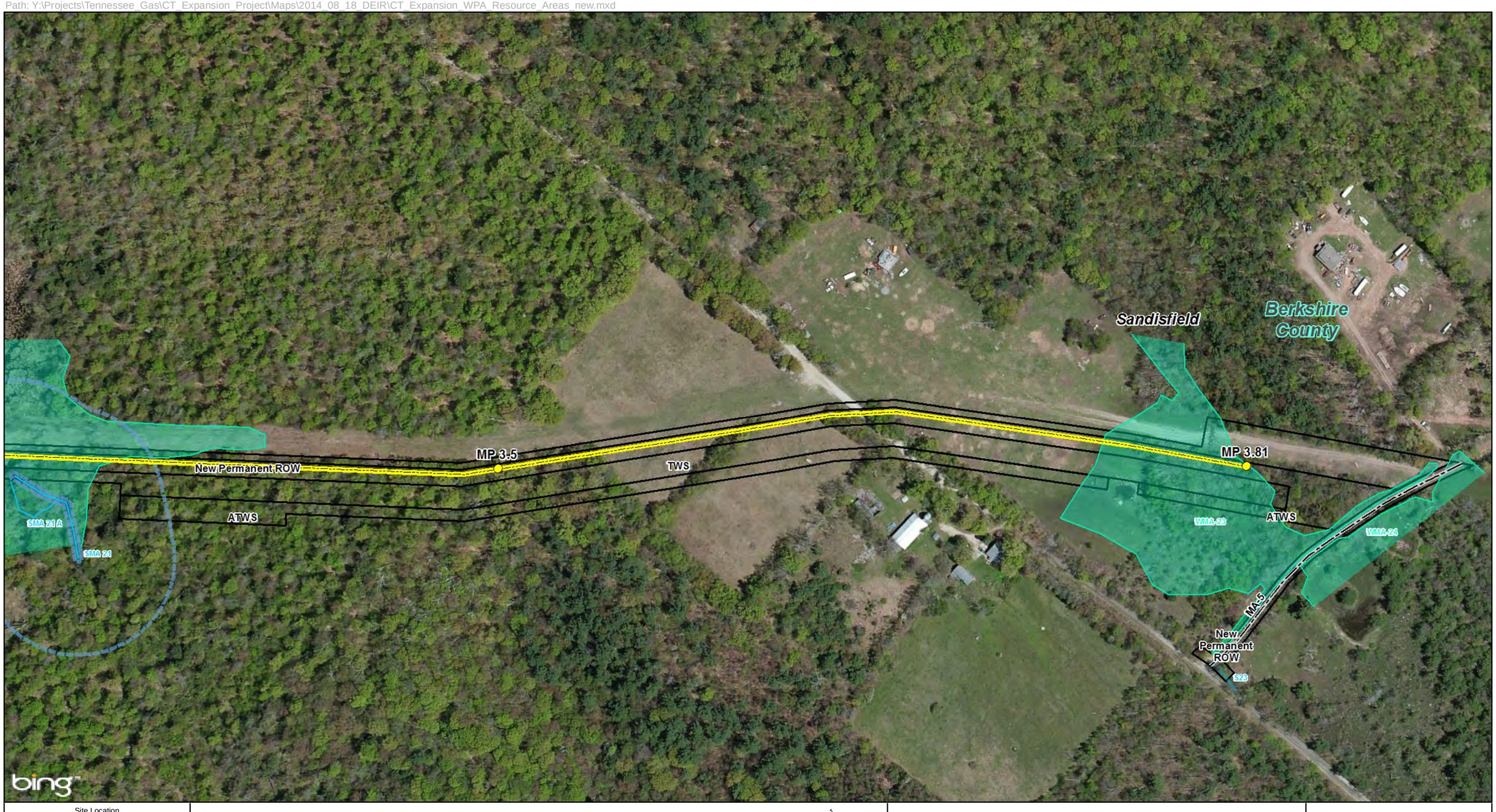

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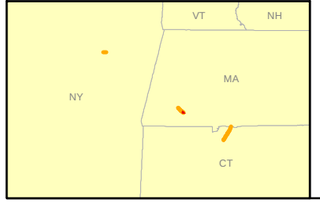

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N E W S

Tennessee Gas Pipeline Company

CT Expansion Project

Massachusetts WPA Resource Areas

0 100 200 400 Feet

1 inch = 200 feet

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

September 2014

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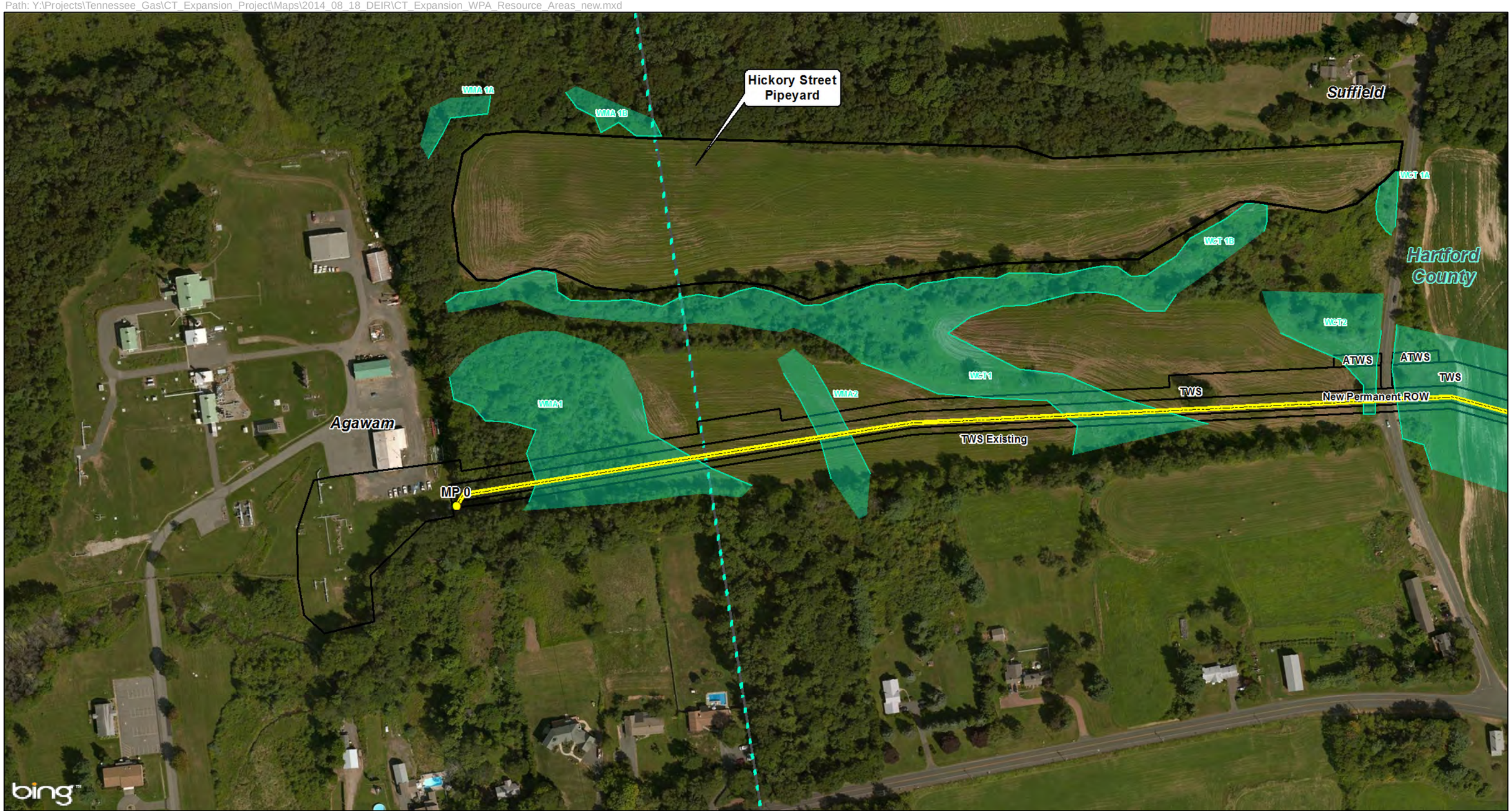

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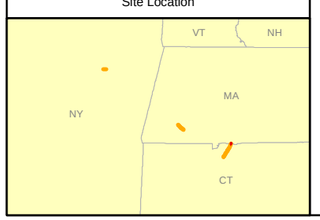

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E N S W

Tennessee Gas Pipeline Company

CT Expansion Project

Massachusetts WPA Resource Areas

0 100 200 400 Feet

1 inch = 200 feet

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

September 2014

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APPENDIX J

Shallow Depth to Bedrock and Stone Wall Mapping

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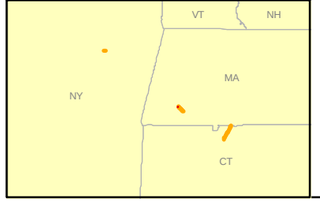

Legend

- Mileposts
- Access Roads
- County Boundary
- Town Boundary
- Workspace
- Identified Stonewall Locations
- DCR Parcels
- High Probability of Bedrock Being Encountered (A)
- Moderate Probability of Bedrock Being Encountered (B)
- Low Probability of Bedrock Being Encountered (C)

N E W S

Tennessee Gas Pipeline Company

CT Expansion Project

Stone Walls and Shallow Depth to Bedrock

0 100 200 400 Feet

1 inch = 200 feet

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

September 2014

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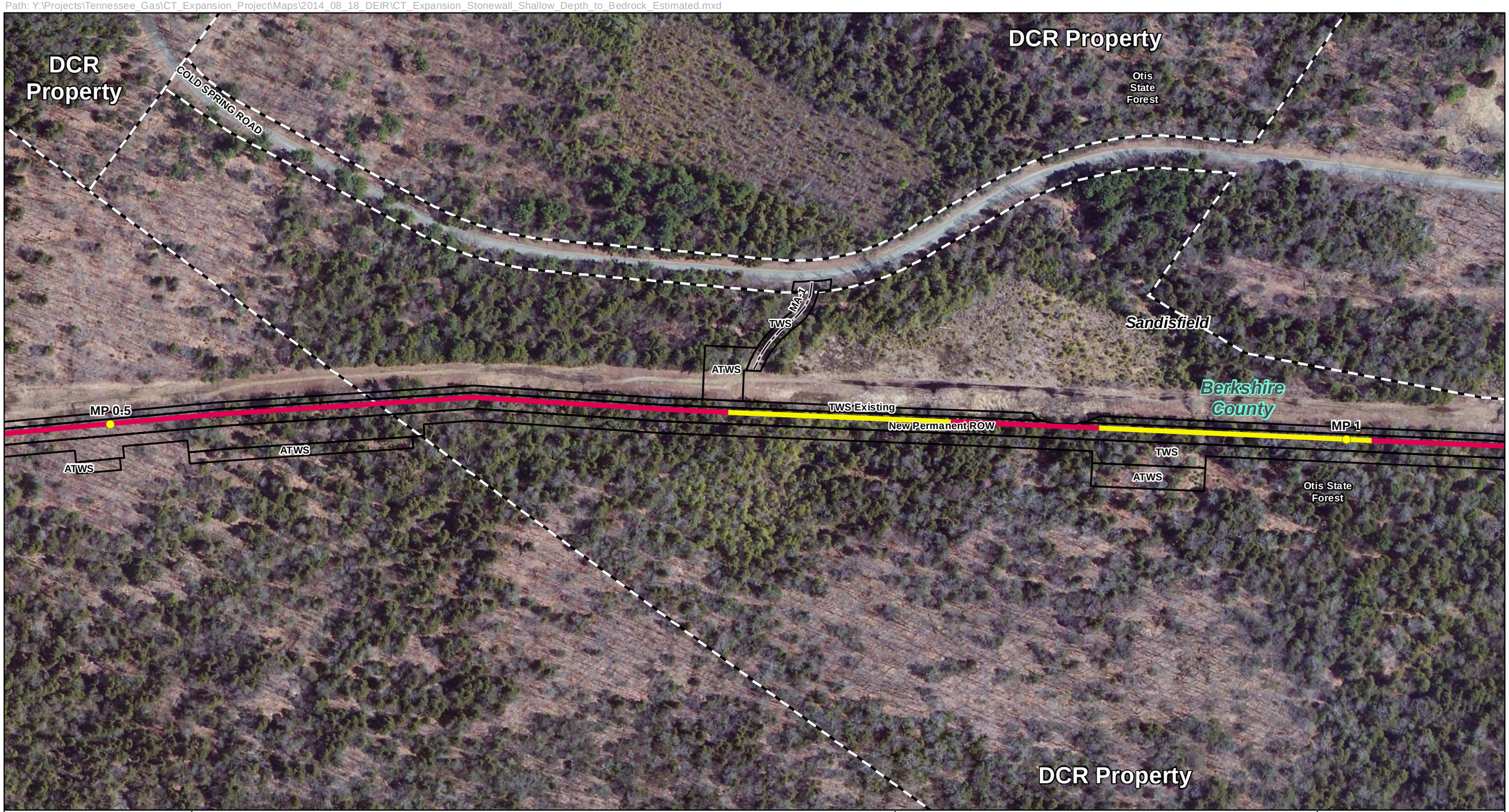

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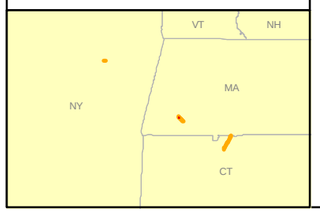

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- Town Boundary
- Workspace
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- Low Probability of Bedrock Being Encountered (C)

N E W S

Tennessee Gas Pipeline Company

CT Expansion Project

Stone Walls and Shallow Depth to Bedrock

0 100 200 400 Feet

1 inch = 200 feet

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

September 2014

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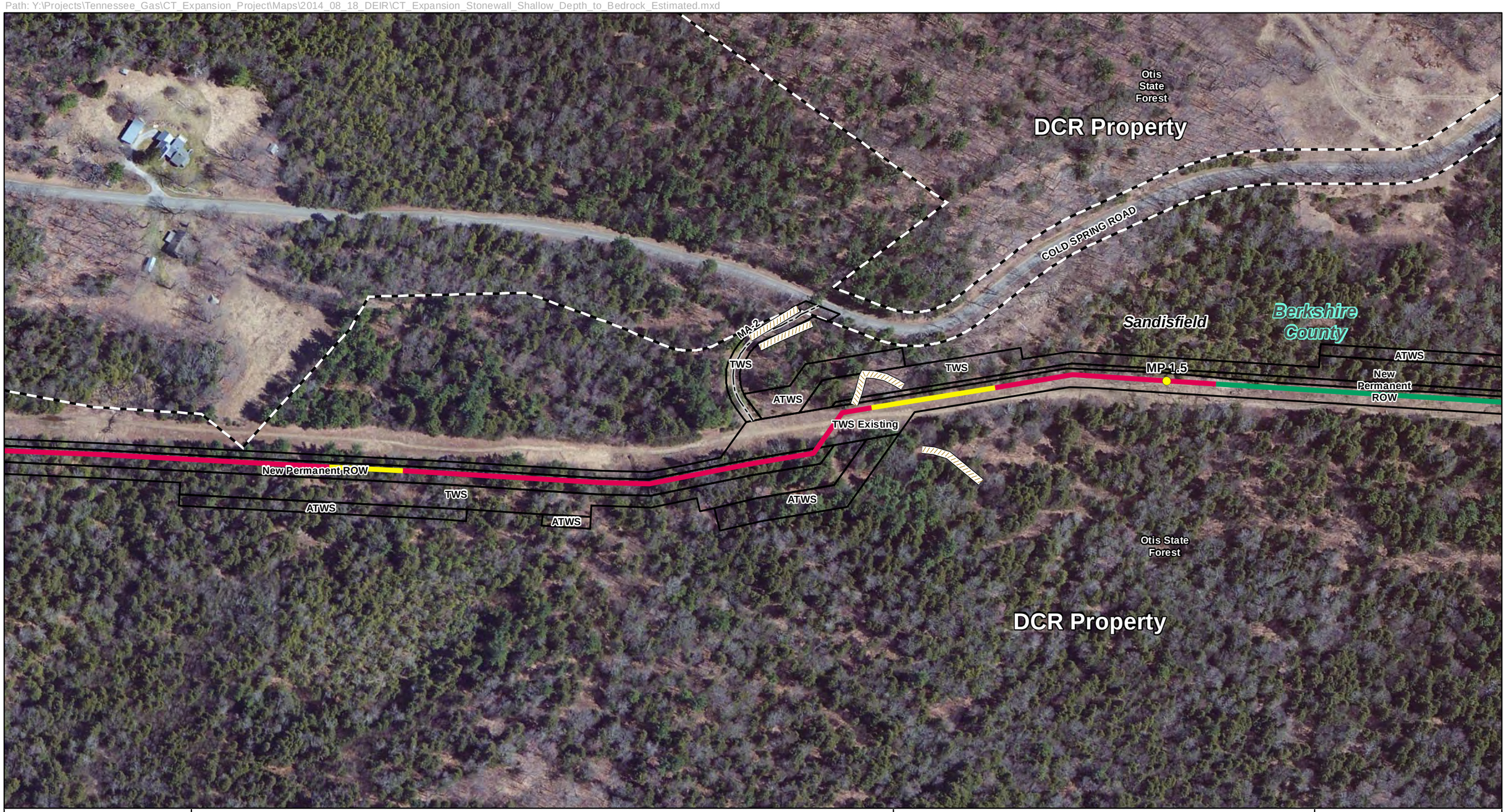

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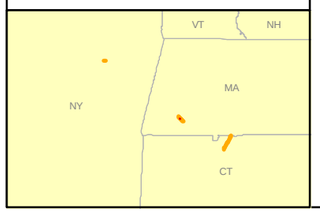

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N E W S

Tennessee Gas Pipeline Company

CT Expansion Project

Stone Walls and Shallow Depth to Bedrock

0 100 200 400 Feet

1 inch = 200 feet

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

September 2014

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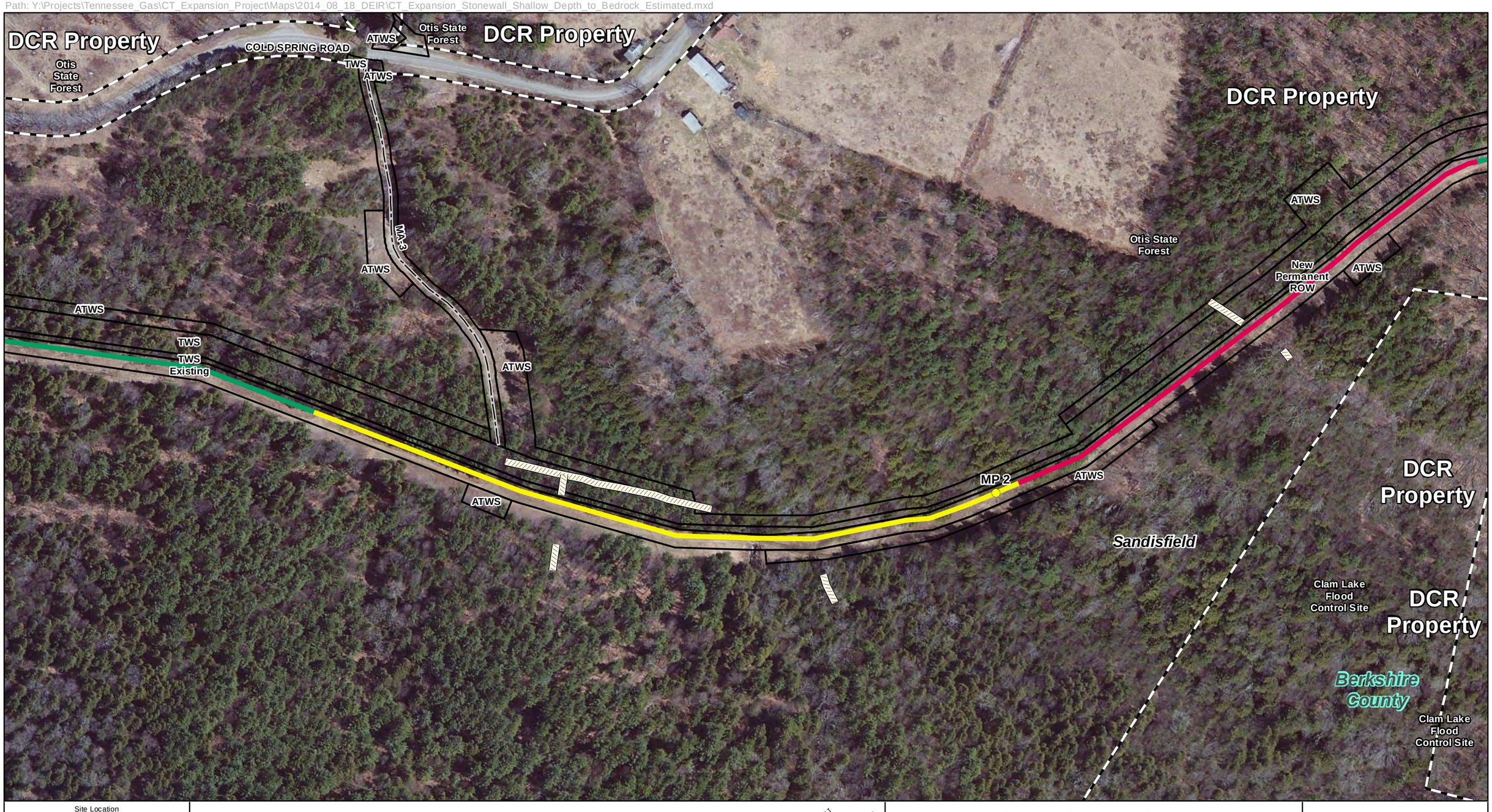

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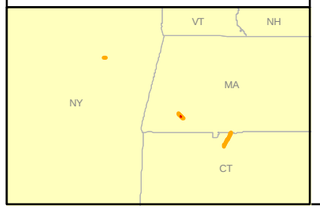

Legend

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- Workspace
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N E S W

Tennessee Gas Pipeline Company

CT Expansion Project

Stone Walls and Shallow Depth to Bedrock

0 100 200 400 Feet

1 inch = 200 feet

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

September 2014

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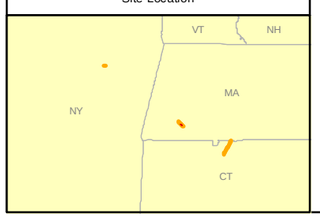

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N E S W

Tennessee Gas Pipeline Company

CT Expansion Project

Stone Walls and Shallow Depth to Bedrock

0 100 200 400 Feet

1 inch = 200 feet

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

September 2014

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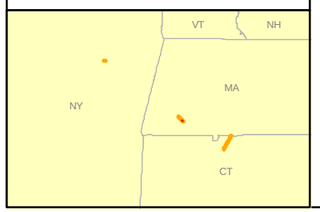

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- Workspace
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N E W S

Tennessee Gas Pipeline Company

CT Expansion Project

Stone Walls and Shallow Depth to Bedrock

0 100 200 400 Feet

1 inch = 200 feet

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

September 2014

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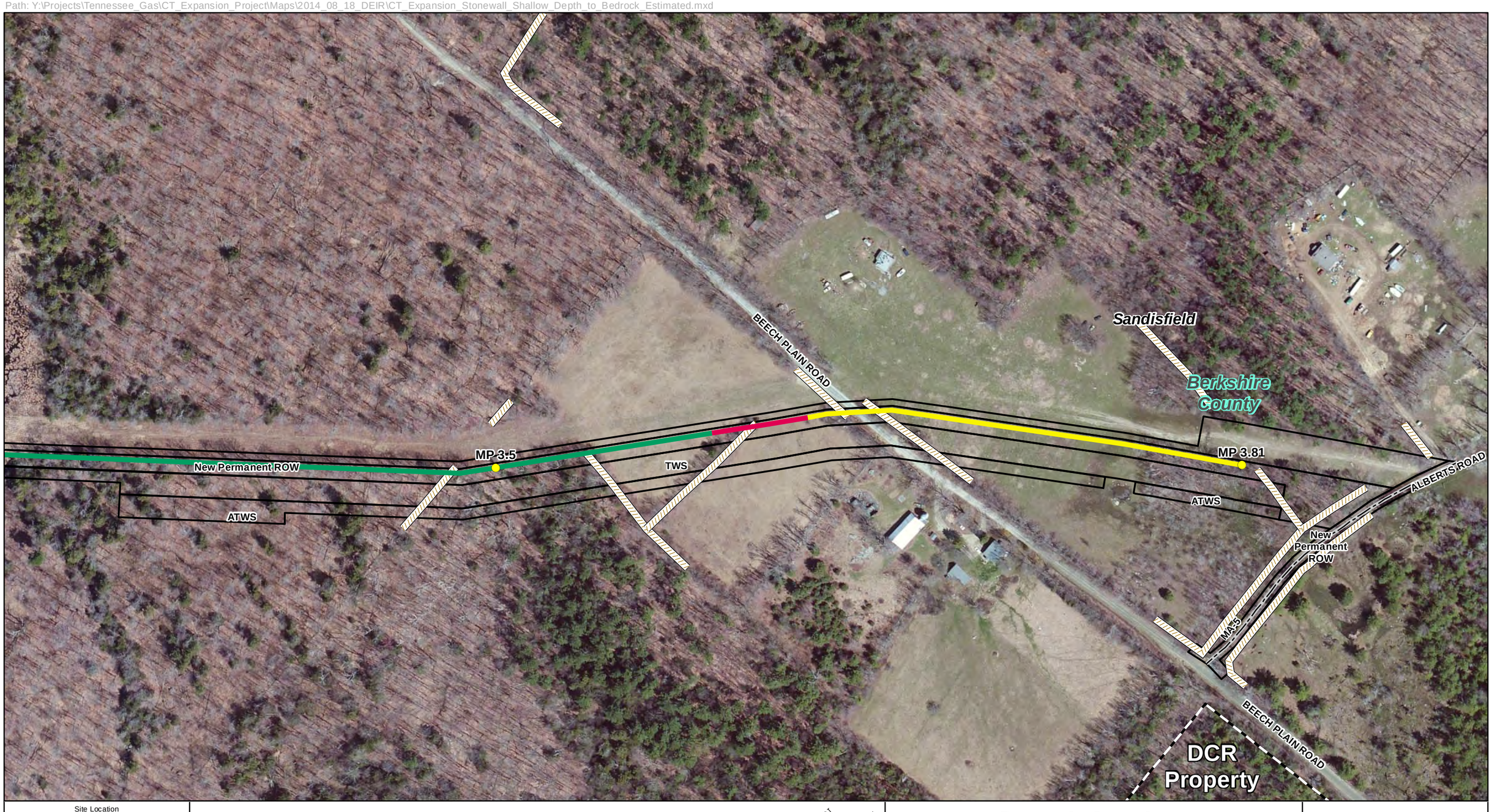

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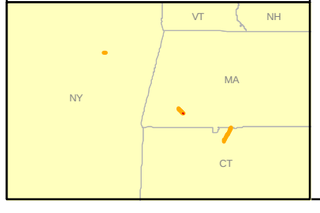

Legend

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- Workspace
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- Moderate Probability of Bedrock Being Encountered (B)
- Low Probability of Bedrock Being Encountered (C)

N E W S

Tennessee Gas Pipeline Company

CT Expansion Project

Stone Walls and Shallow Depth to Bedrock

0 100 200 400 Feet

1 inch = 200 feet

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

September 2014

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APPENDIX J

FEMA Mapping

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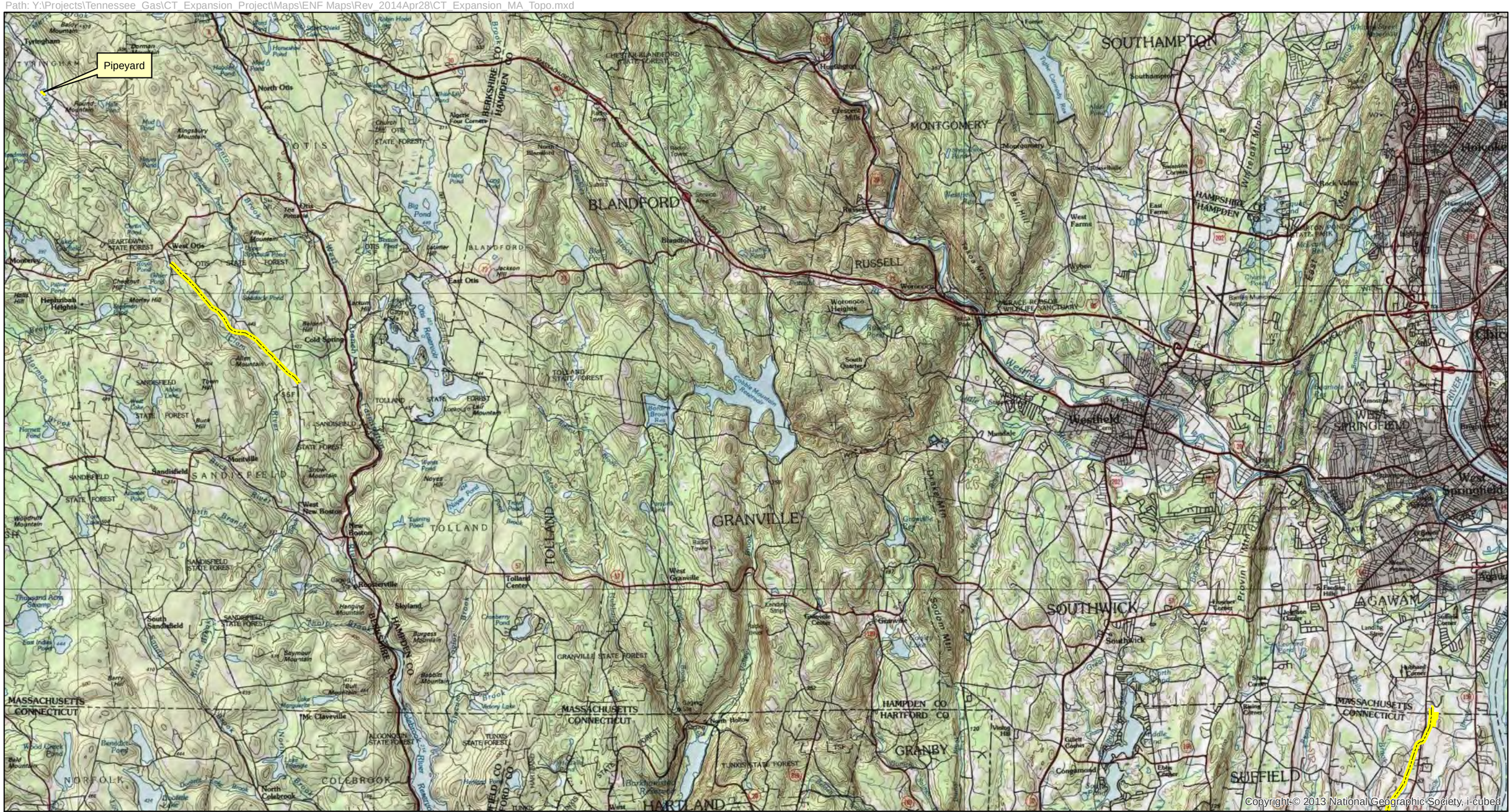

Site Location



Legend

- Proposed Project Centerline
- Pipeyard

N
W E
S

Tennessee Gas Pipeline Company

CT Expansion Project

MA Topo Overview Map

0 5,000 10,000 20,000 Feet

1 inch = 10,423 feet

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

Attachment A

May 2014

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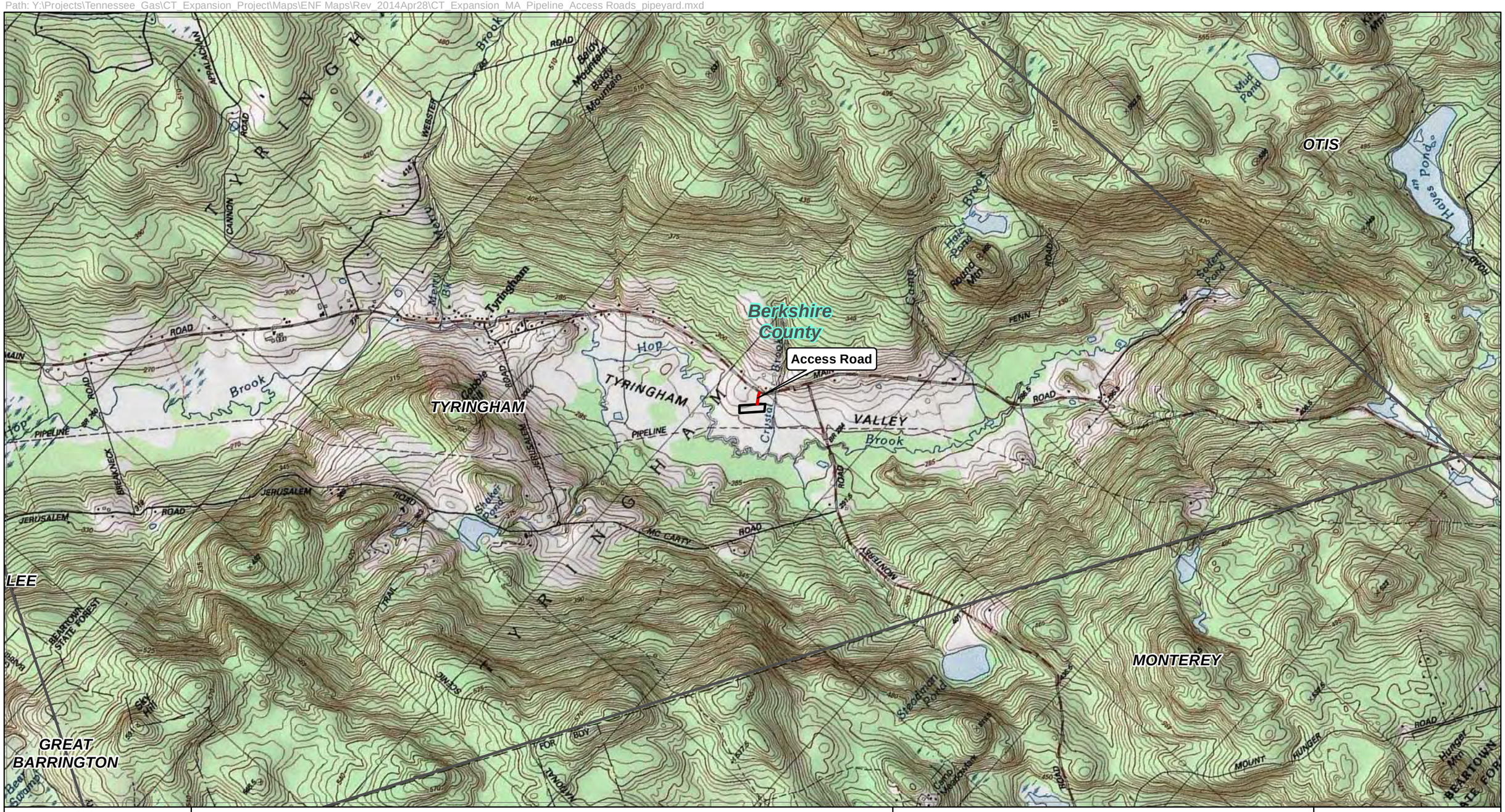

Site Location



Legend

- Proposed Project Centerline
- Access Roads
- Pipeyard
- Town Boundary
- County Boundary

N E W S

Tennessee Gas Pipeline Company

CT Expansion Project

Pipeyard With Access Roads

0 1,000 2,000 4,000 Feet

1 inch = 2,000 feet

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

Attachment A

April 2014

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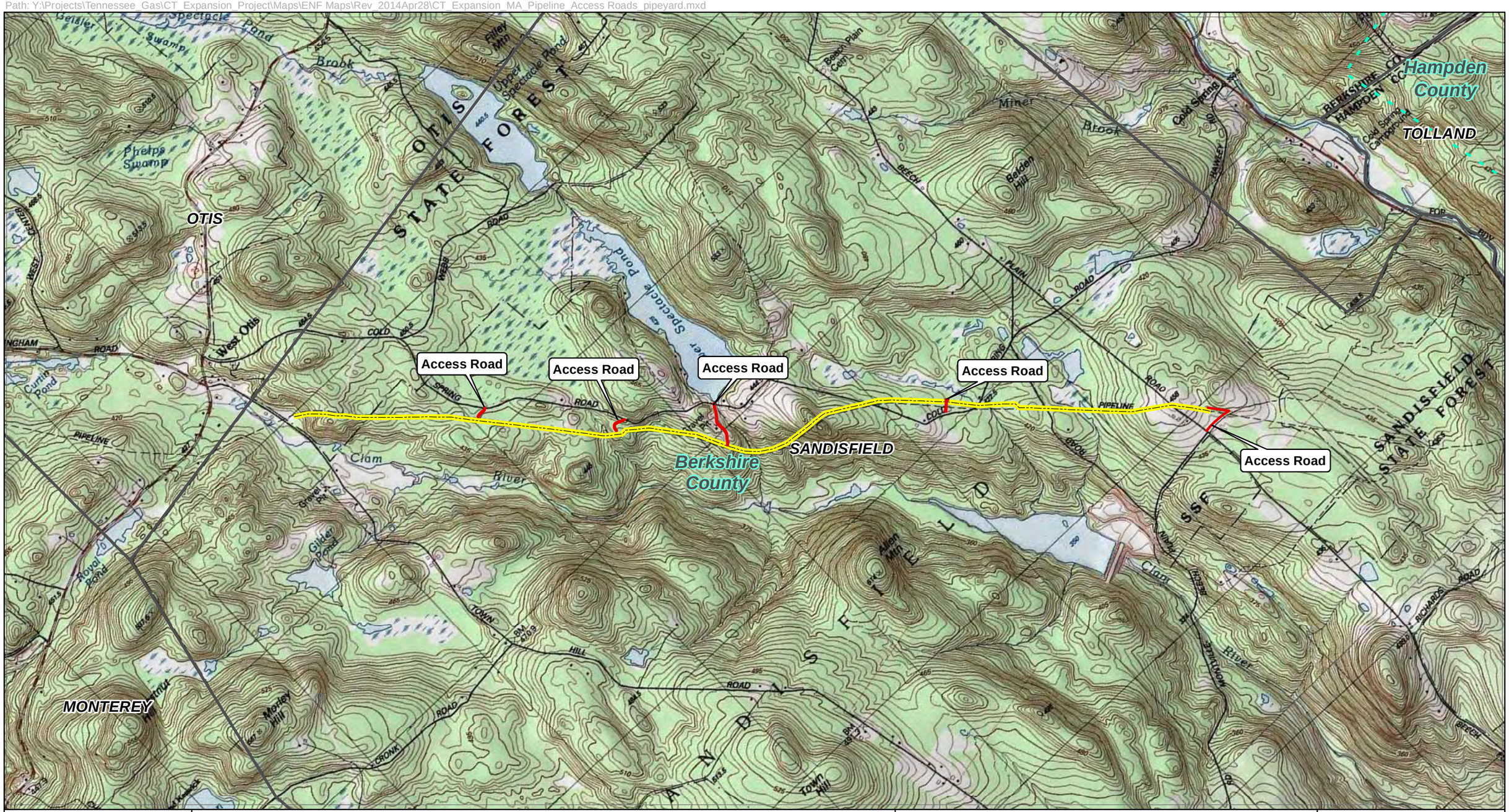

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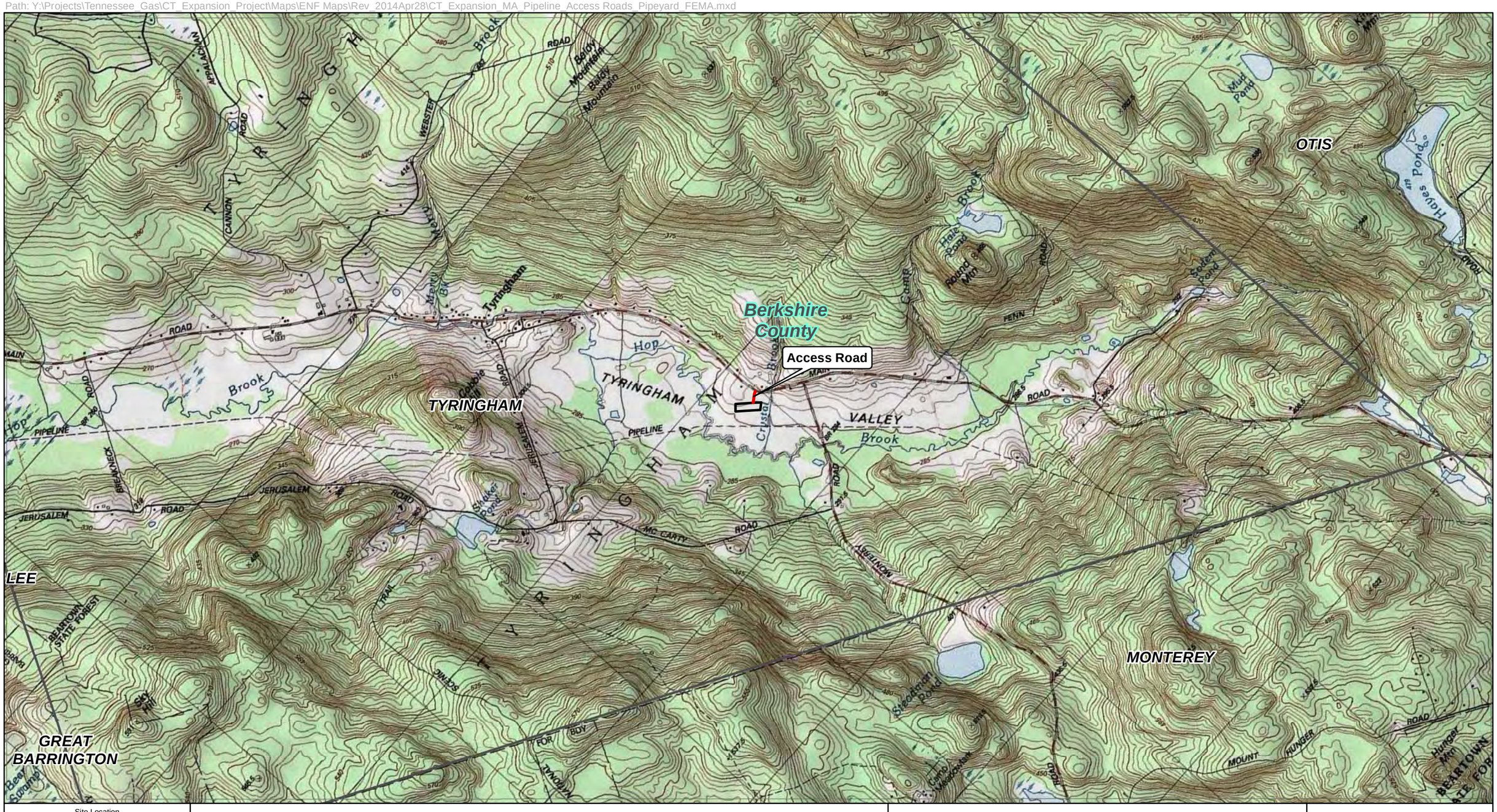

Site Location



Legend

- Proposed Project Centerline
- Access Roads
- Pipeyard
- Town Boundary
- County Boundary

FEMA Flood Zone

- A
- AE

Tennessee Gas Pipeline Company

CT Expansion Project

Pipeyard With Access Roads

FEMA Flood Maps

0 1,000 2,000 4,000 Feet

1 inch = 2,000 feet

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

Attachment A

April 2014

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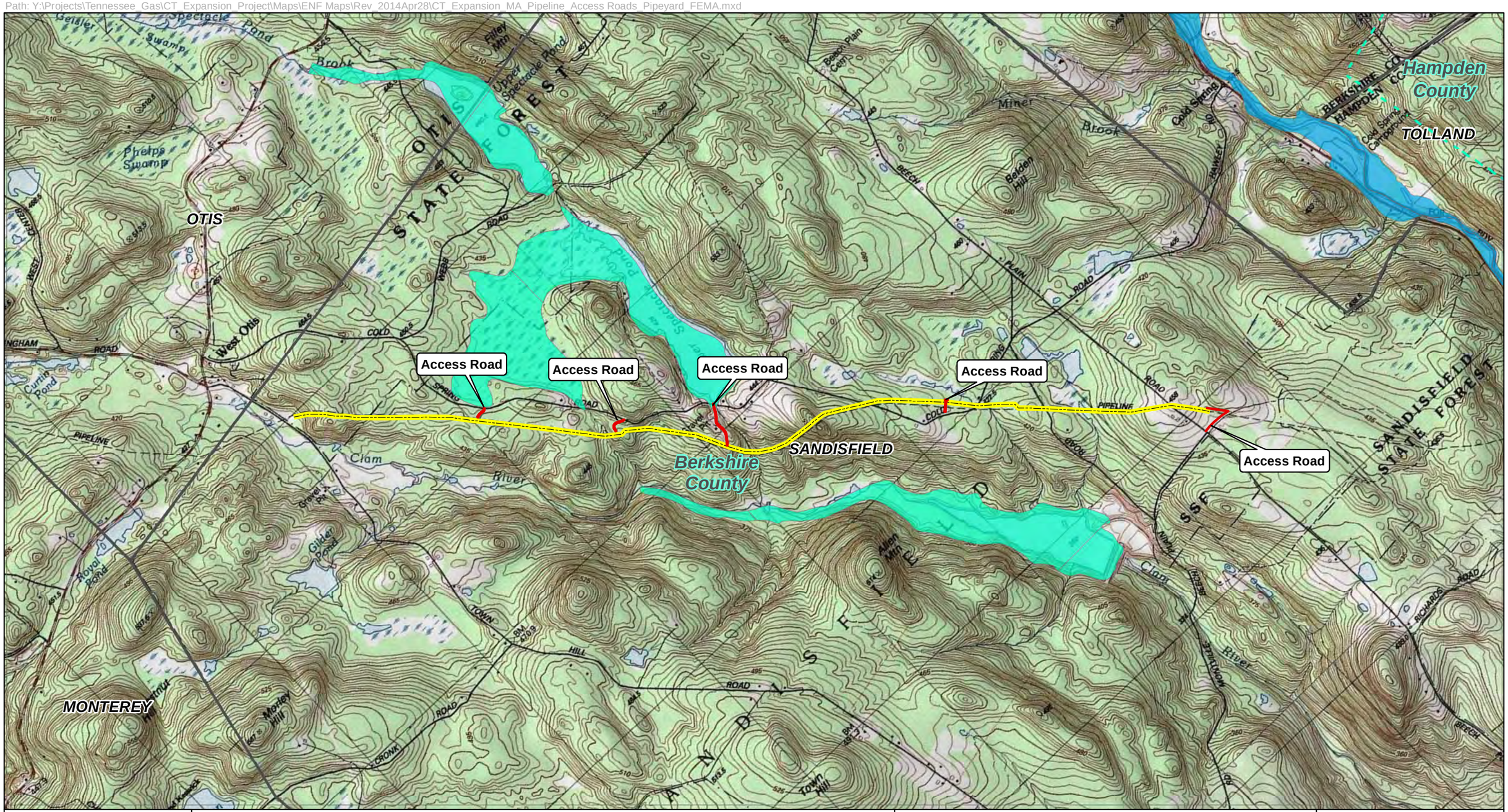

Site Location



Legend

- Proposed Project Centerline
- Access Roads
- Pipeyard
- Town Boundary
- County Boundary

FEMA Flood Zone

- A
- AE

N E W S

Tennessee Gas Pipeline Company

CT Expansion Project

Pipeline Alignment With Access Roads

FEMA Flood Maps

0 1,000 2,000 4,000 Feet

1 inch = 2,000 feet

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

Attachment A

April 2014

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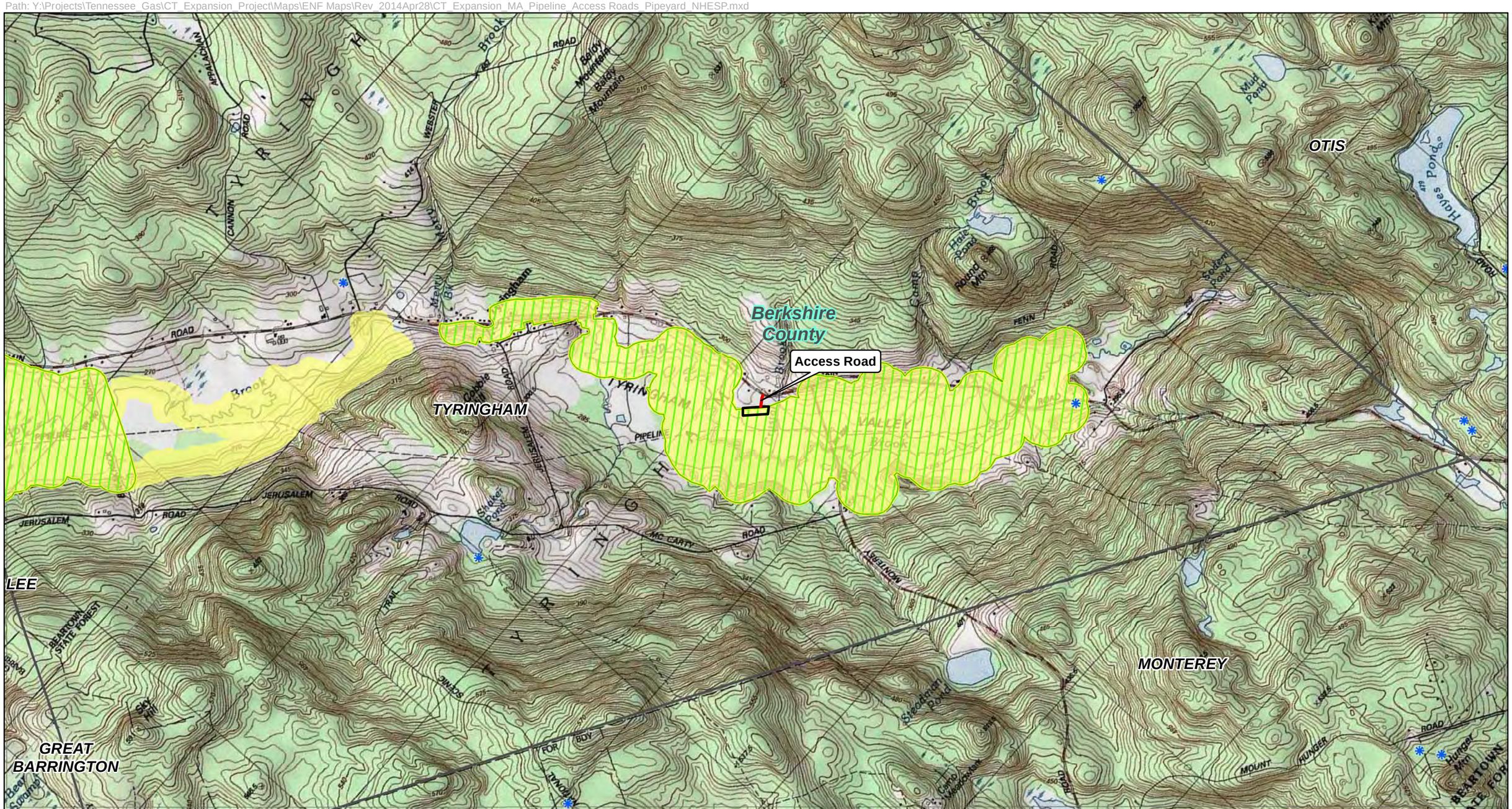

Site Location



Legend

- NHESP Certified Vernal Pools 2009
- Proposed Project Centerline
- Access Roads
- NHESP 2013 Estimated Habitats of Rare Wildlife
- NHESP 2009 Priority Habitats of Rare Species
- Pipeyard
- Town Boundary
- County Boundary

N E W S

Tennessee Gas Pipeline Company

CT Expansion Project

Pipeyard With Access Roads

NHESP Areas

0 1,000 2,000 4,000 Feet

1 inch = 2,000 feet

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

Attachment A

April 2014

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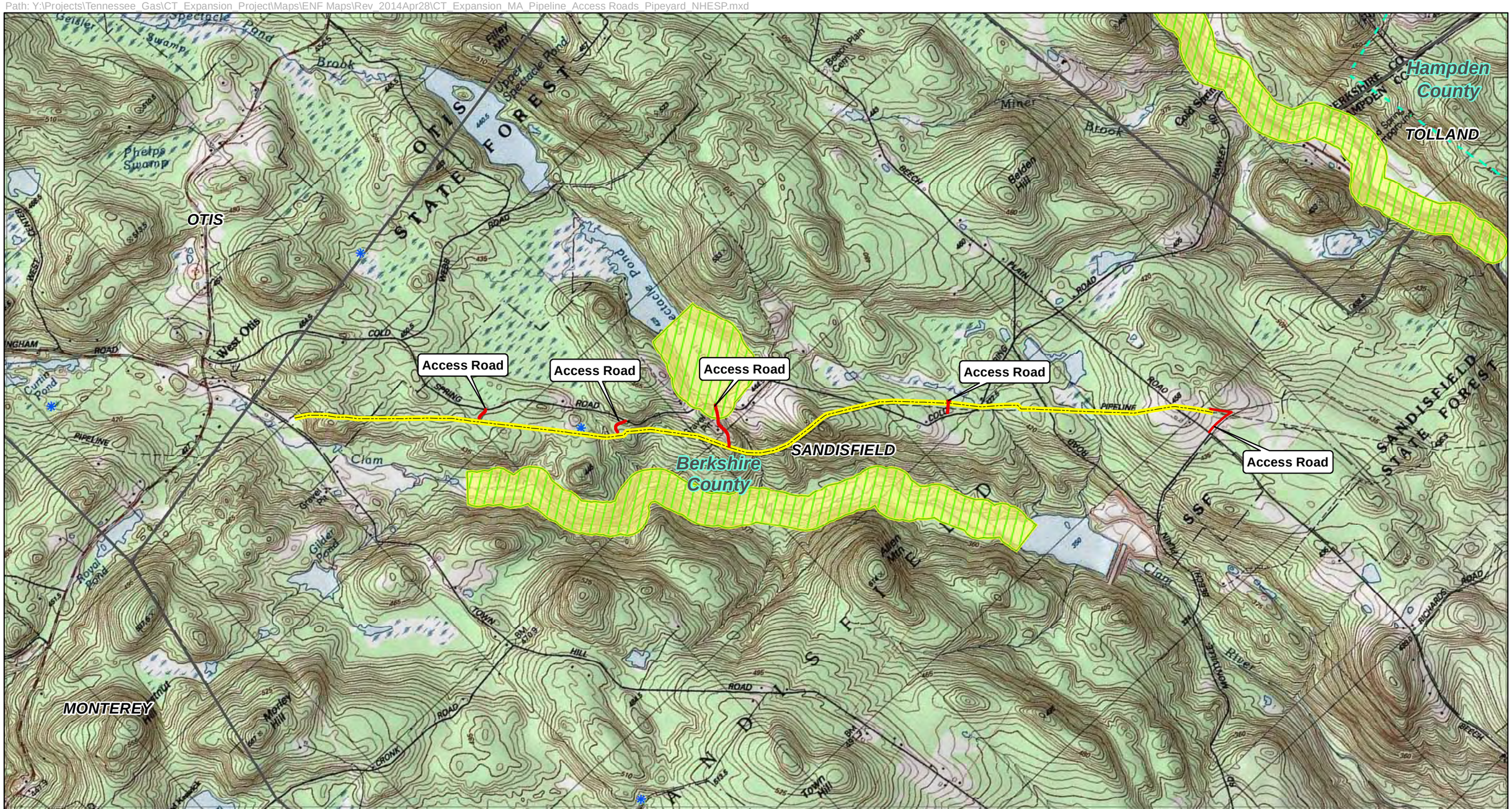

Site Location



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- NHESP 2013 Estimated Habitats of Rare Wildlife
- NHESP 2009 Priority Habitats of Rare Species
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- County Boundary

N E W S

Tennessee Gas Pipeline Company

CT Expansion Project

Pipeline Alignment With Access Roads

NHESP Areas

0 1,000 2,000 4,000 Feet

1 inch = 2,000 feet

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

Attachment A

April 2014

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APPENDIX K

- Vernal Pool Report
- Vernal Pool Workspace Mapping
- Wetland Delineation Report
- Greenhouse Gas Report

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APPENDIX K

Vernal Pool Report

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INVENTORY OF VERNAL POOLS

ALONG THE CONNECTICUT AND MASSACHUSETTS PORTIONS OF

THE CONNECTICUT EXPANSION PROJECT

Prepared For:

Tennessee Gas Pipeline Company, L.L.C.
1001 Louisiana Street
Houston, Texas 77002

Prepared By:

AECOM Environment
10 Orms Street, Suite 405
Providence, Rhode Island 02904

June 2014

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TABLE OF CONTENTS

1.0 Introduction 1
2.0 Vernal Pool Habitat Definitions 2
3.0 Field Investigations 5
4.0 Results 11
5.0 References 16

Index of Table:

Table 1: Vernal Pool Habitat Identified Along the Project Corridor

List of Attachments:

Attachment A: 2014 Vernal Pool Habitat Data Forms

Attachment B: 2014 Vernal Pool Habitat Representative Photographs

Attachment C: 2014 Vernal Pool Mapping

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1.0 Introduction

Tennessee Gas Pipeline Company ("TGP"), a subsidiary of Kinder Morgan ("KM") and a major supplier of natural gas to utilities, distribution companies and power generators in the northeast, plans to construct, install, and operate the Connecticut Expansion Project ("the Project") to increase pipeline capacity and provide additional firm natural gas transportation service into northeast markets. The Project includes the construction, installation, and operation of three pipeline looping segments, one Mainline Valve ("MLV"), minor tie-in piping, and relocating certain pigging facilities and includes components in Connecticut, Massachusetts and New York. TGP will construct, own, and operate the proposed Project facilities.

This report provides a summary of vernal pool habitat investigations conducted along the Connecticut and Massachusetts portions of the Project. These investigations provide data in support of TGP's New England Division's U.S. Army Corps of Engineers (USACE) Section 404 permit application, the Connecticut Department of Energy and Environmental Protection (CT DEEP) Section 401 Water Quality Certification application, the Massachusetts Department of Environmental Protection (MA DEP) Section 401 Water Quality Certification Application, as well as local wetland filings and other required permits.

The Massachusetts Loop is located in Sandisfield, Massachusetts and consists of approximately 3.8 miles of new 36-inch outside diameter ("OD") pipe co-located within or adjacent to TGP's existing 200 Line Mainline right-of-way ("ROW"). The loop segment commences near TGP's existing Mainline Valve ("MLV") 258 adjacent to Town Hill Road and extends southeast to an area southeast of South Beech Plain Road. The Connecticut Loop commences in Agawam, MA, in the yard of Compressor Station 261 and extends southward approximately 8.1 miles to the terminus in Suffield, CT. The relatively short segment of pipeline (0.11 miles) located in Agawam consists of 24-inch OD pipe co-located within or adjacent to TGP's existing ROW, terminating at the Massachusetts and Connecticut state line.

On behalf of TGP, AECOM Environment (AECOM) conducted vernal habitat surveys on the subject ROWs, along which the proposed Project would be located. As part of the

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surveys, AECOM surveyed the entire width of the ROWs, including the areas proposed for the location of the new pipeline facilities and the areas in the vicinity of the existing pipeline, where TGP performs routine vegetation management to promote herbaceous and scrub/shrub/sapling habitats consistent with natural gas pipeline operation.

The vernal pool field investigations were conducted in the spring of 2014. This report discusses the field methods used to identify vernal pool habitats and summarizes the findings of the surveys. Vernal Pool Habitat Data Forms for all pools, documenting the biological evidence which supports these determinations, are included in Attachment A. Representative photographs of vernal pool habitats are included in Attachment B. Mapping showing the locations for confirmed vernal pool habitats is included in Attachment C.

2.0 Vernal Pool Habitat Definitions

State and federal agencies apply slightly different definitions to describe vernal pools. The following summarizes the definitions used by Connecticut, Massachusetts and the USACE.

The CT DEEP defines vernal pools as small bodies of standing fresh water found throughout the spring that typically result from various combinations of snowmelt, precipitation, and high water tables associated with the spring season. These depressions can be natural or man-made (CTDEEP, 2011). In most years, these areas become completely dry, losing water through infiltration and evapotranspiration. Vernal pools vary in many aspects including appearance, water source, hydroperiod, water quality and surrounding habitats. Field investigations must coincide with the amphibian breeding and/or larval development time periods to determine if an area is functioning as a vernal pool.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

In Connecticut, to meet the definition of a vernal pool, the following four criteria must be met:

- Contains water for approximately two months during the growing season;
- Occurs within a confined depression or basin that lacks a permanent outlet stream;
- Lacks any fish populations; and
- Dries out most years, usually by late summer.

The Massachusetts Wetlands Protection Act (310 CMR 10.00) defines vernal pool habitat as "confined basin depressions, which, at least in most years, hold water for a minimum of two continuous months during the spring and/or summer, and which are free of adult fish populations. These areas are essential breeding habitat, and provide other extremely important wildlife habitat functions during the non-breeding season as well, for a variety of amphibian species such as wood frogs (*Lithobates sylvatica*) and the spotted salamander (*Ambystoma maculatum*) and are important habitat for other wildlife species."

Many organisms critically rely upon vernal pool habitat for reproductive success. These species are referred to as obligate vernal pool species. According to the CT DEEP (2011), obligate vernal pool species that may have ranges within the Project area include the following:

- wood frog *(Lithobates sylvatica)*
- Eastern spadefoot toad *(Scaphiopus holbrookii)*
- spotted salamander *(Ambystoma maculatum)*
- Jefferson salamander *(Ambystoma jeffersonianum)*
- marbled salamander *(Ambystoma opacum)*
- fairy shrimp *(Branchiopoda anostraca)*

The Eastern spadefoot toad and Jefferson salamander are listed by Connecticut as State-endangered and Species of Special Concern, respectively. During the vernal pool

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

surveys, neither of these species were observed on the Project ROWs. In addition, Project specific consultations with the Connecticut Natural Diversity Database (CT NDDB) did not result in the identification of the potential occurrence of any rare amphibians in relation to the Project.

Facultative vernal pool species are fauna that utilize, but do not necessarily require, vernal pools for reproductive success. Examples of facultative species include spring peeper (*Pseudacris crucifer*), spotted turtle (*Clemmys guttata*), red-spotted newt (*Notophthalmus viridescens viridescens*), green frog (*Rana clamitans*) and bull frog (*Rana catesbeiana*). Facultative species such as those mentioned above can utilize vernal pool habitats. However, these species can also breed successfully in the margins of permanent water bodies including streams, rivers, and lakes.

The USACE's Programmatic General Permit (PGP) for the State of Connecticut defines vernal pools as: an often temporary body of water occurring in a shallow depression of natural or human origin that fills during spring rains and snow melt and typically dries up during summer months. Vernal pools support populations of species specially adapted to reproducing in these habitats. Such species may include wood frogs, mole salamanders (*Ambystoma* sp.), fairy shrimp, fingernail clams (*Sphaeriidae*), and other amphibians, reptiles and invertebrates. Vernal pools lack breeding populations of fish. It is noted in the PGP that the USACE will determine on a case-by-case basis which vernal pools are within their jurisdiction and that all vernal pools are subject to the jurisdiction of the CT DEEP under Connecticut Water Quality Standards.

Wetland areas associated with the Project ROWs were surveyed to identify the presence or absence of obligate vernal pool species (presence/absence surveys). Where obligate species were observed, the area was further investigated to identify whether the state and federal vernal pool criteria had been satisfied. Observed facultative species were noted on the Vernal Pool Data Forms (Attachment A), but these species were not used to identify an area as a vernal pool.

For the purposes of the ROW investigations and this report, a vernal pool was defined as an area that held obligate species in the 2014 breeding season and that met the majority of the state and federal vernal pool criteria discussed above. Given access

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

constraints to off ROW areas and the temporally limited nature of the observations, it was not possible to be sure every aspect of the criteria was being met in all cases.

In addition, obligate vernal pool species were sometimes observed breeding in perennial water bodies. Areas where this occurred were not identified as a vernal pool due to the presence of a fish population. In cases where large wetland systems exhibited expansive flooded areas within which obligate vernal pool species were documented as breeding, the breeding evidence was recorded and, if appropriate based upon the observed vernal pool criteria, the areas were identified as a vernal pool. These types of areas are typically referred to as “cryptic vernal pools” and, as their name suggests, may be easily overlooked. Such determinations were made by field biologists during the 2014 surveys.

3.0 Field Investigations

AECOM conducted the vernal pool surveys in April and early May of 2014. These survey periods correspond to the appropriate times of the year to identify areas that may function as vernal pools based on the presence of egg masses and developing larvae.

All wetland areas associated with the Project corridor were investigated to determine if breeding amphibians, both obligate and facultative, were present in an effort to identify vernal pools. To facilitate the surveys, biologists were provided with Project specific wetland mapping, dip nets and digital cameras.

The surveys were done after the first significant rainfall events in the spring, when evening low temperatures remained in the 40s (^{o} Fahrenheit). These weather conditions facilitate inward migration of amphibians to the pools for the purpose of breeding. Biologists conducted visual surveys and used dip nets to sweep the water column to assist in determining the presence or absence of amphibians and other vernal pool species. Choruses of breeding frogs were noted when audible.

Representative photographs of the wetlands and observed species were taken at the majority of the identified vernal pool habitats (Attachment B). Evidence of amphibian breeding, including but not limited to wood frog chorusing, mole salamander

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

spermatophores, egg masses and amphibian larvae, was recorded on Vernal Pool Data Forms that are included in this report as Attachment A. Additional data recorded on the data forms included the approximate size and depth of the observed breeding pool(s), substrate type and general comments, if any.

Lastly, the biologists then sketched the extent of the documented vernal pool habitat onto field mapping and/or used a global positioning system (GPS) data collection device to locate the boundaries or center of pool where possible. Field sketches and GPS data were then digitized onto updated Project mapping. Identified vernal pools are presented on mapping in Attachment C.

Life history information for amphibian and reptile species observed during the course of the surveys is presented below.

Wood Frog

In New England, the wood frog is among the first species to arrive at the breeding pools and begin their loud, duck like mating call. Wood frogs have been documented as breeding in open and closed canopy wetlands (Werner and Glennemeier, 1999). The timing of their movement varies annually, depending on climatic conditions but in general terms they immigrate to breeding sites in most years during late February to early April. The large scale migration to the breeding pools generally occurs at night during the first few heavy downpours which are accompanied by warmer air temperatures.

Except for the brief period spent at breeding habitats, wood frogs are mainly terrestrial. They utilize all types of forests and woodlands, including maritime, deciduous, and coniferous (Klemens, 1993); as well as a variety of other types of habitats. During the coldest months wood frogs hibernate under leaf litter, rotting logs, stumps, rocks, and moss. Wood frogs have perfected the cryogenic freezing process. In the winter, as much as 35-45% of the frog's body may freeze, and turn to ice. Ice crystals form beneath the skin and become interspersed among the body's skeletal muscles. During the freeze the frog's breathing, blood flow, and heartbeat cease. Freezing is made possible by specialized proteins and glucose, which prevent intracellular freezing and dehydration.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Compared to other amphibian species that utilize vernal pools for breeding in southern New England, the wood frog is one of the only species that truly can be considered obligate to vernal pools. Wood frogs successfully breed in pools with shorter hydroperiods than any other amphibian in this region, with tadpole metamorphosis often complete by mid-July. Therefore, ponds that dry by August still provide perfectly suitable breeding habitat, whereas it takes much longer for the young of most other species to complete metamorphosis.

Wood frog egg masses are often deposited near the edge of a breeding pool on the water's surface where water temperatures are typically highest. They are usually attached to submerged woody debris and/or herbaceous vegetation. Wood frog egg masses can easily be distinguished from those of the spotted salamander by the lack of an outer gelatinous sheath.

Newly hatched larvae feed on their egg masses and associated algae, as wood frog tadpoles are microphagous filter-feeders with a largely herbivorous diet. Larger tadpoles use their specialized mouth parts to feed on algae and various microorganisms scraped from aquatic vegetation, decaying plants and some animal matter. Adult wood frogs feed on a variety of invertebrates including flies, beetles, spiders, earthworms, moth larva, slugs, snails, and annelids (Klemens, 1993).

Spotted Salamander

In New England, the spotted salamander is a very common and widespread mole salamander. Collectively, the mole salamanders are a secretive group of salamanders that are primarily active at night. These animals are rarely seen except during their nocturnal migrations to and from their breeding pools during their brief early spring breeding season. Often, spotted salamanders can be observed migrating to vernal pools in conjunction with wood frogs. Within a few days after mating, eggs are deposited in firm spherical or kidney-shaped masses and in most cases are attached to submerged objects such as woody debris or other organic material.

Once hatched, larvae feed predominantly on very small aquatic invertebrates. Larger individuals feed on snails, clams, oligochaete worms, small aquatic insects and their

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

larvae and other invertebrates (Kenney and Burne, 2001). In general, zooplankton is the dietary staple of larvae of all size classes. As adults, spotted salamanders are generalized carnivores that forage in upland habitats for a variety of invertebrates including earthworms, snails, slugs, insects and larvae, spiders, and beetles (Degraaf and Yamasaki, 2001).

While breeding and larval development takes place in aquatic habitats, during most of the year, spotted salamanders reside in upland forests away from breeding pools. Adults typically reside up to 200 meters from breeding pools but have been documented moving greater distances. Spotted salamanders typically live in burrows created by small mammals such as the short-tail shrew (*Blarina brevicauda*). They appear to be habitat generalists, and have been documented in forest habitats including deciduous, coniferous and mixed forest. However, they are most abundant in mature deciduous or mixed deciduous woodlands.

Marbled Salamander

The marbled salamander is an unusual mole salamander in that in Connecticut, it is the only species that breeds in the late summer and early fall, has eggs that hatch in November after pools fill with water, and has larvae that overwinter in vernal pools. All other species breed in the spring (Klemens, 1993). Marbled salamanders tend to prefer large, undisturbed tracts of forest, although they can also occur in distinct, large forested tracts of land (Paton and Egan, 2001). Klemens (1993) also found marbled salamanders were more prevalent in rural areas of Connecticut. However, he also collected some individuals in suburban and urban areas.

In Connecticut, marbled salamanders typically breed in pools found in mixed deciduous or coniferous forest stands. This species appears to prefer dry, friable soils including sand and gravel deposits, as well as rocky slopes, although they are sometimes found in low-lying swampy areas (Klemens, 1993). Marbled salamanders are thought to inhabit somewhat drier areas than other species of *Ambystoma* (DeGraaf and Yamasaki, 2001).

In New England, adults start to immigrate to breeding ponds around the 1st of August. Adults are generally only active on rainy nights. The majority of adults are at breeding

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

pools by the 26th of August, with some stragglers arriving as late as the 10th of September (Paton and Crouch, 2002). Klemens (1993) documented peak breeding in Connecticut from mid-September to early October. Eggs are oviposited in a dry pool area, singly, in small depressions usually beneath a sheltering object such as logs, bark, leaf mold, or other organic debris. Eggs hatch in early November as ponds refill and eggs are flooded. The larvae then overwinter in the pools.

Marbled salamander larvae eat small aquatic insects, crustaceans, and other small invertebrates. They are also cannibalistic. Once wood frog eggs hatch in the spring, marbled salamander larvae readily feed on larval wood frogs and spotted salamanders (Klemens, 1993). Adult marbled salamanders feed on adult and larval insects and crustaceans. They also take earthworms and mollusks (DeGraaf and Yamasaki, 2001).

Spring Peeper

Spring peepers are among the most common frog species in southern New England. However, their diminutive size and cryptic coloration prevent most people from ever noticing them. Ironically, almost everyone has heard their springtime mating calls but fail to recognize the source. When not at breeding pools/ponds, peepers are habitat generalists and utilize habitats which range from mature forests to old field habitats. Although they are most commonly found in or near moist deciduous woodlands they also can be found in coniferous forests, grassy meadows, shrubby fields, gardens, sandy coastal dune habitats, as well as pine barrens (Klemens, 1993).

In southern New England (Rhode Island), spring peepers are found at breeding pools/ponds from mid-March through May (Paton et al., 2000). Once there, males establish territories from which they actively call to attract females. After pairing up, females deposit eggs on the pool/pond bottom under organic debris such as dead leaves. Upon hatching, larvae tend to congregate in the warm shallows of ponds, in areas with dense vegetation where they are usually "inactive and benthic" - a strategy used as an anti-predator defense (Lawler, 1989).

Spring peeper larvae feed on small aquatic organisms such as diatoms and algae found on submerged organic debris. Adult peepers feed on a variety of small invertebrates,

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

and thus, are beneficial to the environment by acting as natural pest control agents. Spiders account for the bulk of their diet (48%), although they also gorge themselves on mites, sowbugs, leafhoppers, ants, harvestmen, nematode worms, and lepidoptera (moth and butterfly) larvae (Gilhen, 1984).

Spotted Turtle

The spotted turtle is a small turtle (3.5 to 5.5 inch carapace) which favors clean, shallow, slow moving bodies of water with muddy or mucky bottoms. They reside in marshy meadows, forested wetlands, boggy areas and beaver ponds. This turtle has yellow spots on the head, neck, legs, and upper shell or carapace. Background coloration is black. The number and arrangement of spots is extremely variable and changes with age. Hatchling turtles usually have one spot on each plate. Older individuals can be well sprinkled with 100 or more spots but occasionally all black specimens are observed.

Spotted turtles are active from March to October and may be seen singly or in groups basking in the sun. Diet consists of amphibian eggs and larvae, snails, leeches, worms, slugs, spiders and carrion. Diurnal activity is dependent on the time of year and temperature. Early and late in their activity period, daylight activities are spent hunting and basking in the sun. In the evening, spotted turtles submerge and spend the night in the substrate of their wetland habitats or spend the night under vegetation. In summer, when surface waters are limited, spotted turtles may aestivate (be dormant) for extended periods.

Spotted turtles reach sexual maturity at about 7-10 years of age. Mating occurs from March to May and usually takes place in the water. An open site with good sun exposure, such as a field or the edges of roads is most often chosen for nesting. However, spotted turtles may also deposit their eggs in vegetation such as tussock sedge (*Carex stricta*). The female uses her hind legs and feet to dig a hole that is about 2 to 2.5 inches deep and 2 inches wide. She then lays 3-6 oval shaped eggs that have thin, flexible shells and then covers the eggs.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

4.0 Results

As summarized in Table 1, based on the 2014 breeding season field surveys, 32 wetlands located along the Project corridor were determined to contain vernal pools for obligate species. Several larger wetlands were found to contain multiple vernal pools. As a result, a total of 50 vernal pools were identified along the Project corridor and ROWs.

Digital aerial mapping, provided in 1"=200' Mapsheets in Attachment C, identifies the delineated wetlands and vernal pools along the ROWs for Massachusetts and Connecticut. For wetlands that encompass vernal pools, the vernal pools depicted represent the areas that could be successfully utilized by obligate vernal pool species. Distinct areas within the overall vernal pool where specific data was collected are known as the data collection areas. The size of the data collection areas, as well as the overall vernal pool dimensions, represent data collected during the spring season of 2014 and can be expected to vary from year-to-year based upon seasonal fluctuations in the water table caused by annual variations in the amount and timing of precipitation. These hydrologic variations could in turn affect where exactly amphibians would deposit egg masses in a given year.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Table 1: Vernal Pool Habitat Identified Along the Proposed Project ROWs

Municipality	Vernal Pool Number[1]	Associated Wetland[2]	Adjacent Milepost[3]	Mapsheet Number[4]	Species Observed and/or Heard	Existing Cover Type
Connecticut 8.1 Mile Loop Mapsheets 1 through 8						
Agawam, MA	VP WMA01A	WMA-01A	0.0	1 of 8	>1,000 wood frog tadpoles	PFO
Suffield	VP WCT5	WCT-5	1.0-1.5	2 of 8	2 spotted salamander egg masses	PFO
Suffield	VP WCT6-1	WCT-6	1.0-1.5	2 of 8	>200 wood frog tadpoles, 6 spotted salamander egg masses	PFO
Suffield	VP WCT6-2	WCT-6	1.0-1.5	2 of 8	50-100 wood frog tadpoles	PFO
Suffield	VP WCT7	WCT-7	1.0-1.5	2 of 8	7 spotted salamander egg masses	PEM
Suffield	WCTVP-2	Unidentified	1.0-1.5	2 of 8	3 spotted salamander egg masses	PFO
Suffield	VP WCT9	WCT-09	1.0-1.5	2 of 8	2 spotted salamander egg masses	PFO
Suffield	VP WCT11	WCT-11	1.5	2 of 8	>100 wood frog tadpoles, 5 spotted salamander egg masses	PFO/PSS
Suffield	WCT13-VP1	WCT-13	2.0	3 of 8	Numerous wood frog tadpoles	PFO
Suffield	WCT18-VP1	WCT-18	2.5-3.0	4 of 8	Numerous wood frog tadpoles, 2 spotted salamander egg masses	PFO
Suffield	WCT32-VP1	WCT-32	4.5-5.0	5 of 8	Numerous wood frog tadpoles, 7 spotted salamander egg masses, numerous fairy shrimp	PFO
Suffield	WCT32-VP2	WCT-32	4.5-5.0	5 of 8	Many wood frog tadpoles, 5 wood frog egg masses	PFO
Suffield	WCT-VP1	unidentified	4.5-5.0	5 of 8	Many wood frog tadpoles, 5 wood frog egg masses	PFO
Suffield	WCT33-VP1	WCT-33	5.0-5.5	5 of 8	85 wood frog egg masses, 9 spotted salamander egg masses	PFO

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Table 1: Vernal Pool Habitat Identified Along the Proposed Project ROWs

Municipality	Vernal Pool Number[1]	Associated Wetland[2]	Adjacent Milepost[3]	Mapsheet Number[4]	Species Observed and/or Heard	Existing Cover Type
Suffield	WCT33-VP2	WCT-33	5.0-5.5	5 of 8	5 wood frog egg masses	PSS
Suffield	WCT33-VP3	WCT-33	5.0	5 of 8	2 wood frog egg masses	PSS
Suffield	WCT33-VP4	WCT-33	5.0	5 of 8	1 spotted salamander egg mass	PFO
Suffield	WCT33-VP5	WCT-33	5.0	5 of 8	1 wood frog egg mass, many wood frog tadpoles	PFO
Suffield	WCT33-VP6	WCT-33	5.0	5 of 8	2 wood frog egg masses, many wood frog tadpoles, 1 spotted salamander egg masses	PFO
Suffield	WCT34-VP1	WCT-34	5.0-5.5	5 of 8	3 wood frog egg masses, 2 spotted salamander egg masses	PFO
Suffield	WCT34-VP2	WCT-34	5.0-5.5	5 of 8	Many wood frog tadpoles, 34 spotted salamander egg masses	PFO
Suffield	WCT36-VP1	WCT-36	5.0-5.5	5 of 8	14 wood frog egg masses	PFO
Suffield	WCT39-VP1	WCT-39	6.0	6 of 8	20+ wood frog tadpoles	PEM
Suffield	WCT41-VP1	WCT-41	6.0-6.5	6 of 8	20+ wood frog tadpoles, 1 spotted salamander egg mass	PEM
Suffield	WCT41-VP2	WCT-41	6.0-6.5	6 of 8	1 wood frog egg mass	PFO
Suffield	WCT45-VP1	WCT-45	6.5	7 of 8	1 wood frog egg mass, many wood frog tadpoles, 7 spotted salamander egg masses	PFO
Suffield	WCT45-VP2	WCT-45	6.5	7 of 8	26+ spotted salamander egg masses	PFO
Suffield	WCT46-VP1	WCT-46	6.5-7.0	7 of 8	Many wood frog tadpoles, 3 spotted salamander egg masses	PFO
East Granby	WCT46-VP2	WCT-46	7.0	8 of 8	20+ spotted salamander egg masses	PFO

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Table 1: Vernal Pool Habitat Identified Along the Proposed Project ROWs

Municipality	Vernal Pool Number[1]	Associated Wetland[2]	Adjacent Milepost[3]	Mapsheet Number[4]	Species Observed and/or Heard	Existing Cover Type
East Granby	WCT49-VP1	WCT-49	7.0-7.5	8 of 8	12+ spotted salamander egg masses	PSS
East Granby	WCT50B-VP1	WCT-50B	7.0-7.5	8 of 8	20+ wood frog tadpoles, 1 spotted salamander egg mass	PFO
East Granby	WCT50D-VP1	WCT-50D	7.0-7.5	8 of 8	Many wood frog tadpoles	PFO
East Granby	WCT51-VP1	WCT-51	7.0-7.5	8 of 8	9 spotted salamander egg masses	PFO
Massachusetts 3.8 Mile Loop Mapsheets 1 through 5						
Sandisfield	VP WMA-3-1	WMA-3	0.0	1 of 5	4 spotted salamander egg masses	PFO
Sandisfield	VP WMA-3-2	WMA-3	0.0	1 of 5	4 spotted salamander egg masses	PFO/PEM
Sandisfield	VP WMA-5-1	WMA-5	0.0-0.5	1 of 5	3 spotted salamander egg masses	PFO
Sandisfield	VP WMA-6-1	WMA-6	0.5	1 of 5	2 wood frog egg masses, 3 spotted salamander egg masses	PEM
Sandisfield	VP WMA-7-1	WMA-7	0.5-1.0	2 of 5	6 wood frog egg masses, 1 spotted salamander egg mass	PEM
Sandisfield	VP WMA-7-2	WMA-7	0.5-1.0	2 of 5	450-500 wood frog egg masses, 4 spotted salamander egg masses	PEM
Sandisfield	VP WMA-7-3	WMA-7	0.5-1.0	2 of 5	3 wood frog egg masses, 6 spotted salamander egg masses	PFO/PEM
Sandisfield	VP WMA-7-4	WMA-7	1.0	2 of 5	12 wood frog egg masses, 3 spotted salamander egg masses	PEM
Sandisfield	VP WMA-7-5	WMA-7	1.0-1.5	2 of 5	30-35 wood frog egg masses, 3 spotted salamander egg masses, 1 adult spotted salamander	PEM
Sandisfield	VP WMA-7-6	WMA-7	1.0-1.5	2 of 5	7 wood frog egg masses, 6 spotted salamander egg masses	PSS/PEM

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Table 1: Vernal Pool Habitat Identified Along the Proposed Project ROWs

Municipality	Vernal Pool Number[1]	Associated Wetland[2]	Adjacent Milepost[3]	Mapsheet Number[4]	Species Observed and/or Heard	Existing Cover Type
Sandisfield	MA-CVP-1	None	1.0-1.5	3 of 5	1 wood frog egg mass, 4 spotted salamander egg masses	PFO
Sandisfield	VP WMA-12-1	WMA-12	1.5	3 of 5	6 wood frog egg masses, 2 spotted salamander egg masses	PEM
Sandisfield	VP WMA-13-1	WMA-13	1.5-2.0	3 of 5	40-45 wood frog egg masses, 3 spotted salamander egg masses	PEM
Sandisfield	VP WMA-18-1	WMA-18	2.5	4 of 5	10 wood frog egg masses	PEM
Sandisfield	VP WMA-16-1	WMA-16	2.5-3.0	4 of 5	200-250 wood frog egg masses	PFO
Sandisfield	VP WMA-23	WMA-23	3.5-3.8	5 of 5	50-60 wood frog egg masses	PEM
Sandisfield	VP WMA-24	WMA-24	3.8	5 of 5	80-1000 wood frog egg masses	PEM

1 – Vernal pool habitat number generated by AECOM for identification purposes.
2 – Associated wetland number corresponds to the Project Wetland Identification number.
3 – Refers to mileposts along the existing pipelines for Connecticut and Massachusetts.
4 – See 1"=200' Vernal Pools Mapsheets for Connecticut and Massachusetts.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

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20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Attachment A

2014 Vernal Pool Habitat Data Forms

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VERNAL POOL FIELD DATA SHEET
2014 FIELD SEASON

PROJECT	Connecticut Expansion		
DATE	4/23/14	**WEATHER CONDITIONS**	60° F Partly Cloudy
OBSERVERS	O'Sullivan/Stearns		

CHARACTERISTICS			
WETLAND #	VP WMA01A	**LENGTH & WIDTH**	40x60'
TOWN	Agawam, MA	**CLOSEST WETLAND FLAG**	304
AVERAGE WATER DEPTH	6-14"	**COVER TYPE**	PFO

SUBSTRATE:
- ☐ **Peat**
- ☐ **Leaf Litter**
- ☐ **Sand**
- ☐ **Gravel**
- ☐ **Cobble**
- ☒ **Mud/Muck**

DOMINANT VEGETATION WITHIN POOL:
Acer rubrum, Lindera benzoin, Lonicera tatarica, Sambucus canadensis Symplocarpus foetidus

__0__% of pool w/in maintained ROW __100__% of pool within forested area

Breeding Criteria Codes

1	**Breeding chorus**
2	**Egg masses**
3	**Frog tadpoles**
4	**Salamander larvae**
5	**Presence of adults**

	OBLIGATE SPECIES	CODE	QUANTITY
	Wood frog	3	>1,000
	Spotted salamander		
	Jefferson salamander		
	Blue-spotted salamander		
	Spadefoot toad		
	Fingernail clams		
	Marbled salamander		
	Unidentified mole salamander		
	Fairy shrimp		

FACULTATIVE SPECIES:
- ☐ **Red-spotted newt adults**
- ☐ **Spotted turtles**
- ☐ **Blanding's turtles**
- ☐ **Painted turtles**
- ☐ **Snapping turtles**
- ☐ **Predacious diving beetles**
- ☐ **Dragonfly nymphs**
- ☐ **Amphibious snails**
- ☐ **Spring peepers**
- ☐ **American toads**
- ☐ **Fowler's Toad**
- ☐ **Caddis fly case/larvae**
- ☐ **Dragonfly nymphs**
- ☐ **Damselfly nymphs**
- ☐ **Leeches**
- ☐ **Pickerel Frog**

Additional Species Observed:

Photo Documentation: Yes

Conclusions / Comments:

☒ **Vernal Pool** ☐ **Amphibian Breeding Habitat**

CHARACTERISTICS OF ADJACENT VEGETATION:
(within 100-feet of pool edge)

_____% PSS **__40__% PFO** **_____% PEM**

__40__% UF **_____% ROW** **_____% OFS**

__20__% Other / define: Agricultural field

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VERNAL POOL FIELD DATA SHEET
2014 FIELD SEASON

PROJECT	Connecticut Expansion		
DATE	5/5/14	**WEATHER CONDITIONS**	60° F Partly Cloudy
OBSERVERS	O'Sullivan		

CHARACTERISTICS			
WETLAND #	VP WCT5	**LENGTH & WIDTH**	70x20'
TOWN	Suffield, CT	**CLOSEST WETLAND FLAG**	302
AVERAGE WATER DEPTH	6-24"	**COVER TYPE**	PFO

SUBSTRATE:
- ☐ **Peat**
- ☐ **Leaf Litter**
- ☐ **Sand**
- ☐ **Gravel**
- ☐ **Cobble**
- ☒ **Mud/Muck**

DOMINANT VEGETATION WITHIN POOL:
Acer rubrum, Lindera benzoin, Viburnum recognitum, Symplocarpus foetidus

__0__% of pool w/in maintained ROW __100__% of pool within forested area

Breeding Criteria Codes

1	**Breeding chorus**
2	**Egg masses**
3	**Frog tadpoles**
4	**Salamander larvae**
5	**Presence of adults**

	OBLIGATE SPECIES	CODE	QUANTITY
	Wood frog		
	Spotted salamander	2	2
	Jefferson salamander		
	Blue-spotted salamander		
	Spadefoot toad		
	Fingernail clams		
	Marbled salamander		
	Unidentified mole salamander		
	Fairy shrimp		

FACULTATIVE SPECIES:
- ☐ **Red-spotted newt adults**
- ☐ **Spotted turtles**
- ☐ **Blanding's turtles**
- ☐ **Painted turtles**
- ☐ **Snapping turtles**
- ☒ **Predacious diving beetles**
- ☐ **Dragonfly nymphs**
- ☐ **Amphibious snails**
- ☐ **Spring peepers**
- ☐ **American toads**
- ☐ **Fowler's Toad**
- ☒ **Caddis fly case/larvae**
- ☐ **Dragonfly nymphs**
- ☐ **Damselfly nymphs**
- ☐ **Leeches**
- ☐ **Pickerel Frog**

Additional Species Observed: **None**

Photo Documentation: **Yes**

Conclusions / Comments:

☒ **Vernal Pool** ☐ **Amphibian Breeding Habitat**

CHARACTERISTICS OF ADJACENT VEGETATION:
(within 100-feet of pool edge)

_____% PSS **__10__% PFO** **_____% PEM**

__90__% UF **_____% ROW** **_____% OFS**

_____% Other / define:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VERNAL POOL FIELD DATA SHEET
2014 FIELD SEASON

PROJECT	Connecticut Expansion		
DATE	5/5/14	**WEATHER CONDITIONS**	65° F Partly Cloudy
OBSERVERS	O'Sullivan		

CHARACTERISTICS			
WETLAND #	VP WCT6-1	**LENGTH & WIDTH**	110x40'
TOWN	Suffield, CT	**CLOSEST WETLAND FLAG**	200
AVERAGE WATER DEPTH	1' to > 4'	**COVER TYPE**	PFO

SUBSTRATE:
- ☐ **Peat**
- ☐ **Leaf Litter**
- ☐ **Sand**
- ☐ **Gravel**
- ☐ **Cobble**
- ☒ **Mud/Muck**

DOMINANT VEGETATION WITHIN POOL:
Acer rubrum, Betula alleghaniensis, Lindera benzoin, Viburnum recognitum, Phalaris arundinacea, Symplocarpus foetidus

__0__% of pool w/in maintained ROW __100__% of pool within forested area

Breeding Criteria Codes

1	**Breeding chorus**
2	**Egg masses**
3	**Frog tadpoles**
4	**Salamander larvae**
5	**Presence of adults**

	OBLIGATE SPECIES	CODE	QUANTITY
	Wood frog	3	>200
	Spotted salamander	2	6
	Jefferson salamander		
	Blue-spotted salamander		
	Spadefoot toad		
	Fingernail clams		
	Marbled salamander		
	Unidentified mole salamander		
	Fairy shrimp		

FACULTATIVE SPECIES:
- ☐ **Red-spotted newt adults**
- ☐ **Spotted turtles**
- ☐ **Blanding's turtles**
- ☒ **Painted turtles**
- ☒ **Snapping turtles**
- ☒ **Predacious diving beetles**
- ☐ **Dragonfly nymphs**
- ☐ **Amphibious snails**
- ☐ **Spring peepers**
- ☐ **American toads**
- ☐ **Fowler's Toad**
- ☒ **Caddis fly case/larvae**
- ☐ **Dragonfly nymphs**
- ☐ **Damselfly nymphs**
- ☐ **Leeches**
- ☐ **Pickerel Frog**

Additional Species Observed: **Green frogs**

Photo Documentation: **Yes**

Conclusions / Comments:

☒ **Vernal Pool** ☐ **Amphibian Breeding Habitat**

CHARACTERISTICS OF ADJACENT VEGETATION:
(within 100-feet of pool edge)

_____% PSS **__60__% PFO** **__20__% PEM**

__20__% UF **_____% ROW** **_____% OFS**

_____% Other / define:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VERNAL POOL FIELD DATA SHEET
2014 FIELD SEASON

PROJECT	Connecticut Expansion		
DATE	5/5/14	**WEATHER CONDITIONS**	65° F Partly Cloudy
OBSERVERS	O'Sullivan		

CHARACTERISTICS			
WETLAND #	VP WCT6-2	**LENGTH & WIDTH**	100x30'
TOWN	Suffield, CT	**CLOSEST WETLAND FLAG**	205
AVERAGE WATER DEPTH	6-20"	**COVER TYPE**	PFO PEM

SUBSTRATE:
- ☐ **Peat**
- ☐ **Leaf Litter**
- ☐ **Sand**
- ☐ **Gravel**
- ☐ **Cobble**
- ☒ **Mud/Muck**

DOMINANT VEGETATION WITHIN POOL:
Acer rubrum, Betula alleghaniensis, Sambucus canadensis, Rosa multiflora, Phalaris arundinacea, Symplocarpus foetidus, Phragmites australis

__0__% of pool w/in maintained ROW __100__% of pool within forested area

Breeding Criteria Codes

1	**Breeding chorus**
2	**Egg masses**
3	**Frog tadpoles**
4	**Salamander larvae**
5	**Presence of adults**

	OBLIGATE SPECIES	CODE	QUANTITY
	Wood frog	3	50-100
	Spotted salamander		
	Jefferson salamander		
	Blue-spotted salamander		
	Spadefoot toad		
	Fingernail clams		
	Marbled salamander		
	Unidentified mole salamander		
	Fairy shrimp		

FACULTATIVE SPECIES:
- ☐ **Red-spotted newt adults**
- ☐ **Spotted turtles**
- ☐ **Blanding's turtles**
- ☐ **Painted turtles**
- ☐ **Snapping turtles**
- ☐ **Predacious diving beetles**
- ☐ **Dragonfly nymphs**
- ☐ **Amphibious snails**
- ☐ **Spring peepers**
- ☐ **American toads**
- ☐ **Fowler's Toad**
- ☐ **Caddis fly case/larvae**
- ☐ **Dragonfly nymphs**
- ☐ **Damselfly nymphs**
- ☐ **Leeches**
- ☐ **Pickerel Frog**

Additional Species Observed: **Green frogs**

Photo Documentation: **Yes**

Conclusions / Comments: **Significant accumulation of old solid waste dumped over many years.**

☒ **Vernal Pool** ☐ **Amphibian Breeding Habitat**

CHARACTERISTICS OF ADJACENT VEGETATION:
(within 100-feet of pool edge)

_____% PSS **__40__% PFO** **_____% PEM**

__60__% UF **_____% ROW** **_____% OFS**

_____% Other / define:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VERNAL POOL FIELD DATA SHEET
2014 FIELD SEASON

PROJECT	Connecticut Expansion		
DATE	5/5/14	**WEATHER CONDITIONS**	65° F Partly Cloudy
OBSERVERS	O'Sullivan		

CHARACTERISTICS			
WETLAND #	VP WCT7	**LENGTH & WIDTH**	100x50'
TOWN	Suffield, CT	**CLOSEST WETLAND FLAG**	301
AVERAGE WATER DEPTH	6-12"	**COVER TYPE**	PEM

SUBSTRATE:
- ☐ **Peat**
- ☐ **Leaf Litter**
- ☐ **Sand**
- ☐ **Gravel**
- ☐ **Cobble**
- ☒ **Mud/Muck**

DOMINANT VEGETATION WITHIN POOL:
Acer rubrum, Betula alleghaniensis, Sambucus canadensis, Rosa multiflora, Phalaris arundinacea, Symplocarpus foetidus, Osmunda cinnamomea

100 % of pool w/in maintained ROW 0 % of pool within forested area

Breeding Criteria Codes

1	**Breeding chorus**
2	**Egg masses**
3	**Frog tadpoles**
4	**Salamander larvae**
5	**Presence of adults**

	OBLIGATE SPECIES	CODE	QUANTITY
	Wood frog		
	Spotted salamander	2	7
	Jefferson salamander		
	Blue-spotted salamander		
	Spadefoot toad		
	Fingernail clams		
	Marbled salamander		
	Unidentified mole salamander		
	Fairy shrimp		

FACULTATIVE SPECIES:
- ☐ **Red-spotted newt adults**
- ☐ **Spotted turtles**
- ☐ **Blanding's turtles**
- ☐ **Painted turtles**
- ☐ **Snapping turtles**
- ☐ **Predacious diving beetles**
- ☐ **Dragonfly nymphs**
- ☐ **Amphibious snails**
- ☐ **Spring peepers**
- ☐ **American toads**
- ☐ **Fowler's Toad**
- ☐ **Caddis fly case/larvae**
- ☐ **Dragonfly nymphs**
- ☐ **Damselfly nymphs**
- ☐ **Leeches**
- ☐ **Pickerel Frog**

Additional Species Observed:

Photo Documentation: **Yes**

Conclusions / Comments: **Series of small interconnected pools**

☒ **Vernal Pool** ☐ **Amphibian Breeding Habitat**

CHARACTERISTICS OF ADJACENT VEGETATION:
(within 100-feet of pool edge)

_____% PSS **30 % PFO** **_____% PEM**

70 % UF **_____% ROW** **_____% OFS**

_____% Other / define:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VERNAL POOL FIELD DATA SHEET
2014 FIELD SEASON

PROJECT	Connecticut Expansion		
DATE	5/5/14	**WEATHER CONDITIONS**	65° F Partly Cloudy
OBSERVERS	O'Sullivan		

CHARACTERISTICS			
WETLAND #	WCTVP-2	**LENGTH & WIDTH**	100x50'
TOWN	Suffield, CT	**CLOSEST WETLAND FLAG**	No flags in field
AVERAGE WATER DEPTH	6-12"	**COVER TYPE**	PFO

SUBSTRATE:
- ☐ **Peat**
- ☐ **Leaf Litter**
- ☐ **Sand**
- ☐ **Gravel**
- ☐ **Cobble**
- ☒ **Mud/Muck**

DOMINANT VEGETATION WITHIN POOL:
Acer rubrum, Betula alleghaniensis, Sambucus canadensis, Symplocarpus foetidus,Impatiens capensis, Onoclea sensibilis, Osmunda cinnamomea

__0__% of pool w/in maintained ROW __100__% of pool within forested area

Breeding Criteria Codes

1	**Breeding chorus**
2	**Egg masses**
3	**Frog tadpoles**
4	**Salamander larvae**
5	**Presence of adults**

	OBLIGATE SPECIES	CODE	QUANTITY
	Wood frog		
	Spotted salamander	2	3
	Jefferson salamander		
	Blue-spotted salamander		
	Spadefoot toad		
	Fingernail clams		
	Marbled salamander		
	Unidentified mole salamander		
	Fairy shrimp		

FACULTATIVE SPECIES:
- ☐ **Red-spotted newt adults**
- ☐ **Spotted turtles**
- ☐ **Blanding's turtles**
- ☐ **Painted turtles**
- ☐ **Snapping turtles**
- ☐ **Predacious diving beetles**
- ☐ **Dragonfly nymphs**
- ☐ **Amphibious snails**
- ☐ **Spring peepers**
- ☐ **American toads**
- ☐ **Fowler's Toad**
- ☐ **Caddis fly case/larvae**
- ☐ **Dragonfly nymphs**
- ☐ **Damselfly nymphs**
- ☐ **Leeches**
- ☐ **Pickerel Frog**

Additional Species Observed:

Photo Documentation: Yes

Conclusions / Comments: VP outside of original wetland survey area.

☒ **Vernal Pool** ☐ **Amphibian Breeding Habitat**

CHARACTERISTICS OF ADJACENT VEGETATION:
(within 100-feet of pool edge)

_____% PSS **__60__% PFO** **_____% PEM**

__30__% UF **_____% ROW** **__10__% OFS**

_____% Other / define:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VERNAL POOL FIELD DATA SHEET
2014 FIELD SEASON

PROJECT	Connecticut Expansion		
DATE	5/5/14	**WEATHER CONDITIONS**	70° F Partly Cloudy
OBSERVERS	O'Sullivan		

CHARACTERISTICS			
WETLAND #	VPWCT9	**LENGTH & WIDTH**	15' in diameter
TOWN	Suffield, CT	**CLOSEST WETLAND FLAG**	202
AVERAGE WATER DEPTH	6-16"	**COVER TYPE**	PFO

SUBSTRATE:
- ☐ **Peat**
- ☐ **Leaf Litter**
- ☐ **Sand**
- ☐ **Gravel**
- ☐ **Cobble**
- ☒ **Mud/Muck**

DOMINANT VEGETATION WITHIN POOL:
Acer rubrum, Rosa multiflora, Osmunda cinnamomea
Symplocarpus foetidus,Onoclea sensibilis, Smilax rotundifolia

__0__% of pool w/in maintained ROW __100__% of pool within forested area

Breeding Criteria Codes

1	**Breeding chorus**
2	**Egg masses**
3	**Frog tadpoles**
4	**Salamander larvae**
5	**Presence of adults**

	OBLIGATE SPECIES	CODE	QUANTITY
	Wood frog		
	Spotted salamander	2	2
	Jefferson salamander		
	Blue-spotted salamander		
	Spadefoot toad		
	Fingernail clams		
	Marbled salamander		
	Unidentified mole salamander		
	Fairy shrimp		

FACULTATIVE SPECIES:
- ☒ **Red-spotted newt adults**
- ☐ **Spotted turtles**
- ☐ **Blanding's turtles**
- ☐ **Painted turtles**
- ☐ **Snapping turtles**
- ☐ **Predacious diving beetles**
- ☐ **Dragonfly nymphs**
- ☐ **Amphibious snails**
- ☐ **Spring peepers**
- ☐ **American toads**
- ☐ **Fowler's Toad**
- ☐ **Caddis fly case/larvae**
- ☐ **Dragonfly nymphs**
- ☐ **Damselfly nymphs**
- ☐ **Leeches**
- ☐ **Pickerel Frog**

Additional Species Observed: **Green frog, Red eft, Isopods, finger nail clams**

Photo Documentation: **Yes**

Conclusions / Comments:

☒ **Vernal Pool** ☐ **Amphibian Breeding Habitat**

CHARACTERISTICS OF ADJACENT VEGETATION:
(within 100-feet of pool edge)

_____% PSS **__60__% PFO** **__10__% PEM**

__20__% UF **_____% ROW** **__10__% OFS**

_____% Other / define:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VERNAL POOL FIELD DATA SHEET
2014 FIELD SEASON

PROJECT	Connecticut Expansion		
DATE	5/5/14	**WEATHER CONDITIONS**	70° F Partly Cloudy
OBSERVERS	O'Sullivan		

CHARACTERISTICS			
WETLAND #	VPWCT11	**LENGTH & WIDTH**	75x100'
TOWN	Suffield, CT	**CLOSEST WETLAND FLAG**	100
AVERAGE WATER DEPTH	6-18"	**COVER TYPE**	PFO PSS

SUBSTRATE:
- ☐ **Peat**
- ☐ **Leaf Litter**
- ☐ **Sand**
- ☐ **Gravel**
- ☐ **Cobble**
- ☒ **Mud/Muck**

DOMINANT VEGETATION WITHIN POOL:
Acer rubrum, Cephalanthus occidentalis, Osmunda cinnamomea
Symplocarpus foetidus,Onoclea sensibilis

__10__% of pool w/in maintained ROW __90__% of pool within forested area

Breeding Criteria Codes

1	**Breeding chorus**
2	**Egg masses**
3	**Frog tadpoles**
4	**Salamander larvae**
5	**Presence of adults**

	OBLIGATE SPECIES	CODE	QUANTITY
	Wood frog	3	>100
	Spotted salamander	2	5
	Jefferson salamander		
	Blue-spotted salamander		
	Spadefoot toad		
	Fingernail clams		
	Marbled salamander		
	Unidentified mole salamander		
	Fairy shrimp		

FACULTATIVE SPECIES:
- ☐ **Red-spotted newt adults**
- ☐ **Spotted turtles**
- ☐ **Blanding's turtles**
- ☐ **Painted turtles**
- ☐ **Snapping turtles**
- ☐ **Predacious diving beetles**
- ☐ **Dragonfly nymphs**
- ☐ **Amphibious snails**
- ☐ **Spring peepers**
- ☐ **American toads**
- ☐ **Fowler's Toad**
- ☐ **Caddis fly case/larvae**
- ☐ **Dragonfly nymphs**
- ☐ **Damselfly nymphs**
- ☐ **Leeches**
- ☐ **Pickerel Frog**

Additional Species Observed:

Photo Documentation: **Yes**

Conclusions / Comments:

☒ **Vernal Pool** ☐ **Amphibian Breeding Habitat**

CHARACTERISTICS OF ADJACENT VEGETATION:
(within 100-feet of pool edge)

_____% PSS **__50__% PFO** **__10__% PEM**

__30__% UF **_____% ROW** **__10__% OFS**

_____% Other / define:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VERNAL POOL FIELD DATA SHEET
2014 FIELD SEASON

PROJECT	Connecticut Expansion		
DATE	May 5, 2014	**WEATHER CONDITIONS**	Clear and Sunny, 67°F
OBSERVERS	S. Egan, B. Morrill		

CHARACTERISTICS			
WETLAND #	WCT13	**LENGTH & WIDTH**	130'X50'
TOWN	Suffield, CT	**CLOSEST WETLAND FLAG**	#304
AVERAGE WATER DEPTH	18" (Max 3')	**COVER TYPE**	PEM (PSS) PFO

SUBSTRATE:
- ☐ **Peat**
- ☐ **Leaf Litter**
- ☐ **Sand**
- ☐ **Gravel**
- ☐ **Cobble**
- ☒ **Mud/Muck**

DOMINANT VEGETATION WITHIN POOL:

Cephalanthus occidentalis
Vaccinium corymbosum
Onoclea sensibilis
Acer rubrum
Nyssa sylvatica
Carex stricta

0 % of pool w/in maintained ROW 100 % of pool within forested area

Breeding Criteria Codes

1	**Breeding chorus**
2	**Egg masses**
3	**Frog tadpoles**
4	**Salamander larvae**
5	**Presence of adults**

	OBLIGATE SPECIES	CODE	QUANTITY
	Wood frog	3	(numerous)
	Spotted salamander		
	Jefferson salamander		
	Blue-spotted salamander		
	Spadefoot toad		
	Fingernail clams		
	Marbled salamander		
	Unidentified mole salamander		
	Fairy shrimp		

FACULTATIVE SPECIES:
- ☐ **Red-spotted newt adults**
- ☐ **Spotted turtles**
- ☐ **Blanding's turtles**
- ☐ **Painted turtles**
- ☐ **Snapping turtles**
- ☒ **Predacious diving beetles**
- ☐ **Dragonfly nymphs**
- ☒ **Amphibious snails**
- ☐ **Spring peepers**
- ☐ **American toads**
- ☐ **Fowler's Toad**
- ☒ **Caddis fly case/larvae**
- ☐ **Dragonfly nymphs**
- ☐ **Damselfly nymphs**
- ☐ **Leeches**
- ☐ **Pickerel Frog**

Additional Species Observed:
None

Photo Documentation:
None

Conclusions / Comments:

☒ **Vernal Pool** ☐ **Amphibian Breeding Habitat**

CHARACTERISTICS OF ADJACENT VEGETATION:
(within 100-feet of pool edge)

_____% PSS **10 % PFO** **_____% PEM**

35 % UF **20 % ROW** **25 % OFS**

10 % Other / define: Open Water

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VERNAL POOL FIELD DATA SHEET
2014 FIELD SEASON

PROJECT	Connecticut Expansion		
DATE	May 5, 2014	**WEATHER CONDITIONS**	Clear and Sunny, 67°F
OBSERVERS	S. Egan, B. Morrill		

CHARACTERISTICS			
WETLAND #	WCT18	**LENGTH & WIDTH**	90'X75'
TOWN	Suffield, CT	**CLOSEST WETLAND FLAG**	#307
AVERAGE WATER DEPTH	12" (Max 2')	**COVER TYPE**	PEM PSS (PFO)

SUBSTRATE:
- ☐ **Peat**
- ☒ **Leaf Litter**
- ☐ **Sand**
- ☐ **Gravel**
- ☐ **Cobble**
- ☒ **Mud/Muck**

DOMINANT VEGETATION WITHIN POOL:

Salix alba
Vaccinium corymbosum
Rosa multiflora
Acer rubrum
Quercus palustris

0 % of pool w/in maintained ROW 100 % of pool within forested area

Breeding Criteria Codes

1	**Breeding chorus**
2	**Egg masses**
3	**Frog tadpoles**
4	**Salamander larvae**
5	**Presence of adults**

	OBLIGATE SPECIES	CODE	QUANTITY
	Wood frog	3	(numerous)
	Spotted salamander	2	2
	Jefferson salamander		
	Blue-spotted salamander		
	Spadefoot toad		
	Fingernail clams		
	Marbled salamander		
	Unidentified mole salamander		
	Fairy shrimp		

FACULTATIVE SPECIES:
- ☐ **Red-spotted newt adults**
- ☐ **Spotted turtles**
- ☐ **Blanding's turtles**
- ☐ **Painted turtles**
- ☐ **Snapping turtles**
- ☒ **Predacious diving beetles**
- ☐ **Dragonfly nymphs**
- ☐ **Amphibious snails**
- ☐ **Spring peepers**
- ☐ **American toads**
- ☐ **Fowler's Toad**
- ☒ **Caddis fly case/larvae**
- ☒ **Dragonfly nymphs**
- ☐ **Damselfly nymphs**
- ☐ **Leeches**
- ☐ **Pickerel Frog**

Additional Species Observed:
None

Photo Documentation:
None

Conclusions / Comments:

☒ **Vernal Pool** ☐ **Amphibian Breeding Habitat**

CHARACTERISTICS OF ADJACENT VEGETATION:
(within 100-feet of pool edge)

_____% PSS **20 % PFO** **_____% PEM**

15 % UF **_____% ROW** **65 % OFS**

_____% Other / define:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VERNAL POOL FIELD DATA SHEET
2014 FIELD SEASON

PROJECT	Connecticut Expansion		
DATE	April 30, 2014	**WEATHER CONDITIONS**	Raining (1.94"), 45°F
OBSERVERS	S. Egan, B. Morrill		

CHARACTERISTICS			
WETLAND #	WCT32-VP1	**LENGTH & WIDTH**	60'X54'
TOWN	Suffield, CT	**CLOSEST WETLAND FLAG**	#314-319
AVERAGE WATER DEPTH	24" (Max >3')	**COVER TYPE**	PEM PSS (PFO)

SUBSTRATE:
- ☐ **Peat**
- ☒ **Leaf Litter**
- ☐ **Sand**
- ☐ **Gravel**
- ☐ **Cobble**
- ☒ **Mud/Muck**

DOMINANT VEGETATION WITHIN POOL:
Nyssa sylvatica — *Acer rubrum*
Vaccinium corymbosum — *Betula allaghaniensis*

__0__% of pool w/in maintained ROW __100__% of pool within forested area

Breeding Criteria Codes

1	**Breeding chorus**
2	**Egg masses**
3	**Frog tadpoles**
4	**Salamander larvae**
5	**Presence of adults**

	OBLIGATE SPECIES	CODE	QUANTITY
	Wood frog	3	numerous
	Spotted salamander	2	7
	Jefferson salamander		
	Blue-spotted salamander		
	Spadefoot toad		
	Fingernail clams		
	Marbled salamander		
	Unidentified mole salamander		
	Fairy shrimp	5	numerous

FACULTATIVE SPECIES:
- ☐ **Red-spotted newt adults**
- ☐ **Spotted turtles**
- ☐ **Blanding's turtles**
- ☐ **Painted turtles**
- ☐ **Snapping turtles**
- ☒ **Predacious diving beetles**
- ☐ **Dragonfly nymphs**
- ☐ **Amphibious snails**
- ☐ **Spring peepers**
- ☐ **American toads**
- ☐ **Fowler's Toad**
- ☒ **Caddis fly case/larvae**
- ☒ **Dragonfly nymphs**
- ☐ **Damselfly nymphs**
- ☐ **Leeches**
- ☐ **Pickerel Frog**

Additional Species Observed:
None

Photo Documentation:
View Looking E of Pool
Spotted salamander egg mass

Conclusions / Comments:

☒ **Vernal Pool** ☐ **Amphibian Breeding Habitat**

CHARACTERISTICS OF ADJACENT VEGETATION:
(within 100-feet of pool edge)

_____% PSS **__60__% PFO** **_____% PEM**

__25__% UF **__10__% ROW** **_____% OFS**

__5__% Other / define: Another vernal pool

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VERNAL POOL FIELD DATA SHEET
2014 FIELD SEASON

PROJECT	Connecticut Expansion		
DATE	April 30, 2014	**WEATHER CONDITIONS**	Raining (1.94"), 45°F
OBSERVERS	S. Egan, B. Morrill		

CHARACTERISTICS			
WETLAND #	WCT32-VP2	**LENGTH & WIDTH**	60'X54'
TOWN	Suffield, CT	**CLOSEST WETLAND FLAG**	#308-312
AVERAGE WATER DEPTH	30" (Max 3')	**COVER TYPE**	PEM PSS (PFO)

SUBSTRATE:
- ☐ **Peat**
- ☒ **Leaf Litter**
- ☐ **Sand**
- ☐ **Gravel**
- ☐ **Cobble**
- ☒ **Mud/Muck**

DOMINANT VEGETATION WITHIN POOL:
Nyssa sylvatica *Acer rubrum*
Vaccinium corymbosum *Quercus bicolor*

__0__% of pool w/in maintained ROW __100__% of pool within forested area

Breeding Criteria Codes

1	**Breeding chorus**
2	**Egg masses**
3	**Frog tadpoles**
4	**Salamander larvae**
5	**Presence of adults**

	OBLIGATE SPECIES	CODE	QUANTITY
	Wood frog	2/3	5/many
	Spotted salamander		
	Jefferson salamander		
	Blue-spotted salamander		
	Spadefoot toad		
	Fingernail clams		
	Marbled salamander		
	Unidentified mole salamander		
	Fairy shrimp		

FACULTATIVE SPECIES:
- ☐ **Red-spotted newt adults**
- ☐ **Spotted turtles**
- ☐ **Blanding's turtles**
- ☐ **Painted turtles**
- ☐ **Snapping turtles**
- ☒ **Predacious diving beetles**
- ☐ **Dragonfly nymphs**
- ☐ **Amphibious snails**
- ☐ **Spring peepers**
- ☐ **American toads**
- ☐ **Fowler's Toad**
- ☒ **Caddis fly case/larvae**
- ☐ **Dragonfly nymphs**
- ☐ **Damselfly nymphs**
- ☐ **Leeches**
- ☐ **Pickerel Frog**

Additional Species Observed:
None

Photo Documentation:
View Looking NE of Pool
Wood frog egg mass and tadpoles

Conclusions / Comments:

☒ **Vernal Pool** ☐ **Amphibian Breeding Habitat**

CHARACTERISTICS OF ADJACENT VEGETATION:
(within 100-feet of pool edge)

_____% PSS **__60__% PFO** **_____% PEM**

__20__% UF **__15__% ROW** **_____% OFS**

__5__% Other / define: Another vernal pool

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VERNAL POOL FIELD DATA SHEET
2014 FIELD SEASON

PROJECT	Connecticut Expansion		
DATE	April 30, 2014	**WEATHER CONDITIONS**	Raining (1.94"), 45°F
OBSERVERS	S. Egan, B. Morrill		

CHARACTERISTICS			
WETLAND #	WCT33-VP1	**LENGTH & WIDTH**	90'X40'
TOWN	Suffield, CT	**CLOSEST WETLAND FLAG**	#206-213
AVERAGE WATER DEPTH	24" (Max >3')	**COVER TYPE**	PEM PSS (PFO)

SUBSTRATE:
- ☐ **Peat**
- ☒ **Leaf Litter**
- ☐ **Sand**
- ☐ **Gravel**
- ☐ **Cobble**
- ☒ **Mud/Muck**

DOMINANT VEGETATION WITHIN POOL:
Tsuga canadensis, *Acer rubrum*, *Vaccinium corymbosum*, *Fagus sylvatica*, *Pinus strobus*

0 % of pool w/in maintained ROW 100 % of pool within forested area

Breeding Criteria Codes

1	**Breeding chorus**
2	**Egg masses**
3	**Frog tadpoles**
4	**Salamander larvae**
5	**Presence of adults**

	OBLIGATE SPECIES	CODE	QUANTITY
	Wood frog	2	85
	Spotted salamander	2	9
	Jefferson salamander		
	Blue-spotted salamander		
	Spadefoot toad		
	Fingernail clams		
	Marbled salamander		
	Unidentified mole salamander		
	Fairy shrimp		

FACULTATIVE SPECIES:
- ☐ **Red-spotted newt adults**
- ☐ **Spotted turtles**
- ☐ **Blanding's turtles**
- ☐ **Painted turtles**
- ☐ **Snapping turtles**
- ☐ **Predacious diving beetles**
- ☒ **Fingernail clams**
- ☐ **Amphibious snails**
- ☐ **Spring peepers**
- ☐ **American toads**
- ☐ **Fowler's Toad**
- ☒ **Caddis fly case/larvae**
- ☐ **Dragonfly nymphs**
- ☐ **Damselfly nymphs**
- ☐ **Leeches**
- ☐ **Pickerel Frog**

Additional Species Observed:
None

Photo Documentation:
View Looking E of Pool
Wood frog and spotted salamander egg mass

Conclusions / Comments:

☒ **Vernal Pool** ☐ **Amphibian Breeding Habitat**

CHARACTERISTICS OF ADJACENT VEGETATION:
(within 100-feet of pool edge)

_____% PSS **25 % PFO** **_____% PEM**

60 % UF **10 % ROW** **_____% OFS**

5 % Other / define: WCT33-VP2

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VERNAL POOL FIELD DATA SHEET
2014 FIELD SEASON

PROJECT	Connecticut Expansion		
DATE	April 30, 2014	**WEATHER CONDITIONS**	Raining (1.94"), 45°F
OBSERVERS	S. Egan, B. Morrill		

CHARACTERISTICS			
WETLAND #	WCT33-VP2	**LENGTH & WIDTH**	90'X40'
TOWN	Suffield, CT	**CLOSEST WETLAND FLAG**	#215-219
AVERAGE WATER DEPTH	14" (Max 2')	**COVER TYPE**	PEM (PSS) PFO

SUBSTRATE:
- ☐ **Peat**
- ☒ **Leaf Litter**
- ☐ **Sand**
- ☐ **Gravel**
- ☐ **Cobble**
- ☒ **Mud/Muck**

DOMINANT VEGETATION WITHIN POOL:

Tsuga canadensis	*Acer rubrum*
Vaccinium corymbosum	*Fraxinus americana*
Pinus strobus	*Ilex verticillata*

__0__% of pool w/in maintained ROW __100__% of pool within forested area

Breeding Criteria Codes

1	**Breeding chorus**
2	**Egg masses**
3	**Frog tadpoles**
4	**Salamander larvae**
5	**Presence of adults**

	OBLIGATE SPECIES	CODE	QUANTITY
	Wood frog	2	5
	Spotted salamander		
	Jefferson salamander		
	Blue-spotted salamander		
	Spadefoot toad		
	Fingernail clams		
	Marbled salamander		
	Unidentified mole salamander		
	Fairy shrimp		

FACULTATIVE SPECIES:
- ☐ **Red-spotted newt adults**
- ☐ **Spotted turtles**
- ☐ **Blanding's turtles**
- ☐ **Painted turtles**
- ☐ **Snapping turtles**
- ☐ **Predacious diving beetles**
- ☒ **Fingernail clams**
- ☐ **Amphibious snails**
- ☐ **Spring peepers**
- ☐ **American toads**
- ☐ **Fowler's Toad**
- ☐ **Caddis fly case/larvae**
- ☐ **Dragonfly nymphs**
- ☐ **Damselfly nymphs**
- ☐ **Leeches**
- ☐ **Pickerel Frog**

Additional Species Observed:
None

Photo Documentation:
View Looking N of Pool
Wood frog egg mass

Conclusions / Comments:

☒ **Vernal Pool** ☐ **Amphibian Breeding Habitat**

CHARACTERISTICS OF ADJACENT VEGETATION:
(within 100-feet of pool edge)

_____% PSS **__60__% PFO** **_____% PEM**

__25__% UF **__10__% ROW** **_____% OFS**

__5__% Other / define: WCT33-VP1

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VERNAL POOL FIELD DATA SHEET
2014 FIELD SEASON

PROJECT	Connecticut Expansion		
DATE	April 30, 2014	**WEATHER CONDITIONS**	Raining (1.94"), 45°F
OBSERVERS	S. Egan, B. Morrill		

CHARACTERISTICS			
WETLAND #	WCT33-VP3	**LENGTH & WIDTH**	50'X60'
TOWN	Suffield, CT	**CLOSEST WETLAND FLAG**	#415
AVERAGE WATER DEPTH	24" (Max >3')	**COVER TYPE**	PEM (PSS) PFO

SUBSTRATE:
- ☐ **Peat**
- ☒ **Leaf Litter**
- ☐ **Sand**
- ☐ **Gravel**
- ☐ **Cobble**
- ☒ **Mud/Muck**

DOMINANT VEGETATION WITHIN POOL:

Alnus rugosa — *Acer rubrum*
Vaccinium corymbosum — *Cephalanthus occidentalis*
Lemna minor — *Ilex verticillata*

0 % of pool w/in maintained ROW 100 % of pool within forested area

Breeding Criteria Codes

1	**Breeding chorus**
2	**Egg masses**
3	**Frog tadpoles**
4	**Salamander larvae**
5	**Presence of adults**

	OBLIGATE SPECIES	CODE	QUANTITY
	Wood frog	2	2
	Spotted salamander		
	Jefferson salamander		
	Blue-spotted salamander		
	Spadefoot toad		
	Fingernail clams		
	Marbled salamander		
	Unidentified mole salamander		
	Fairy shrimp		

FACULTATIVE SPECIES:
- ☐ **Red-spotted newt adults**
- ☐ **Spotted turtles**
- ☐ **Blanding's turtles**
- ☐ **Painted turtles**
- ☐ **Snapping turtles**
- ☐ **Predacious diving beetles**
- ☐ **Dragonfly nymphs**
- ☒ **Amphibious snails**
- ☐ **Spring peepers**
- ☐ **American toads**
- ☐ **Fowler's Toad**
- ☒ **Caddis fly case/larvae**
- ☐ **Dragonfly nymphs**
- ☐ **Damselfly nymphs**
- ☐ **Leeches**
- ☐ **Pickerel Frog**

Additional Species Observed:
None

Photo Documentation:
View Looking E of Pool
Wood frog egg mass

Conclusions / Comments:

☒ **Vernal Pool** ☐ **Amphibian Breeding Habitat**

CHARACTERISTICS OF ADJACENT VEGETATION:
(within 100-feet of pool edge)

____% PSS **95 % PFO** **____% PEM**

____% UF **____% ROW** **____% OFS**

5 % Other / define: WCT33-VP4

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VERNAL POOL FIELD DATA SHEET
2014 FIELD SEASON

PROJECT	Connecticut Expansion		
DATE	April 30, 2014	**WEATHER CONDITIONS**	Raining (1.94"), 45°F
OBSERVERS	S. Egan, B. Morrill		

CHARACTERISTICS			
WETLAND #	WCT33-VP4	**LENGTH & WIDTH**	100'X25'
TOWN	Suffield, CT	**CLOSEST WETLAND FLAG**	#415
AVERAGE WATER DEPTH	24" (Max 3')	**COVER TYPE**	PEM PSS (PFO)

SUBSTRATE:
- ☐ **Peat**
- ☒ **Leaf Litter**
- ☐ **Sand**
- ☐ **Gravel**
- ☐ **Cobble**
- ☒ **Mud/Muck**

DOMINANT VEGETATION WITHIN POOL:

Nyssa sylvatica — *Acer rubrum*
Vaccinium corymbosum — *Tsuga canadensis*
Betula allaghaniensis — *Ilex verticillata*

__0__% of pool w/in maintained ROW __100__% of pool within forested area

Breeding Criteria Codes

1	**Breeding chorus**
2	**Egg masses**
3	**Frog tadpoles**
4	**Salamander larvae**
5	**Presence of adults**

	OBLIGATE SPECIES	CODE	QUANTITY
	Wood frog		
	Spotted salamander	2	1
	Jefferson salamander		
	Blue-spotted salamander		
	Spadefoot toad		
	Fingernail clams		
	Marbled salamander		
	Unidentified mole salamander		
	Fairy shrimp		

FACULTATIVE SPECIES:
- ☐ **Red-spotted newt adults**
- ☐ **Spotted turtles**
- ☐ **Blanding's turtles**
- ☐ **Painted turtles**
- ☐ **Snapping turtles**
- ☐ **Predacious diving beetles**
- ☐ **Dragonfly nymphs**
- ☐ **Amphibious snails**
- ☐ **Spring peepers**
- ☐ **American toads**
- ☐ **Fowler's Toad**
- ☐ **Caddis fly case/larvae**
- ☐ **Dragonfly nymphs**
- ☐ **Damselfly nymphs**
- ☐ **Leeches**
- ☐ **Pickerel Frog**

Additional Species Observed:
None

Photo Documentation:
View Looking E of Pool
Spotted Salamander egg mass

Conclusions / Comments:

☒ **Vernal Pool** ☐ **Amphibian Breeding Habitat**

CHARACTERISTICS OF ADJACENT VEGETATION:
(within 100-feet of pool edge)

_____% PSS **__95__% PFO** **_____% PEM**

_____% UF **_____% ROW** **_____% OFS**

__5__% Other / define: WCT33-VP3

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VERNAL POOL FIELD DATA SHEET
2014 FIELD SEASON

PROJECT	Connecticut Expansion		
DATE	April 30, 2014	**WEATHER CONDITIONS**	Raining (1.94"), 45°F
OBSERVERS	S. Egan, B. Morrill		

CHARACTERISTICS			
WETLAND #	WCT33-VP5	**LENGTH & WIDTH**	30'X40'
TOWN	Suffield, CT	**CLOSEST WETLAND FLAG**	#403
AVERAGE WATER DEPTH	24" (Max >3')	**COVER TYPE**	PEM PSS (PFO)

SUBSTRATE:
- ☐ **Peat**
- ☒ **Leaf Litter**
- ☐ **Sand**
- ☐ **Gravel**
- ☐ **Cobble**
- ☒ **Mud/Muck**

DOMINANT VEGETATION WITHIN POOL:

Nyssa sylvatica — *Acer rubrum*
Vaccinium corymbosum — *Tsuga canadensis*
Cephalanthus occidentails — *Ilex verticillata*

__0__% of pool w/in maintained ROW __100__% of pool within forested area

Breeding Criteria Codes

1	**Breeding chorus**
2	**Egg masses**
3	**Frog tadpoles**
4	**Salamander larvae**
5	**Presence of adults**

	OBLIGATE SPECIES	CODE	QUANTITY
	Wood frog	2/3	1/many
	Spotted salamander		
	Jefferson salamander		
	Blue-spotted salamander		
	Spadefoot toad		
	Fingernail clams		
	Marbled salamander		
	Unidentified mole salamander		
	Fairy shrimp		

FACULTATIVE SPECIES:
- ☐ **Red-spotted newt adults**
- ☐ **Spotted turtles**
- ☐ **Blanding's turtles**
- ☐ **Painted turtles**
- ☐ **Snapping turtles**
- ☐ **Predacious diving beetles**
- ☐ **Dragonfly nymphs**
- ☒ **Amphibious snails**
- ☐ **Spring peepers**
- ☐ **American toads**
- ☐ **Fowler's Toad**
- ☐ **Caddis fly case/larvae**
- ☐ **Dragonfly nymphs**
- ☐ **Damselfly nymphs**
- ☐ **Leeches**
- ☐ **Pickerel Frog**

Additional Species Observed:
None

Photo Documentation:
View Looking N of Pool
Wood frog tadpoles

Conclusions / Comments:

☒ **Vernal Pool** ☐ **Amphibian Breeding Habitat**

CHARACTERISTICS OF ADJACENT VEGETATION:
(within 100-feet of pool edge)

_____% PSS **__90__% PFO** **_____% PEM**

__5__% UF **__5__% ROW** **_____% OFS**

_____% Other / define:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VERNAL POOL FIELD DATA SHEET
2014 FIELD SEASON

PROJECT	Connecticut Expansion		
DATE	April 30, 2014	**WEATHER CONDITIONS**	Raining (1.94"), 45°F
OBSERVERS	S. Egan, B. Morrill		

CHARACTERISTICS			
WETLAND #	WCT33-VP6	**LENGTH & WIDTH**	30'X40'
TOWN	Suffield, CT	**CLOSEST WETLAND FLAG**	#405
AVERAGE WATER DEPTH	24" (Max >3')	**COVER TYPE**	PEM PSS (PFO)

SUBSTRATE:
- ☐ **Peat**
- ☒ **Leaf Litter**
- ☐ **Sand**
- ☐ **Gravel**
- ☐ **Cobble**
- ☒ **Mud/Muck**

DOMINANT VEGETATION WITHIN POOL:
Nyssa sylvatica *Acer rubrum*
Vaccinium corymbosum *Betula allaghaniensis*

__0__% of pool w/in maintained ROW __100__% of pool within forested area

Breeding Criteria Codes

1	**Breeding chorus**
2	**Egg masses**
3	**Frog tadpoles**
4	**Salamander larvae**
5	**Presence of adults**

	OBLIGATE SPECIES	CODE	QUANTITY
	Wood frog	2/3	2/many
	Spotted salamander	2	1
	Jefferson salamander		
	Blue-spotted salamander		
	Spadefoot toad		
	Fingernail clams		
	Marbled salamander		
	Unidentified mole salamander		
	Fairy shrimp		

FACULTATIVE SPECIES:
- ☐ **Red-spotted newt adults**
- ☐ **Spotted turtles**
- ☐ **Blanding's turtles**
- ☐ **Painted turtles**
- ☐ **Snapping turtles**
- ☐ **Predacious diving beetles**
- ☐ **Dragonfly nymphs**
- ☒ **Amphibious snails**
- ☐ **Spring peepers**
- ☐ **American toads**
- ☐ **Fowler's Toad**
- ☒ **Caddis fly case/larvae**
- ☐ **Dragonfly nymphs**
- ☐ **Damselfly nymphs**
- ☐ **Leeches**
- ☐ **Pickerel Frog**

Additional Species Observed:
None

Photo Documentation:
View Looking NE of Pool
Spotted Salamander egg mass

Conclusions / Comments:

☒ **Vernal Pool** ☐ **Amphibian Breeding Habitat**

CHARACTERISTICS OF ADJACENT VEGETATION:
(within 100-feet of pool edge)

__10__% PSS **__90__% PFO** **_____% PEM**

_____% UF **_____% ROW** **_____% OFS**

_____% Other / define:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VERNAL POOL FIELD DATA SHEET
2014 FIELD SEASON

PROJECT	Connecticut Expansion		
DATE	April 30, 2014	**WEATHER CONDITIONS**	Raining (1.94"), 45°F
OBSERVERS	S. Egan, B. Morrill		

CHARACTERISTICS			
WETLAND #	WCT34-VP1	**LENGTH & WIDTH**	40'X35'
TOWN	Suffield, CT	**CLOSEST WETLAND FLAG**	#102 & 205-206
AVERAGE WATER DEPTH	24" (Max >3')	**COVER TYPE**	PEM PSS (PFO)

SUBSTRATE:
- ☐ **Peat**
- ☒ **Leaf Litter**
- ☐ **Sand**
- ☐ **Gravel**
- ☐ **Cobble**
- ☒ **Mud/Muck**

DOMINANT VEGETATION WITHIN POOL:

Tsuga canadensis
Vaccinium corymbosum
Acer rubrum
Betula allaghaniensis
Sphagnum

__0__% of pool w/in maintained ROW __100__% of pool within forested area

Breeding Criteria Codes

1	**Breeding chorus**
2	**Egg masses**
3	**Frog tadpoles**
4	**Salamander larvae**
5	**Presence of adults**

	OBLIGATE SPECIES	CODE	QUANTITY
	Wood frog	2	3
	Spotted salamander	2	2
	Jefferson salamander		
	Blue-spotted salamander		
	Spadefoot toad		
	Fingernail clams		
	Marbled salamander		
	Unidentified mole salamander		
	Fairy shrimp		

FACULTATIVE SPECIES:
- ☐ **Red-spotted newt adults**
- ☐ **Spotted turtles**
- ☐ **Blanding's turtles**
- ☐ **Painted turtles**
- ☐ **Snapping turtles**
- ☐ **Predacious diving beetles**
- ☐ **Fingernail clams**
- ☐ **Amphibious snails**
- ☐ **Spring peepers**
- ☐ **American toads**
- ☐ **Fowler's Toad**
- ☐ **Caddis fly case/larvae**
- ☐ **Dragonfly nymphs**
- ☐ **Damselfly nymphs**
- ☐ **Leeches**
- ☐ **Pickerel Frog**

Additional Species Observed:
None

Photo Documentation:
View Looking E of Pool
Spotted salamander egg mass

Conclusions / Comments:

☒ **Vernal Pool** ☐ **Amphibian Breeding Habitat**

CHARACTERISTICS OF ADJACENT VEGETATION:
(within 100-feet of pool edge)

_____% PSS **__35__% PFO** **_____% PEM**

__60__% UF **_____% ROW** **_____% OFS**

__5__% Other / define: WCT34-VP2

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VERNAL POOL FIELD DATA SHEET
2014 FIELD SEASON

PROJECT	Connecticut Expansion		
DATE	April 30, 2014	**WEATHER CONDITIONS**	Raining (1.94"), 45°F
OBSERVERS	S. Egan, B. Morrill		

CHARACTERISTICS			
WETLAND #	WCT34-VP2	**LENGTH & WIDTH**	90'X45'
TOWN	Suffield, CT	**CLOSEST WETLAND FLAG**	#104-110
AVERAGE WATER DEPTH	24" (Max >3')	**COVER TYPE**	PEM PSS (PFO)

SUBSTRATE:
- ☐ **Peat**
- ☒ **Leaf Litter**
- ☐ **Sand**
- ☐ **Gravel**
- ☐ **Cobble**
- ☒ **Mud/Muck**

DOMINANT VEGETATION WITHIN POOL:

Tsuga canadensis — *Acer rubrum*
Vaccinium corymbosum — *Nyssa sylvatica*

__0__% of pool w/in maintained ROW __100__% of pool within forested area

Breeding Criteria Codes

1	**Breeding chorus**
2	**Egg masses**
3	**Frog tadpoles**
4	**Salamander larvae**
5	**Presence of adults**

	OBLIGATE SPECIES	CODE	QUANTITY
	Wood frog	3	many
	Spotted salamander	2	34
	Jefferson salamander		
	Blue-spotted salamander		
	Spadefoot toad		
	Fingernail clams		
	Marbled salamander		
	Unidentified mole salamander		
	Fairy shrimp		

FACULTATIVE SPECIES:
- ☐ **Red-spotted newt adults**
- ☐ **Spotted turtles**
- ☐ **Blanding's turtles**
- ☐ **Painted turtles**
- ☐ **Snapping turtles**
- ☐ **Predacious diving beetles**
- ☒ **Fingernail clams**
- ☐ **Amphibious snails**
- ☐ **Spring peepers**
- ☐ **American toads**
- ☐ **Fowler's Toad**
- ☒ **Caddis fly case/larvae**
- ☐ **Dragonfly nymphs**
- ☐ **Damselfly nymphs**
- ☐ **Leeches**
- ☐ **Pickerel Frog**

Additional Species Observed:
None

Photo Documentation:
View Looking NW of Pool
Spotted salamander egg mass

Conclusions / Comments:

☒ **Vernal Pool** ☐ **Amphibian Breeding Habitat**

CHARACTERISTICS OF ADJACENT VEGETATION:
(within 100-feet of pool edge)

_____% PSS **__25__% PFO** **_____% PEM**

__60__% UF **__10__% ROW** **_____% OFS**

__5__% Other / define: WCT34-VP1

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VERNAL POOL FIELD DATA SHEET
2014 FIELD SEASON

PROJECT	Connecticut Expansion		
DATE	April 30, 2014	**WEATHER CONDITIONS**	Raining (1.94"), 45°F
OBSERVERS	S. Egan, B. Morrill		

CHARACTERISTICS			
WETLAND #	WCT36-VP1	**LENGTH & WIDTH**	30'X45'
TOWN	Suffield, CT	**CLOSEST WETLAND FLAG**	#108
AVERAGE WATER DEPTH	18" (Max 3')	**COVER TYPE**	PEM PSS (PFO)

SUBSTRATE:
- ☐ **Peat**
- ☒ **Leaf Litter**
- ☐ **Sand**
- ☐ **Gravel**
- ☐ **Cobble**
- ☐ **Mud/Muck**

DOMINANT VEGETATION WITHIN POOL:
Osmunda cinnamomea, *Acer rubrum*, *Vaccinium corymbosum*, *Betula allaghaniensis*

0 % of pool w/in maintained ROW 100 % of pool within forested area

Breeding Criteria Codes

1	**Breeding chorus**
2	**Egg masses**
3	**Frog tadpoles**
4	**Salamander larvae**
5	**Presence of adults**

	OBLIGATE SPECIES	CODE	QUANTITY
	Wood frog	2	14
	Spotted salamander		
	Jefferson salamander		
	Blue-spotted salamander		
	Spadefoot toad		
	Fingernail clams		
	Marbled salamander		
	Unidentified mole salamander		
	Fairy shrimp		

FACULTATIVE SPECIES:
- ☐ **Red-spotted newt adults**
- ☐ **Spotted turtles**
- ☐ **Blanding's turtles**
- ☐ **Painted turtles**
- ☐ **Snapping turtles**
- ☐ **Predacious diving beetles**
- ☐ **Fingernail clams**
- ☐ **Amphibious snails**
- ☐ **Spring peepers**
- ☐ **American toads**
- ☐ **Fowler's Toad**
- ☒ **Caddis fly case/larvae**
- ☐ **Dragonfly nymphs**
- ☐ **Damselfly nymphs**
- ☐ **Leeches**
- ☐ **Pickerel Frog**

Additional Species Observed:
None

Photo Documentation:
View Looking E of Pool
Wood frog egg mass

Conclusions / Comments:

☒ **Vernal Pool** ☐ **Amphibian Breeding Habitat**

CHARACTERISTICS OF ADJACENT VEGETATION:
(within 100-feet of pool edge)

_____% PSS **99 % PFO** **_____% PEM**

_____% UF **1 % ROW** **_____% OFS**

_____% Other / define:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VERNAL POOL FIELD DATA SHEET
2014 FIELD SEASON

PROJECT	Connecticut Expansion		
DATE	May 1, 2014	**WEATHER CONDITIONS**	Raining, (0.89"), Overcast, 69°F
OBSERVERS	S. Egan, B. Morrill		

CHARACTERISTICS			
WETLAND #	WCT39-VP1	**LENGTH & WIDTH**	100'X40'
TOWN	Suffield, CT	**CLOSEST WETLAND FLAG**	#106-110
AVERAGE WATER DEPTH	18" (Max 3')	**COVER TYPE**	(PEM) PSS PFO

SUBSTRATE:
- ☐ **Peat**
- ☒ **Leaf Litter**
- ☐ **Sand**
- ☐ **Gravel**
- ☐ **Cobble**
- ☒ **Mud/Muck**

DOMINANT VEGETATION WITHIN POOL:

Onoclea sensibilis, *Vaccinium corymbosum*, *Carex stricta*, *Acer rubrum*, *Scirpus cyperinus*, *Cornus amomum*

100 % of pool w/in maintained ROW 0 % of pool within forested area

Breeding Criteria Codes

1	**Breeding chorus**
2	**Egg masses**
3	**Frog tadpoles**
4	**Salamander larvae**
5	**Presence of adults**

	OBLIGATE SPECIES	CODE	QUANTITY
	Wood frog	3	20+
	Spotted salamander		
	Jefferson salamander		
	Blue-spotted salamander		
	Spadefoot toad		
	Fingernail clams		
	Marbled salamander		
	Unidentified mole salamander		
	Fairy shrimp		

FACULTATIVE SPECIES:
- ☐ **Red-spotted newt adults**
- ☐ **Spotted turtles**
- ☐ **Blanding's turtles**
- ☐ **Painted turtles**
- ☐ **Snapping turtles**
- ☐ **Predacious diving beetles**
- ☐ **Fingernail clams**
- ☒ **Amphibious snails**
- ☒ **Spring peepers**
- ☐ **American toads**
- ☐ **Fowler's Toad**
- ☒ **Caddis fly case/larvae**
- ☒ **Dragonfly nymphs**
- ☐ **Damselfly nymphs**
- ☐ **Leeches**
- ☐ **Pickerel Frog**

Additional Species Observed:
None

Photo Documentation:
View Looking S of Pool

Conclusions / Comments:

☒ **Vernal Pool** ☐ **Amphibian Breeding Habitat**

CHARACTERISTICS OF ADJACENT VEGETATION:
(within 100-feet of pool edge)

____% PSS **2 % PFO** **____% PEM**

63 % UF **10 % ROW** **25 % OFS**

____% Other / define:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VERNAL POOL FIELD DATA SHEET
2014 FIELD SEASON

PROJECT	Connecticut Expansion		
DATE	May 1, 2014	**WEATHER CONDITIONS**	Raining, (0.89"), Overcast, 69°F
OBSERVERS	S. Egan, B. Morrill		

CHARACTERISTICS			
WETLAND #	WCT41-VP1	**LENGTH & WIDTH**	70'X40'
TOWN	Suffield, CT	**CLOSEST WETLAND FLAG**	#201
AVERAGE WATER DEPTH	12" (Max 2')	**COVER TYPE**	(PEM) PSS PFO

SUBSTRATE:
- ☐ **Peat**
- ☐ **Leaf Litter**
- ☐ **Sand**
- ☐ **Gravel**
- ☐ **Cobble**
- ☒ **Mud/Muck**

DOMINANT VEGETATION WITHIN POOL:
Onoclea sensibilis, *Acer rubrum*, *Alnus rugosa*, *Juncus effusus*, *Scirpus cyperinus*

0 % of pool w/in maintained ROW 100 % of pool within forested area

Breeding Criteria Codes

1	**Breeding chorus**
2	**Egg masses**
3	**Frog tadpoles**
4	**Salamander larvae**
5	**Presence of adults**

	OBLIGATE SPECIES	CODE	QUANTITY
	Wood frog	3	20+
	Spotted salamander	2	1
	Jefferson salamander		
	Blue-spotted salamander		
	Spadefoot toad		
	Fingernail clams		
	Marbled salamander		
	Unidentified mole salamander		
	Fairy shrimp		

FACULTATIVE SPECIES:
- ☐ **Red-spotted newt adults**
- ☐ **Spotted turtles**
- ☐ **Blanding's turtles**
- ☐ **Painted turtles**
- ☐ **Snapping turtles**
- ☐ **Predacious diving beetles**
- ☐ **Fingernail clams**
- ☒ **Amphibious snails**
- ☐ **Spring peepers**
- ☐ **American toads**
- ☐ **Fowler's Toad**
- ☒ **Caddis fly case/larvae**
- ☐ **Dragonfly nymphs**
- ☐ **Damselfly nymphs**
- ☐ **Leeches**
- ☐ **Pickerel Frog**

Additional Species Observed:
None

Photo Documentation:
View Looking NE of Pool
Wood frog tadpoles and spotted salamander egg mass

Conclusions / Comments:

☒ **Vernal Pool** ☐ **Amphibian Breeding Habitat**

CHARACTERISTICS OF ADJACENT VEGETATION:
(within 100-feet of pool edge)

_____% PSS **90 % PFO** **_____% PEM**

_____% UF **10 % ROW** **_____% OFS**

_____% Other / define:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VERNAL POOL FIELD DATA SHEET
2014 FIELD SEASON

PROJECT	Connecticut Expansion		
DATE	May 1, 2014	**WEATHER CONDITIONS**	Raining, (0.89"), Overcast, 69°F
OBSERVERS	S. Egan, B. Morrill		

CHARACTERISTICS			
WETLAND #	WCT41-VP2	**LENGTH & WIDTH**	60'X50'
TOWN	Suffield, CT	**CLOSEST WETLAND FLAG**	#193-196
AVERAGE WATER DEPTH	14" (Max 3')	**COVER TYPE**	PEM PSS (PFO)

SUBSTRATE:
- ☐ **Peat**
- ☐ **Leaf Litter**
- ☐ **Sand**
- ☐ **Gravel**
- ☐ **Cobble**
- ☒ **Mud/Muck**

DOMINANT VEGETATION WITHIN POOL:

Onoclea sensibilis
Ilex verticillata
Quercus palustris
Acer rubrum
Equisetum sp.
Carex sp.

__0__% of pool w/in maintained ROW __100__% of pool within forested area

Breeding Criteria Codes

1	**Breeding chorus**
2	**Egg masses**
3	**Frog tadpoles**
4	**Salamander larvae**
5	**Presence of adults**

	OBLIGATE SPECIES	CODE	QUANTITY
	Wood frog	2	1
	Spotted salamander		
	Jefferson salamander		
	Blue-spotted salamander		
	Spadefoot toad		
	Fingernail clams		
	Marbled salamander		
	Unidentified mole salamander		
	Fairy shrimp		

FACULTATIVE SPECIES:
- ☐ **Red-spotted newt adults**
- ☐ **Spotted turtles**
- ☐ **Blanding's turtles**
- ☐ **Painted turtles**
- ☐ **Snapping turtles**
- ☐ **Predacious diving beetles**
- ☐ **Fingernail clams**
- ☐ **Amphibious snails**
- ☐ **Spring peepers**
- ☐ **American toads**
- ☐ **Fowler's Toad**
- ☐ **Caddis fly case/larvae**
- ☐ **Dragonfly nymphs**
- ☐ **Damselfly nymphs**
- ☐ **Leeches**
- ☐ **Pickerel Frog**

Additional Species Observed:
None

Photo Documentation:
View Looking E of Pool

Conclusions / Comments:

☒ **Vernal Pool** ☐ **Amphibian Breeding Habitat**

CHARACTERISTICS OF ADJACENT VEGETATION:
(within 100-feet of pool edge)

_____% PSS **__80__% PFO** **_____% PEM**

_____% UF **__0__% ROW** **__10__% OFS**

__10__% Other / define: Dirt access/farm road

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VERNAL POOL FIELD DATA SHEET
2014 FIELD SEASON

PROJECT	Connecticut Expansion		
DATE	May 1, 2014	**WEATHER CONDITIONS**	Raining, (0.89"), Overcast, 69°F
OBSERVERS	S. Egan, B. Morrill		

CHARACTERISTICS			
WETLAND #	WCT45-VP1	**LENGTH & WIDTH**	175'X30'
TOWN	Suffield, CT	**CLOSEST WETLAND FLAG**	#402-405
AVERAGE WATER DEPTH	12" (Max 2')	**COVER TYPE**	PEM PSS (PFO)

SUBSTRATE:
- ☐ **Peat**
- ☒ **Leaf Litter**
- ☐ **Sand**
- ☐ **Gravel**
- ☐ **Cobble**
- ☒ **Mud/Muck**

DOMINANT VEGETATION WITHIN POOL:
Symplocarpus foetidus *Acer rubrum*
Carex stricta
Rhododendron viscosum

__0__% of pool w/in maintained ROW __100__% of pool within forested area

Breeding Criteria Codes

1	**Breeding chorus**
2	**Egg masses**
3	**Frog tadpoles**
4	**Salamander larvae**
5	**Presence of adults**

	OBLIGATE SPECIES	CODE	QUANTITY
	Wood frog	2/3	1/many
	Spotted salamander	2	7
	Jefferson salamander		
	Blue-spotted salamander		
	Spadefoot toad		
	Fingernail clams		
	Marbled salamander		
	Unidentified mole salamander		
	Fairy shrimp		

FACULTATIVE SPECIES:
- ☐ **Red-spotted newt adults**
- ☐ **Spotted turtles**
- ☐ **Blanding's turtles**
- ☐ **Painted turtles**
- ☐ **Snapping turtles**
- ☐ **Predacious diving beetles**
- ☐ **Fingernail clams**
- ☒ **Amphibious snails**
- ☐ **Spring peepers**
- ☐ **American toads**
- ☐ **Fowler's Toad**
- ☒ **Caddis fly case/larvae**
- ☐ **Dragonfly nymphs**
- ☐ **Damselfly nymphs**
- ☐ **Leeches**
- ☐ **Pickerel Frog**

Additional Species Observed:
None

Photo Documentation:
View Looking NW of Pool
Spotted salamander egg masses

Conclusions / Comments:

☒ **Vernal Pool** ☐ **Amphibian Breeding Habitat**

CHARACTERISTICS OF ADJACENT VEGETATION:
(within 100-feet of pool edge)

_____% PSS **__85__% PFO** **_____% PEM**

__15__% UF **__0__% ROW** **_____% OFS**

_____% Other / define:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VERNAL POOL FIELD DATA SHEET
2014 FIELD SEASON

PROJECT	Connecticut Expansion		
DATE	May 1, 2014	**WEATHER CONDITIONS**	Raining, (0.89"), Overcast, 69°F
OBSERVERS	S. Egan, B. Morrill		

CHARACTERISTICS			
WETLAND #	WCT45-VP2	**LENGTH & WIDTH**	100'X55'
TOWN	Suffield, CT	**CLOSEST WETLAND FLAG**	#202-214
AVERAGE WATER DEPTH	18" (Max >3')	**COVER TYPE**	PEM PSS (PFO)

SUBSTRATE:
- ☐ **Peat**
- ☒ **Leaf Litter**
- ☐ **Sand**
- ☐ **Gravel**
- ☐ **Cobble**
- ☒ **Mud/Muck**

DOMINANT VEGETATION WITHIN POOL:

Symplocarpus foetidus
Carex stricta
Rhododendron viscosum
Acer rubrum
Vaccinium corymbosum

__0__% of pool w/in maintained ROW __100__% of pool within forested area

Breeding Criteria Codes

1	**Breeding chorus**
2	**Egg masses**
3	**Frog tadpoles**
4	**Salamander larvae**
5	**Presence of adults**

	OBLIGATE SPECIES	CODE	QUANTITY
	Wood frog		
	Spotted salamander	2	26+
	Jefferson salamander		
	Blue-spotted salamander		
	Spadefoot toad		
	Fingernail clams		
	Marbled salamander		
	Unidentified mole salamander		
	Fairy shrimp		

FACULTATIVE SPECIES:
- ☐ **Red-spotted newt adults**
- ☐ **Spotted turtles**
- ☐ **Blanding's turtles**
- ☐ **Painted turtles**
- ☐ **Snapping turtles**
- ☐ **Predacious diving beetles**
- ☒ **Fingernail clams**
- ☐ **Amphibious snails**
- ☐ **Spring peepers**
- ☐ **American toads**
- ☐ **Fowler's Toad**
- ☒ **Caddis fly case/larvae**
- ☒ **Dragonfly nymphs**
- ☐ **Damselfly nymphs**
- ☐ **Leeches**
- ☐ **Pickerel Frog**

Additional Species Observed:
None

Photo Documentation:
View Looking W of Pool
Spotted salamander egg masses

Conclusions / Comments:

☒ **Vernal Pool** ☐ **Amphibian Breeding Habitat**

CHARACTERISTICS OF ADJACENT VEGETATION:
(within 100-feet of pool edge)

_____% PSS **__40__% PFO** **_____% PEM**

__57__% UF **__3__% ROW** **_____% OFS**

_____% Other / define:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VERNAL POOL FIELD DATA SHEET
2014 FIELD SEASON

PROJECT	Connecticut Expansion		
DATE	May 1, 2014	**WEATHER CONDITIONS**	Raining, (0.89"), Overcast, 69°F
OBSERVERS	S. Egan, B. Morrill		

CHARACTERISTICS			
WETLAND #	WCT46-VP1	**LENGTH & WIDTH**	100'X55'
TOWN	Suffield, CT	**CLOSEST WETLAND FLAG**	#404-405
AVERAGE WATER DEPTH	12" (Max 30")	**COVER TYPE**	PEM PSS (PFO)

SUBSTRATE:
- ☐ **Peat**
- ☒ **Leaf Litter**
- ☐ **Sand**
- ☐ **Gravel**
- ☐ **Cobble**
- ☒ **Mud/Muck**

DOMINANT VEGETATION WITHIN POOL:

Symplocarpus foetidus *Acer rubrum*
Quercus palustris *Vaccinium corymbosum*

__0__% of pool w/in maintained ROW __100__% of pool within forested area

Breeding Criteria Codes

1	**Breeding chorus**
2	**Egg masses**
3	**Frog tadpoles**
4	**Salamander larvae**
5	**Presence of adults**

	OBLIGATE SPECIES	CODE	QUANTITY
	Wood frog	3	Many
	Spotted salamander	2	3
	Jefferson salamander		
	Blue-spotted salamander		
	Spadefoot toad		
	Fingernail clams		
	Marbled salamander		
	Unidentified mole salamander		
	Fairy shrimp		

FACULTATIVE SPECIES:
- ☐ **Red-spotted newt adults**
- ☐ **Spotted turtles**
- ☐ **Blanding's turtles**
- ☐ **Painted turtles**
- ☐ **Snapping turtles**
- ☐ **Predacious diving beetles**
- ☒ **Fingernail clams**
- ☐ **Amphibious snails**
- ☐ **Spring peepers**
- ☐ **American toads**
- ☐ **Fowler's Toad**
- ☒ **Caddis fly case/larvae**
- ☐ **Dragonfly nymphs**
- ☐ **Damselfly nymphs**
- ☐ **Leeches**
- ☐ **Pickerel Frog**

Additional Species Observed:
None

Photo Documentation:
View Looking W of Pool

Conclusions / Comments:

☒ **Vernal Pool** ☐ **Amphibian Breeding Habitat**

CHARACTERISTICS OF ADJACENT VEGETATION:
(within 100-feet of pool edge)

_____% PSS **__96__% PFO** **_____% PEM**

__4__% UF **_____% ROW** **_____% OFS**

_____% Other / define:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VERNAL POOL FIELD DATA SHEET
2014 FIELD SEASON

PROJECT	Connecticut Expansion		
DATE	May 1, 2014	**WEATHER CONDITIONS**	Raining, (0.89"), Overcast, 69°F
OBSERVERS	S. Egan, B. Morrill		

CHARACTERISTICS			
WETLAND #	WCT46-VP2	**LENGTH & WIDTH**	120'X90'
TOWN	Suffield, CT	**CLOSEST WETLAND FLAG**	#225-231
AVERAGE WATER DEPTH	24" (Max >3')	**COVER TYPE**	PEM PSS (PFO)

SUBSTRATE:
- ☐ **Peat**
- ☒ **Leaf Litter**
- ☐ **Sand**
- ☐ **Gravel**
- ☐ **Cobble**
- ☒ **Mud/Muck**

DOMINANT VEGETATION WITHIN POOL:
Symplocarpus foetidus, *Acer rubrum*, *Ilex verticillata*, *Vaccinium corymbosum*

__0__% of pool w/in maintained ROW __100__% of pool within forested area

Breeding Criteria Codes

1	**Breeding chorus**
2	**Egg masses**
3	**Frog tadpoles**
4	**Salamander larvae**
5	**Presence of adults**

	OBLIGATE SPECIES	CODE	QUANTITY
	Wood frog		
	Spotted salamander	2	20+
	Jefferson salamander		
	Blue-spotted salamander		
	Spadefoot toad		
	Fingernail clams		
	Marbled salamander		
	Unidentified mole salamander		
	Fairy shrimp		

FACULTATIVE SPECIES:
- ☐ **Red-spotted newt adults**
- ☐ **Spotted turtles**
- ☐ **Blanding's turtles**
- ☐ **Painted turtles**
- ☐ **Snapping turtles**
- ☐ **Predacious diving beetles**
- ☐ **Fingernail clams**
- ☐ **Amphibious snails**
- ☐ **Spring peepers**
- ☐ **American toads**
- ☐ **Fowler's Toad**
- ☒ **Caddis fly case/larvae**
- ☐ **Dragonfly nymphs**
- ☐ **Damselfly nymphs**
- ☐ **Leeches**
- ☐ **Pickerel Frog**

Additional Species Observed:
None

Photo Documentation:
View Looking W of Pool
Spotted salamander egg masses

Conclusions / Comments:

☒ **Vernal Pool** ☐ **Amphibian Breeding Habitat**

CHARACTERISTICS OF ADJACENT VEGETATION:
(within 100-feet of pool edge)

_____% PSS **__35__% PFO** **_____% PEM**

__50__% UF **__15__% ROW** **_____% OFS**

_____% Other / define:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VERNAL POOL FIELD DATA SHEET
2014 FIELD SEASON

PROJECT	Connecticut Expansion		
DATE	May 1, 2014	**WEATHER CONDITIONS**	Raining, (0.89"), Overcast, 69°F
OBSERVERS	S. Egan, B. Morrill		

CHARACTERISTICS			
WETLAND #	WCT49-VP1	**LENGTH & WIDTH**	80'X80'
TOWN	Suffield, CT	**CLOSEST WETLAND FLAG**	#400-412
AVERAGE WATER DEPTH	24" (Max >3')	**COVER TYPE**	PEM (PSS) PFO

SUBSTRATE:
- ☐ **Peat**
- ☒ **Leaf Litter**
- ☐ **Sand**
- ☐ **Gravel**
- ☐ **Cobble**
- ☒ **Mud/Muck**

DOMINANT VEGETATION WITHIN POOL:
Cephalanthus occidentalis *Acer rubrum*
Ilex verticillata *Vaccinium corymbosum*

20 % of pool w/in maintained ROW 80 % of pool within forested area

Breeding Criteria Codes

1	**Breeding chorus**
2	**Egg masses**
3	**Frog tadpoles**
4	**Salamander larvae**
5	**Presence of adults**

	OBLIGATE SPECIES	CODE	QUANTITY
	Wood frog		
	Spotted salamander	2	12+
	Jefferson salamander		
	Blue-spotted salamander		
	Spadefoot toad		
	Fingernail clams		
	Marbled salamander		
	Unidentified mole salamander		
	Fairy shrimp		

FACULTATIVE SPECIES:
- ☐ **Red-spotted newt adults**
- ☐ **Spotted turtles**
- ☐ **Blanding's turtles**
- ☐ **Painted turtles**
- ☐ **Snapping turtles**
- ☐ **Predacious diving beetles**
- ☐ **Fingernail clams**
- ☐ **Amphibious snails**
- ☐ **Spring peepers**
- ☒ **American toads**
- ☐ **Fowler's Toad**
- ☒ **Caddis fly case/larvae**
- ☐ **Dragonfly nymphs**
- ☐ **Damselfly nymphs**
- ☐ **Leeches**
- ☐ **Pickerel Frog**

Additional Species Observed:
Ribbon Snake

Photo Documentation:
View Looking SE of Pool
Spotted salamander egg masses

Conclusions / Comments:

☒ **Vernal Pool** ☐ **Amphibian Breeding Habitat**

CHARACTERISTICS OF ADJACENT VEGETATION:
(within 100-feet of pool edge)

_____% PSS **_____% PFO** **_____% PEM**

23 % UF **15 % ROW** **50 % OFS**

12 % Other / define: Access Road, gravel/paved

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VERNAL POOL FIELD DATA SHEET
2014 FIELD SEASON

PROJECT	Connecticut Expansion		
DATE	May 1, 2014	**WEATHER CONDITIONS**	Raining, (0.89"), Overcast, 69°F
OBSERVERS	S. Egan, B. Morrill		

CHARACTERISTICS			
WETLAND #	WCT50B-VP1	**LENGTH & WIDTH**	60'X60'
TOWN	Suffield, CT	**CLOSEST WETLAND FLAG**	#307
AVERAGE WATER DEPTH	18" (Max 3')	**COVER TYPE**	PEM PSS (PFO)

SUBSTRATE:
- ☐ **Peat**
- ☒ **Leaf Litter**
- ☐ **Sand**
- ☐ **Gravel**
- ☐ **Cobble**
- ☒ **Mud/Muck**

DOMINANT VEGETATION WITHIN POOL:

Fagus grandifolia
Ilex verticillata
Fraxinus americana
Acer rubrum
Vaccinium corymbosum
Osmunda cinnamomea

0 % of pool w/in maintained ROW 100 % of pool within forested area

Breeding Criteria Codes

1	**Breeding chorus**
2	**Egg masses**
3	**Frog tadpoles**
4	**Salamander larvae**
5	**Presence of adults**

	OBLIGATE SPECIES	CODE	QUANTITY
	Wood frog	3	20+
	Spotted salamander	2	1
	Jefferson salamander		
	Blue-spotted salamander		
	Spadefoot toad		
	Fingernail clams		
	Marbled salamander		
	Unidentified mole salamander		
	Fairy shrimp		

FACULTATIVE SPECIES:
- ☐ **Red-spotted newt adults**
- ☐ **Spotted turtles**
- ☐ **Blanding's turtles**
- ☐ **Painted turtles**
- ☐ **Snapping turtles**
- ☐ **Predacious diving beetles**
- ☐ **Fingernail clams**
- ☐ **Amphibious snails**
- ☐ **Spring peepers**
- ☐ **American toads**
- ☐ **Fowler's Toad**
- ☐ **Caddis fly case/larvae**
- ☐ **Dragonfly nymphs**
- ☐ **Damselfly nymphs**
- ☐ **Leeches**
- ☐ **Pickerel Frog**

Additional Species Observed:
None

Photo Documentation:
View Looking NE of Pool
Spotted salamander egg mass

Conclusions / Comments:

☒ **Vernal Pool** ☐ **Amphibian Breeding Habitat**

CHARACTERISTICS OF ADJACENT VEGETATION:
(within 100-feet of pool edge)

_____% PSS **60 % PFO** **_____% PEM**

10 % UF **_____% ROW** **30 % OFS**

_____% Other / define:

VERNAL POOL FIELD DATA SHEET
2014 FIELD SEASON

PROJECT	Connecticut Expansion		
DATE	May 1, 2014	**WEATHER CONDITIONS**	Raining, (0.89"), Overcast, 69°F
OBSERVERS	S. Egan, B. Morrill		

CHARACTERISTICS			
WETLAND #	WCT50D-VP1	**LENGTH & WIDTH**	60'X60'
TOWN	Suffield, CT	**CLOSEST WETLAND FLAG**	#300-304
AVERAGE WATER DEPTH	24" (Max >3')	**COVER TYPE**	PEM PSS (PFO)

SUBSTRATE:
- ☐ **Peat**
- ☒ **Leaf Litter**
- ☐ **Sand**
- ☐ **Gravel**
- ☐ **Cobble**
- ☒ **Mud/Muck**

DOMINANT VEGETATION WITHIN POOL:
Nyssa sylvatica *Acer rubrum*
Ilex verticillata *Vaccinium corymbosum*

__0__% of pool w/in maintained ROW __100__% of pool within forested area

Breeding Criteria Codes

1	**Breeding chorus**
2	**Egg masses**
3	**Frog tadpoles**
4	**Salamander larvae**
5	**Presence of adults**

	OBLIGATE SPECIES	CODE	QUANTITY
	Wood frog	3	many
	Spotted salamander		
	Jefferson salamander		
	Blue-spotted salamander		
	Spadefoot toad		
	Fingernail clams		
	Marbled salamander		
	Unidentified mole salamander		
	Fairy shrimp		

FACULTATIVE SPECIES:
- ☐ **Red-spotted newt adults**
- ☐ **Spotted turtles**
- ☐ **Blanding's turtles**
- ☐ **Painted turtles**
- ☐ **Snapping turtles**
- ☐ **Predacious diving beetles**
- ☐ **Fingernail clams**
- ☐ **Amphibious snails**
- ☐ **Spring peepers**
- ☐ **American toads**
- ☐ **Fowler's Toad**
- ☒ **Caddis fly case/larvae**
- ☐ **Dragonfly nymphs**
- ☐ **Damselfly nymphs**
- ☐ **Leeches**
- ☐ **Pickerel Frog**

Additional Species Observed:
None

Photo Documentation:
View Looking S of Pool

Conclusions / Comments:

☒ **Vernal Pool** ☐ **Amphibian Breeding Habitat**

CHARACTERISTICS OF ADJACENT VEGETATION:
(within 100-feet of pool edge)

_____% PSS **__10__% PFO** **_____% PEM**

__15__% UF **_____% ROW** **__75__% OFS**

_____% Other / define:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VERNAL POOL FIELD DATA SHEET
2014 FIELD SEASON

PROJECT	Connecticut Expansion		
DATE	May 1, 2014	**WEATHER CONDITIONS**	Raining, (0.89"), Overcast, 69°F
OBSERVERS	S. Egan, B. Morrill		

CHARACTERISTICS			
WETLAND #	WCT51-VP1	**LENGTH & WIDTH**	80'X30'
TOWN	Suffield, CT	**CLOSEST WETLAND FLAG**	#104-107
AVERAGE WATER DEPTH	12" (Max 18")	**COVER TYPE**	PEM PSS (PFO)

SUBSTRATE:
- ☐ **Peat**
- ☒ **Leaf Litter**
- ☐ **Sand**
- ☐ **Gravel**
- ☐ **Cobble**
- ☒ **Mud/Muck**

DOMINANT VEGETATION WITHIN POOL:
Cornus amomum, *Acer rubrum*, *Ilex verticillata*, *Vaccinium corymbosum*, *Fraxinus americana*

0 % of pool w/in maintained ROW 100 % of pool within forested area

Breeding Criteria Codes

1	**Breeding chorus**
2	**Egg masses**
3	**Frog tadpoles**
4	**Salamander larvae**
5	**Presence of adults**

	OBLIGATE SPECIES	CODE	QUANTITY
	Wood frog		
	Spotted salamander	2	9
	Jefferson salamander		
	Blue-spotted salamander		
	Spadefoot toad		
	Fingernail clams		
	Marbled salamander		
	Unidentified mole salamander		
	Fairy shrimp		

FACULTATIVE SPECIES:
- ☐ **Red-spotted newt adults**
- ☐ **Spotted turtles**
- ☐ **Blanding's turtles**
- ☐ **Painted turtles**
- ☐ **Snapping turtles**
- ☐ **Predacious diving beetles**
- ☐ **Fingernail clams**
- ☐ **Amphibious snails**
- ☐ **Spring peepers**
- ☐ **American toads**
- ☐ **Fowler's Toad**
- ☐ **Caddis fly case/larvae**
- ☐ **Dragonfly nymphs**
- ☐ **Damselfly nymphs**
- ☐ **Leeches**
- ☐ **Pickerel Frog**

Additional Species Observed:
None

Photo Documentation:
View Looking SE of Pool
Spotted salamander egg mass

Conclusions / Comments:

☒ **Vernal Pool** ☐ **Amphibian Breeding Habitat**

CHARACTERISTICS OF ADJACENT VEGETATION:
(within 100-feet of pool edge)

____ % PSS **15 % PFO** **____ % PEM**

40 % UF **13 % ROW** **10 % OFS**

22 % Other / define: PEM/Open Ag Field

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VERNAL POOL FIELD DATA SHEET
2014 FIELD SEASON

PROJECT	Connecticut Expansion		
DATE	April 30, 2014	**WEATHER CONDITIONS**	Raining (1.94"), 45°F
OBSERVERS	S. Egan, B. Morrill		

CHARACTERISTICS			
WETLAND #	Near WCT32	**LENGTH & WIDTH**	46'X50'
TOWN	Suffield, CT	**CLOSEST WETLAND FLAG**	#300
AVERAGE WATER DEPTH	24" (Max 3.5')	**COVER TYPE**	PEM PSS (PFO)

SUBSTRATE:
- ☐ **Peat**
- ☒ **Leaf Litter**
- ☐ **Sand**
- ☐ **Gravel**
- ☐ **Cobble**
- ☒ **Mud/Muck**

DOMINANT VEGETATION WITHIN POOL:
Nyssa sylvatica *Acer rubrum*
Vaccinium corymbosum *Quercus bicolor*

45 % of pool w/in maintained ROW 55 % of pool within forested area

Breeding Criteria Codes

1	**Breeding chorus**
2	**Egg masses**
3	**Frog tadpoles**
4	**Salamander larvae**
5	**Presence of adults**

	OBLIGATE SPECIES	CODE	QUANTITY
	Wood frog	2/3	9/many
	Spotted salamander	2	6
	Jefferson salamander		
	Blue-spotted salamander		
	Spadefoot toad		
	Fingernail clams	5	many
	Marbled salamander		
	Unidentified mole salamander		
	Fairy shrimp		

FACULTATIVE SPECIES:
- ☐ **Red-spotted newt adults**
- ☐ **Spotted turtles**
- ☐ **Blanding's turtles**
- ☐ **Painted turtles**
- ☐ **Snapping turtles**
- ☐ **Predacious diving beetles**
- ☐ **Dragonfly nymphs**
- ☐ **Amphibious snails**
- ☐ **Spring peepers**
- ☐ **American toads**
- ☐ **Fowler's Toad**
- ☒ **Caddis fly case/larvae**
- ☐ **Dragonfly nymphs**
- ☐ **Damselfly nymphs**
- ☐ **Leeches**
- ☐ **Pickerel Frog**

Additional Species Observed:
None

Photo Documentation:
View NE of Pool
Spotted salamander egg masses

Conclusions / Comments:

☒ **Vernal Pool** ☐ **Amphibian Breeding Habitat**

CHARACTERISTICS OF ADJACENT VEGETATION:
(within 100-feet of pool edge)

____% PSS **39 % PFO** **____% PEM**

39 % UF **20 % ROW** **____% OFS**

2 % Other / define: WCT32-VP2

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VERNAL POOL FIELD DATA SHEET
2014 FIELD SEASON

PROJECT	Connecticut Expansion		
DATE	4/21/14	**WEATHER CONDITIONS**	45° F Full Sun
OBSERVERS	O'Sullivan/Stearns		

CHARACTERISTICS			
WETLAND #	VP WMA3-1	**LENGTH & WIDTH**	8x30'
TOWN	Sandisfield, MA	**CLOSEST WETLAND FLAG**	416
AVERAGE WATER DEPTH	8-10"	**COVER TYPE**	PFO

SUBSTRATE:
- ☐ **Peat**
- ☐ **Leaf Litter**
- ☐ **Sand**
- ☐ **Gravel**
- ☐ **Cobble**
- ☒ **Mud/Muck**

DOMINANT VEGETATION WITHIN POOL:
Tsuga canadensis, Acer rubrum, Oncolea sensibilis, Sambucus candensis*, *Typha latifolia

__0__% of pool w/in maintained ROW __100__% of pool within forested area

Breeding Criteria Codes

1	**Breeding chorus**
2	**Egg masses**
3	**Frog tadpoles**
4	**Salamander larvae**
5	**Presence of adults**

	OBLIGATE SPECIES	CODE	QUANTITY
	Wood frog		
	Spotted salamander	2	4
	Jefferson salamander		
	Blue-spotted salamander		
	Spadefoot toad		
	Fingernail clams		
	Marbled salamander		
	Unidentified mole salamander		
	Fairy shrimp		

FACULTATIVE SPECIES:
- ☐ **Red-spotted newt adults**
- ☐ **Spotted turtles**
- ☐ **Blanding's turtles**
- ☐ **Painted turtles**
- ☐ **Snapping turtles**
- ☐ **Predacious diving beetles**
- ☐ **Dragonfly nymphs**
- ☐ **Amphibious snails**
- ☐ **Spring peepers**
- ☐ **American toads**
- ☐ **Fowler's Toad**
- ☐ **Caddis fly case/larvae**
- ☐ **Dragonfly nymphs**
- ☐ **Damselfly nymphs**
- ☐ **Leeches**
- ☐ **Pickerel Frog**

Additional Species Observed: **None**

Photo Documentation: **Yes**

Conclusions / Comments:

☒ **Vernal Pool** ☐ **Amphibian Breeding Habitat**

CHARACTERISTICS OF ADJACENT VEGETATION:
(within 100-feet of pool edge)

_____% PSS **__50__% PFO** **_____% PEM**

__20__% UF **_____% ROW** **_____% OFS**

__30__% Other / define: Town Hill Road and above ground gas line facility

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VERNAL POOL FIELD DATA SHEET
2014 FIELD SEASON

PROJECT	Connecticut Expansion		
DATE	4/21/14	**WEATHER CONDITIONS**	45° F Full Sun
OBSERVERS	O'Sullivan/Stearns		

CHARACTERISTICS			
WETLAND #	VP WMA3-2	**LENGTH & WIDTH**	10x50'
TOWN	Sandisfield, MA	**CLOSEST WETLAND FLAG**	406
AVERAGE WATER DEPTH	8-14"	**COVER TYPE**	PFO PEM

SUBSTRATE:
- ☐ **Peat**
- ☐ **Leaf Litter**
- ☐ **Sand**
- ☐ **Gravel**
- ☐ **Cobble**
- ☒ **Mud/Muck**

DOMINANT VEGETATION WITHIN POOL:
Tsuga canadensis, Acer rubrum, Oncolea sensibilis, Sambucus candensis*, *Typha latifolia, Carex spp.

30 % of pool w/in maintained ROW 70 % of pool within forested area

Breeding Criteria Codes

1	**Breeding chorus**
2	**Egg masses**
3	**Frog tadpoles**
4	**Salamander larvae**
5	**Presence of adults**

	OBLIGATE SPECIES	CODE	QUANTITY
	Wood frog		
	Spotted salamander	2	4
	Jefferson salamander		
	Blue-spotted salamander		
	Spadefoot toad		
	Fingernail clams		
	Marbled salamander		
	Unidentified mole salamander		
	Fairy shrimp		

FACULTATIVE SPECIES:
- ☐ **Red-spotted newt adults**
- ☐ **Spotted turtles**
- ☐ **Blanding's turtles**
- ☐ **Painted turtles**
- ☐ **Snapping turtles**
- ☐ **Predacious diving beetles**
- ☐ **Dragonfly nymphs**
- ☐ **Amphibious snails**
- ☐ **Spring peepers**
- ☐ **American toads**
- ☐ **Fowler's Toad**
- ☐ **Caddis fly case/larvae**
- ☐ **Dragonfly nymphs**
- ☐ **Damselfly nymphs**
- ☐ **Leeches**
- ☐ **Pickerel Frog**

Additional Species Observed: **None**

Photo Documentation: **Yes**

Conclusions / Comments:

☒ **Vernal Pool** ☐ **Amphibian Breeding Habitat**

CHARACTERISTICS OF ADJACENT VEGETATION:
(within 100-feet of pool edge)

_____% PSS **30 % PFO** **10 % PEM**

20 % UF **_____% ROW** **20 % OFS**

20 % Other / define: Above ground gas line facility

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VERNAL POOL FIELD DATA SHEET
2014 FIELD SEASON

PROJECT	Connecticut Expansion		
DATE	4/21/14	**WEATHER CONDITIONS**	50° F Full Sun
OBSERVERS	O'Sullivan/Stearns		

CHARACTERISTICS			
WETLAND #	VP WMA5-1	**LENGTH & WIDTH**	8x15'
TOWN	Sandisfield, MA	**CLOSEST WETLAND FLAG**	306
AVERAGE WATER DEPTH	6-8"	**COVER TYPE**	PFO

SUBSTRATE:
- ☐ **Peat**
- ☐ **Leaf Litter**
- ☐ **Sand**
- ☐ **Gravel**
- ☐ **Cobble**
- ☒ **Mud/Muck**

DOMINANT VEGETATION WITHIN POOL:
Tsuga canadensis, Acer rubrum, Betula alleghaniensis, Osmunda cinnamomea, Oncolea sensibilis, Dryopteris sp.

__0__% of pool w/in maintained ROW __100__% of pool within forested area

Breeding Criteria Codes

1	**Breeding chorus**
2	**Egg masses**
3	**Frog tadpoles**
4	**Salamander larvae**
5	**Presence of adults**

	OBLIGATE SPECIES	CODE	QUANTITY
	Wood frog		
	Spotted salamander	2	3
	Jefferson salamander		
	Blue-spotted salamander		
	Spadefoot toad		
	Fingernail clams		
	Marbled salamander		
	Unidentified mole salamander		
	Fairy shrimp		

FACULTATIVE SPECIES:
- ☐ **Red-spotted newt adults**
- ☐ **Spotted turtles**
- ☐ **Blanding's turtles**
- ☐ **Painted turtles**
- ☐ **Snapping turtles**
- ☐ **Predacious diving beetles**
- ☐ **Dragonfly nymphs**
- ☐ **Amphibious snails**
- ☐ **Spring peepers**
- ☐ **American toads**
- ☐ **Fowler's Toad**
- ☐ **Caddis fly case/larvae**
- ☐ **Dragonfly nymphs**
- ☐ **Damselfly nymphs**
- ☐ **Leeches**
- ☐ **Pickerel Frog**

Additional Species Observed: None

Photo Documentation: Yes

Conclusions / Comments:

☒ **Vernal Pool** ☐ **Amphibian Breeding Habitat**

CHARACTERISTICS OF ADJACENT VEGETATION:
(within 100-feet of pool edge)

_____% PSS **__70__% PFO** **_____% PEM**

__20__% UF **__10__% ROW** **_____% OFS**

_____% Other / define:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VERNAL POOL FIELD DATA SHEET
2014 FIELD SEASON

PROJECT	Connecticut Expansion		
DATE	4/21/14	**WEATHER CONDITIONS**	50° F Full Sun
OBSERVERS	O'Sullivan/Stearns		

CHARACTERISTICS			
WETLAND #	VP WMA6-1	**LENGTH & WIDTH**	10x40'
TOWN	Sandisfield, MA	**CLOSEST WETLAND FLAG**	312
AVERAGE WATER DEPTH	6-8"	**COVER TYPE**	PEM

SUBSTRATE:
- ☐ **Peat**
- ☐ **Leaf Litter**
- ☐ **Sand**
- ☐ **Gravel**
- ☐ **Cobble**
- ☒ **Mud/Muck**

DOMINANT VEGETATION WITHIN POOL:
Phragmites australis, Carex spp., Spiraea latifolia, Spiraea tomentosa, Oncolea sensibilis,

100 % of pool w/in maintained ROW 0 % of pool within forested area

Breeding Criteria Codes

1	**Breeding chorus**
2	**Egg masses**
3	**Frog tadpoles**
4	**Salamander larvae**
5	**Presence of adults**

	OBLIGATE SPECIES	CODE	QUANTITY
	Wood frog	2	2
	Spotted salamander	2	3
	Jefferson salamander		
	Blue-spotted salamander		
	Spadefoot toad		
	Fingernail clams		
	Marbled salamander		
	Unidentified mole salamander		
	Fairy shrimp		

FACULTATIVE SPECIES:
- ☐ **Red-spotted newt adults**
- ☐ **Spotted turtles**
- ☐ **Blanding's turtles**
- ☐ **Painted turtles**
- ☐ **Snapping turtles**
- ☐ **Predacious diving beetles**
- ☐ **Dragonfly nymphs**
- ☐ **Amphibious snails**
- ☒ **Spring peepers**
- ☐ **American toads**
- ☐ **Fowler's Toad**
- ☐ **Caddis fly case/larvae**
- ☐ **Dragonfly nymphs**
- ☐ **Damselfly nymphs**
- ☐ **Leeches**
- ☐ **Pickerel Frog**

Additional Species Observed: **None**

Photo Documentation: **Yes**

Conclusions / Comments:

☒ **Vernal Pool** ☐ **Amphibian Breeding Habitat**

CHARACTERISTICS OF ADJACENT VEGETATION:
(within 100-feet of pool edge)

_____% PSS **20 % PFO** **20 % PEM**

20 % UF **_____% ROW** **40 % OFS**

_____% Other / define:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VERNAL POOL FIELD DATA SHEET
2014 FIELD SEASON

PROJECT	Connecticut Expansion		
DATE	4/21/14	**WEATHER CONDITIONS**	55° F Full Sun
OBSERVERS	O'Sullivan/Stearns		

CHARACTERISTICS			
WETLAND #	VP WMA7-1	**LENGTH & WIDTH**	10x15'
TOWN	Sandisfield, MA	**CLOSEST WETLAND FLAG**	123
AVERAGE WATER DEPTH	6-8"	**COVER TYPE**	PEM

SUBSTRATE:
- ☐ **Peat**
- ☐ **Leaf Litter**
- ☐ **Sand**
- ☐ **Gravel**
- ☐ **Cobble**
- ☒ **Mud/Muck**

DOMINANT VEGETATION WITHIN POOL:
Carex spp. **Pool mostly un-vegetated**

_100_ % of pool w/in maintained ROW _0_ % of pool within forested area

Breeding Criteria Codes

1	**Breeding chorus**
2	**Egg masses**
3	**Frog tadpoles**
4	**Salamander larvae**
5	**Presence of adults**

	OBLIGATE SPECIES	CODE	QUANTITY
	Wood frog	2	6
	Spotted salamander	2	1
	Jefferson salamander		
	Blue-spotted salamander		
	Spadefoot toad		
	Fingernail clams		
	Marbled salamander		
	Unidentified mole salamander		
	Fairy shrimp		

FACULTATIVE SPECIES:
- ☐ **Red-spotted newt adults**
- ☐ **Spotted turtles**
- ☐ **Blanding's turtles**
- ☐ **Painted turtles**
- ☐ **Snapping turtles**
- ☐ **Predacious diving beetles**
- ☐ **Dragonfly nymphs**
- ☐ **Amphibious snails**
- ☐ **Spring peepers**
- ☐ **American toads**
- ☐ **Fowler's Toad**
- ☐ **Caddis fly case/larvae**
- ☐ **Dragonfly nymphs**
- ☐ **Damselfly nymphs**
- ☐ **Leeches**
- ☐ **Pickerel Frog**

Additional Species Observed: **Water striders**

Photo Documentation: **Yes**

Conclusions / Comments:

☒ **Vernal Pool** ☐ **Amphibian Breeding Habitat**

CHARACTERISTICS OF ADJACENT VEGETATION:
(within 100-feet of pool edge)

_____% PSS **_20_ % PFO** **_40_ % PEM**

_20_ % UF **_____% ROW** **_20_ % OFS**

_____% Other / define:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VERNAL POOL FIELD DATA SHEET
2014 FIELD SEASON

PROJECT	Connecticut Expansion		
DATE	4/21/14	**WEATHER CONDITIONS**	60° F Full Sun
OBSERVERS	O'Sullivan/Stearns		

CHARACTERISTICS			
WETLAND #	VP WMA7-2	**LENGTH & WIDTH**	700x10-100'
TOWN	Sandisfield, MA	**CLOSEST WETLAND FLAG**	104
AVERAGE WATER DEPTH	8-20"	**COVER TYPE**	PEM

SUBSTRATE:
- ☐ **Peat**
- ☐ **Leaf Litter**
- ☐ **Sand**
- ☐ **Gravel**
- ☐ **Cobble**
- ☒ **Mud/Muck**

DOMINANT VEGETATION WITHIN POOL:
***Typha latifolia*, *Phragmites australis*, *Carex spp.*,**
Sphagnum sp., Juncus effusus, Vaccinium corymbosum

100 % of pool w/in maintained ROW 0 % of pool within forested area

Breeding Criteria Codes

1	**Breeding chorus**
2	**Egg masses**
3	**Frog tadpoles**
4	**Salamander larvae**
5	**Presence of adults**

	OBLIGATE SPECIES	CODE	QUANTITY
	Wood frog	2	450-500
	Spotted salamander	2	6
	Jefferson salamander		
	Blue-spotted salamander		
	Spadefoot toad		
	Fingernail clams		
	Marbled salamander		
	Unidentified mole salamander		
	Fairy shrimp		

FACULTATIVE SPECIES:
- ☒ **Red-spotted newt adults**
- ☐ **Spotted turtles**
- ☐ **Blanding's turtles**
- ☐ **Painted turtles**
- ☐ **Snapping turtles**
- ☐ **Predacious diving beetles**
- ☐ **Dragonfly nymphs**
- ☐ **Amphibious snails**
- ☒ **Spring peepers**
- ☐ **American toads**
- ☐ **Fowler's Toad**
- ☐ **Caddis fly case/larvae**
- ☐ **Dragonfly nymphs**
- ☐ **Damselfly nymphs**
- ☐ **Leeches**
- ☐ **Pickerel Frog**

Additional Species Observed: **Water striders**

Photo Documentation: **Yes**

Conclusions / Comments:

☒ **Vernal Pool** ☐ **Amphibian Breeding Habitat**

CHARACTERISTICS OF ADJACENT VEGETATION:
(within 100-feet of pool edge)

_____% PSS **60 % PFO** **20 % PEM**

10 % UF **_____% ROW** **10 % OFS**

_____% Other / define:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VERNAL POOL FIELD DATA SHEET
2014 FIELD SEASON

PROJECT	Connecticut Expansion		
DATE	4/21/14	**WEATHER CONDITIONS**	60° F Full Sun
OBSERVERS	O'Sullivan/Stearns		

CHARACTERISTICS			
WETLAND #	VP WMA7-3	**LENGTH & WIDTH**	30x60'
TOWN	Sandisfield, MA	**CLOSEST WETLAND FLAG**	276
AVERAGE WATER DEPTH	8-12"	**COVER TYPE**	PFO/PEM

SUBSTRATE:
- ☐ **Peat**
- ☐ **Leaf Litter**
- ☐ **Sand**
- ☐ **Gravel**
- ☐ **Cobble**
- ☒ **Mud/Muck**

DOMINANT VEGETATION WITHIN POOL:
***Tsuga canadensis*, *Acer rubrum*, *Carex spp.*,**
Sphagnum sp., Juncus effusus, Vaccinium corymbosum

__70__% of pool w/in maintained ROW __30__% of pool within forested area

Breeding Criteria Codes

1	**Breeding chorus**
2	**Egg masses**
3	**Frog tadpoles**
4	**Salamander larvae**
5	**Presence of adults**

	OBLIGATE SPECIES	CODE	QUANTITY
	Wood frog	2	3
	Spotted salamander	2	4
	Jefferson salamander		
	Blue-spotted salamander		
	Spadefoot toad		
	Fingernail clams		
	Marbled salamander		
	Unidentified mole salamander		
	Fairy shrimp		

FACULTATIVE SPECIES:
- ☒ **Red-spotted newt adults**
- ☐ **Spotted turtles**
- ☐ **Blanding's turtles**
- ☐ **Painted turtles**
- ☐ **Snapping turtles**
- ☐ **Predacious diving beetles**
- ☐ **Dragonfly nymphs**
- ☐ **Amphibious snails**
- ☐ **Spring peepers**
- ☐ **American toads**
- ☐ **Fowler's Toad**
- ☐ **Caddis fly case/larvae**
- ☐ **Dragonfly nymphs**
- ☐ **Damselfly nymphs**
- ☐ **Leeches**
- ☐ **Pickerel Frog**

Additional Species Observed: **Water striders**

Photo Documentation: **Yes**

Conclusions / Comments:

☒ **Vernal Pool** ☐ **Amphibian Breeding Habitat**

CHARACTERISTICS OF ADJACENT VEGETATION:
(within 100-feet of pool edge)

_____% PSS **__50__% PFO** **__30__% PEM**

__20__% UF **_____% ROW** **_____% OFS**

_____% Other / define:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VERNAL POOL FIELD DATA SHEET
2014 FIELD SEASON

PROJECT	Connecticut Expansion		
DATE	4/21/14	**WEATHER CONDITIONS**	65° F Full Sun
OBSERVERS	O'Sullivan/Stearns		

CHARACTERISTICS			
WETLAND #	VP WMA7-4	**LENGTH & WIDTH**	100x20'
TOWN	Sandisfield, MA	**CLOSEST WETLAND FLAG**	274
AVERAGE WATER DEPTH	6-8"	**COVER TYPE**	PEM

SUBSTRATE:
- ☐ **Peat**
- ☐ **Leaf Litter**
- ☐ **Sand**
- ☐ **Gravel**
- ☐ **Cobble**
- ☒ **Mud/Muck**

DOMINANT VEGETATION WITHIN POOL:
Carex spp.,Alisma plantago, Sphagnum sp., Juncus effusus

100 % of pool w/in maintained ROW 0 % of pool within forested area

Breeding Criteria Codes

1	**Breeding chorus**
2	**Egg masses**
3	**Frog tadpoles**
4	**Salamander larvae**
5	**Presence of adults**

	OBLIGATE SPECIES	CODE	QUANTITY
	Wood frog	2	12
	Spotted salamander	2	3
	Jefferson salamander		
	Blue-spotted salamander		
	Spadefoot toad		
	Fingernail clams		
	Marbled salamander		
	Unidentified mole salamander		
	Fairy shrimp		

FACULTATIVE SPECIES:
- ☒ **Red-spotted newt adults**
- ☐ **Spotted turtles**
- ☐ **Blanding's turtles**
- ☐ **Painted turtles**
- ☐ **Snapping turtles**
- ☐ **Predacious diving beetles**
- ☐ **Dragonfly nymphs**
- ☐ **Amphibious snails**
- ☐ **Spring peepers**
- ☐ **American toads**
- ☐ **Fowler's Toad**
- ☐ **Caddis fly case/larvae**
- ☐ **Dragonfly nymphs**
- ☐ **Damselfly nymphs**
- ☐ **Leeches**
- ☐ **Pickerel Frog**

Additional Species Observed: **Water striders**

Photo Documentation: **Yes**

Conclusions / Comments: **15-20 Spermatophores observed.**

☒ **Vernal Pool** ☐ **Amphibian Breeding Habitat**

CHARACTERISTICS OF ADJACENT VEGETATION:
(within 100-feet of pool edge)

_____% PSS **40 % PFO** **10 % PEM**

40 % UF **_____% ROW** **10 % OFS**

_____% Other / define:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VERNAL POOL FIELD DATA SHEET
2014 FIELD SEASON

PROJECT	Connecticut Expansion		
DATE	4/21/14	**WEATHER CONDITIONS**	65° F Full Sun
OBSERVERS	O'Sullivan/Stearns		

CHARACTERISTICS			
WETLAND #	VP WMA7-5	**LENGTH & WIDTH**	60x30'
TOWN	Sandisfield, MA	**CLOSEST WETLAND FLAG**	267
AVERAGE WATER DEPTH	8-14"	**COVER TYPE**	PEM

SUBSTRATE:
- ☐ **Peat**
- ☐ **Leaf Litter**
- ☐ **Sand**
- ☐ **Gravel**
- ☐ **Cobble**
- ☒ **Mud/Muck**

DOMINANT VEGETATION WITHIN POOL:
Carex spp.,Alisma plantago,
Sphagnum sp., Juncus effusus

100 % of pool w/in maintained ROW 0 % of pool within forested area

Breeding Criteria Codes

1	**Breeding chorus**
2	**Egg masses**
3	**Frog tadpoles**
4	**Salamander larvae**
5	**Presence of adults**

	OBLIGATE SPECIES	CODE	QUANTITY
	Wood frog	2	30-35
	Spotted salamander	2/5	3/1
	Jefferson salamander		
	Blue-spotted salamander		
	Spadefoot toad		
	Fingernail clams		
	Marbled salamander		
	Unidentified mole salamander		
	Fairy shrimp		

FACULTATIVE SPECIES:
- ☒ **Red-spotted newt adults**
- ☐ **Spotted turtles**
- ☐ **Blanding's turtles**
- ☐ **Painted turtles**
- ☐ **Snapping turtles**
- ☐ **Predacious diving beetles**
- ☐ **Dragonfly nymphs**
- ☐ **Amphibious snails**
- ☒ **Spring peepers**
- ☐ **American toads**
- ☐ **Fowler's Toad**
- ☐ **Caddis fly case/larvae**
- ☐ **Dragonfly nymphs**
- ☐ **Damselfly nymphs**
- ☐ **Leeches**
- ☐ **Pickerel Frog**

Additional Species Observed: **Water striders**

Photo Documentation: **Yes**

Conclusions / Comments:

☒ **Vernal Pool** ☐ **Amphibian Breeding Habitat**

CHARACTERISTICS OF ADJACENT VEGETATION:
(within 100-feet of pool edge)

_____% PSS **30 % PFO** **20 % PEM**

40 % UF **_____% ROW** **10 % OFS**

_____% Other / define:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VERNAL POOL FIELD DATA SHEET
2014 FIELD SEASON

PROJECT	Connecticut Expansion		
DATE	4/21/14	**WEATHER CONDITIONS**	65° F Full Sun
OBSERVERS	O'Sullivan/Stearns		

CHARACTERISTICS			
WETLAND #	VP WMA7-6	**LENGTH & WIDTH**	150x35'
TOWN	Sandisfield, MA	**CLOSEST WETLAND FLAG**	258
AVERAGE WATER DEPTH	6-18"	**COVER TYPE**	PSS PEM

SUBSTRATE:
- ☐ **Peat**
- ☐ **Leaf Litter**
- ☐ **Sand**
- ☐ **Gravel**
- ☐ **Cobble**
- ☒ **Mud/Muck**

DOMINANT VEGETATION WITHIN POOL:
Pinus strobus, Tsuga Canadensis*, *Vaccinium corymbosum,
Alisma plantago, Typha latifolia, Sphagnum sp., Juncus effusus

__10__% of pool w/in maintained ROW __90__% of pool within forested area

Breeding Criteria Codes

1	**Breeding chorus**
2	**Egg masses**
3	**Frog tadpoles**
4	**Salamander larvae**
5	**Presence of adults**

	OBLIGATE SPECIES	CODE	QUANTITY
	Wood frog	2	7
	Spotted salamander	2	6
	Jefferson salamander		
	Blue-spotted salamander		
	Spadefoot toad		
	Fingernail clams		
	Marbled salamander		
	Unidentified mole salamander		
	Fairy shrimp		

FACULTATIVE SPECIES:
- ☒ **Red-spotted newt adults**
- ☐ **Spotted turtles**
- ☐ **Blanding's turtles**
- ☐ **Painted turtles**
- ☐ **Snapping turtles**
- ☐ **Predacious diving beetles**
- ☐ **Dragonfly nymphs**
- ☐ **Amphibious snails**
- ☒ **Spring peepers**
- ☐ **American toads**
- ☐ **Fowler's Toad**
- ☐ **Caddis fly case/larvae**
- ☐ **Dragonfly nymphs**
- ☐ **Damselfly nymphs**
- ☐ **Leeches**
- ☐ **Pickerel Frog**

Additional Species Observed: **Water striders**
Finger nail clams

Photo Documentation: **Yes**

Conclusions / Comments:

☒ **Vernal Pool** ☐ **Amphibian Breeding Habitat**

CHARACTERISTICS OF ADJACENT VEGETATION:
(within 100-feet of pool edge)

_____% PSS **__30__% PFO** **__10__% PEM**

__50__% UF **_____% ROW** **__10__% OFS**

_____% Other / define:

VERNAL POOL FIELD DATA SHEET
2014 FIELD SEASON

PROJECT	Connecticut Expansion		
DATE	4/21/14	**WEATHER CONDITIONS**	65° F Full Sun
OBSERVERS	O'Sullivan/Stearns		

CHARACTERISTICS			
WETLAND #	MA CVP 1	**LENGTH & WIDTH**	20x40'
TOWN	Sandisfield, MA	**CLOSEST WETLAND FLAG**	Area not flagged as wetland
AVERAGE WATER DEPTH	24-36"	**COVER TYPE**	PFO

SUBSTRATE:
- ☐ **Peat**
- ☒ **Leaf Litter**
- ☐ **Sand**
- ☐ **Gravel**
- ☐ **Cobble**
- ☐ **Mud/Muck**

DOMINANT VEGETATION WITHIN POOL:
Pool un-vegetated with boulders and upland soil

__0__% of pool w/in maintained ROW __100__% of pool within forested area

Breeding Criteria Codes

1	**Breeding chorus**
2	**Egg masses**
3	**Frog tadpoles**
4	**Salamander larvae**
5	**Presence of adults**

	OBLIGATE SPECIES	CODE	QUANTITY
	Wood frog	2	1
	Spotted salamander	2	4
	Jefferson salamander		
	Blue-spotted salamander		
	Spadefoot toad		
	Fingernail clams		
	Marbled salamander		
	Unidentified mole salamander		
	Fairy shrimp		

FACULTATIVE SPECIES:
- ☐ **Red-spotted newt adults**
- ☐ **Spotted turtles**
- ☐ **Blanding's turtles**
- ☐ **Painted turtles**
- ☐ **Snapping turtles**
- ☒ **Predacious diving beetles**
- ☐ **Dragonfly nymphs**
- ☐ **Amphibious snails**
- ☐ **Spring peepers**
- ☐ **American toads**
- ☐ **Fowler's Toad**
- ☐ **Caddis fly case/larvae**
- ☐ **Dragonfly nymphs**
- ☐ **Damselfly nymphs**
- ☐ **Leeches**
- ☐ **Pickerel Frog**

Additional Species Observed:

Photo Documentation: Yes

Conclusions / Comments: Area formed due to grading from initial pipeline construction and is manmade. No hydric soil or wetland plant community present.

☒ **Vernal Pool** ☐ **Amphibian Breeding Habitat**

CHARACTERISTICS OF ADJACENT VEGETATION:
(within 100-feet of pool edge)

_____% PSS **_____% PFO** **_____% PEM**

__80__% UF **_____% ROW** **__20__% OFS**

_____% Other / define:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VERNAL POOL FIELD DATA SHEET
2014 FIELD SEASON

PROJECT	Connecticut Expansion		
DATE	4/23/14	**WEATHER CONDITIONS**	45° F Cloudy
OBSERVERS	O'Sullivan/Stearns		

CHARACTERISTICS			
WETLAND #	VP WMA12-1	**LENGTH & WIDTH**	10x4'
TOWN	Sandisfield, MA	**CLOSEST WETLAND FLAG**	205
AVERAGE WATER DEPTH	6-10"	**COVER TYPE**	PEM

SUBSTRATE:
- ☐ **Peat**
- ☐ **Leaf Litter**
- ☐ **Sand**
- ☐ **Gravel**
- ☐ **Cobble**
- ☒ **Mud/Muck**

DOMINANT VEGETATION WITHIN POOL:
Phragmites australis*, *Solidago sp., Ilex verticillata, Salix spp., Onoclea sensibilis, Carex spp., Sphagnum sp., Juncus effusus

100 % of pool w/in maintained ROW 0 % of pool within forested area

Breeding Criteria Codes

1	**Breeding chorus**
2	**Egg masses**
3	**Frog tadpoles**
4	**Salamander larvae**
5	**Presence of adults**

	OBLIGATE SPECIES	CODE	QUANTITY
	Wood frog	2	6
	Spotted salamander	2	2
	Jefferson salamander		
	Blue-spotted salamander		
	Spadefoot toad		
	Fingernail clams		
	Marbled salamander		
	Unidentified mole salamander		
	Fairy shrimp		

FACULTATIVE SPECIES:
- ☐ **Red-spotted newt adults**
- ☐ **Spotted turtles**
- ☐ **Blanding's turtles**
- ☐ **Painted turtles**
- ☐ **Snapping turtles**
- ☐ **Predacious diving beetles**
- ☐ **Dragonfly nymphs**
- ☐ **Amphibious snails**
- ☐ **Spring peepers**
- ☐ **American toads**
- ☐ **Fowler's Toad**
- ☐ **Caddis fly case/larvae**
- ☐ **Dragonfly nymphs**
- ☐ **Damselfly nymphs**
- ☐ **Leeches**
- ☐ **Pickerel Frog**

Additional Species Observed: 150-200 spermatophores observed

Photo Documentation: Yes

Conclusions / Comments:

☒ **Vernal Pool** ☐ **Amphibian Breeding Habitat**

CHARACTERISTICS OF ADJACENT VEGETATION:
(within 100-feet of pool edge)

_____% PSS **70 % PFO** **30 % PEM**

_____% UF **_____% ROW** **_____% OFS**

_____% Other / define:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VERNAL POOL FIELD DATA SHEET
2014 FIELD SEASON

PROJECT	Connecticut Expansion		
DATE	4/23/14	**WEATHER CONDITIONS**	45° F Cloudy
OBSERVERS	O'Sullivan/Stearns		

CHARACTERISTICS			
WETLAND #	VP WMA13-1	**LENGTH & WIDTH**	70x10'
TOWN	Sandisfield, MA	**CLOSEST WETLAND FLAG**	402
AVERAGE WATER DEPTH	6-8"	**COVER TYPE**	PEM

SUBSTRATE:
- ☐ **Peat**
- ☐ **Leaf Litter**
- ☐ **Sand**
- ☐ **Gravel**
- ☐ **Cobble**
- ☒ **Mud/Muck**

DOMINANT VEGETATION WITHIN POOL:
Phragmites australis*, *Solidago sp., Ilex verticillata, Salix spp., Onoclea sensibilis, Carex spp., Sphagnum sp., Juncus effusus

100 % of pool w/in maintained ROW 0 % of pool within forested area

Breeding Criteria Codes

1	**Breeding chorus**
2	**Egg masses**
3	**Frog tadpoles**
4	**Salamander larvae**
5	**Presence of adults**

	OBLIGATE SPECIES	CODE	QUANTITY
	Wood frog	2	40-45
	Spotted salamander	2	3
	Jefferson salamander		
	Blue-spotted salamander		
	Spadefoot toad		
	Fingernail clams		
	Marbled salamander		
	Unidentified mole salamander		
	Fairy shrimp		

FACULTATIVE SPECIES:
- ☐ **Red-spotted newt adults**
- ☐ **Spotted turtles**
- ☐ **Blanding's turtles**
- ☐ **Painted turtles**
- ☐ **Snapping turtles**
- ☐ **Predacious diving beetles**
- ☐ **Dragonfly nymphs**
- ☐ **Amphibious snails**
- ☐ **Spring peepers**
- ☐ **American toads**
- ☐ **Fowler's Toad**
- ☐ **Caddis fly case/larvae**
- ☐ **Dragonfly nymphs**
- ☐ **Damselfly nymphs**
- ☐ **Leeches**
- ☐ **Pickerel Frog**

Additional Species Observed: 200-250 spermatophores observed

Photo Documentation: Yes

Conclusions / Comments:

☒ **Vernal Pool** ☐ **Amphibian Breeding Habitat**

CHARACTERISTICS OF ADJACENT VEGETATION:
(within 100-feet of pool edge)

_____% PSS **70 % PFO** **15 % PEM**

_____% UF **_____% ROW** **15 % OFS**

_____% Other / define:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VERNAL POOL FIELD DATA SHEET
2014 FIELD SEASON

PROJECT	Connecticut Expansion		
DATE	4/23/14	**WEATHER CONDITIONS**	45° F Cloudy
OBSERVERS	O'Sullivan/Stearns		

CHARACTERISTICS			
WETLAND #	VP WMA16-1	**LENGTH & WIDTH**	120x20'
TOWN	Sandisfield, MA	**CLOSEST WETLAND FLAG**	328
AVERAGE WATER DEPTH	12-24"	**COVER TYPE**	PFO

SUBSTRATE:
- ☐ **Peat**
- ☐ **Leaf Litter**
- ☐ **Sand**
- ☐ **Gravel**
- ☐ **Cobble**
- ☒ **Mud/Muck**

DOMINANT VEGETATION WITHIN POOL:
Acer rubrum, Spiraea latifolia, Salix discolor, Ilex verticillata, Salix spp., Onoclea sensibilis, Carex spp., Sphagnum sp., Juncus effusus

__0__% of pool w/in maintained ROW __100__% of pool within forested area

Breeding Criteria Codes

1	**Breeding chorus**
2	**Egg masses**
3	**Frog tadpoles**
4	**Salamander larvae**
5	**Presence of adults**

	OBLIGATE SPECIES	CODE	QUANTITY
	Wood frog	2	200-250
	Spotted salamander		
	Jefferson salamander		
	Blue-spotted salamander		
	Spadefoot toad		
	Fingernail clams		
	Marbled salamander		
	Unidentified mole salamander		
	Fairy shrimp		

FACULTATIVE SPECIES:
- ☐ **Red-spotted newt adults**
- ☐ **Spotted turtles**
- ☐ **Blanding's turtles**
- ☐ **Painted turtles**
- ☐ **Snapping turtles**
- ☐ **Predacious diving beetles**
- ☐ **Dragonfly nymphs**
- ☐ **Amphibious snails**
- ☐ **Spring peepers**
- ☐ **American toads**
- ☐ **Fowler's Toad**
- ☐ **Caddis fly case/larvae**
- ☐ **Dragonfly nymphs**
- ☐ **Damselfly nymphs**
- ☐ **Leeches**
- ☐ **Pickerel Frog**

Additional Species Observed: 150-200 spermatophores observed.

Photo Documentation: Yes

Conclusions / Comments:

☒ **Vernal Pool** ☐ **Amphibian Breeding Habitat**

CHARACTERISTICS OF ADJACENT VEGETATION:
(within 100-feet of pool edge)

_____% PSS **__40__% PFO** **_____% PEM**

__40__% UF **_____% ROW** **_____% OFS**

__20__% Other / define: Cold Spring Road

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VERNAL POOL FIELD DATA SHEET
2014 FIELD SEASON

PROJECT	Connecticut Expansion		
DATE	4/23/14	**WEATHER CONDITIONS**	45° F Cloudy
OBSERVERS	O'Sullivan/Stearns		

CHARACTERISTICS			
WETLAND #	VP WMA18-1	**LENGTH & WIDTH**	20x25'
TOWN	Sandisfield, MA	**CLOSEST WETLAND FLAG**	105
AVERAGE WATER DEPTH	10-12"	**COVER TYPE**	PEM

SUBSTRATE:
- ☐ **Peat**
- ☐ **Leaf Litter**
- ☐ **Sand**
- ☐ **Gravel**
- ☐ **Cobble**
- ☒ **Mud/Muck**

DOMINANT VEGETATION WITHIN POOL:
Phragmites australis*, *Solidago sp., Ilex verticillata, Salix spp., Onoclea sensibilis, Carex spp., Sphagnum sp., Juncus effusus

100 % of pool w/in maintained ROW 0 % of pool within forested area

Breeding Criteria Codes

1	**Breeding chorus**
2	**Egg masses**
3	**Frog tadpoles**
4	**Salamander larvae**
5	**Presence of adults**

	OBLIGATE SPECIES	CODE	QUANTITY
	Wood frog	2	10
	Spotted salamander		
	Jefferson salamander		
	Blue-spotted salamander		
	Spadefoot toad		
	Fingernail clams		
	Marbled salamander		
	Unidentified mole salamander		
	Fairy shrimp		

FACULTATIVE SPECIES:
- ☐ **Red-spotted newt adults**
- ☐ **Spotted turtles**
- ☐ **Blanding's turtles**
- ☐ **Painted turtles**
- ☐ **Snapping turtles**
- ☐ **Predacious diving beetles**
- ☐ **Dragonfly nymphs**
- ☐ **Amphibious snails**
- ☐ **Spring peepers**
- ☐ **American toads**
- ☐ **Fowler's Toad**
- ☐ **Caddis fly case/larvae**
- ☐ **Dragonfly nymphs**
- ☐ **Damselfly nymphs**
- ☐ **Leeches**
- ☐ **Pickerel Frog**

Additional Species Observed: 20-25 spermatophores observed.

Photo Documentation: Yes

Conclusions / Comments:

☒ **Vernal Pool** ☐ **Amphibian Breeding Habitat**

CHARACTERISTICS OF ADJACENT VEGETATION:
(within 100-feet of pool edge)

_____% PSS **60 % PFO** **10 % PEM**

20 % UF **_____% ROW** **10 % OFS**

_____% Other / define:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VERNAL POOL FIELD DATA SHEET
2014 FIELD SEASON

PROJECT	Connecticut Expansion		
DATE	4/17/14	**WEATHER CONDITIONS**	50° F Partly Sunny
OBSERVERS	O'Sullivan/Stearns		

CHARACTERISTICS			
WETLAND #	VP WMA23	**LENGTH & WIDTH**	~30' in diameter
TOWN	Sandisfield, MA	**CLOSEST WETLAND FLAG**	309
AVERAGE WATER DEPTH	12-18"	**COVER TYPE**	PEM

SUBSTRATE: **DOMINANT VEGETATION WITHIN POOL: Pool un-vegetated. Shallow pond dug for livestock water source. Likely dries out. No fish observed. Entire surrounding area is a pasture.**

- ☐ **Peat**
- ☐ **Leaf Litter**
- ☐ **Sand**
- ☐ **Gravel**
- ☐ **Cobble** **100 % of pool w/in maintained ROW 0 % of pool within forested area**
- ☒ **Mud/Muck**

Breeding Criteria Codes

1	**Breeding chorus**
2	**Egg masses**
3	**Frog tadpoles**
4	**Salamander larvae**
5	**Presence of adults**

	OBLIGATE SPECIES	**CODE**	**QUANTITY**
	Wood frog	2	50-60
	Spotted salamander		
	Jefferson salamander		
	Blue-spotted salamander		
	Spadefoot toad		
	Fingernail clams		
	Marbled salamander		
	Unidentified mole salamander		
	Fairy shrimp		

FACULTATIVE SPECIES:

- ☐ **Red-spotted newt adults**
- ☐ **Spotted turtles**
- ☐ **Blanding's turtles**
- ☐ **Painted turtles**
- ☐ **Snapping turtles**
- ☐ **Predacious diving beetles**
- ☐ **Dragonfly nymphs**
- ☐ **Amphibious snails**
- ☐ **Spring peepers**
- ☐ **American toads**
- ☐ **Fowler's Toad**
- ☐ **Caddis fly case/larvae**
- ☐ **Dragonfly nymphs**
- ☐ **Damselfly nymphs**
- ☐ **Leeches**
- ☐ **Pickerel Frog**

Additional Species Observed: **None**

Photo Documentation: **Yes**

Conclusions / Comments:

☒ **Vernal Pool** ☐ **Amphibian Breeding Habitat**

CHARACTERISTICS OF ADJACENT VEGETATION:
(within 100-feet of pool edge)

_____% PSS **20 % PFO** **60 % PEM**

_____% UF **_____% ROW** **_____% OFS**

20 % Other / define: Upland meadow/pasture

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VERNAL POOL FIELD DATA SHEET
2014 FIELD SEASON

PROJECT	Connecticut Expansion		
DATE	4/17/14	**WEATHER CONDITIONS**	50° F Partly Sunny
OBSERVERS	O'Sullivan/Stearns		

CHARACTERISTICS			
WETLAND #	VP WMA24	**LENGTH & WIDTH**	~30' in diameter
TOWN	Sandisfield, MA	**CLOSEST WETLAND FLAG**	308
AVERAGE WATER DEPTH	11-15"	**COVER TYPE**	PEM

SUBSTRATE: **DOMINANT VEGETATION WITHIN POOL: *Typha latifolia*. Shallow pond dug for livestock water source. Likely dries out. No fish observed. Entire surrounding area is a pasture.**

- ☐ **Peat**
- ☐ **Leaf Litter**
- ☐ **Sand**
- ☐ **Gravel**
- ☐ **Cobble** **100 % of pool w/in maintained ROW 0 % of pool within forested area**
- ☒ **Mud/Muck**

Breeding Criteria Codes

1	**Breeding chorus**
2	**Egg masses**
3	**Frog tadpoles**
4	**Salamander larvae**
5	**Presence of adults**

	OBLIGATE SPECIES	CODE	QUANTITY
	Wood frog	2	80-100
	Spotted salamander		
	Jefferson salamander		
	Blue-spotted salamander		
	Spadefoot toad		
	Fingernail clams		
	Marbled salamander		
	Unidentified mole salamander		
	Fairy shrimp		

FACULTATIVE SPECIES:

- ☐ **Red-spotted newt adults**
- ☐ **Spotted turtles**
- ☐ **Blanding's turtles**
- ☐ **Painted turtles**
- ☐ **Snapping turtles**
- ☐ **Predacious diving beetles**
- ☐ **Dragonfly nymphs**
- ☐ **Amphibious snails**
- ☐ **Spring peepers**
- ☐ **American toads**
- ☐ **Fowler's Toad**
- ☐ **Caddis fly case/larvae**
- ☐ **Dragonfly nymphs**
- ☐ **Damselfly nymphs**
- ☐ **Leeches**
- ☐ **Pickerel Frog**

Additional Species Observed: **None**

Photo Documentation: **Yes**

Conclusions / Comments:

☒ **Vernal Pool** ☐ **Amphibian Breeding Habitat**

CHARACTERISTICS OF ADJACENT VEGETATION:
(within 100-feet of pool edge)

_____% PSS **75 % PFO** **25 % PEM**

_____% UF **_____% ROW** **_____% OFS**

_____% Other / define:

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Attachment B

2014 Vernal Pool Representative Site Photographs



VP WMA01A



VP WCT5



VP WCT6-1



VP WCT6-2



VP WCT-7



WCTCP-2



VP WCT-9



VP WCT-11



WCT-VP1



WCT-VP2



WCT-VP1



WCT33-VP1



WCT33-VP2



WCT33-VP3



WCT33-VP5



WCT-VP5 (Wood frog egg mass)



WCT33-VP6



WCT34-VP2



WCT34-VP1



WCT36-VP1



WCT39-VP1



WCT41-VP1



WCT41-VP2



WCT45-VP1



WCT45-VP2



WCT46-VP1



WCT46-VP2



WCT49-VP1



WCT50B-VP1



WCT50D-VP1



WCT51-VP1



VP WMA-3-1



VP WMA-3-2



VP WMA-5-1



VP WMA-6-1



VP WMA-7-1



VP WMA-7-2



VP WMA-7-3



VP WMA-7-4



VP WMA-7-5



VP WMA-7-6



MA-CVP-1



VP WMA-12-1



VP WMA-13-1



VP WMA-18-1



VP WMA-A6-1



VP WMA-23



VP WMA-24

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Attachment C

2014 Vernal Pool Mapping

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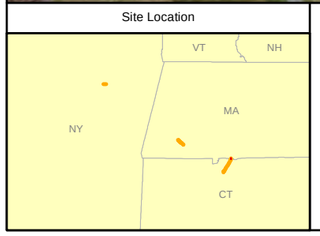
Site Location



Legend

- Streams
- Wetland Lines
- Proposed Project Centerline
- Vernal Pools
- Waterbodies
- Wetlands
- County Boundary
- Town Boundary

N E S W

Tennessee Gas Pipeline Company

CT Expansion Project

Connecticut Vernal Pools

0 100 200 400 Feet

1 inch = 200 feet

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

June 2014

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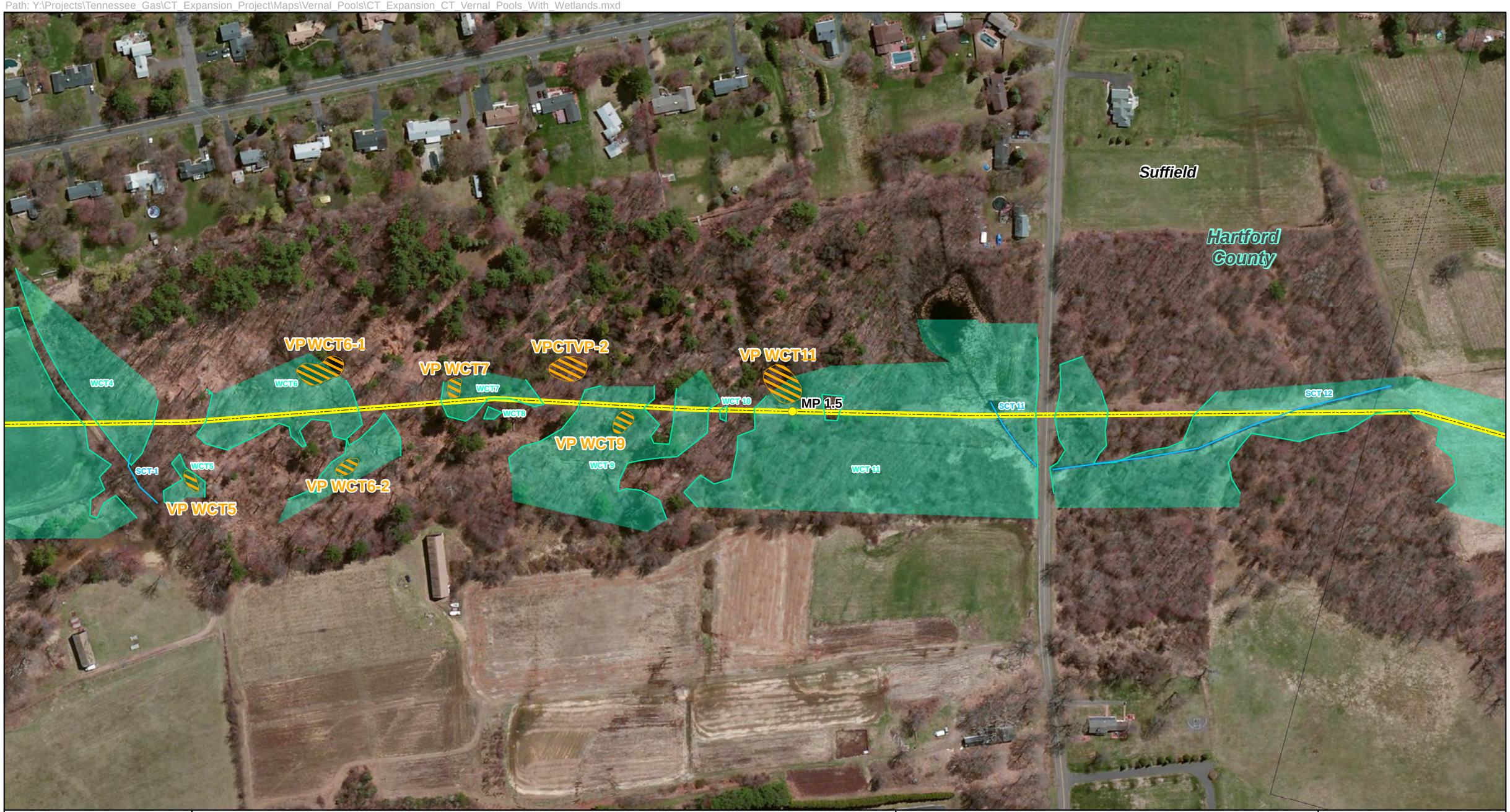

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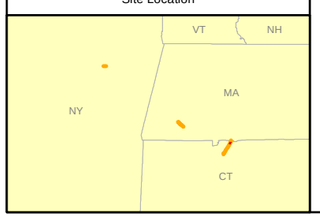

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N

Tennessee Gas Pipeline Company

CT Expansion Project

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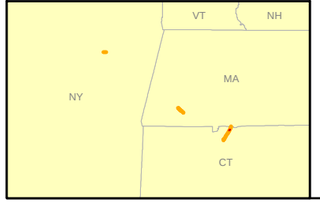

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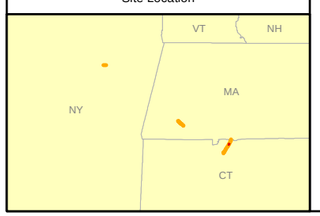

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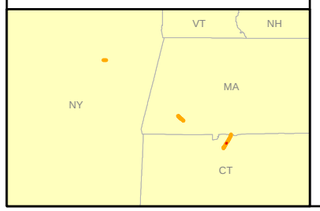

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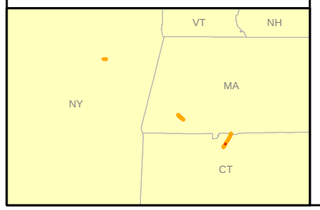

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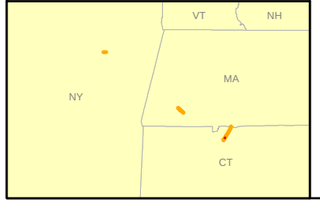

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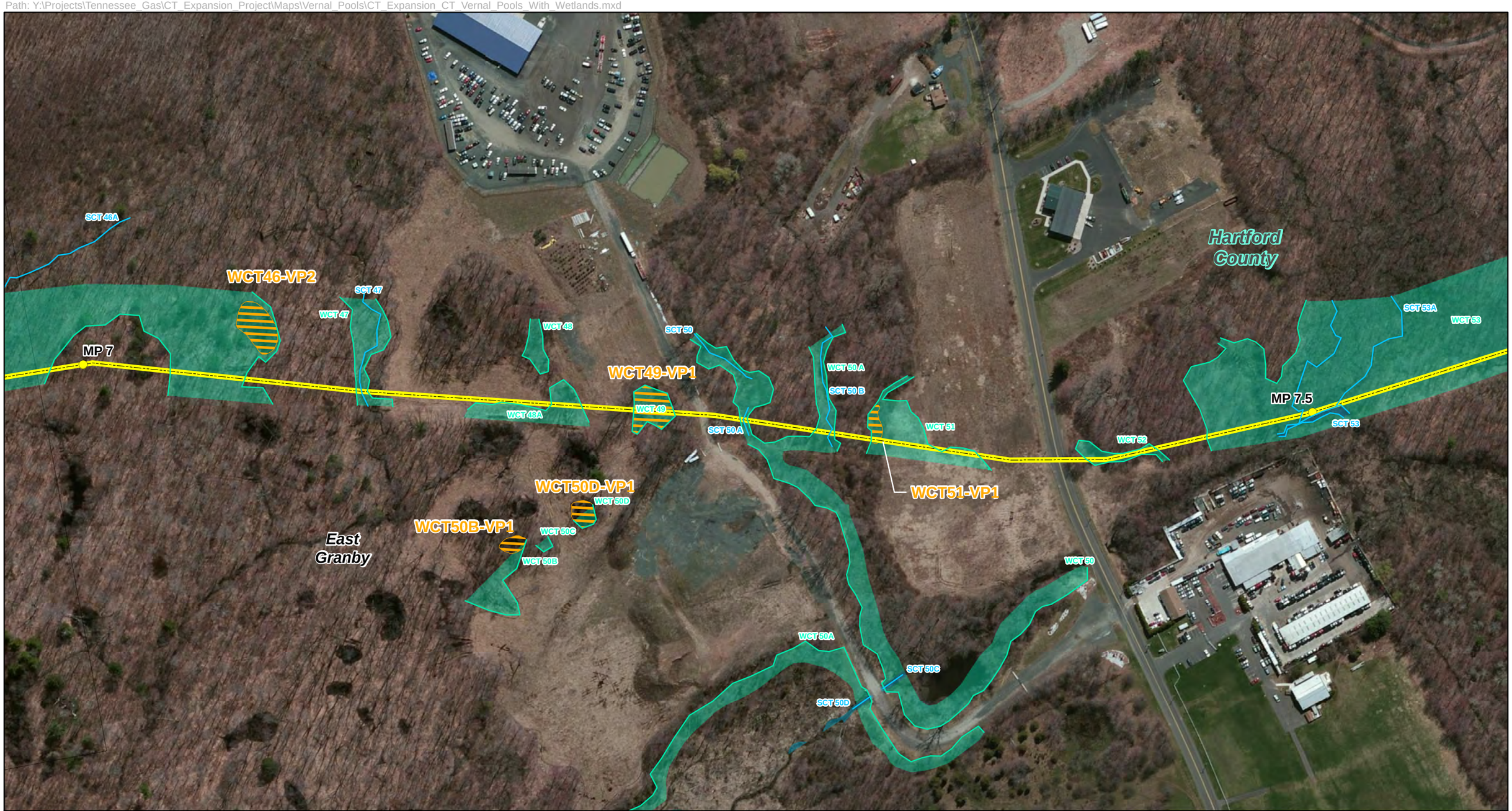

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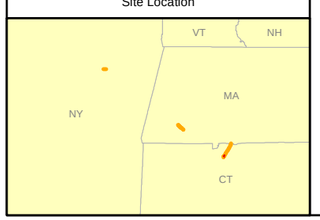

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E S N W

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CT Expansion Project

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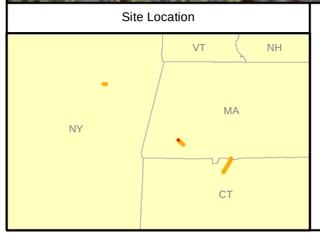

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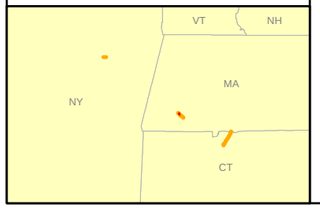

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N E S W

Tennessee Gas Pipeline Company

CT Expansion Project

Massachusetts Vernal Pools

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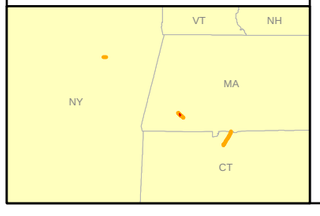

Legend

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N E W S

Tennessee Gas Pipeline Company

CT Expansion Project

Massachusetts Vernal Pools

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Tennessee Gas Pipeline Company, L.L.C.
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June 2014

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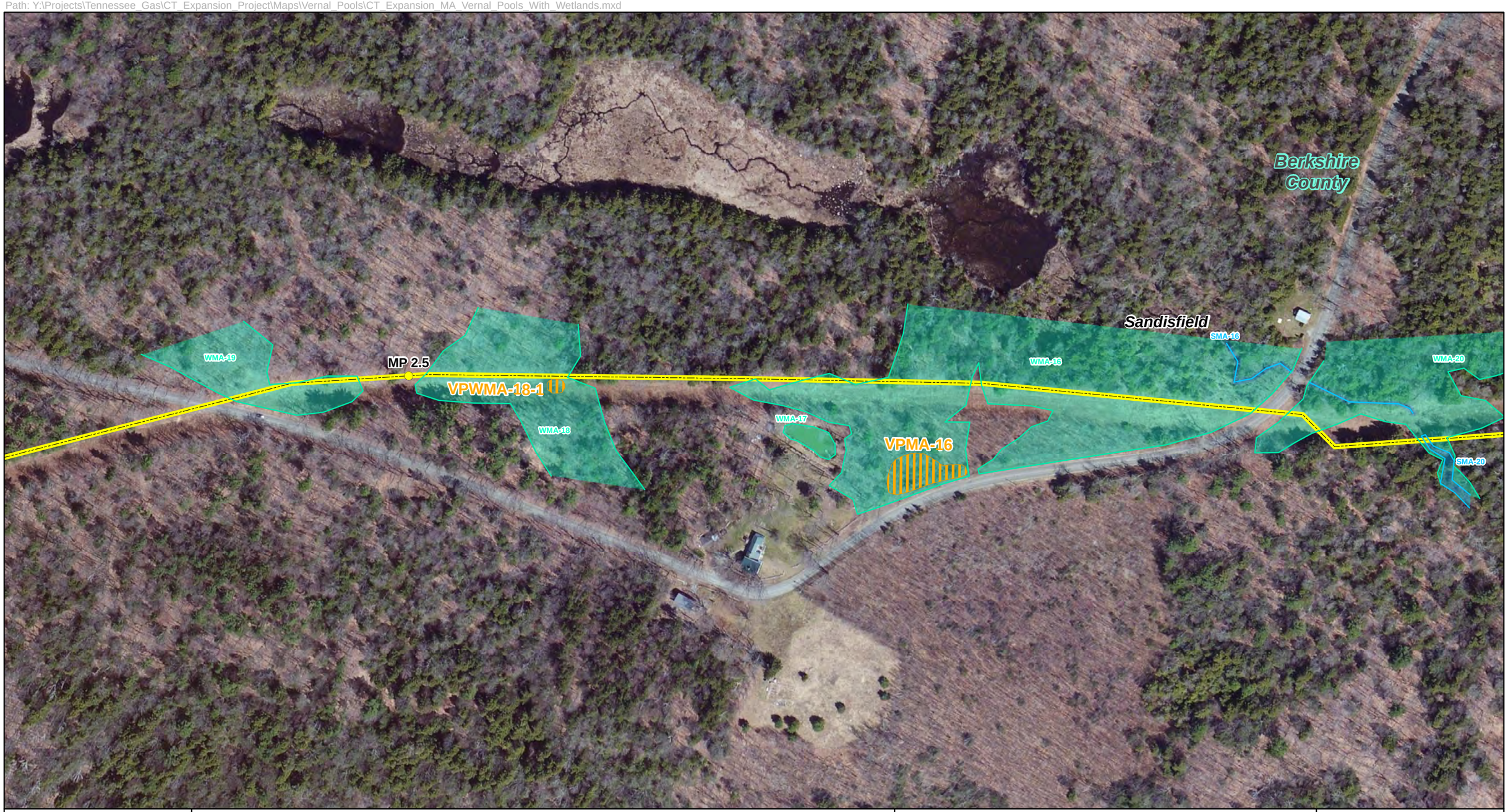

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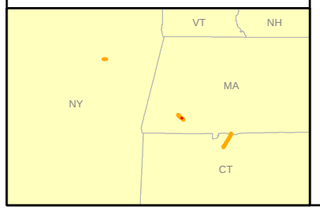

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Tennessee Gas Pipeline Company

CT Expansion Project

Massachusetts Vernal Pools

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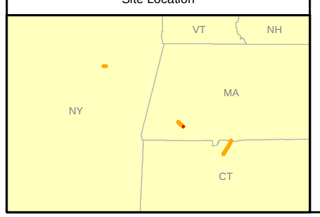

Legend

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N E S W

Tennessee Gas Pipeline Company

CT Expansion Project

Massachusetts Vernal Pools

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Tennessee Gas Pipeline Company, L.L.C.
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APPENDIX K

Vernal Pool Workspace Mapping

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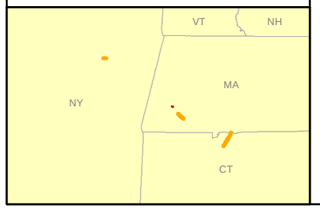

Legend

- Mileposts
- Proposed Project Centerline
- Access Roads
- Streams
- Wetland Lines
- Vernal Pools
- Waterbodies
- Wetlands
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- Town Boundary
- Workspace
- Pipeyard

N E W S

Tennessee Gas Pipeline Company

CT Expansion Project

Vernal Pools

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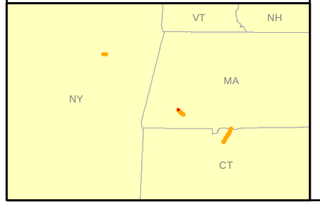

Legend

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N E W S

Tennessee Gas Pipeline Company

CT Expansion Project

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a Kinder Morgan company

September 2014

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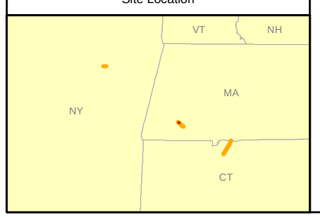

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Tennessee Gas Pipeline Company

CT Expansion Project

Vernal Pools

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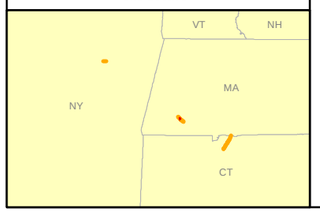

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Tennessee Gas Pipeline Company

CT Expansion Project

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September 2014

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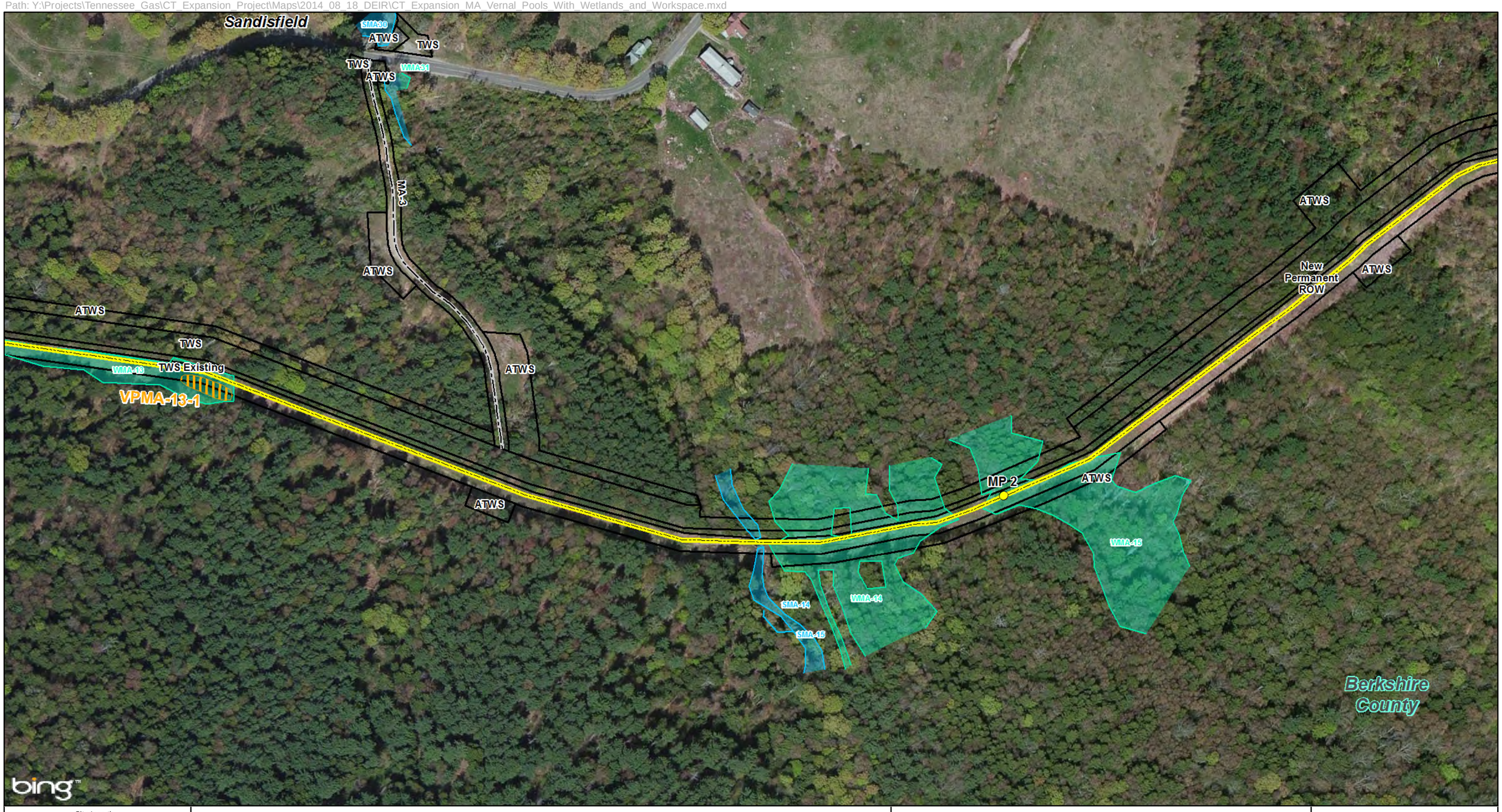

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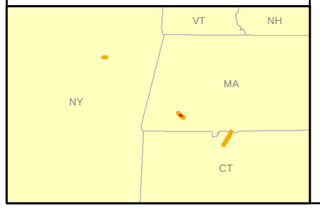

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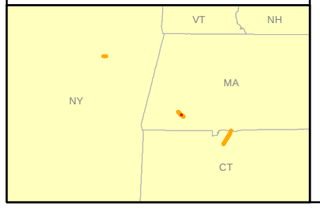

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a Kinder Morgan company

September 2014

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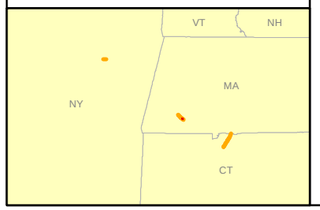
Site Location



Legend

- Mileposts
- Proposed Project Centerline
- Access Roads
- Streams
- Wetland Lines
- Vernal Pools
- Waterbodies
- Wetlands
- County Boundary
- Town Boundary
- Workspace
- Pipeyard

N E W S

Tennessee Gas Pipeline Company

CT Expansion Project

Vernal Pools

0 100 200 400 Feet

1 inch = 200 feet

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

September 2014

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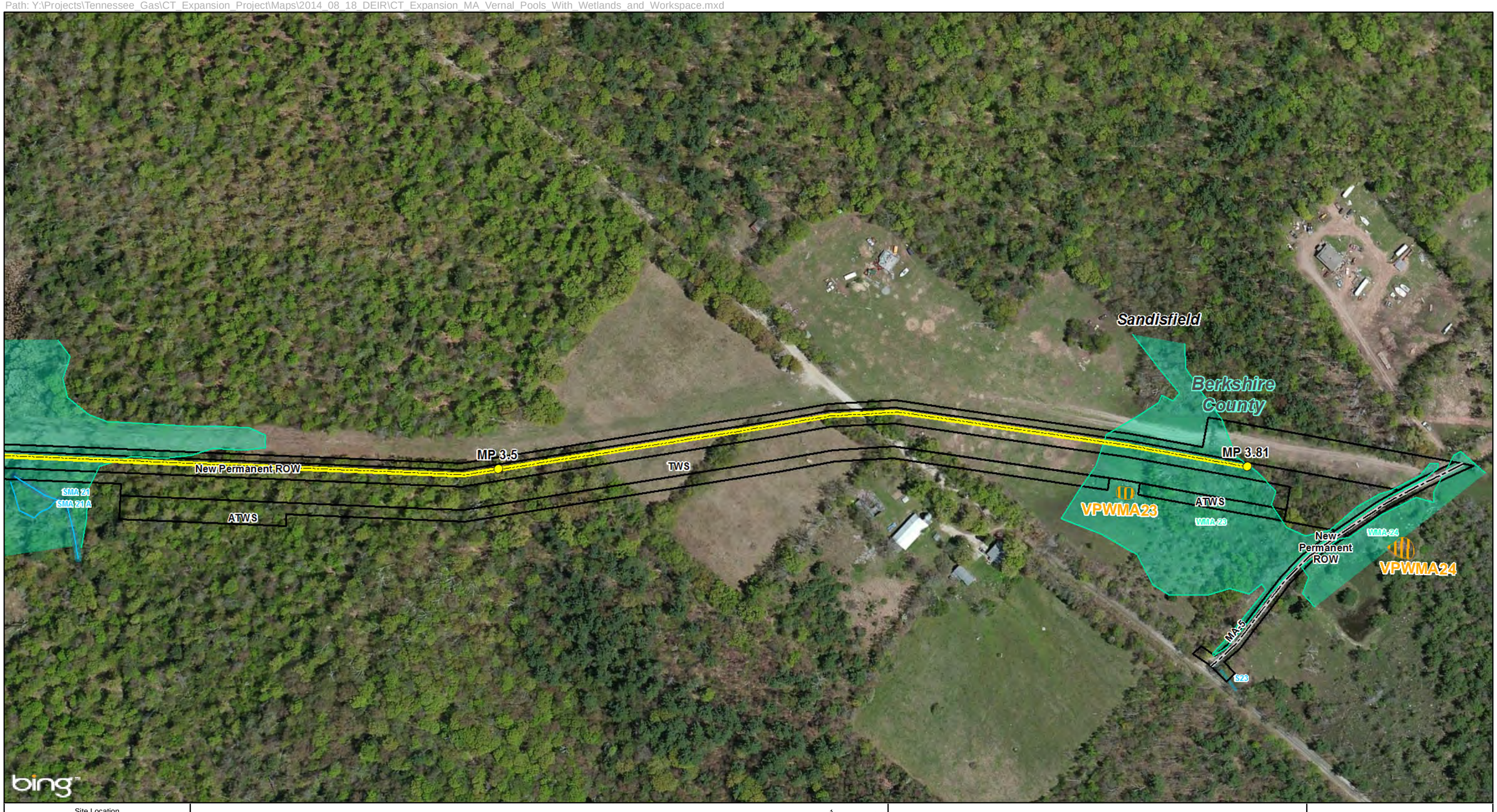

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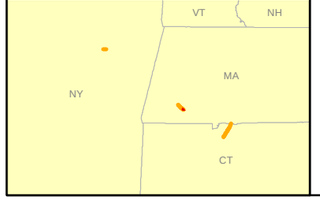

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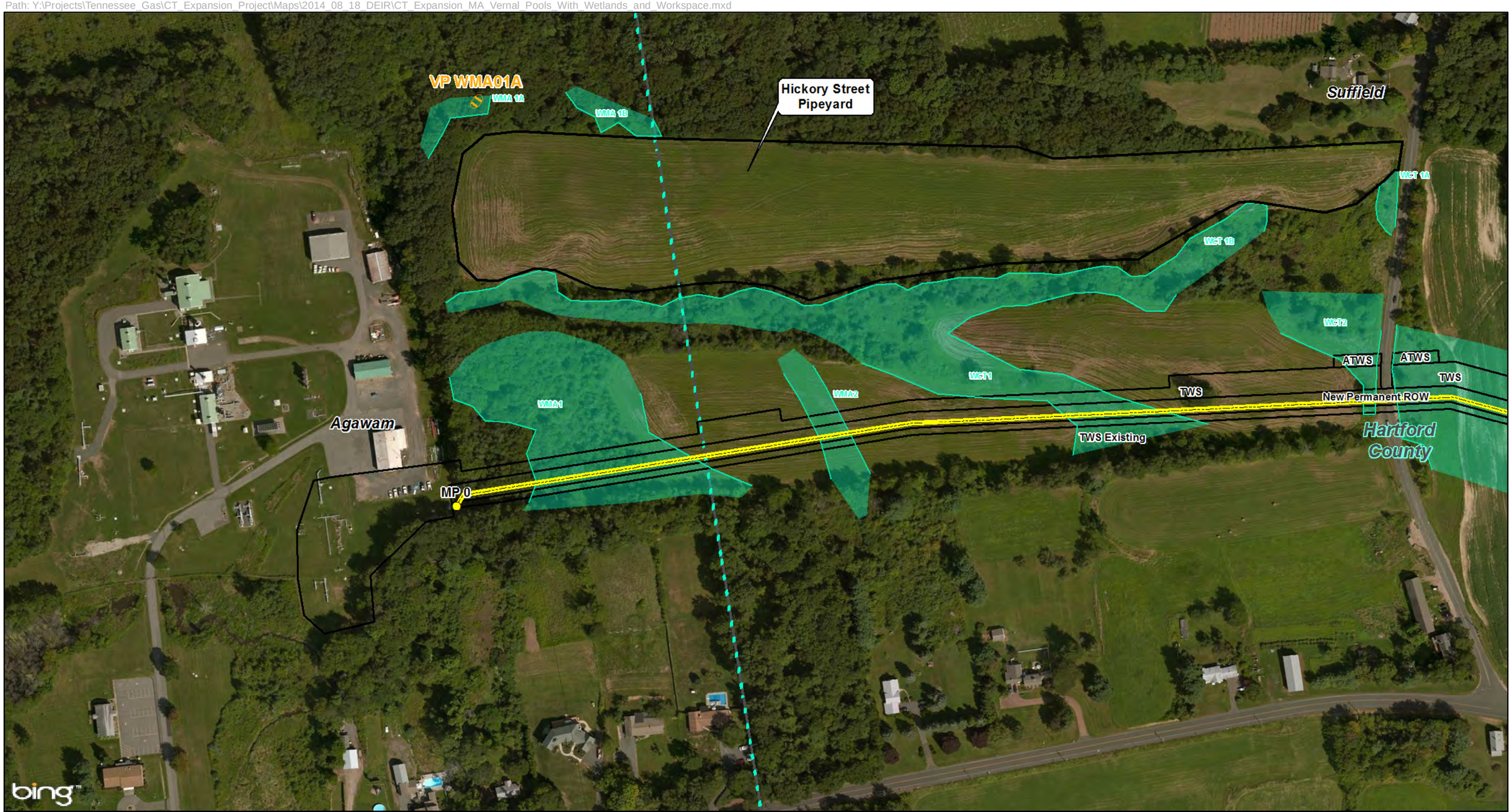

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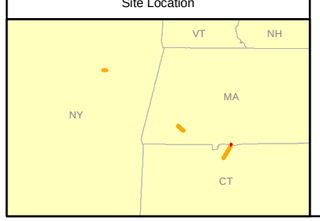

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20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

APPENDIX K

Wetland Delineation Report

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

INVENTORY AND DELINEATION OF WETLANDS AND WATERCOURSES

ALONG THE MASSACHUSETTS PORTION OF

THE CONNECTICUT EXPANSION PROJECT

Prepared For:

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July 2014

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

TABLE OF CONTENTS

1.0 Introduction....1
2.0 Wetland and Watercourse Regulations....1
2.1 Section 404 – Clean Water Act....1
2.2 Massachusetts Department of Environmental Protection Regulations....2
3.0 Wetland Delineation Procedures....3
3.1 Wetland Delineation Procedures....3
3.2 Pre-Survey Desktop Investigations....3
3.3 Field Surveys....4
3.4 Wetland Classification....5
3.5 Post-Survey Desktop Analysis....6
4.0 Results....6
4.1 Functions and Values....8
5.0 References....1

Index of Tables

Table 1 Wetland Soil Indicators for the Northcentral and Northeast Region

Table 2 Wetland Hydrology Indicators for the Northcentral and Northeast Region

Table 3 USACE Highway Methodology Function and Values Assessment

List of Appendices

Appendix A: Wetlands and Watercourses Identified along the Massachusetts Portion of the Connecticut Expansion Project

Appendix B: Connecticut Expansion Project Maps: Massachusetts Wetlands and Watercourses

Appendix C: Army Corp of Engineers Wetland Transect Forms

Appendix D: Representative Wetland Photographs

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

1.0 Introduction

This report provides a summary of wetland and watercourse inventories and delineations conducted along the Massachusetts portions of the proposed Connecticut Expansion Project. The proposed project, as currently configured, would involve the construction of approximately 13.3-miles of pipeline looping (i.e., the installation of additional pipe to adjacent to the existing pipeline) in New York, Massachusetts, and Connecticut. The proposed Connecticut Expansion Project facilities are as follows:

- 1.4-miles of 36-inch pipeline loop in Albany County, New York;
- 3.8-miles of 36-inch pipeline loop in Berkshire County, Massachusetts;
- 8.1-miles of 24-inch pipeline loop in Hampden County, Massachusetts and Hartford County, Connecticut;
- Minor tie-in piping; and
- Moving and relocating certain pigging facilities.

The Project is proposed by Tennessee Gas Pipeline Company (Tennessee), a wholly-owned subsidiary of Kinder Morgan, Inc. and a major supplier of natural gas to utilities and power generators in the Northeast. The Massachusetts Portion of the Project will traverse a small section of Agawam and 3.8-miles in Sandisfield, Massachusetts along an existing pipeline right-of-way (ROW).

On behalf of Tennessee, AECOM conducted wetland and watercourse identification and delineations along all of the proposed Project routes and variations described above. Offsite desktop analyses, as well as onsite field delineations were employed to determine state and federal wetland boundaries. The onsite and offsite wetland and watercourse investigations were conducted in Fall 2013. This report discusses the methods used to identify the wetlands and watercourses encountered along the Massachusetts route, in Sandisfield and Agawam, and summarizes the findings of the surveys.

Tables listing all wetlands and watercourses identified during the course of the surveys are located in Appendix A. Appendix B contains the wetland and watercourse mapping associated with the Project. Appendix C contains the field data forms which were used to document the wetland and watercourse delineations, and representative wetland and watercourse photographs are located in Appendix D.

2.0 Wetland and Watercourse Regulations

AECOM personnel identified wetlands and watercourses subject to state or federal jurisdiction based upon the Federal Clean Water Act and the Massachusetts Department of Environmental Protection (MADEP), Freshwater Wetlands Protection Act (WPA), M.G.L. Chapter 131, section 40, implemented by 310 CMR 10.00.

2.1 Section 404 – Clean Water Act

Wetlands, springs, and other waters of the United States are regulated under Section 404 of the Federal Clean Water Act (“CWA”; 33 U.S.C. 1341) by the U.S. Environmental Protection Agency (EPA) and the U.S. Army Corps of Engineers (“USACE”). Under 33 CFR Part 328.3(a), the term “waters of the U.S.” include:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

1. *All waters that are currently used, or were used in the past, or may be susceptible to use in interstate or foreign commerce, including all waters that are subject to the ebb and flow of the tide;*
2. *All interstate waters including interstate wetlands;*
3. *All other waters such as intrastate lakes, rivers, streams (including intermittent streams), mudflats, sandflats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, the use, degradation or destruction of which could affect interstate or foreign commerce, including any such waters:*
    i. *Which are or could be used by interstate or foreign travelers for recreational or other purposes; or*
    ii. *From which fish or shellfish are or could be taken and sold in interstate or foreign commerce; or*
    iii. *Which are used or could be used for industrial purpose by industries in interstate commerce;*
4. *All impoundments of waters otherwise defined as waters of the United States under the definition;*
5. *Tributaries of waters identified in paragraphs (a) (1) through (4) of this section;*
6. *The territorial seas;*
7. *Wetlands adjacent to waters (other than waters that are themselves wetlands) identified in paragraphs (a) (1) through (6) of this section.*
8. *Waters of the United States do not include prior converted cropland. Notwithstanding the determination of an area's status as prior converted cropland by any other Federal agency, for the purposes of the Clean Water Act, the final authority regarding Clean Water Act jurisdiction remains with EPA.*

The term “wetlands” means those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas (33 CFR 328.3(b)).
Under 33 CFR 328.4(c), the limits of federal jurisdiction for non-tidal waters of the United States extend to:

1. *the ordinary high water mark In the absence of adjacent wetlands; or*
2. *beyond the ordinary high water mark to the limit of the adjacent wetlands when adjacent wetlands are present; or*
3. *to the limit of the wetland when the water of the United States consists only of wetlands*

Wetlands meeting these criteria are subject to federal jurisdiction under Section 404 of the Federal Clean Water Act.

2.2 Massachusetts Department of Environmental Protection Regulations

In Massachusetts, wetlands and watercourses are regulated by the MADEP under the Massachusetts Wetlands Protection Act (“WPA” MGL c.131 s.40). The WPA defines Bordering Vegetated Wetlands (BVW) as “freshwater wetlands which border on creeks, rivers, streams, ponds and lakes and includes wet meadows, marshes, swamps and bogs. Bordering Vegetated Wetlands are areas where the soils are saturated and/or inundated such that they support a predominance of wetland indicator plants.” The WPA also defines Riverfront Area as being associated with, “any natural flowing body of water that empties to any ocean, lake, pond, or other river and which flows throughout the year.” The Massachusetts Rivers Protection Act (MGL c.258, Acts of 1996) further protects Riverfront Area and defines it as “a 200-foot wide

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corridor on each side of a perennial river or stream, measured from the mean annual high-water line of the river."

3.0 Wetland Delineation Procedures

3.1 Wetland Delineation Procedures

The wetland delineation methodologies outlined in the Corps of Engineers Wetland Delineation Manual ("1987 Corps Manual", USACE, Environmental Laboratory 1987), and the Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region Version 2.0 ("NC/NE Regional Supplement"; USACE 2011a), were used to identify and delineate wetlands along the proposed Project alignment in Massachusetts. Though Massachusetts has developed a wetland delineation manual (MADEP 1995) for identification of bordering vegetated wetlands, this manual makes use of methods and information found in the 1987 Corps Manual while offering detailed alternative methods to provide users with a selection to suit a range of circumstances. For consistency in wetland delineation methods and in application of current approved professional standards for wetland delineation, all wetlands were delineated using the 1987 Corps Manual and NC/NE Regional Supplement.

According to the 1987 Corps Manual and the NC/NE Regional Supplement, three distinct characteristics must be exhibited for an area to be considered wetlands:

1. The prevalent vegetation must consist of plants adapted to life in hydric soil conditions. These species, due to morphological, physiological, and/or reproductive adaptations, can and do persist in anaerobic soil conditions;
2. Soils must be classified as hydric or they must possess characteristics that are associated with reducing soil conditions; and
3. The area must be inundated either permanently or periodically at mean water depths less than 6.6 feet (2 meters) or the soil saturated at the surface for some time during the growing season of the prevalent vegetation.

In accordance with the Corps Manual, hydrophytic vegetation, hydric soils, and wetland hydrology must all be present for a wetland to be subject to jurisdiction under Section 404 of the Clean Water Act.

3.2 Pre-Survey Desktop Investigations

Prior to the commencement of field surveys, AECOM reviewed information from multiple sources to determine the potential extent of wetlands within the survey areas. Pre-survey information reviewed included: USGS topographical quadrangles, National Wetland Inventory Maps, Natural Resource Conservation Service – Web Soil Surveys, Mass GIS Resource Mapping that includes Massachusetts Natural Heritage Endangered Species Program (NHESP) datalayers.

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3.3 Field Surveys

Vegetation, soils, and hydrology data were assessed during the field surveys to determine if the wetland parameters described above were satisfied for each potential wetland area. AECOM used the "top of bank" to demarcate the limits of a watercourse when no wetlands were adjacent to the channel. During the field investigations along the ROWs, AECOM biologists identified the boundary between the water resource (wetland and/or watercourse) and the upland area, and delineated the boundary with survey flagging. Wetlands were delineated in the field with survey tape hung on vegetation at approximately 15 – 30 foot intervals. Documentation of the wetland boundaries was taken at specific locations within each wetland series. AECOM generated wetland resource field data summary sheets, which were completed for the wetland and watercourse resource surveys (see Appendix C: Wetlands and Watercourses Field Data Forms). Representative photographs of each wetland were taken during the delineation (see Appendix D: Representative Site Photographs). Each wetland and waterbody was given a unique alphanumeric designation.

The specific methods for characterizing and evaluating vegetation, hydrology, and soils for a wetland determination were performed as follows:

Soils: At the center of each data plot, AECOM characterized the soil profile to determine the hydric soil status. Borings were taken with a hand-held auger to depths necessary to accurately determine a soil's hydric status (typically 18-24 inches below ground surface). The information collected for each soil profile included soil horizons, depth, texture, color, and the presence or absence of redoximorphic features (mottles and other features). Colors of the soil matrix and mottles were identified using Munsell Soil Color Charts. AECOM based all hydric soil determinations on criteria established in the USACE Wetlands Delineation Manual (Environmental Laboratory 1987), along with *Field Indicators of Hydric Soils in the United States* (NRCS 2006) and *Field Indicators for Identifying Hydric Soils in New England* (NEIWPCC 2004). Additionally, AECOM noted the presence of any saturation and/or standing water encountered during the soil profile description.

Table 1
Wetland Soil Indicators for the Northcentral and Northeast Region

Hydric Soil Indicators		Indicators for Problematic Hydric Soil
Histosol (A1)	Dark Surface (S7)(LRR R, MLRA 149B)	2cm Muck (A10)(LRR K, L, MLRA 149B)
Histic Epipedon (A2)	Thin Dark Surface (S9)(LRR R, MLRA 149B)	Coast Prairie Redox (A16)(LRR K, L, R)
Black Histic (A3)	Loamy Mucky Mineral (F1)(LRR K, L)	5cm Mucky Peat or Peat (S3) (LRR K, L, R)
Hydrogen Sulfide (A4)	Loamy Gleyed Matrix (F2)	Dark Surface (S7)(LRR K, L, M)
Stratified Layers (A5)	Depleted Matrix (F3)	Polyvalue Below Surface (S8)(LRR K, L)
Depleted Below Dark Surface (A11)	Redox Dark Surface (F6)	Thin Dark Surface (S9)(LRR K, L, R)
Thick Dark Surface (A12)	Depleted Dark Surface (F7)	Iron-Mg Masses (F12)(LRR K, L, R)
Sandy Mucky Mineral (S1)	Redox Depressions (F8)	Piedmont Floodplain Soils (F19)(MLRA 149B)
Sandy Gleyed Matrix (S4)		Mesic Spodic (TA6)(MLRA 144A, 145, 149B)
Sandy Redox (S5)		Red Parent Material (F21)
Stripped Matrix (S6)		Very Shallow Dark Surface (TF12)

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Vegetation: Species abundance in both upland and wetland communities was visually estimated. Dominant trees and shrubs/saplings were recorded within a 30-foot and 15-foot radius, respectively, from the center of each documentation plot. Woody vines were recorded within a 30-foot radius plot. Dominant herbaceous vegetation was recorded within a 5-foot radius plot. AECOM identified plant species using appropriate botanical reference material for the region. The hydrophytic indicator status of each species was identified using the North American Digital Flora: National Wetland Plant List (Lichvar and Kartesz 2009). Indicators of hydrophytic vegetation are satisfied if the results of the rapid assessment include all species rated as OBL or FACW (Indicator 1), the dominance test is greater than 50% (Indicator 2), or the prevalence index is less than or equal to 3.0 (Indicator 3) based on the USACE Wetland Determination Data Form (USACE, 2011b).

Hydrology: Site hydrology was evaluated during field surveys by initially observing whether the soil at the surface was inundated or saturated. If the ground surface was dry, the depth to freestanding groundwater or saturated soil was measured, and the presence or absence of other indicators of wetland hydrology (e.g. drift lines, water-stained leaves, etc.) was noted. The wetland hydrology criterion was met if one or more primary or two or more secondary field indicators were present (U.S. Army Corps of Engineers, 1987).

Table 2
Wetland Hydrology Indicators for the Northcentral and Northeast Region

Primary Indicators (minimum of one is required)		Secondary Indicators (minimum of two is required)
Surface Water (A1)	Sparsely Vegetated Concave Surface (B8)	Surface Soil Cracks (B6)
High Water Table (A2)	Water Stained Leave (B9)	Drainage Patters (B10)
Saturation (A3)	Aquatic Fauna (B13)	Moss Trim Lines (B16)
Water Marks (B1)	Marl Deposits (B15)	Dry Season Water Table (C2)
Sediment Deposits (B2)	Hydrogen Sulfide Odor (C1)	Crayfish Burrows (C8)
Drift Deposits (B3)	Oxidized Rhizospheres on Living Roots (C3)	Saturation Visible on Aerial Imagery (C9)
Algal Mat or Crust (B4)	Presence of Reduced Iron (C4)	Stunted or Stressed Plants (D1)
Iron Deposits (B5)	Recent Iron Reduction in Tilled Soils (C6)	Geomorphic Position (D2)
Inundation Visible on Aerial Imagery (B7)	Thick Muck Surface (C7)	Shallow Aquitard (D3)
		Microtopographic Relief (D4)
		FAC-Neutral Test (D5)

Wetland and watercourse flag positions and data point locations were field located by surveyors and plotted out on aerial photograph imagery.

3.4 Wetland Classification

While in the field, AECOM wetland scientists classified the various wetlands and watercourses according to the “Cowardin system”, which is a process discussed in the “Classification of

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Wetlands and Deepwater Habitats of the United States" (Cowardin et. Al 1979). Identified wetlands were classified as Palustrine Forested (PFO), Palustrine Emergent (PEM), Palustrine Scrub-Shrub (PSS) and Palustrine Open Water (POW) and are further described below. In some cases, a wetland complex contained more than one wetland classification type. In those situations, each wetland type is listed and the first classification type represents the more dominant characteristic.

Palustrine Forested Wetlands (PFO)
Forested wetlands are characterized by woody vegetation that is six meters (approximately 20 feet) tall or taller and normally includes an overstory of trees, an understory of young trees and/or shrubs and an herbaceous layer.

Palustrine Scrub-Shrub Wetlands (PSS)
Scrub-shrub wetlands are typically dominated by woody vegetation less than six meters (approximately 20 feet) tall. Scrub-shrub land types may represent a successional stage leading to a forested wetland and includes shrubs, saplings, and trees or shrubs that are small and/or stunted due to environmental conditions.

Palustrine Emergent Wetlands (PEM)
Emergent wetlands are characterized by erect, rooted, herbaceous hydrophytes not including mosses and lichens. These wetlands maintain the same appearance year after year, and are typically dominated by perennial plants that are present for the majority of the growing season.

Palustrine Open Water (POW)
Areas of permanent open water that border on palustrine systems are referred to as POW. Areas of open water may exist as man-made or natural waterbodies.

3.5 Post-Survey Desktop Analysis

The wetland and watercourse boundaries were plotted on aerial imagery and subsequently reviewed and confirmed by AECOM personnel. The aerial-based wetland plans in Appendix B: Connecticut Expansion Project Maps, Massachusetts Wetlands and Watercourses, show the locations of the delineated resources relative to the proposed limits of the Project. Water quality designations were determined using Massachusetts mapping resources.

4.0 Results

Appendix A includes tables highlighting the Wetlands and Watercourses identified during these investigations. Appendix B provides a project mapping depicting the locations of the inventoried wetlands and watercourses; Appendix C includes the wetlands and watercourses data forms; and Appendix D provides representative site photographs of wetlands and watercourses located within the Massachusetts study area.

As illustrated in Tables A-1 and A-2 (Appendix A), a total of 27 wetlands, 14 watercourses and 1 pond were identified in association with the Massachusetts study area during the Fall 2013 investigations. Nineteen wetlands examined in this study area are classified in-part as PFO,

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

PSS and/or PEM. Seven wetlands examined during this study are classified wholly as PFO, 3 wetlands are classified wholly as PEM, and 1 was classified wholly as an Open Waterbody (OW).

Wetland Vegetation

The wetlands inventoried during the course of these investigations ranged from the drier PFO wetlands, to PEM wetlands and deepwater habitat. Common species encountered in the various PFO wetlands during the investigations included: Eastern hemlock (*Tsuga canadensis*) red maple (*Acer rubrum),* American elm (*Ulmus americana*), northern arrowwood (*Viburnum dentatum*), spicebush (*Lindera benzoin*), arrowleaf tearthumb (*Polygonum sagittatum*), skunk cabbage (*Symplocarpus foetidus*), sensitive fern (*Onoclea sensibilis*), winterberry (*Ilex verticillata*), cinnamon fern (*Osmunda cinnamomea*), poison ivy (*Toxicodendron radicans*), jewelweed (*Impatiens capensis)*, and swamp white oak (*Quercus bicolor*). The common vegetation species encountered during the PSS wetland investigations included: red maple, multiflora rose (*Rosa multiflora*), silky dogwood (*Cornus amomum*), northern arrowwood, arrowleaf tearthumb, sensitive fern, jewelweed, woolgrass (*Scirpus cyperinus*)*,* and reed canary grass (*Phalaris arundinacea*). Common vegetation types found within the PEM wetland areas included: common cattail (*Typha latifolia*), jewelweed, arrowleaf tearthumb, woolgrass, willow (*Salix* spp.), arrowwood, meadowsweet (*Spiraea latifolia*), purple loosestrife (*Lythrum salicaria*), lurid sedge (*Carex lurida*), aster spp. (*Symphyotrichum spp.*), goldenrods (*Solidago* spp.), soft rush (*Juncus effusus*), Joe-Pye-weed (*Eupatorium maculatum*), sedges (*Carex* spp.) and sensitive fern. See Appendix C for additional details and site specific information for each wetland area.

Wetland Soils

Multiple soil types representing a wide variety of soil series designations were identified during this wetland and watercourse inventory. Soils described in the various wetlands appear to have formed in parent material including glacial till, glaciolacustrine sediments and glacial outwash. The soil types were identified as poorly drained to very poorly drained mineral soil with varying degrees of organics, and included fine sandy loams, silt loams, sandy loams and mucks. Many areas were also identified as frequently flooded. Poor drainage was noted in areas with the presence of deep organic soils, sapric material in the surface layers, high organic contents in the topsoil and/or prolonged standing water. Additionally, varying degrees of stoniness and rockiness were observed. In the more developed and industrial portions of the study area, the wetland soils were often described as, or officially mapped as, disturbed.

See Appendix C and Resource Report 7 for additional soils details and site specific information for each wetland area.

Watercourses

The watercourses encountered during this inventory varied greatly in type, size and character. Some of the streams that were inventoried are natural, whereas others were man-made. Silty sediments, sand, rock, gravel, riprap, and/or cobble bottoms dominated the natural stream beds that were inventoried. The shape, height, susceptibility to erosion and direction of flow of the individual watercourses also varied. Manmade watercourses that were inventoried included those with culverts and corrugated and smooth drainage pipes, retention ponds, and man-made farm ponds.

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See Appendix C for additional details and site specific information for each watercourse area.

4.1 Functions and Values

As stated in the Corps of Engineers' Descriptive Approach, "…we advocate an approach that includes a qualitative description of the physical characteristics of the wetlands, identifies the functions and values exhibited, and most importantly, the bases for the conclusions using 'best professional judgment'." The basic concept behind most wetland evaluation or assessment methods is that wetland characteristics contribute to give rise to wetland functions that have certain value to natural systems, including man. By assessing the relative importance of certain characteristics indicated by research or experience to contribute toward particular functions (e.g., the dominant vegetative class affects wildlife habitat value), and then weighting the various conditions which that characteristic may occur in wetlands (e.g., shallow marsh, wooded swamp, etc.), some picture of the relative significance a particular wetland may play in providing certain functions can be developed. This concept is fundamental to the wetland evaluation procedures that were drawn from to assess the functional values of the wetland areas on the site.

As listed and described in *The Highway Methodology Workbook Supplement – Wetland Function and Values/A Descriptive Approach* (U.S. Army Corps of Engineers, New England Division; September 1999), eight (8) functions and five (5) values may be associated with a given wetland. These functions/values include:

FUNCTIONS

- Groundwater Recharge/Discharge - *This function considers the potential for the wetland to serve as a groundwater recharge and /or discharge area. It refers to the fundamental interaction between wetlands and aquifers, where there is potential for the wetland to contribute water to an aquifer (recharge) or to function as a groundwater discharge area.*
- Floodflow Alteration (Storage and Desynchronization) - *This function considers the effectiveness of the wetland in reducing flood damage by attenuating floodwaters for prolonged periods following precipitation and snow melt events.*
- Fish and Shellfish Habitat - *This function considers the effectiveness or importance of seasonal or permanent waterbodies associated with the wetlands in question for fish and shellfish habitat.*
- Sediment/Toxicant/Pathogen Retention - *This function reduces or prevents degradation of water quality. It relates to the effectiveness of the wetland to act as a trap for sediments, toxicants, or pathogens that may be contained in river or runoff water.*
- Nutrient Removal/Retention/Transformation - *This wetland function considers the effectiveness of the wetland to prevent adverse effects of excess nutrients entering aquifers or surface water. The effectiveness is related to the ability of the wetland to trap and process these nutrients into other forms or tropic levels.*
- Production Export - *This function evaluates the effectiveness of the wetland to produce food or useable products for humans or other living organisms.*
- Sediment/Shoreline Stabilization - *This function considers the effectiveness of a wetland to stabilize stream banks and shorelines against erosion.*

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

- Wildlife Habitat - *This function considers the effectiveness of the wetland to provide habitat for various types and population of animals typically associated with wetlands and the wetland edge. Both resident and/or migrating species are considered.*

VALUES

- Recreation (Consumptive and Non-Consumptive) - *This value considers the suitability of the wetland and associated watercourses to provide recreational opportunities such as hiking, canoeing, boating, fishing, hunting, and other active or passive recreational activities. Both "consumptive" and "non-consumptive" types of recreation are considered.*
- Education/Scientific Value - *This function considers the Suitability of the wetland as a site for an "outdoor classroom" or as a location for scientific study or research.*
- Uniqueness/Heritage - *This value relates to the effectiveness of the wetland or its associated watersheds to provide certain special values such as archeological sites, unusual aesthetic qualities, historical events, unique plants, animals, geologic features, etc.*
- Visual Quality/Aesthetics - *This value relates to the visual and aesthetic qualities of the wetland.*
- Threatened or Endangered Species Habitat - *This function considers the suitability of the wetland or associated waterseheds to support rare, threatened, or endangered species.*

Each factors associated with the presence/absence of a specific function/value was evaluated relative to each project area wetland. Table 3, below, presents an inventory of the wetlands and enumerates which of the 13 functions and values are associated with wetlands within or proximate to the Project site.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Table 3: USACE Highway Methodology Function and Values Assessment

Town/State	Wetland Number	Wetland Classification – Conclusion[1]	Comments	Wetland Functions and Values[2]												
				GWR/D	FFA	F&SH	S&TR	NR&T	PE	S&S	WLH	REC	ED/S	U/H	VQ/A	T&E
Agawam, MA	WMA-01	PFO/PEM	Depicted on CT loop mapping.	X			X	X			X					
Agawam, MA	WMA-01A	PFO	Contains a vernal pool. Depicted on CT loop mapping.	X	X		X	X	X		X				X	
Agawam, MA	WMA-01B	PFO	Depicted on CT loop mapping.	X	X		X	X			X					
Agawam, MA Suffield, CT	WCT-01/01B	PFO/PSS/PEM	Wetland crosses state boundaries.	X	X		X	X			X					
Sandisfield, MA	WMA-03	PFO/PEM	Contains (2) vernal pools.	X			X	X	X		X					
Sandisfield, MA	WMA-04	PFO	Isolated.	X	X		X	X			X					
Sandisfield, MA	WMA-05	PFO/PEM	Contains (1) vernal pool.	X	X		X	X	X		X				X	
Sandisfield, MA	WMA-06	PFO/PEM	Contains (1) vernal pool.	X	X		X	X	X		X					
Sandisfield, MA	WMA-07	PFO/PSS/PEM	Very large wetland, contains (6) vernal pools.	X	X		X	X	X		X				X	
Sandisfield, MA	WMA-08	PFO		X	X		X	X			X					
Sandisfield, MA	WMA-09	PFO		X	X		X	X			X					
Sandisfield, MA	WMA-10	PFO/PEM		X	X		X	X			X					
Sandisfield, MA	CVP-1	PFO	This area did not qualify as a wetland (no hydric soil or hydrophytic veg.) but did as a vernal pool.													
Sandisfield, MA	WMA-11	PFO		X	X		X	X			X					
Sandisfield, MA	WMA-12	PFO/PEM	Area contains (1) vernal pool.	X	X		X	X	X		X					
Sandisfield, MA	WMA-13	PFO/PEM	Isolated Area contains (1) vernal pool.	X	X		X	X	X		X					
Sandisfield, MA	WMA-14	PFO/PEM		X			X	X			X					
Sandisfield, MA	WMA-15	PFO/PEM		X			X	X			X					
Sandisfield, MA	WMA-16	PFO/PEM	Contains a vernal pool.	X	X		X	X	X		X					
Sandisfield, MA	WMA-17	OW	Small pond	X	X	X	X	X			X					
Sandisfield, MA	WMA-18	PFO/PEM	Contains a vernal pool.	X	X			X	X		X			X	X	
Sandisfield, MA	WMA-19	PFO/PEM		X				X			X					
Sandisfield, MA	WMA-20	PFO/PEM	Associated with a perennial stream.	X	X	X	X	X	X		X					
Sandisfield, MA	WMA-21	PEM/PFO	Large marsh.	X	X	X	X	X	X	X	X		X	X	X	
Tyringham, MA	WMA-22	PEM	Ag field.	X	X						X					X
Sandisfield, MA	WMA-23	PFO/PEM	Entire wetland is an active pasture and contains (1) vernal pool.	X	X		X	X	X		X					
Sandisfield, MA	WMA-24	PFO/PEM	Entire wetland is an active pasture and contains (1) vernal pool.	X	X		X	X	X		X					
Sandisfield, MA	WMA-31	PFO	Associated with perennial tributary of Clam River.	X	X	X	X	X		X						

1 Wetland Classification: PFO – Palustrine Forested Wetland, PSS – Palustrine Scrub-Shrub Wetland, PEM – Palustrine Emergent Wetland
2 Wetland Functions and Values: GWR/D – Groundwater Recharge/Discharge, FFA – Floodflow Alteration, F&SH – Fish and Shellfish Habitat, S&TR – Sediment/Toxicant Removal, NR&T – Nutrient Removal, PE – Production Export, S&S – Sediment/Shoreline Stabilization, WLH – Wildlife habitat, REC – Recreation, ED/S – Education/Scientific Value, U/H – Uniqueness/Heritage, VQ/A – Visual Quality/Aesthetics, T&E – Endangered Species Habitat.

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Appendix A

Massachusetts Wetlands and Watercourses Identified Along the Connecticut Expansion Project

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Table A-1
Wetlands Identified Along the Massachusetts Portion of the Connecticut Expansion Project

Approximate Milepost	AECOM Wetland Number[1]	Wetland Class[2]	Wetland Hydrology Indicator	Hydrophytic Vegetation Indicator	Hydric Soil Indicator	Wetland Description
0.01 – 0.12 (CT Loop)	WMA-01	PFO/PEM	B9, C3, C4,C2	Observed	F3	Low lying forested wetland.
0.38 – 0.39 (CT Loop)	WMA-01A	PFO	B9, C3, C4,C2	Observed	F3	Low lying forested wetland.
0.01 – 0.34 (CT Loop)	WMA-01B	PFO	B9, C3, C4,C2	Observed	F3	Low lying forested wetland.
0.01 – 0.34 (CT Loop)	WCT-01B	PFO	B9, C3, C4,C2	Observed	F3	Low lying forested wetland.
0.14 – 0.17 (CT Loop)	WMA-02	PEM	A2, C3, C4	Observed	F3	Low lying portion of an agricultural field
0.00 – 0.02	WMA-3	PEM/PFO	A1, A2, A3, C3, B10, D2	Dominance test	S5	Forested and emergent wetland associated with an intermittent stream
0.49 – 0.51	WMA-4	PFO	A3, B9, B10, D4	Dominance Test	S5	Small isolated wetland
0.26 – 0.32	WMA-5	PFO/PEM	A3, B10	Rapid Test & Prevalence Index	A11	Forested and emergent wetland associated with an intermittent stream channel
0.44-0.45	WMA-6	PEM/PFO	A2, A3, C1, C3	Rapid Test, Dominance Test	A2	Forested and emergent wetland slopes west
0.41 – 1.07	WMA-7	PEM/PFO	A1,A3, B7, B9	Dominance Test	A1, A3	Large emergent and forested swamp
1.24 – 1.26	WMA-8	PFO	A2, A3, B1	Observed	A11	Forested wetland
1.17 – 1.22	WMA-9	PFO	A2, A3, B1	Observed	A11	Forested wetland
1.25 – 1.28	WMA-10	PEM/PFO	A1, A2, A3, B1	Observed	A11	Emergent marsh vegetation within ROW with forested wetlands off ROW
1.44 – 1.47	WMA-11	PFO	A1,A2, A3, B1	Observed	A2	Forested wetland
1.43 – 1.54	WMA-12	PFO/PEM	A1, A2, A3	Observed	A2	Emergent marsh vegetation within ROW with forested wetlands off ROW
1.56 – 1.66	WMA-13	PEM	A2, A3, B1	Observed	A11	Emergent marsh
1.89 – 1.97	WMA-14	PFO/PEM	A2, A3, B1	Observed	A11	Emergent marsh vegetation within ROW with forested wetlands off ROW
1.98 – 2.05	WMA-15	PEM/PFO	A3	Dominance Test	S5,S6	Emergent marsh vegetation within ROW with forested wetlands off ROW
2.62 – 1.84	WMA-16	PEM/PFO	A1, A2, A3, B1, B13	Observed	A1	Large emergent and forested swamp associated with a ponded area and a perennial stream
2.64 – 2.66	WMA-17	OW	A1, A2,	Observed	N/A	Manmade Pond

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Table A-1
Wetlands Identified Along the Massachusetts Portion of the Connecticut Expansion Project

Approximate Milepost	AECOM Wetland Number[1]	Wetland Class[2]	Wetland Hydrology Indicator	Hydrophytic Vegetation Indicator	Hydric Soil Indicator	Wetland Description
			B13			
2.49 – 2.58	WMA-18	PFO/PEM	A2, B1,B9,C3	Observed	A11	Large forested and emergent swamp
2.38 – 2.47	WMA-19	PEM/PFO	A1, A2	Observed	A11	Forested and emergent wetland with disturbed soils in ROW.
2.83 – 2.99	WMA-20	PFO/PEM	A1, A3, B1, B9,C3	Dominance Test	A11	Large emergent and forested wetland associated with a perennial stream
3.11 – 3.39	WMA-21	PEM/PFO	A2, A3, B1, B7, B9, B13	Dominance Test	A1 in emergent areas, A11	Large emergent marsh associated with a perennial stream
N/A	WMA-22	PEM	A2, B5, C3	Dominance Test	A11	Large emergent marsh associated with perennial stream (pipe yard).
3.8	WMA-23	PEM/PFO	A1, A3, B1, B9, C3, C4, B10, C9	Dominance Test	A3, A4, A11	Primarily emergent marsh within a livestock pasture includes a small persistent pond.
N/A	WMA-24	PEM	A1, A3, B1, B9, C3, C4, B10, C9	Dominance Test	A3, A4, A11	Emergent marsh associated with a stream channel. (access road)

1: Wetland series number generated by AECOM to identify wetlands within and adjacent to the Project corridor; 2: wetlands classification according to Cowardin et al 1979; PEM = Palustrine Emergent Wetland; PFO = Palustrine Forested Wetland; PSS = Palustrine Scrub-Shrub Wetland; OW = Open Water.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Table A-2
Watercourses Identified Along the Massachusetts Portion of the Connecticut Expansion Project

Approximate Milepost	AECOM Watercourse Series Number & Name (Where Applicable)	Watercourse Frequency Type (P or I)[a]	Width (ft)	Water Quality (where applicable)/ Fishery Classification[b]
0.00 – 0.00	Unnamed stream (SMA-03)	I	5	B
0.31 – 0.31	Unnamed stream (SMA-05)	I	4	B
0.31 – 0.31	Unnamed stream (SMA-05A)	I	6	B
0.60 – 0.71	Unnamed stream (SMA-07)	I	7	B
1.25 – 1.26	Unnamed stream (SMA-08)	I	4	B
1.26 – 1.27	Unnamed stream (SMA-10)	I	4	B
1.48 – 1.50	Unnamed stream (SMA-12)	I	3	B
1.86 – 1.91	Spectacle Pond Brook (SMA-14)	P	25	B
1.89 – 1.90	Oxbow of Spectacle Pond Brook (SMA-15)	I	25	B
2.81 – 2.84	Unnamed stream (SMA-16)	P	5	B
2.85 – 2.91	Unnamed stream (SMA-20)	P	10	B
3.29 – 3.32	Unnamed stream (SMA-21)	P	8	B
3.29 – 3.31	Unnamed stream (SMA-21A)	P	3	B
N/A	Drainage Ditch (SMA-23)	I	3	B

a : P = perennial; I = intermittent
b : State Designations Use Description
All surface waters in the Farmington River Basin are designated Class B, unless otherwise specified. These waters are designated as a habitat for fish, other aquatic life, and wildlife, including for their reproduction, migration, growth, and for primary and secondary contact recreation.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Appendix B

Connecticut Expansion Project Maps: Massachusetts Wetlands and Watercourses

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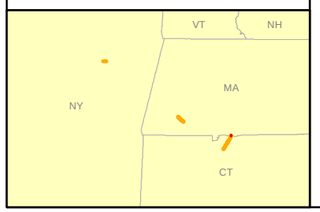

Legend

- Mileposts
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- Town Boundary
- Stream Flag
- Wetland Flag
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- Waterbodies
- Wetlands
- Matchlines

N E S W

Tennessee Gas Pipeline Company

CT Expansion Project

Wetlands

Connecticut

0 100 200 400 Feet

1 inch = 200 feet

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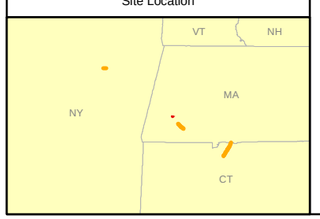

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N E W S

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CT Expansion Project

Wetlands

Massachusetts

0 100 200 400 Feet

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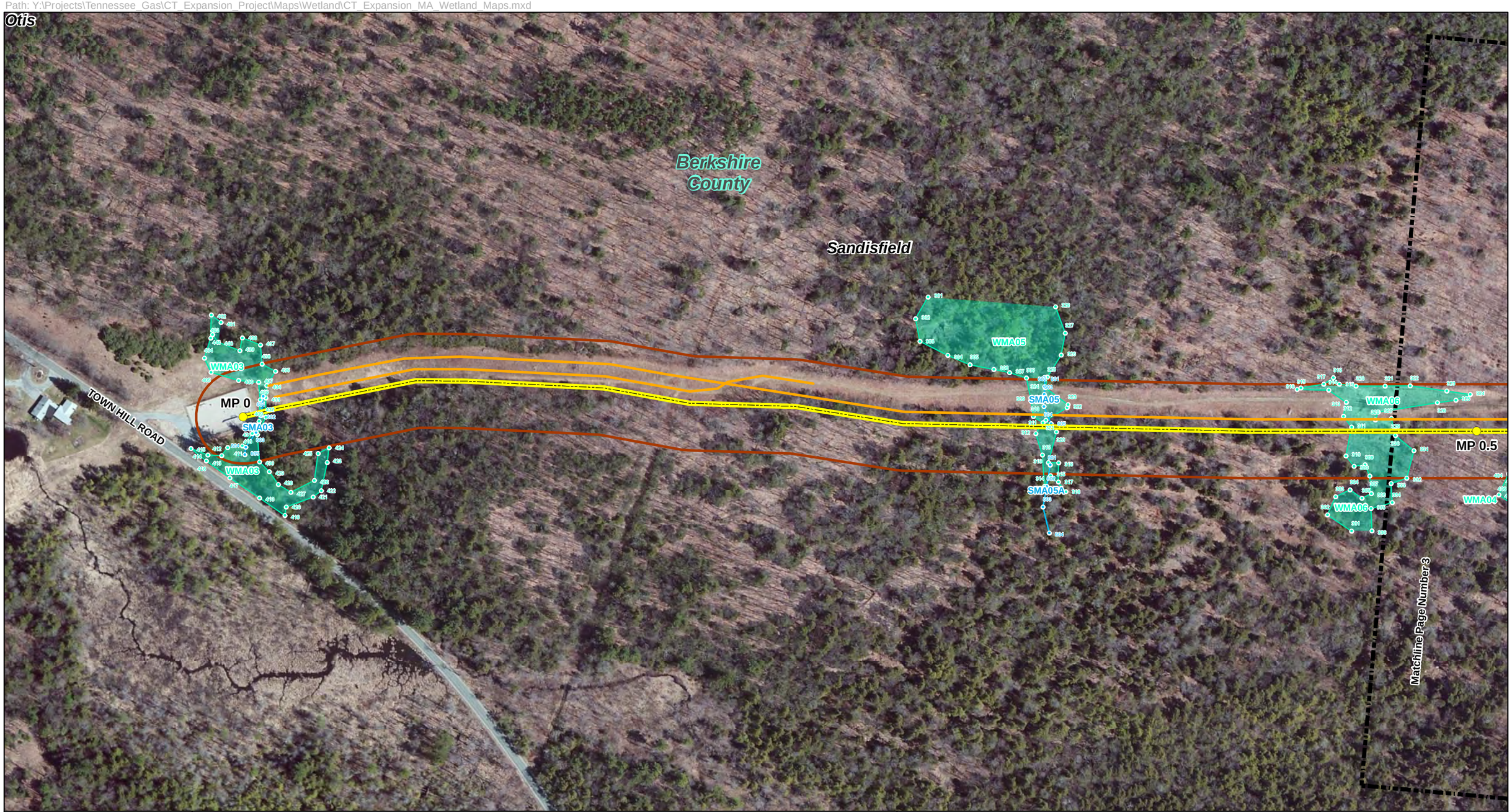

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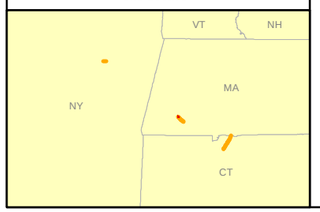

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Wetlands

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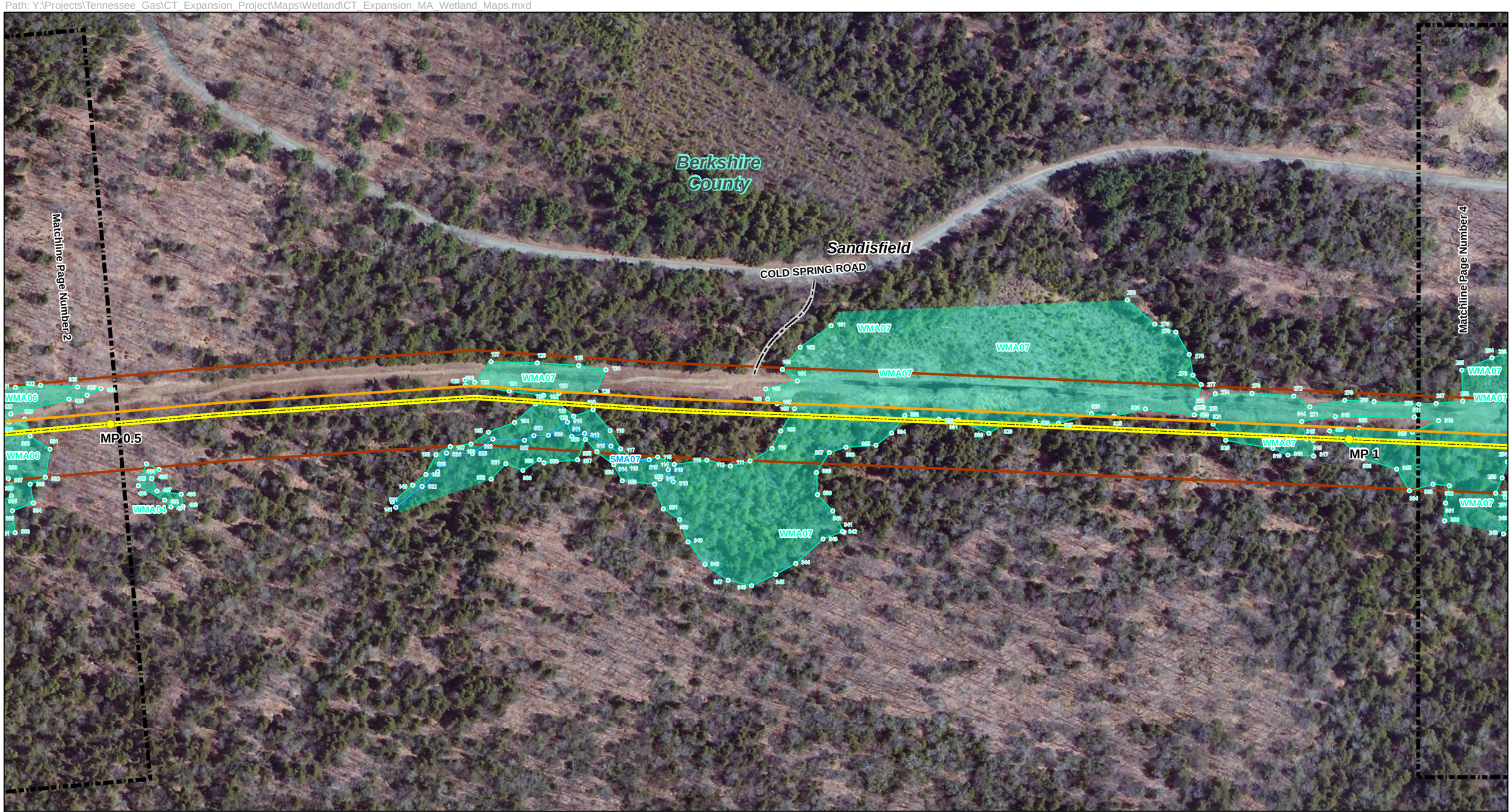

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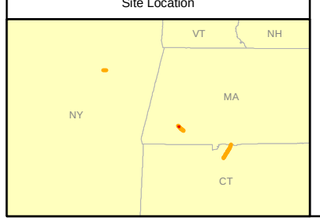

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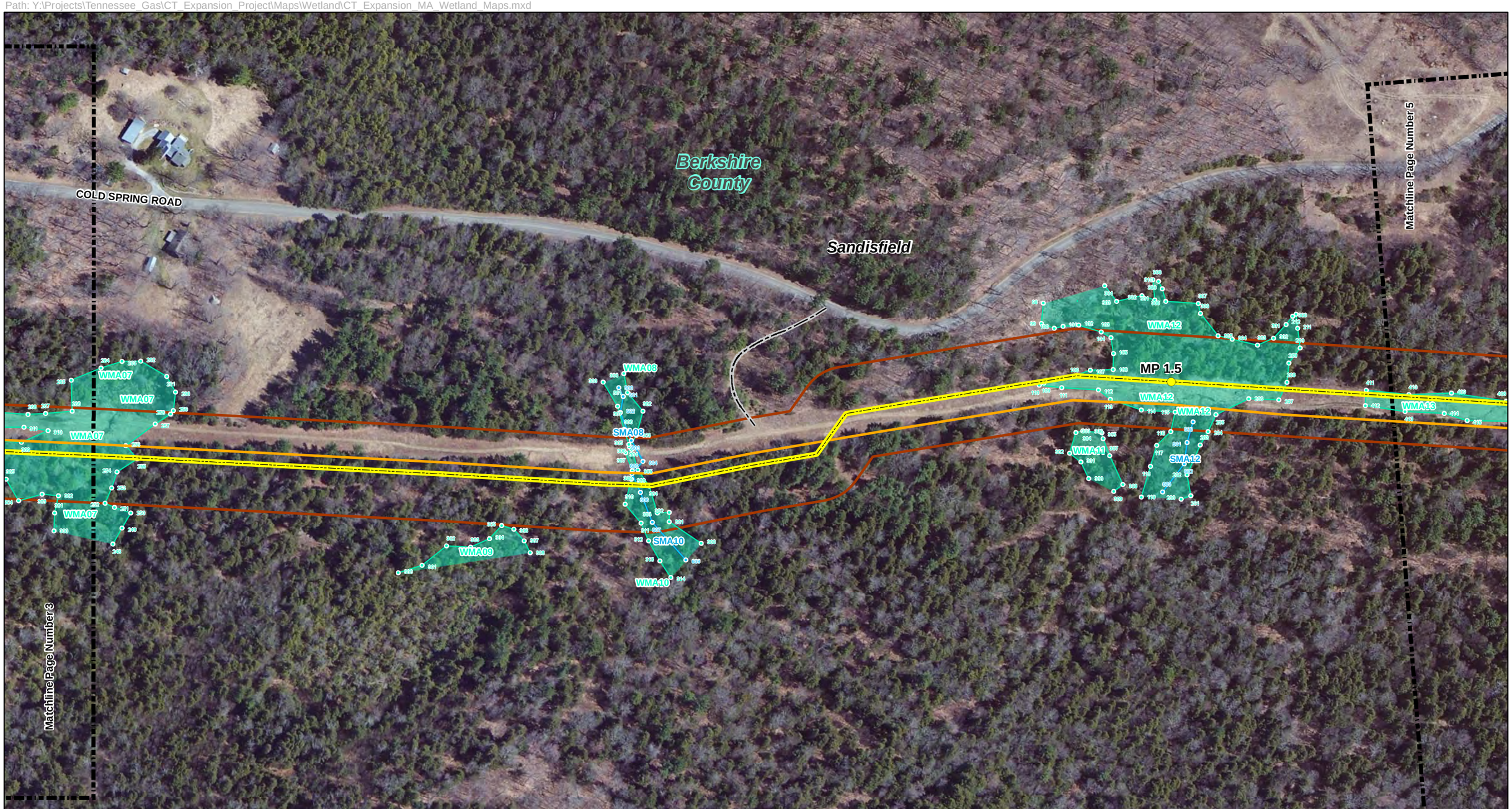

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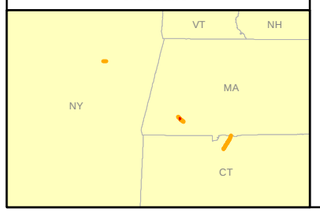

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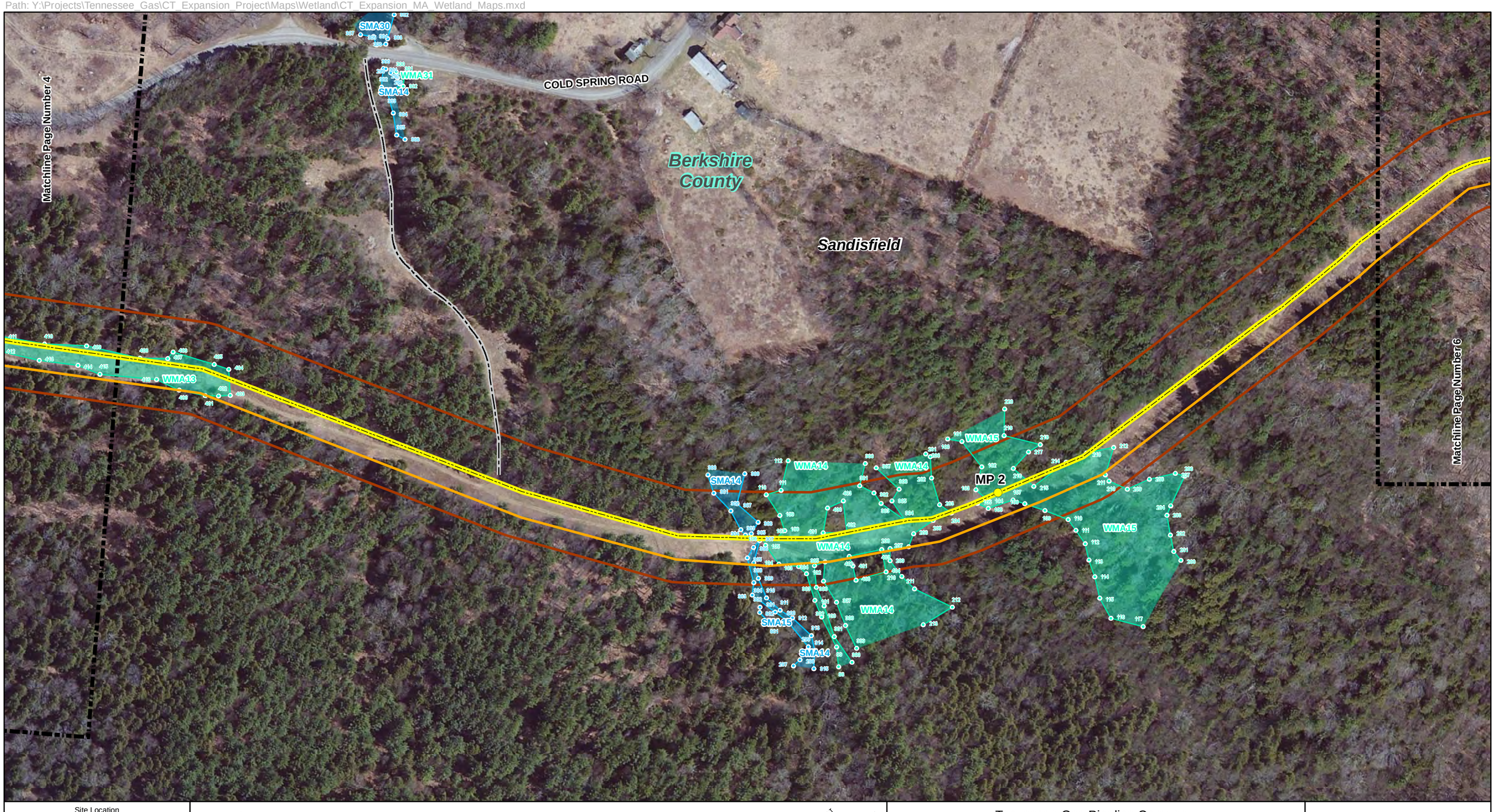

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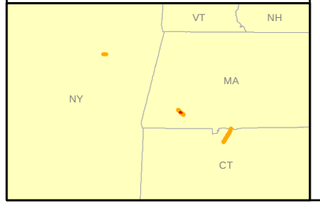

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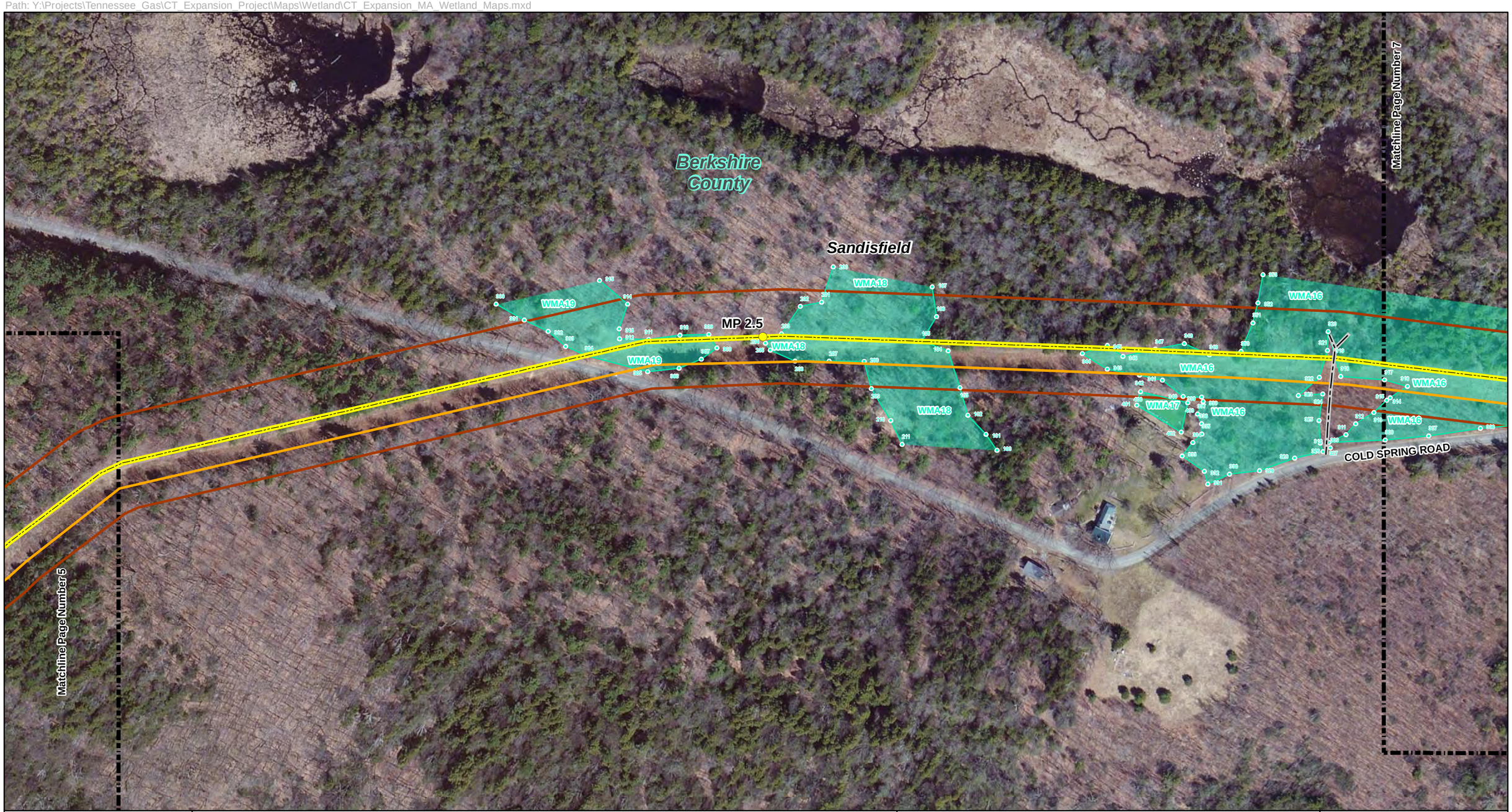

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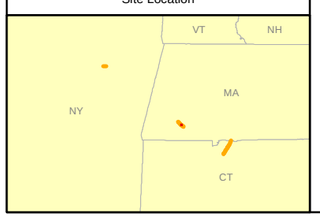

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CT Expansion Project

Wetlands

Massachusetts

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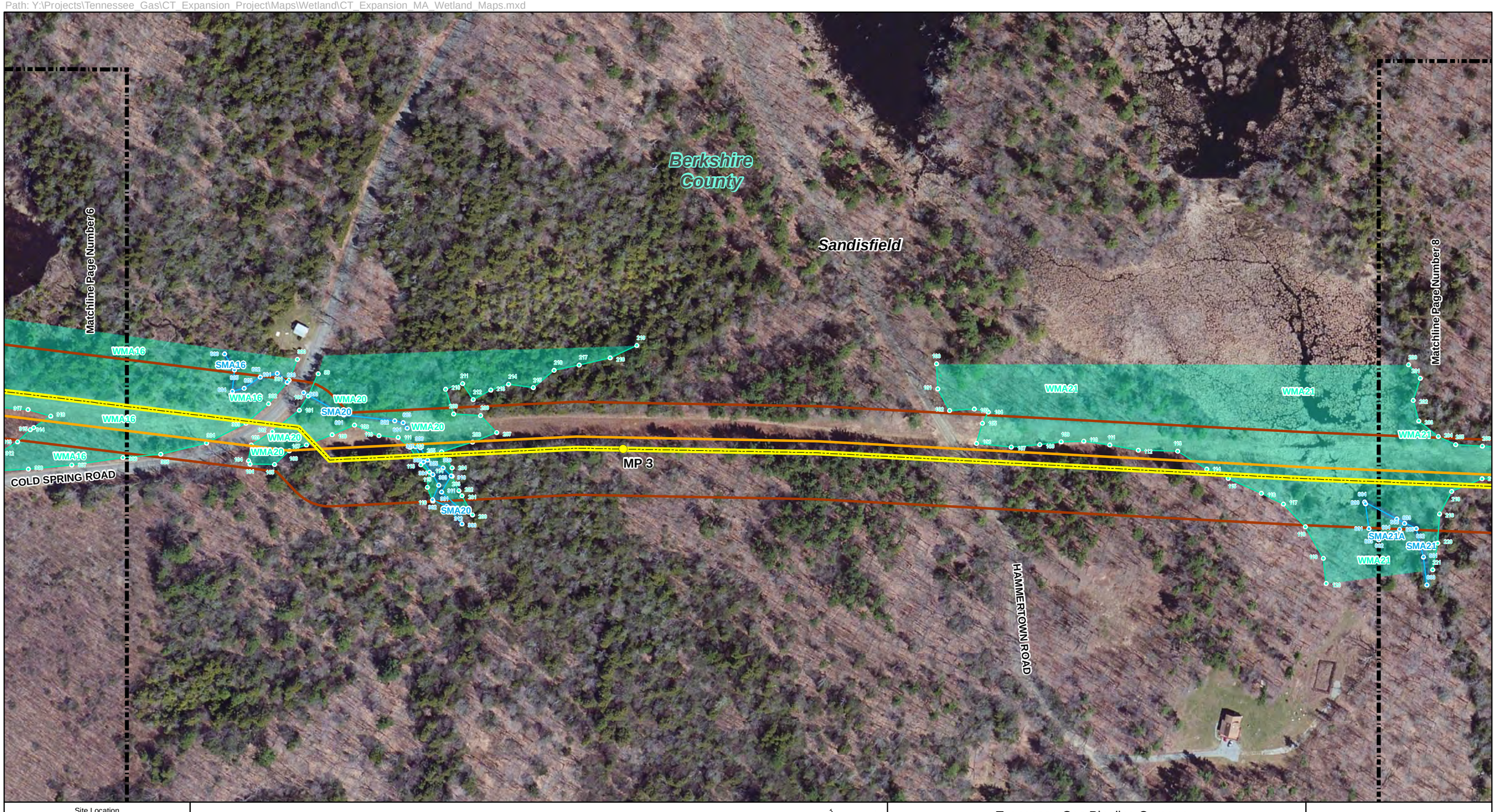

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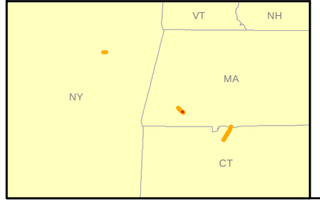

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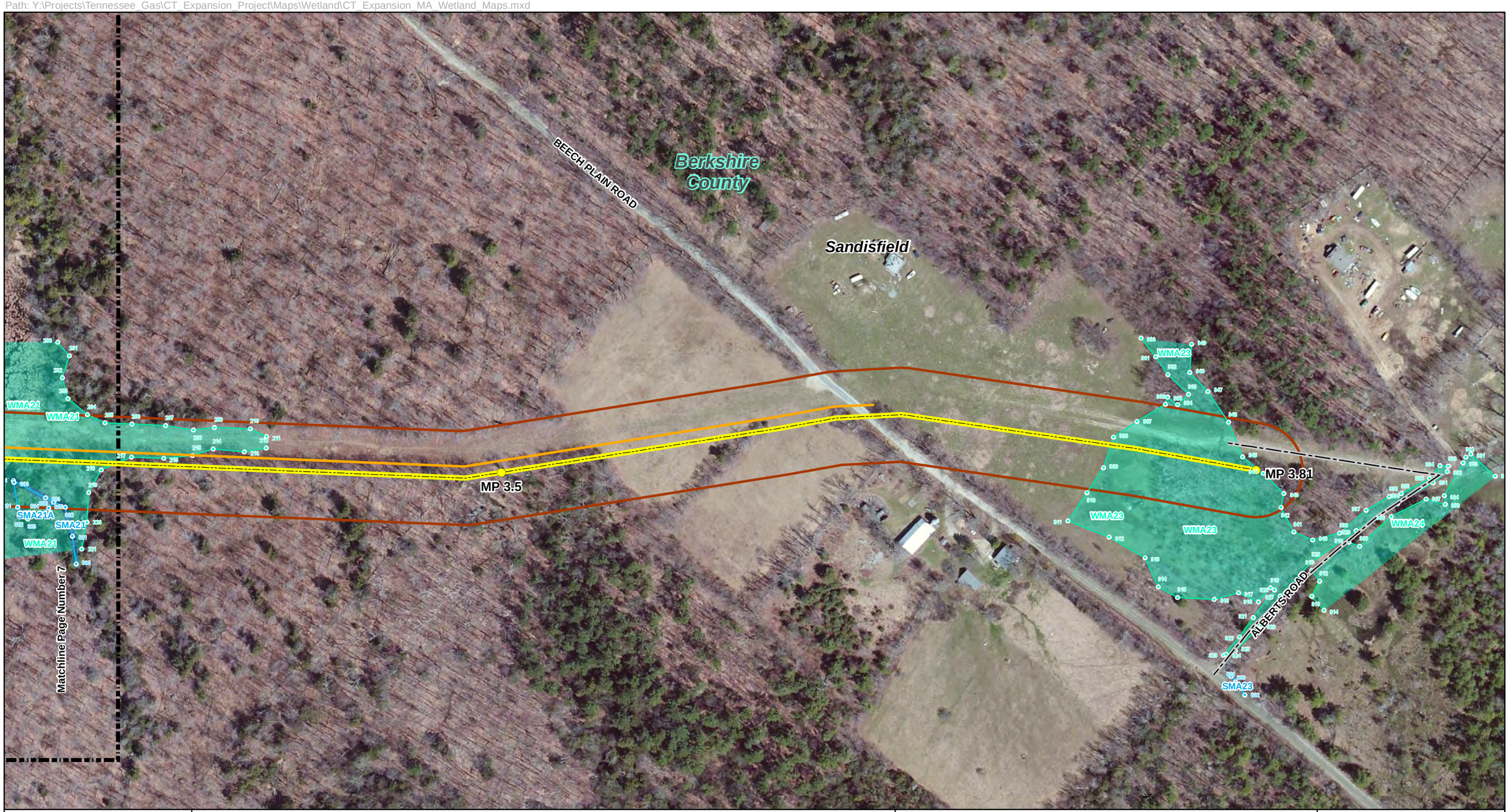
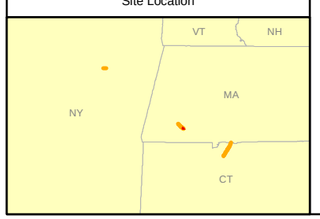


Site Location



Legend

- Mileposts
- Access Roads
- Proposed Project Centerline
- Existing Pipeline Centerline
- 200' Survey Corridor
- County Boundary
- Town Boundary
- Stream Flag
- Wetland Flag
- Streams
- Wetland Lines
- Waterbodies
- Wetlands
- Matchlines

N E W S

Tennessee Gas Pipeline Company

CT Expansion Project

Wetlands

Massachusetts

0 100 200 400 Feet

1 inch = 200 feet

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

April 2014

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Appendix C

Army Corp of Engineers Wetland Transect Data Forms

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: CT Expansion City/County: Sandisfield/ Berkshire Sampling Date: 10/28/2013

Applicant/Owner: State: MA Sampling Point: WMA-3 UPL

Investigator(s): Samuel Haines & Alison Milliman Section, Township, Range:

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): none

Slope (%): 1 Lat: 42.178190 Long: -73.144925 Datum: NAD 83

Soil Map Unit Name: Peru-Marlow Association, rolling, extremely stony NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil X, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No X	**Is the Sampled Area within a Wetland?** **Yes** _____ **No** X
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes _____	No X	If yes, optional Wetland Site ID: _____

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes _____	No X	Depth (inches): _____
Water Table Present?	Yes _____	No X	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): _____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VEGETATION – Use scientific names of plants.

Sampling Point: WMA-3 UPL

Tree Stratum (Plot size: 30' radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Tsuga canadensis	30	Y	FACU
2. Pinus strobus	20	Y	FACU
3. Acer rubrum	5	N	FAC
4.			
5.			
6.			
7.			
	55	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15' radius)			
1. Acer rubrum	5	Y	FAC
2. Liriodendron tulipifera	5	Y	FACU
3. Betula lenta	10	Y	FACU
4.			
5.			
6.			
7.			
	20	= Total Cover	

Herb Stratum (Plot size: 5' radius)			
1. Solidago canadensis	10	Y	FACU
2. Dennstaedtia punctilobula	15	Y	UPL
3. Dryopteris sp.	5	N	
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	30	= Total Cover	

Woody Vine Stratum (Plot size: 30' radius)			
1. none			
2.			
3.			
4.			
		= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.14 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	10	x 3 =	30
FACU species	75	x 4 =	300
UPL species	15	x 5 =	75
Column Totals:	100 (A)		405 (B)

Prevalence Index = B/A = 4.05

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** _____ **No** X

Remarks: (Include photo numbers here or on a separate sheet.)

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

SOIL

Sampling Point: WMA-3 UPL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
1-0								organic duff
0-13	2.5 Y 5/4						loamy sand	
13-18	10 YR 3/4						sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** _____ **No** X

Remarks:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: CT Expansion City/County: Sandisfield/ Berkshire Sampling Date: 10/28/2013

Applicant/Owner: State: MA Sampling Point: WMA-3 WET

Investigator(s): Samuel Haines & Alison Milliman Section, Township, Range:

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): none

Slope (%): Lat: 42.178190 Long: -73.144925 Datum: NAD 83

Soil Map Unit Name: Peru-Marlow Association, rolling, extremely stony NWI classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation ____, Soil X, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No	**Is the Sampled Area within a Wetland?** **Yes** X **No**
Hydric Soil Present?	Yes X	No	
Wetland Hydrology Present?	Yes X	No	If yes, optional Wetland Site ID:

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- X Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- X Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes X	No	Depth (inches): 2
Water Table Present?	Yes X	No	Depth (inches): 3
Saturation Present? (includes capillary fringe)	Yes X	No	Depth (inches): 0

Wetland Hydrology Present? **Yes** X **No**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VEGETATION – Use scientific names of plants.

Sampling Point: WMA-3 WET

Tree Stratum (Plot size: 30' radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. none			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15' radius)			
1. Pinus strobus	5	Y	FACU
2.			
3.			
4.			
5.			
6.			
7.			
	5 = Total Cover		
Herb Stratum (Plot size: 5' radius)			
1. Typha latifolia	30	Y	OBL
2. Phalaris arundinacea	60	Y	FACW
3. Aster sp.	10	N	
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: 30' radius)			
1. none			
2.			
3.			
4.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.67 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

X Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** _____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: WMA-3 WET

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12	2.5 Y 5/1	98	10 YR 4/4	2	C	PL	loamy sand	saturated surface, water at +3"

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- X Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** _____

Remarks:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: CT Expansion City/County: Sandisfield/ Berkshire Sampling Date: 10/28/2013

Applicant/Owner: State: MA Sampling Point: WMA-3 WET

Investigator(s): Samuel Haines & Alison Milliman Section, Township, Range:

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): none

Slope (%): Lat: 42.178190 Long: -73.144925 Datum: NAD 83

Soil Map Unit Name: Peru-Marlow Association, rolling, extremely stony NWI classification: PFO

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation , Soil X, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes X No

Are Vegetation , Soil , or Hydrology naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No	**Is the Sampled Area within a Wetland?** **Yes** X **No**
Hydric Soil Present?	Yes X	No	If yes, optional Wetland Site ID:
Wetland Hydrology Present?	Yes X	No	

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- X Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- X Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes	No X	Depth (inches):	
Water Table Present?	Yes X	No	Depth (inches):	5
Saturation Present? (includes capillary fringe)	Yes X	No	Depth (inches):	0

Wetland Hydrology Present? **Yes** X **No**

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: WMA-3 WET

Tree Stratum (Plot size: 30' radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer rubrum	30	Y	FAC
2. Pinus strobus	20	Y	FACU
3. Tsuga canadensis	10	N	FACU
4.			
5.			
6.			
7.			
	60	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15' radius)			
1. Acer rubrum	5	Y	FAC
2. Fagus grandifolia	5	Y	FACU
3. Alnus rugosa	15	Y	FACW
4.			
5.			
6.			
7.			
	25	= Total Cover	

Herb Stratum (Plot size: 5' radius)			
1. Microstegium vimineum	40	Y	FAC
2. Calamagrostis canadensis	15	N	OBL
3. Onoclea sensibilis	10	N	FACW
4. Aster sp.	20	Y	
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	85	= Total Cover	

Woody Vine Stratum (Plot size: 30' radius)			
1. none			
2.			
3.			
4.			
		= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.67 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

X Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** _____

Remarks: (Include photo numbers here or on a separate sheet.)

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

SOIL

Sampling Point: WMA-3 WET

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-2	10 YR 2/2	100						partially decomposed organic
2-16	2.5 Y 4/1	100					loamy sand	organic staining

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- X Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** _____

Remarks:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: CT Expansion City/County: Sandisfield/ Berkshire Sampling Date: 10/29/2013

Applicant/Owner: State: MA Sampling Point: WMA-4 UPL

Investigator(s): Samuel Haines & Alison Milliman Section, Township, Range:

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): concave

Slope (%): 1 Lat: 42.172807 Long: -73.137393 Datum: NAD 83

Soil Map Unit Name: Peru-Marlow Association, rolling, extremely stony NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil X, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No X	**Is the Sampled Area within a Wetland?** **Yes** _____ **No** X
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes _____	No X	If yes, optional Wetland Site ID: _____

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes _____	No X	Depth (inches): _____
Water Table Present?	Yes _____	No X	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): _____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: WMA-4 UPL

Tree Stratum (Plot size: 30' radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer rubrum	70	Y	FAC
2. Betula allegheniensis	20	Y	FAC
3.			
4.			
5.			
6.			
7.			
	90	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15' radius)			
1. Acer rubrum	5	Y	FAC
2. Fagus grandifolia	10	Y	FACU
3.			
4.			
5.			
6.			
7.			
	15	= Total Cover	

Herb Stratum (Plot size: 5' radius)			
1. Polystichum acrostichoides	30	Y	FACU
2. Carex pennsylvanica	30	Y	UPL
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	60	= Total Cover	

Woody Vine Stratum (Plot size: 30' radius)			
1. none			
2.			
3.			
4.			
		= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.50 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	95	x 3 =	285
FACU species	40	x 4 =	160
UPL species	30	x 5 =	150
Column Totals:	165 (A)		595 (B)

Prevalence Index = B/A = 3.6

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** _____ **No** X

Remarks: (Include photo numbers here or on a separate sheet.)

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

SOIL

Sampling Point: WMA-4 UPL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-2	10 YR 2/2	100					loam	
2-18	10 YR 3/4	100					sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** _____ **No** X

Remarks:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: CT Expansion City/County: Sandisfield/ Berkshire Sampling Date: 10/29/2013

Applicant/Owner: State: MA Sampling Point: WMA-4 WET

Investigator(s): Samuel Haines & Alison Milliman Section, Township, Range:

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): concave

Slope (%): 2 Lat: 42.172807 Long: -73.137393 Datum: NAD 83

Soil Map Unit Name: Peru-Marlow Association, rolling, extremely stony NWI classification: PFO

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil X, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No _____	**Is the Sampled Area within a Wetland?** **Yes** X **No** _____
Hydric Soil Present?	Yes X	No _____	If yes, optional Wetland Site ID: _____
Wetland Hydrology Present?	Yes X	No _____	

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- X Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- X Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- X Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- X Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes _____	No X	Depth (inches): _____
Water Table Present?	Yes _____	No X	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes X	No _____	Depth (inches): 10

Wetland Hydrology Present? **Yes** X **No** _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

Advantageous roots and buttressing on trees.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VEGETATION – Use scientific names of plants.

Sampling Point: WMA-4 WET

Tree Stratum (Plot size: 30' radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer rubrum	40	Y	FAC
2. Fraxinus pennsylvanica	10	N	FACW
3. Betula allegeniensis	20	Y	FAC
4.			
5.			
6.			
7.			
	70	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15' radius)			
1. Acer rubrum	5	Y	FAC
2.			
3.			
4.			
5.			
6.			
7.			
	5	= Total Cover	

Herb Stratum (Plot size: 5' radius)			
1. Cinna arundinacea	50	Y	FACW
2. Carex crinita	20	Y	OBL
3. Dryopteris sp.	20	Y	
4. Aster sp.	5	N	
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	95	= Total Cover	

Woody Vine Stratum (Plot size: 30' radius)			
1. none			
2.			
3.			
4.			
		= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 5 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

X Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** _____

Remarks: (Include photo numbers here or on a separate sheet.)

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

SOIL

Sampling Point: WMA-4 WET

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-18	10 YR 2/1	95%	10 YR 5/4	5	C	M	sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- X Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** _____

Remarks:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: CT Expansion City/County: Sandisfield/ Berkshire Sampling Date: 10/28/2013

Applicant/Owner: State: MA Sampling Point: WMA-5 UPL

Investigator(s): Samuel Haines & Alison Milliman Section, Township, Range:

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): none

Slope (%): 5 Lat: 42.176401 Long: -73.142243 Datum: NAD 83

Soil Map Unit Name: Peru-Marlow Association, rolling, extremely stony NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil X, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No X	**Is the Sampled Area within a Wetland?** **Yes** _____ **No** X
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes _____	No X	If yes, optional Wetland Site ID: _____

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes _____	No X	Depth (inches): _____
Water Table Present?	Yes _____	No X	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): _____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: WMA-5 UPL

Tree Stratum (Plot size: 30' radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Tsuga canadensis	50	Y	FACU
2. Fagus grandifolia	20	Y	FACU
3. Quercus rubra	10	N	FACU
4.			
5.			
6.			
7.			
	80	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15' radius)			
1. Fagus grandifolia	10	Y	FACU
2.			
3.			
4.			
5.			
6.			
7.			
	10	= Total Cover	

Herb Stratum (Plot size: 5' radius)			
1. Gaultheria procumbens	15	Y	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	15	= Total Cover	

Woody Vine Stratum (Plot size: 30' radius)			
1. none			
2.			
3.			
4.			
		= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 4 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	105	x 4 =	420
UPL species	0	x 5 =	0
Column Totals:	105 (A)		420 (B)

Prevalence Index = B/A = 4

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** _____ **No** X

Remarks: (Include photo numbers here or on a separate sheet.)

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

SOIL

Sampling Point: WMA-5 UPL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-3	10 YR 3/2	100					loam	
3-18	7.5 YR 5/6	100					fine sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** _____ **No** X

Remarks:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: CT Expansion City/County: Sandisfield/ Berkshire Sampling Date: 10/28/2013

Applicant/Owner: State: MA Sampling Point: WMA-5 WET

Investigator(s): Samuel Haines & Alison Milliman Section, Township, Range:

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): none

Slope (%): 5 Lat: 42.176401 Long: -73.142243 Datum: NAD 83

Soil Map Unit Name: Peru-Marlow Association, rolling, extremely stony NWI classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil X, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No _____	**Is the Sampled Area within a Wetland?** **Yes** X **No** _____
Hydric Soil Present?	Yes X	No _____	If yes, optional Wetland Site ID: _____
Wetland Hydrology Present?	Yes X	No _____	

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- X Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- X Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes _____	No X	Depth (inches): _____
Water Table Present?	Yes _____	No X	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes X	No _____	Depth (inches): 2

Wetland Hydrology Present? **Yes** X **No** _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

10% sphagnum moss

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VEGETATION – Use scientific names of plants.

Sampling Point: WMA-5 WET

Tree Stratum (Plot size: 30' radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. none			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15' radius)			
1. Spiraea alba	25	Y	FACW
2.			
3.			
4.			
5.			
6.			
7.			
	25 = Total Cover		
Herb Stratum (Plot size: 5' radius)			
1. Scirpus cyperinus	25	Y	OBL
2. Phalaris arundinacea	25	Y	FACW
3. Onoclea sensibilis	15	N	FACW
4. Carex lurida	30	Y	OBL
5. Symphotrichum novi-belgii	5	N	FACW
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: 30' radius)			
1. none			
2.			
3.			
4.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)

Total Number of Dominant Species Across All Strata: _____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

X Rapid Test for Hydrophytic Vegetation

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** _____

Remarks: (Include photo numbers here or on a separate sheet.)

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

SOIL

Sampling Point: WMA-5 WET

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-2	10 YR 3/2	100					sandy loam	
2-16	2.5 Y 5/1	70	2.5 Y 5/6	30	C	M	loamy sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- X Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** _____

Remarks:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: CT Expansion City/County: Sandisfield/ Berkshire Sampling Date: 10/28/2013

Applicant/Owner: State: MA Sampling Point: WMA-5 WET

Investigator(s): Samuel Haines & Alison Milliman Section, Township, Range:

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): none

Slope (%): 5 Lat: 42.176401 Long: -73.142243 Datum: NAD 83

Soil Map Unit Name: Peru-Marlow Association, rolling, extremely stony NWI classification: PFO

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil X, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No _____	**Is the Sampled Area within a Wetland?** **Yes** X **No** _____
Hydric Soil Present?	Yes X	No _____	If yes, optional Wetland Site ID: _____
Wetland Hydrology Present?	Yes X	No _____	

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- X Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- X Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes X	No _____	Depth (inches): 2
Water Table Present?	Yes X	No _____	Depth (inches): 5
Saturation Present? (includes capillary fringe)	Yes X	No _____	Depth (inches): 5

Wetland Hydrology Present? **Yes** X **No** _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:
Subsurface flow downhill.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VEGETATION – Use scientific names of plants.

Sampling Point: WMA-5 WET

Tree Stratum (Plot size: 30' radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer rubrum	20	Y	FAC
2. Fraxinus pennsylvanica	20	Y	FACW
3. Tsuga canadensis	30	Y	FACU
4. Betula nigra	10	N	FACW
5.			
6.			
7.			
	80	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15' radius)			
1. Fagus grandifolia	5	Y	FACU
2. Tsuga canadensis	5	Y	FACU
3.			
4.			
5.			
6.			
7.			
	10	= Total Cover	

Herb Stratum (Plot size: 5' radius)			
1. Osmunda cinnamomea	10	Y	FACW
2. Carex sp.	20	Y	
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	30	= Total Cover	

Woody Vine Stratum (Plot size: 30' radius)			
1. none			
2.			
3.			
4.			
		= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 3 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: .50 (A/B)

Prevalence Index worksheet:

	Total % Cover of:		Multiply by:
OBL species	0	x 1 =	0
FACW species	40	x 2 =	80
FAC species	20	x 3 =	60
FACU species	40	x 4 =	160
UPL species	0	x 5 =	0
Column Totals:	100 (A)		300 (B)

Prevalence Index = B/A = 3

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

___ Dominance Test is >50%

X Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** _____

Remarks: (Include photo numbers here or on a separate sheet.)

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

SOIL

Sampling Point: WMA-5 WET

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-8	10 YR 3/2							organic
8-16	5Y 5/2	98	7.5 YR 4/6	2	C	M	sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- X Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** _____

Remarks:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: CT Expansion City/County: Sandisfield/ Berkshire Sampling Date: 10/28/2013

Applicant/Owner: State: MA Sampling Point: WMA-6 UPL

Investigator(s): Samuel Haines & Alison Milliman Section, Township, Range:

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): none

Slope (%): 3 Lat: 42.172807 Long: -73.137393 Datum: NAD 83

Soil Map Unit Name: Peru-Marlow Association, rolling, extremely stony NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil X, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No X	**Is the Sampled Area within a Wetland?** **Yes** _____ **No** X
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes _____	No X	If yes, optional Wetland Site ID: _____

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes _____	No X	Depth (inches): _____
Water Table Present?	Yes _____	No X	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): _____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: WMA-6 UPL

Tree Stratum (Plot size: 30' radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Tsuga canadensis	40	Y	FACU
2. Acer rubrum	20	Y	FAC
3. Fagus grandifolia	20	Y	FACU
4.			
5.			
6.			
7.			
	80	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15' radius)			
1. Fagus grandifolia	20	Y	FACU
2. Tsuga canadensis	20	Y	FACU
3.			
4.			
5.			
6.			
7.			
	40	= Total Cover	
Herb Stratum (Plot size: 5' radius)			
1. Polystichum acrostichoides	10	Y	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	10	= Total Cover	
Woody Vine Stratum (Plot size: 30' radius)			
1. none			
2.			
3.			
4.			
		= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.17 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species 0	x 1 = 0
FACW species 0	x 2 = 0
FAC species 20	x 3 = 60
FACU species 110	x 4 = 440
UPL species 0	x 5 = 0
Column Totals: 130 (A)	500 (B)

Prevalence Index = B/A = 3.85

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** _____ **No** X

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: WMA-6 UPL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth	Matrix		Redox Features					
(inches)	Color (moist)	%	Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-16	10 YR 2/2	100					loam	
16-20	7.5 Y 5/4	100					sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** _____ **No** X

Remarks:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: CT Expansion City/County: Sandisfield/ Berkshire Sampling Date: 10/28/2013

Applicant/Owner: State: MA Sampling Point: WMA-6 WET

Investigator(s): Samuel Haines & Alison Milliman Section, Township, Range:

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): none

Slope (%): 3 Lat: 42.172807 Long: -73.137393 Datum: NAD 83

Soil Map Unit Name: Peru-Marlow Association, rolling, extremely stony NWI classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil X, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No _____	**Is the Sampled Area within a Wetland?** **Yes** X **No** _____
Hydric Soil Present?	Yes X	No _____	If yes, optional Wetland Site ID: _____
Wetland Hydrology Present?	Yes X	No _____	

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- X Hydrogen Sulfide Odor (C1)
- X Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- X Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes _____	No X	Depth (inches): _____
Water Table Present?	Yes X	No _____	Depth (inches): 2
Saturation Present? (includes capillary fringe)	Yes X	No _____	Depth (inches): 0

Wetland Hydrology Present? **Yes** X **No** _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VEGETATION – Use scientific names of plants.

Sampling Point: WMA-6 WET

Tree Stratum (Plot size: 30' radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. none			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15' radius)			
1. none			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
Herb Stratum (Plot size: 5' radius)			
1. Phragmites australis	30	Y	FACW
2. Phalaris arundinacea	50	Y	FACW
3. Solidago rugosa	5	N	FAC
4. Carex crinita	5	N	OBL
5. Panicum virgatum	5	N	FAC
6. Carex lurida	5	N	OBL
7.			
8.			
9.			
10.			
11.			
12.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: 30' radius)			
1. none			
2.			
3.			
4.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)

Total Number of Dominant Species Across All Strata: _____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

- X Rapid Test for Hydrophytic Vegetation
- ___ Dominance Test is >50%
- ___ Prevalence Index is ≤3.0[1]
- ___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)
- ___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** _____

Remarks: (Include photo numbers here or on a separate sheet.)

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

SOIL

Sampling Point: WMA-6 WET

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-9	10 YR 2/2	100						organic muck
9-18	10 YR 4/1	98	7.5 YR 5/4	2	C	PL	sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- X Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** _____

Remarks:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: CT Expansion City/County: Sandisfield/ Berkshire Sampling Date: 10/28/2013

Applicant/Owner: State: MA Sampling Point: WMA-6 WET

Investigator(s): Samuel Haines & Alison Milliman Section, Township, Range:

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): none

Slope (%): 3 Lat: 42.172807 Long: -73.137393 Datum: NAD 83

Soil Map Unit Name: Peru-Marlow Association, rolling, extremely stony NWI classification: PFO

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil X, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil X, or Hydrology X naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No _____	**Is the Sampled Area within a Wetland?** **Yes** X **No** _____
Hydric Soil Present?	Yes X	No _____	If yes, optional Wetland Site ID: _____
Wetland Hydrology Present?	Yes X	No _____	

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- X Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- X Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes X	No _____	Depth (inches): 2
Water Table Present?	Yes X	No _____	Depth (inches): 0
Saturation Present? (includes capillary fringe)	Yes X	No _____	Depth (inches): 0

Wetland Hydrology Present? **Yes** X **No** _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: WMA-6 WET

Tree Stratum (Plot size: 30' radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Acer rubrum	15	Y	FAC
2. Betula lenta	10	Y	FACU
3. Ulmus rubra	5	N	FAC
4.			
5.			
6.			
7.			
	30	= Total Cover	
Sapling/Shrub Stratum (Plot size: 15' radius)			
1. Alnus rugosa	10	Y	FACW
2. Vaccinium corymbosum	5	Y	FACW
3. Fagus grandifolia	5	Y	FACU
4.			
5.			
6.			
7.			
	20	= Total Cover	
Herb Stratum (Plot size: 5' radius)			
1. Carex crinita	40	Y	OBL
2. Solidago rugosa	15	N	FAC
3. Aster sp.	15	N	
4. Phalaris arundinacea	20	Y	FACW
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	90	= Total Cover	
Woody Vine Stratum (Plot size: 30' radius)			
1. none			
2.			
3.			
4.			
		= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 5 (A)

Total Number of Dominant Species Across All Strata: 7 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.71 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

X Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** _____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: WMA-6 WET

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-16	10 YR 2/1	100						organic

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- X Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** _____

Remarks:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: CT Expansion City/County: Sandisfield/ Berkshire Sampling Date: 10/29/2013

Applicant/Owner: State: MA Sampling Point: WMA-7, 8 & 9 UPL

Investigator(s): Samuel Haines & Alison Milliman Section, Township, Range:

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): none

Slope (%): 1 Lat: 42.163861 Long: -73.127057 Datum: NAD 83

Soil Map Unit Name: Peru-Marlow Association, rolling, extremely stony NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil X, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No X	**Is the Sampled Area within a Wetland?** **Yes** _____ **No** X
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes _____	No X	If yes, optional Wetland Site ID: _____

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes _____	No X	Depth (inches): _____
Water Table Present?	Yes _____	No X	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): _____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: WMA-7, 8 & 9 UPL

Tree Stratum (Plot size: 30' radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Tsuga canadensis	100	Y	FACU
2.			
3.			
4.			
5.			
6.			
7.			
	100 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15' radius)			
1. Tsuga canadensis	10	Y	FACU
2. Fagus grandifolia	20	Y	FACU
3. Amelanchier arborea	10	Y	FACU
4.			
5.			
6.			
7.			
	40 = Total Cover		
Herb Stratum (Plot size: 5' radius)			
1. Mitchella repens	40	Y	FACU
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	40 = Total Cover		
Woody Vine Stratum (Plot size: 30' radius)			
1. none			
2.			
3.			
4.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	180	x 4 =	720
UPL species	0	x 5 =	0
Column Totals:	180 (A)		720 (B)

Prevalence Index = B/A = 4

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** _____ **No** X

Remarks: (Include photo numbers here or on a separate sheet.)

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

SOIL

Sampling Point: WMA-7, 8 & 9 UPL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-11	10 YR 2/2						loam	
11-16	10 YR 5/4						loamy sand	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** _____ **No** X

Remarks:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: CT Expansion City/County: Sandisfield/ Berkshire Sampling Date: 10/29/2013

Applicant/Owner: State: MA Sampling Point: WMA-7, 8 & 9 WET

Investigator(s): Samuel Haines & Alison Milliman Section, Township, Range:

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): none

Slope (%): 1 Lat: 42.163861 Long: -73.127057 Datum: NAD 83

Soil Map Unit Name: Peru-Marlow Association, rolling, extremely stony NWI classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil X, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No _____	**Is the Sampled Area within a Wetland?** **Yes** X **No** _____
Hydric Soil Present?	Yes X	No _____	If yes, optional Wetland Site ID: _____
Wetland Hydrology Present?	Yes X	No _____	

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- ___ High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- X Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes X	No _____	Depth (inches): 3
Water Table Present?	Yes X	No _____	Depth (inches): 0
Saturation Present? (includes capillary fringe)	Yes X	No _____	Depth (inches): 0

Wetland Hydrology Present? **Yes** X **No** _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VEGETATION – Use scientific names of plants.

Sampling Point: WMA-7, 8 & 9 WET

Tree Stratum (Plot size: 30' radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Tsuga canadensis	20	Y	FACU
2.			
3.			
4.			
5.			
6.			
7.			
	20 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15' radius)			
1. Acer rubrum	10	Y	FAC
2.			
3.			
4.			
5.			
6.			
7.			
	10 = Total Cover		
Herb Stratum (Plot size: 5' radius)			
1. Carex lurida	20	Y	OBL
2. Phalaris arundinacea	50	Y	FACW
3. Euthamia graminifolia	20	Y	FAC
4. Agrostis sp.	10	N	
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: 30' radius)			
1. none			
2.			
3.			
4.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.8 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

X Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** _____

Remarks: (Include photo numbers here or on a separate sheet.)

SOIL

Sampling Point: WMA-7, 8 & 9 WET

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-12	10 YR 2/1	100						organic muck

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- X Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** _____

Remarks:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: CT Expansion City/County: Sandisfield/ Berkshire Sampling Date: 10/29/2013

Applicant/Owner: State: MA Sampling Point: WMA-7, 8 & 9 WET

Investigator(s): Samuel Haines & Alison Milliman Section, Township, Range:

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): none

Slope (%): 1 Lat: 42.163861 Long: -73.127057 Datum: NAD 83

Soil Map Unit Name: Peru-Marlow Association, rolling, extremely stony NWI classification: PFO

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil X, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No _____	**Is the Sampled Area within a Wetland?** **Yes** X **No** _____
Hydric Soil Present?	Yes X	No _____	If yes, optional Wetland Site ID: _____
Wetland Hydrology Present?	Yes X	No _____	

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- ___ High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- X Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- X Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- X Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes X	No _____	Depth (inches): 3
Water Table Present?	Yes X	No _____	Depth (inches): 0
Saturation Present? (includes capillary fringe)	Yes X	No _____	Depth (inches): 0

Wetland Hydrology Present? **Yes** X **No** _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

10% cover of sphagnum moss.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VEGETATION – Use scientific names of plants.

Sampling Point: WMA-7, 8 & 9 WET

Tree Stratum (Plot size: 30' radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Tsuga canadensis	50	Y	FACU
2. Betula allegheniensis	20	Y	FAC
3.			
4.			
5.			
6.			
7.			
	70	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15' radius)			
1. Tsuga canadensis	10	N	FACU
2. Betula allegheniensis	10	N	FAC
3. Kalmia latifolia	20	Y	FACU
4. Spiraea alba	15	Y	FACW
5.			
6.			
7.			
	55	= Total Cover	

Herb Stratum (Plot size: 5' radius)			
1. Onoclea sensibilis	20	Y	FACW
2. Rubus hispidus	15	Y	FACW
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	35	= Total Cover	

Woody Vine Stratum (Plot size: 30' radius)			
1. none			
2.			
3.			
4.			
		= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.67 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

X Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** _____

Remarks: (Include photo numbers here or on a separate sheet.)

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

SOIL

Sampling Point: WMA-7, 8 & 9 WET

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-8	10 YR 2/1	100						organic muck
8-16	10 YR 4/2	100					loamy sand	organic staining

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- X Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** _____

Remarks:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: CT Expansion City/County: Sandisfield/ Berkshire Sampling Date: 11/13/2013

Applicant/Owner: State: MA Sampling Point: WMA-14 & 15 UPL

Investigator(s): Julie Stearns & Alison Milliman Section, Township, Range:

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): concave

Slope (%): 7 Lat: 42.157677 Long: -73.121263 Datum: NAD 83

Soil Map Unit Name: Lyman-Tunbridge Association, steep, very stony NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil X, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No X	**Is the Sampled Area within a Wetland?** **Yes** _____ **No** X
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes _____	No X	If yes, optional Wetland Site ID: _____

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes _____	No X	Depth (inches): _____
Water Table Present?	Yes _____	No X	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): _____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VEGETATION – Use scientific names of plants.

Sampling Point: WMA-14 & 15 UPL

Tree Stratum (Plot size: 30' radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Tsuga canadensis	100	Y	FACU
2.			
3.			
4.			
5.			
6.			
7.			
	100 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15' radius)			
1. none			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
Herb Stratum (Plot size: 5' radius)			
1. none			
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	= Total Cover		
Woody Vine Stratum (Plot size: 30' radius)			
1. none			
2.			
3.			
4.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species 0	x 1 = 0
FACW species 0	x 2 = 0
FAC species 0	x 3 = 0
FACU species 100	x 4 = 400
UPL species 0	x 5 = 0
Column Totals: 100 (A)	400 (B)

Prevalence Index = B/A = 4

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** _____ **No** X

Remarks: (Include photo numbers here or on a separate sheet.)

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

SOIL

Sampling Point: WMA-14 & 15 UPL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-2	10 YR 2/1	100						
2-10	10 YR 5/4	100						
10-20+	10 YR 4/6	100						

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No __X__

Remarks:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: CT Expansion City/County: Sandisfield/ Berkshire Sampling Date: 11/13/2013

Applicant/Owner: State: MA Sampling Point: WMA-14 & 15 WET

Investigator(s): Julie Stearns & Alison Milliman Section, Township, Range:

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): concave

Slope (%): 7 Lat: 42.157677 Long: -73.121263 Datum: NAD 83

Soil Map Unit Name: Lyman-Tunbridge Association, steep, very stony NWI classification: PFO/PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil X, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No X	**Is the Sampled Area within a Wetland?** **Yes** X **No** _____
Hydric Soil Present?	Yes X	No _____	
Wetland Hydrology Present?	Yes X	No _____	If yes, optional Wetland Site ID: _____

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes _____	No X	Depth (inches): _____
Water Table Present?	Yes _____	No X	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes X	No _____	Depth (inches): 0

Wetland Hydrology Present? **Yes** X **No** _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: WMA-14 &15 WET

Tree Stratum (Plot size: 30' radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Tsuga canadensis	90	Y	FACU
2.			
3.			
4.			
5.			
6.			
7.			
	90 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15' radius)			
1. Fagus grandifolia	15	Y	FACU
2.			
3.			
4.			
5.			
6.			
7.			
	15 = Total Cover		
Herb Stratum (Plot size: 5' radius)			
1. Dropteris sp.	30	Y	
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	30 = Total Cover		
Woody Vine Stratum (Plot size: 30' radius)			
1. none			
2.			
3.			
4.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 2 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species 0	x 1 = 0
FACW species 0	x 2 = 0
FAC species 0	x 3 = 0
FACU species 105	x 4 = 420
UPL species 0	x 5 = 0
Column Totals: 105 (A)	420 (B)

Prevalence Index = B/A = 4

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

X Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** _____ **No** X

Remarks: (Include photo numbers here or on a separate sheet.)

Indicators of hydric soil and wetland hydrology exist on the site. Vegetation was observed after several weeks of hard frost, and many/ all of the herbaceous vegetation was dormant.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

SOIL

Sampling Point: WMA-14 &15 WET

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-4	10 YR 2/2	100						organic
4-10	2.5 Y 4/2						fine sandy loam	streaking
10-20	2.5 Y 4/3				C	SM	fine sandy loam	many bright mottles

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- X Stripped Matrix (S6)
- ___ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** _____

Remarks:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: CT Expansion City/County: Sandisfield/ Berkshire Sampling Date: 11/12/2013

Applicant/Owner: State: MA Sampling Point: WMA-20 UPL

Investigator(s): Julie Stearns & Alison Milliman Section, Township, Range:

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none):

Slope (%): 2 Lat: 42.149927 Long: -73.105428 Datum: NAD 83

Soil Map Unit Name: Peru-Marlow Association, rolling, ex. stony/ Pillsbury loam, 0-8% slopes, ex. stony NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil X, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No X	**Is the Sampled Area within a Wetland?** **Yes** _____ **No** X
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes _____	No X	If yes, optional Wetland Site ID: _____

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes _____	No X	Depth (inches): _____
Water Table Present?	Yes _____	No X	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): _____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VEGETATION – Use scientific names of plants.

Sampling Point: WMA-20 UPL

Tree Stratum (Plot size: 30' radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Fagus grandifolia	30	Y	FACU
2. Pinus strobus	30	Y	FACU
3. Betula populifolia	30	Y	FAC
4. Tsuga canadensis	10	N	FACU
5. Quercus velutina	30	Y	UPL
6. Betula allegheniensis	10	N	FAC
7.			
	140	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15' radius)			
1. Fagus grandifolia	10	Y	FACU
2.			
3.			
4.			
5.			
6.			
7.			
	10	= Total Cover	

Herb Stratum (Plot size: 5' radius)			
1. Dryopteris sp.	50	Y	
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	50	= Total Cover	

Woody Vine Stratum (Plot size: 30' radius)			
1. none			
2.			
3.			
4.			
		= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 1 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.20 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	40	x 3 =	120
FACU species	80	x 4 =	320
UPL species	30	x 5 =	150
Column Totals:	150 (A)		590 (B)

Prevalence Index = B/A = 3.93

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** _____ **No** X

Remarks: (Include photo numbers here or on a separate sheet.)

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

SOIL

Sampling Point: WMA-20 UPL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-4	7.5 Y 2.5/2	100					fine sandy loam	
4-16+	2.5 Y 4/4	100					fine sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** _____ **No** X

Remarks:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: CT Expansion City/County: Sandisfield, MA Sampling Date: 11/12/2013

Applicant/Owner: State: MA Sampling Point: WMA-20 WET

Investigator(s): Julie Stearns & Alison Milliman Section, Township, Range:

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): none

Slope (%): 2 Lat: 42.149927 Long: -73.105428 Datum: NAD 83

Soil Map Unit Name: Peru-Marlow Association, rolling, ex. stony/ Pillsbury loam, 0-8% slopes, ex. stony NWI classification: PFO/PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil X, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No _____	**Is the Sampled Area within a Wetland?** **Yes** X **No** _____
Hydric Soil Present?	Yes X	No _____	If yes, optional Wetland Site ID: _____
Wetland Hydrology Present?	Yes X	No _____	

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- X Surface Water (A1)
- ___ High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes X	No _____	Depth (inches): 4
Water Table Present?	Yes X	No _____	Depth (inches): 10
Saturation Present? (includes capillary fringe)	Yes X	No _____	Depth (inches): 0

Wetland Hydrology Present? **Yes** X **No** _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VEGETATION – Use scientific names of plants.

Sampling Point: WMA-21 WET

Tree Stratum (Plot size: 30' radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Tsuga canadensis	90	Y	FACU
2.			
3.			
4.			
5.			
6.			
7.			
	90 = Total Cover		
Sapling/Shrub Stratum (Plot size: 15' radius)			
1. none			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
Herb Stratum (Plot size: 5' radius)			
1. Onoclea sensibilis	10	N	FACW
2. Dryopternis sp.	20	Y	
3. Osmunda cinnamomea	30	Y	FACW
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	60 = Total Cover		
Woody Vine Stratum (Plot size: 30' radius)			
1. none			
2.			
3.			
4.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 2 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.67 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

X Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** _____

Remarks: (Include photo numbers here or on a separate sheet.)

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

SOIL

Sampling Point: WMA-21 WET

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Redox Features Type[1]	Redox Features Loc[2]	Texture	Remarks
0-8	10 YR 2/2	100						with light depletions
8-16	2.5 Y 4/2	90	10 YR 4/5	10	C	M		refusal at 16"

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- X Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** _____

Remarks:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: CT Expansion City/County: Sandisfield/ Berkshire Sampling Date: 11/13/2013

Applicant/Owner: State: MA Sampling Point: WMA-21 UPL

Investigator(s): Julie Stearns & Alison Milliman Section, Township, Range:

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): none

Slope (%): Lat: 42.146096 Long: -73.100235 Datum: NAD 83

Soil Map Unit Name: Peru-Marlow Association, rolling, extremely stony NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No (If no, explain in Remarks.)

Are Vegetation ____, Soil X, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes X No ____

Are Vegetation ____, Soil ____, or Hydrology ____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ____	No X	**Is the Sampled Area within a Wetland?** **Yes** ____ **No** X
Hydric Soil Present?	Yes ____	No X	
Wetland Hydrology Present?	Yes ____	No X	If yes, optional Wetland Site ID: ____

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes ____	No X	Depth (inches): ____
Water Table Present?	Yes ____	No X	Depth (inches): ____
Saturation Present? (includes capillary fringe)	Yes ____	No X	Depth (inches): ____

Wetland Hydrology Present? Yes ____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: WMA-21 UPL

Tree Stratum (Plot size: 30' radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Fagus grandifolia	60	Y	FACU
2. Pinus strobus	40	Y	FACU
3. Prunus serotina	20	N	FACU
4. Acer saccharum	30	Y	FACU
5.			
6.			
7.			
	150	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15' radius)			
1. none			
2.			
3.			
4.			
5.			
6.			
7.			
		= Total Cover	

Herb Stratum (Plot size: 5' radius)			
1. Dryopteris sp.	10	Y	
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	10	= Total Cover	

Woody Vine Stratum (Plot size: 30' radius)			
1. none			
2.			
3.			
4.			
		= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 3 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	0	x 2 =	0
FAC species	0	x 3 =	0
FACU species	150	x 4 =	600
UPL species	0	x 5 =	0
Column Totals:	150 (A)		600 (B)

Prevalence Index = B/A = 4

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** _____ **No** X

Remarks: (Include photo numbers here or on a separate sheet.)

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

SOIL

Sampling Point: WMA-21 UPL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox Features %	Type[1]	Loc[2]	Texture	Remarks
0-6	10 YR 2/2	100						
6-10	10 Y/R 4/2	50						
	10 YR 5/1	50						
10-14	10 YR 4/3	100						
14-18+	10 YR 3/6	100						

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** _____ **No** X

Remarks:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: CT Expansion City/County: Sandisfield/ Berkshire Sampling Date: 11/13/2013

Applicant/Owner: State: MA Sampling Point: WMA-21 WET

Investigator(s): Julie Stearns & Alison Milliman Section, Township, Range:

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): none

Slope (%): 5 Lat: 42.146096 Long: -73.100235 Datum: NAD 83

Soil Map Unit Name: Pillsbury loam, 0-8% slopes, extremely stony NWI classification: PFO/PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil X, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No _____	**Is the Sampled Area within a Wetland?** **Yes** X **No** _____
Hydric Soil Present?	Yes X	No _____	If yes, optional Wetland Site ID: _____
Wetland Hydrology Present?	Yes X	No _____	

Remarks: (Explain alternative procedures here or in a separate report.)

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- X High Water Table (A2)
- X Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes _____	No X	Depth (inches): _____
Water Table Present?	Yes X	No _____	Depth (inches): 8
Saturation Present? (includes capillary fringe)	Yes X	No _____	Depth (inches): 0

Wetland Hydrology Present? **Yes** X **No** _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: WMA-21 WET

Tree Stratum (Plot size: 30' radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Fagus grandifolia	40	Y	FACU
2. Prunus serotina	20	N	FACU
3. Acer rubrum	60	Y	FAC
4.			
5.			
6.			
7.			
	120	= Total Cover	

Sapling/Shrub Stratum (Plot size: 15' radius)			
1. none			
2.			
3.			
4.			
5.			
6.			
7.			
		= Total Cover	

Herb Stratum (Plot size: 5' radius)			
1. Osmunda cinnamomea	60	Y	FACW
2. Onoclea sensibilis	80	Y	FACW
3. Carex crinita	20	N	OBL
4. Solidago rugosa	80	Y	FAC
5. Osmunda spectabilis	20	N	OBL
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	260	= Total Cover	

Woody Vine Stratum (Plot size: 30' radius)			
1. none			
2.			
3.			
4.			
		= Total Cover	

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 4 (A)

Total Number of Dominant Species Across All Strata: 5 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0.8 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species	x 1 =
FACW species	x 2 =
FAC species	x 3 =
FACU species	x 4 =
UPL species	x 5 =
Column Totals: (A)	(B)

Prevalence Index = B/A =

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

X Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** _____

Remarks: (Include photo numbers here or on a separate sheet.)

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

SOIL

Sampling Point: WMA-21 WET

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-4	10 YR 4/2							
4-8	10 YR 4/1				D	M		
8-16	10 YR 5/1	95	10 YR 4/1	2.5	C	M		
			10 YR 4/2	2.5	C	M		

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- X Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** _____

Remarks:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: CT Expansion City/County: Sandisfield/ Berkshire Sampling Date: 11/15/2013

Applicant/Owner: State: MA Sampling Point: WMA-22 UPL

Investigator(s): Julie Stearns & Tim O'Sullivan Section, Township, Range:

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): none

Slope (%): 3 Lat: 42.230567 Long: -73.197398 Datum: NAD 83

Soil Map Unit Name: Kendaia silt loam, 0-3 & slopes NWI classification:

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation X, Soil X, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes _____	No X	**Is the Sampled Area within a Wetland?** **Yes** _____ **No** X
Hydric Soil Present?	Yes _____	No X	
Wetland Hydrology Present?	Yes _____	No X	If yes, optional Wetland Site ID: _____

Remarks: (Explain alternative procedures here or in a separate report.)

Plowed farm field planted with grasses. Area drained with ditch.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- ___ Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes _____	No X	Depth (inches): _____
Water Table Present?	Yes _____	No X	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): _____

Wetland Hydrology Present? Yes _____ No X

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION – Use scientific names of plants.

Sampling Point: WMA-22 UPL

Tree Stratum (Plot size: 30' radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. none			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15' radius)			
1. none			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
Herb Stratum (Plot size: 5' radius)			
1. Taraxacum officinale	20	N	FACU
2. Trifolium repens	30	N	FACU
3. Vicia sp.	10	N	
4. Gallium sp.	10	N	
5. Unknown grass	90	Y	
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	160 = Total Cover		
Woody Vine Stratum (Plot size: 30' radius)			
1. none			
2.			
3.			
4.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 0 (A)

Total Number of Dominant Species Across All Strata: 1 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 0 (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species 0	x 1 = 0
FACW species 0	x 2 = 0
FAC species 0	x 3 = 0
FACU species 50	x 4 = 200
UPL species 0	x 5 = 0
Column Totals: 50 (A)	200 (B)

Prevalence Index = B/A = 4

Hydrophytic Vegetation Indicators:

___ Rapid Test for Hydrophytic Vegetation

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** _____ **No** X

Remarks: (Include photo numbers here or on a separate sheet.)

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

SOIL

Sampling Point: WMA-22 UPL

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-12	10 YR 3/2	100	7.5 YR 4/6		C	PL	sandy loam	plowed horizon
12+	10 YR 4/4	99	10 Y/R 4/6	1	C	M		Bw

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- ___ Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** _____ **No** X

Remarks:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

WETLAND DETERMINATION DATA FORM – Northcentral and Northeast Region

Project/Site: CT Expansion City/County: Sandisfield/ Berkshire Sampling Date: 11/15/2013

Applicant/Owner: State: MA Sampling Point: WMA-22 WET

Investigator(s): Julie Stearns & Tim O'Sullivan Section, Township, Range:

Landform (hillslope, terrace, etc.): hillslope Local relief (concave, convex, none): none

Slope (%): 2 Lat: 42.230567 Long: -73.197398 Datum: NAD 83

Soil Map Unit Name: Limerick silt loam, 0-3% slopes NWI classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes X No _____ (If no, explain in Remarks.)

Are Vegetation X, Soil X, or Hydrology X significantly disturbed? Are "Normal Circumstances" present? Yes X No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes X	No _____	**Is the Sampled Area within a Wetland?** **Yes** X **No** _____
Hydric Soil Present?	Yes X	No _____	If yes, optional Wetland Site ID: _____
Wetland Hydrology Present?	Yes X	No _____	

Remarks: (Explain alternative procedures here or in a separate report.)

Plowed farm field planted with grasses. Area drained with ditch.

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ___ Surface Water (A1)
- ___ High Water Table (A2)
- ___ Saturation (A3)
- ___ Water Marks (B1)
- ___ Sediment Deposits (B2)
- ___ Drift Deposits (B3)
- ___ Algal Mat or Crust (B4)
- ___ Iron Deposits (B5)
- ___ Inundation Visible on Aerial Imagery (B7)
- ___ Sparsely Vegetated Concave Surface (B8)
- ___ Water-Stained Leaves (B9)
- ___ Aquatic Fauna (B13)
- ___ Marl Deposits (B15)
- ___ Hydrogen Sulfide Odor (C1)
- X Oxidized Rhizospheres on Living Roots (C3)
- ___ Presence of Reduced Iron (C4)
- ___ Recent Iron Reduction in Tilled Soils (C6)
- ___ Thin Muck Surface (C7)
- ___ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ___ Surface Soil Cracks (B6)
- ___ Drainage Patterns (B10)
- ___ Moss Trim Lines (B16)
- ___ Dry-Season Water Table (C2)
- ___ Crayfish Burrows (C8)
- ___ Saturation Visible on Aerial Imagery (C9)
- ___ Stunted or Stressed Plants (D1)
- ___ Geomorphic Position (D2)
- ___ Shallow Aquitard (D3)
- ___ Microtopographic Relief (D4)
- ___ FAC-Neutral Test (D5)

Field Observations:

Surface Water Present?	Yes _____	No X	Depth (inches): _____
Water Table Present?	Yes _____	No X	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes _____	No X	Depth (inches): _____

Wetland Hydrology Present? Yes X **No** _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

VEGETATION – Use scientific names of plants.

Sampling Point: WMA-22 WET

Tree Stratum (Plot size: 30' radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. none			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
Sapling/Shrub Stratum (Plot size: 15' radius)			
1. none			
2.			
3.			
4.			
5.			
6.			
7.			
	= Total Cover		
Herb Stratum (Plot size: 5' radius)			
1. Calamagrostis canadensis	80	Y	OBL
2. Verbena hastata	10	N	FACW
3. Lythrum salicaria	10	N	OBL
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	100 = Total Cover		
Woody Vine Stratum (Plot size: 30' radius)			
1. none			
2.			
3.			
4.			
	= Total Cover		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: _____ (A)

Total Number of Dominant Species Across All Strata: _____ (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: _____ (A/B)

Prevalence Index worksheet:

Total % Cover of:	Multiply by:
OBL species _____	x 1 = _____
FACW species _____	x 2 = _____
FAC species _____	x 3 = _____
FACU species _____	x 4 = _____
UPL species _____	x 5 = _____
Column Totals: _____ (A)	_____ (B)

Prevalence Index = B/A = _____

Hydrophytic Vegetation Indicators:

X Rapid Test for Hydrophytic Vegetation

___ Dominance Test is >50%

___ Prevalence Index is ≤3.0[1]

___ Morphological Adaptations[1] (Provide supporting data in Remarks or on a separate sheet)

___ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Vegetation Strata:

Tree – Woody plants 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/shrub – Woody plants less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vines – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? **Yes** X **No** _____

Remarks: (Include photo numbers here or on a separate sheet.)

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

SOIL

Sampling Point: WMA-22 WET

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	%	Redox Features Color (moist)	%	Type[1]	Loc[2]	Texture	Remarks
0-10	10 YR 2.5/2		7.5 YR 4/6		C	PL	fine sandy loam	plowed/pore linings
10+	Gley 4/10 Y	100					fine sandy loam	

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, CS=Covered or Coated Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators:

- ___ Histosol (A1)
- ___ Histic Epipedon (A2)
- ___ Black Histic (A3)
- ___ Hydrogen Sulfide (A4)
- ___ Stratified Layers (A5)
- ___ Depleted Below Dark Surface (A11)
- ___ Thick Dark Surface (A12)
- ___ Sandy Mucky Mineral (S1)
- ___ Sandy Gleyed Matrix (S4)
- ___ Sandy Redox (S5)
- ___ Stripped Matrix (S6)
- ___ Dark Surface (S7) (**LRR R, MLRA 149B**)
- ___ Polyvalue Below Surface (S8) (**LRR R, MLRA 149B**)
- ___ Thin Dark Surface (S9) (**LRR R, MLRA 149B**)
- ___ Loamy Mucky Mineral (F1) (**LRR K, L**)
- X Loamy Gleyed Matrix (F2)
- ___ Depleted Matrix (F3)
- ___ Redox Dark Surface (F6)
- ___ Depleted Dark Surface (F7)
- ___ Redox Depressions (F8)

Indicators for Problematic Hydric Soils[3]:

- ___ 2 cm Muck (A10) (**LRR K, L, MLRA 149B**)
- ___ Coast Prairie Redox (A16) (**LRR K, L, R**)
- ___ 5 cm Mucky Peat or Peat (S3) (**LRR K, L, R**)
- ___ Dark Surface (S7) (**LRR K, L**)
- ___ Polyvalue Below Surface (S8) (**LRR K, L**)
- ___ Thin Dark Surface (S9) (**LRR K, L**)
- ___ Iron-Manganese Masses (F12) (**LRR K, L, R**)
- ___ Piedmont Floodplain Soils (F19) (**MLRA 149B**)
- ___ Mesic Spodic (TA6) (**MLRA 144A, 145, 149B**)
- ___ Red Parent Material (TF2)
- ___ Very Shallow Dark Surface (TF12)
- ___ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? **Yes** X **No** _____

Remarks:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Appendix D

Representative Wetland Photographs

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM



SMA-3



WMA-4

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM



SMA-5



WMA-5

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM



SMA-6



WMA-6

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM



SMA-7



WMA-7

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM



SMA-8 and WMA-8



WMA-10

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM



WMA-15



WMA-16

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM



SMA-20 and WMA-20



WMA-21

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM



WMA-22



WMA-23

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM



WMA-24

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM



WMA-22



WMA-01

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM



WMA-01A



WMA-01B

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

APPENDIX K

Greenhouse Gas Report

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Connecticut Expansion Project
Greenhouse Gas Analysis

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

1. Background Information

1.1 MEPA Greenhouse Gas Policy and Protocol

The Executive Office of Energy and Environmental Affairs (EOEEA) has established a Greenhouse Gas (GHG) Emissions Policy and Protocol (Policy, last revised May 5, 2010) in accordance with the Massachusetts Environment Policy Act (MEPA). The purpose of the Policy is to inform the MEPA office of the quantity of GHG associated with proposed projects, by assessing the project baseline, considering where alternatives are available, and evaluating the feasibility and impact of performing the alternatives.

The Policy applies to new projects which file an Environmental Notification Form which initiates MEPA review after the May 5, 2010 effective date of the revised Policy.

Upon review of the submitted Expanded Environmental Notification Form, EOEEA requested that a GHG Analysis be provided in accordance with the Policy.

Calculated emissions are presented in terms of carbon dioxide equivalents (CO_2e) which is an accounting measure of greenhouse gas (GHG) which takes into account different species and places them on a single basis using Global Warming Potentials[1]. For example, one ton of carbon dioxide (CO_2) is equal to one ton of CO_2e, one ton of methane (CH_4) is equal to 25 tons of CO_2e, and one ton of nitrous oxide is equal to 298 tons of CO_2e. The combined GHG total, represented as CO_2e, equals the amount of CO_2 that has the equivalent global warming impact as the combination of different GHG species.

1.2 General Project Description

The Tennessee Gas Pipeline Company, L.L.C. (Tennessee) is proposing The Connecticut Expansion Project (the Project), which includes the placement of approximately 3.9 miles of new natural gas underground pipeline in the Massachusetts towns of Sandisfield in Berkshire County and Agawam in Hampden County along an existing pipeline right-of-way (ROW). This will create a pipeline loop in Sandisfield and the beginning of a loop in Agawam. A loop is created by constructing a portion of new parallel pipeline beside an existing pipeline, similar to adding a motor vehicle highway lane to an existing highway. The purpose of the loops is to increase the volume of gas that can be transported along an existing section of pipeline ROW, in lieu of constructing an entirely new pipeline to increase supply within a service area. This will allow the natural gas to be pressurized in one or more of the portions of pipeline prior to an expected surge in demand.

Approximately 3.8 miles of new 36-inch outside diameter pipeline co-located within or adjacent to Tennessee's existing 200 Line Mainline ROW will be added as part of "The Massachusetts Loop" in Sandisfield. This loop segment will commence near Tennessee's existing Mainline Valve (MLV) 258 at mile-point (MP) 0.0, adjacent to Town Hill Road, and extend southeast to approximately MP 3.8, southeast of South Beech Plain Road. Besides the land associated with the pipeline itself, an area of approximately 3.5 acres in a field in Tyringham will be used as a staging area/pipeyard.

As part of "The Connecticut Loop", approximately 0.11 miles of 24-inch outer diameter pipeline will be co-located within or adjacent to Tennessee's existing ROW in Agawam. The Massachusetts portion of the

[1] *Global Warming Potentials are taken from EPA's Mandatory Reporting of Greenhouse Gasses (40 CFR Part 98), Appendix A-1*

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

loop will commence in Agawam in the yard of Compressor Station 261 at MP 0.0 and extend southward approximately 0.11 miles to the Massachusetts/Connecticut border.

The Project will also construct appurtenant secondary facilities, to be located within the existing ROW, which will include two in-line launchers, one in-line receiver and one relocated mainline valve. One in-line launcher will be constructed at the western end of the Project in Sandisfield at MP 0.0 and one in-line receiver and one relocated mainline valve will be constructed at the eastern end of the Project in Sandisfield at the terminus at MP 3.8 (Tennessee plans to relocate the existing valve site located off Town Hill Road to the terminus of the loop at MP 3.8). One in-line launcher associated with the existing workspace at Compressor Station 261 in Agawam will be constructed. Pipeline inspection gauges are round cylindrical objects which are used to clean and inspect the inside of the pipeline without having to remove individual sections of pipe. A short section of pipe is extended from the pipeline to serve as a launching and receiving ends.

The pipeline loop segments will be located within or directly adjacent to Tennessee's existing permanent ROWs. While an additional permanent ROW will be required along with temporary workspace, the routing for the pipeline loop will be conducted in a manner to avoid significant areas of residential development, minimize the number of affected landowners, and effectively minimize environmental impacts.

Construction of the Massachusetts pipeline loops is expected to take three to four months to complete.

1.3 Project Scope

The scope of the Project within Massachusetts is limited to the construction and operation of the proposed 3.9 miles of natural gas pipeline and appurtenant facilities. The proposed pipeline only transports natural gas for shippers pursuant to transportation service agreements from the upstream transmission network to the downstream transmission network. Therefore, for the purpose of this GHG analysis, Tennessee is not evaluating the life cycle of the natural gas before or after it enters and leaves the physical pipeline proposed within the Massachusetts sections of the Project since it is outside the scope.

1.4 Sources of Greenhouse Gas Emissions

Sources of GHG emissions from the Project are divided into five categories and are expected to be negligible once operation has started. The five categories are:

- Construction
- Commissioning
- Normal Operation
- Non-routine Operations
- Vegetation (Tree) Removal

During the construction period, GHG emissions will be emitted from diesel fired non-road construction equipment and diesel and gasoline fired on-road construction and commuter vehicles. Emissions can also occur when gas is vented as the new pipeline is tied into the existing pipeline (called a tie-in). GHG associated with construction are carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) from construction and commuter vehicle internal combustion engines. CH_4 and CO_2 may be released from pipeline operations involved with the tie-in. This is a one-time event where emissions associated with construction will not continue beyond the construction period.

During the commissioning process of the Project, CH_4 and CO_2 may be released from pipeline operations involved with commissioning. These GHG emissions will result from purging the air out of the new pipeline and filling it with natural gas. This is a necessary and important step to make sure that the oxygen level inside of the pipeline meets safety thresholds. A safety valve will be opened to allow the air to vent from the pipeline and small amounts of natural gas will vent to ensure that the air is removed prior to placing the pipeline into service. In addition, shortly after placing the pipeline segments into service, Tennessee will run a pipeline inspection gauge through the pipeline to clean impurities and check pipe wall integrity. These in-line inspection gauges are round cylindrical objects which are used to clean and inspect the inside of the pipeline without having to remove individual sections of pipe. Emissions from in-line inspections are a result of venting the launcher and receiver tubes (barrels) prior to opening hatches. Launcher and receiver barrels are short sections of pipe which protrude out of the ground to allow loading and unloading of the in-line inspection gauges. The loading or removal of the inspection/maintenance will cause a small amount of natural gas to escape when the launcher or receiver barrel is vented prior to opening. These purging and inspection operations during commissioning are one-time events where emissions will not continue beyond the construction period.

During normal operation, very small amounts of CH_4 and CO_2 emissions may occur from fugitive leaks in the pipeline. The location of fugitive leaks is primarily limited to valves at either end of the new pipeline. The underground pipeline itself is not expected to be a source of fugitive leaks. Even though the underground pipeline is not expected to be a source of fugitive leaks during normal operation, fugitive emissions were still estimated using standard emission factors from the Interstate Natural Gas Association of America[2] (INGAA) and the length of pipeline to conservatively account for some level of fugitive leaks. The emissions quantified in **Section 2.3** are the emissions being emitted each year.

Other non-routine operations may occur for long term maintenance procedures or unplanned blowdowns of pipeline sections. Long term maintenance consists of pipeline inspections and consists of small releases of gas when venting the launcher or receiver barrels prior to opening the hatches. As noted above a one-time in-line inspection event will also occur during commissioning. Blowdowns occur when a section of pipe which is in service must be vented for safety purposes. Blowdowns may be required if there is a need to perform unplanned maintenance repair on a section of pipeline. Blowdowns are performed to reduce the pressure within the pipeline and release gas to safely perform any required repairs. There are no planned blowdowns expected to occur along the pipeline. CH_4 and CO_2 emissions from in-line inspections and blowdowns are sporadic in nature and are expected to occur infrequently. Ongoing in-line inspection/maintenance of the new pipeline sections may occur once every 5-7 years or more and blowdowns are expected to be an even rarer event as they only occur as a result of an unplanned response to a discrete incident.

2. Baseline and Alternative Analysis

Pursuant to the MEPA GHG Policy and Protocol, this section presents a quantification and evaluation of the Project baseline and alternatives to the baseline which may represent GHG mitigation or reduction opportunities.

The baseline and alternative analysis is conducted separately for each of the five emission categories identified in **Section 1.4**. The analysis is conducted in this manner since the alternative/mitigation approaches evaluated are very specific to the phase of the project.

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[2] *INGAA GHG Emission Estimates – Table 4-4* http://www.ingaa.org/Topics/ClimateChange/6490.aspx

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

2.1 Construction

2.1.1 Baseline

The Baseline is based on construction equipment's engine emissions. These emissions are calculated using standard emission factors and assumptions and venting 10 miles of pipeline at an absolute pressure of 600 psia during the pipeline tie-in process.

GHG emissions from construction equipment engines (non-road and on-road) which are used during the Project construction have been estimated based on the anticipated types of non-road and on-road equipment and their levels of use. These estimations of equipment and usage levels are based on other similar pipeline construction projects conducted by Tennessee. Emission factors for diesel on-road vehicles were developed from EPA's MOVES2010b model[3]. Emissions for diesel non-road equipment engines are derived from EPA's NONROAD model calculation procedures and documentation[4]. For conservatism, emission factors using Tier 2 diesel engine standards have been assumed to apply to construction equipment engines during 2016 and do not reflect the anticipated phasing-in of more stringent Tier 3 and 4 emissions standard compliant engines. Ultra-low sulfur diesel fuel use was assumed for the non-road diesel vehicles, which complies with the Massachusetts Department of Environmental Protection (MADEP) Diesel Retrofit Program. The detailed construction emission estimates including assumptions, data, and emission factors used are provided in **Attachment A**.

While the amount of GHG emission reductions are not quantified, exhaust emissions from diesel-fueled construction equipment and vehicle engines will be minimized by Federal design standards imposed at the time of manufacture of the vehicles and will comply with EPA mobile and non-road emission regulations (40 CFR Parts 85, 86, and 89). Emissions also will be controlled by purchasing commercial diesel fuel products whose specifications are controlled by Federal and state air pollution control regulations applicable to fuel suppliers and distributors. Contractors and employees will be encouraged to minimize vehicle and equipment idling time to the extent practical during construction activities, pursuant to Massachusetts regulations (310 CMR 7.11).

GHG emissions from the venting release during the construction tie-in process have been estimated assuming the need of 10 miles of pipeline vented at an initial pressure of 600 psia. The venting release is associated with removing existing natural gas in a portion of the existing pipeline segment prior to connecting the new pipeline. The detailed emission estimates including assumptions, data, and emission factors used are provided in **Attachment A**. The calculated GHG emissions for the Baseline are shown in **Table 2-1.**

Table 2-1 Construction Emissions - Baseline

Construction Phase – Tons				
	CO_2	**CH_4**	**N_2O**	**CO_2e**
Non-Road and On-Road Construction Equipment and Vehicles	1,070.00	0.01	0.05	1,085.93
Pipeline Tie-In Venting Release	0.98	143.75	--	3,594.85
Total	**1,070.97**	**143.77**	**0.05**	**4,680.77**

[3] *http://www.epa.gov/otaq/models/moves/index.htm*
[4] *http://www.epa.gov/otaq/nonrdmdl.htm#techrept*

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

2.1.2 Alternative 1

For Alternative 1, the primary focus of GHG emission minimization is on the pipeline tie-in emissions. This is because the non-road and on-road equipment and vehicle emissions already represent the preferred alternative.

To minimize the emissions from the pipeline tie-in for this alternative case, Tennessee can draw down the existing natural gas in the pipeline before the safety related venting release. The drawing down process reduces the pressure and amount of natural gas contained in the pipeline. Based on engineering estimates, it is believed the natural gas can be drawn down from 600 psia to an absolute pressure of 150 psia. This would significantly decrease emissions from venting. **Table 2-2** illustrates emissions if this alternative were implemented.

Table 2-2 Construction Emissions - Alternative 1

Construction Phase – Tons				
	CO_2	CH_4	N_2O	CO_2e
Non-Road and On-Road Construction Equipment and Vehicles	1,070.00	0.01	0.05	1,085.93
Pipeline Tie-In Venting Release	0.24	35.94	--	898.71
Total	**1,070.24**	**35.95**	**0.05**	**1,984.64**

2.1.3 Alternative 2

Alternative 2 involves conducting the tie-in using a process called hot-tapping. Hot tapping is the technique of attaching a mechanical or welded branch fitting to piping in service and creating an opening in the piping without taking the existing piping out of service. It allows the new pipe to be safely connected to the existing pipe without the need to perform a safety related venting release. Therefore, the existing pipe will not need to be vented, and thus no emissions will result during construction from the tie-in phase. **Table 2-3** shows what emissions would be if this alternative is chosen.

Table 2-3 Construction Emissions - Alternative 2

Construction Phase – Tons				
	CO_2	CH_4	N_2O	CO_2e
Non-Road and On-Road Construction Equipment and Vehicles	1,070.00	0.01	0.05	1,085.93
Pipeline Tie-In Venting Release	--	--	--	--
Total	**1,070.00**	**0.01**	**0.05**	**1,085.93**

2.1.4 Preferred Alternative

Tennessee is planning on using the hot-tap methodology for connecting the pipelines. This will result in a decrease of approximately 3,595 tons of CO_2e compared to the Baseline. Total construction-related GHG emissions will be those of Alternative 2.

2.2 Commissioning

Commissioning the pipeline is a two stage process which involves (1) pressure testing the pipes to ensure that they can handle a maximum pressure beyond what they will function during normal operations when transporting natural gas and (2) safety related purging the pipes of any air before final placement into service.

2.2.1 Baseline

Tennessee is committed to pressure testing all segments of the pipeline using hydrostatic testing prior to placement in service. Hydrostatic testing involves using water to pressurize the pipeline to a level that exceeds any pressure that the pipe will function with when transporting natural gas. Because water is used in this process, there is no venting of natural gas and thus no GHG emissions.

Before the pipeline can be placed into service, all air from the pipes must be removed and replaced with natural gas. Purging is intended to remove air or impurities from the pipeline after construction and to prepare the pipeline prior to filling it with natural gas. Purging is completed via Kinder Morgan's Operating and Maintenance Procedure. The natural gas is introduced to the new pipe section until a monitoring gauge measures 100% natural gas. An additional two minutes of gas venting is allowed after it appears that all the air has been purged to ensure that there is absolutely no oxygen left within the new pipe section before shutting the blow-off valve. During the purging process natural gas is released to the atmosphere from a blow-off valve as the pipe is being filled. This is a one-time only event during commissioning and the emissions are minimal as shown in **Table 2-4**. This is a very important process for pipeline safety which is required by and regulated under 40 CFR 169 to minimize the oxygen content in the pipeline, and therefore prevent a hazardous mixture of gas and oxygen in the line.

An in-line inspection gauge is run through the new section of pipeline to further clean any impurities from the construction operations and inspect pipe wall welding integrity. Small amounts of emissions result from opening the launcher and receiver hatches as shown in **Table 2-4**.

Emissions from the commissioning phase are detailed in **Table 2-4**. Emissions are based on the amount of gas expected to be released during in-line inspections and purging operations. Detailed calculations are in **Appendix A**.

Table 2-4 Commissioning Emissions – Baseline

Commissioning – Tons			
	CO_2	CH_4	CO_2e
Pressure Testing	--	--	--
Purging	0.02	2.38	59.62
In-Line Inspection	0.004	0.63	15.64
Total	**0.02**	**3.01**	**75.26**

2.2.2 Alternative 1

Since there are no GHG emissions from hydrostatic testing, there are no alternatives to the Baseline pressure testing methodology.

As can be seen in **Table 2-4**, GHG emissions from the purging and inspection operation are insignificant. As a result, it would not be practical or cost effective to apply an emissions control. It would not be

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

economically feasible to recompress or flare the small amount of natural gas that would be released during purging since the venting would just occur for a few minutes. The in-line inspection process would only release approximately 100 cubic feet of natural gas, not enough to make flaring or recompressing a feasible option.

2.2.3 Preferred Alternative

The Preferred Alternative is the Baseline. Tennessee is already committed to pressure testing the pipeline using non-GHG hydrostatic testing. Emissions resulting from purging and the initial inspection of the pipeline are minimal enough to make any control attempt impractical as seen in **Table 2-4**.

2.3 Normal Operation

2.3.1 Baseline

Normal operation of the pipeline involves routine and non-routine inspections and maintenance. During normal operation, emissions may occur from fugitive leaks in the pipeline. The location of fugitive leaks is primarily limited to valves at either end of the new pipeline. The pipeline itself, which is underground, is not expected to be a source of fugitive leaks.

To minimize emissions, Tennessee implements the following measures:

- Cathodic protection to minimize and control corrosion of the steel pipeline. This is known as protected steel. According to the INGAA, by using protected steel, CO_2 emission factors are reduced from 30.5 lbs CO_2 per pipeline mile to 2.2 lbs CO_2 per mile, assuming a 2 percent volume CO_2 in natural gas. The amount of CH_4 reduces to 15.1 lbs CH_4 per pipeline mile from 276 lb CH_4 per mile, assuming 93.4 percent volume CH_4 in natural gas. This is a significant reduction resulting from the use of cathodically protected steel pipe.

- Transportation of odorized natural gas. This allows for quicker recognition of a leak and allows for repairs earlier than may occur if detection was reliant of periodic inspections. The natural gas is odorized upstream of receipt by Tennessee in Sandisfield and Agawam custody transfer points. Tennessee does not add any additional odorants.

- Periodic flyovers of the pipeline ROW. This allows for potentially quicker recognition of leaks and allow for expedited repair. Flyovers may occur once a month during the winter and twice a month during the balance of the year. The flyovers will be in compliance with 49 CFR 192.705 and 49 CFR 192.706. The frequency of the flyovers may be more than the required once per year.

- Readily available supply of emergency pipe, leak repair clamps, sleeves and other equipment needed for repair activities. By keeping such supplies readily available, repairs are expedited and the amount of leakage with associated emissions is limited.

Table 2-5 illustrates the estimated annual emissions for normal operations. Fugitive emissions from the valves and pipeline are estimated using emission factors from INGAA and are based on the length of pipeline. The INGAA emission factors used are the factors for protected steel transmission pipe and are adjusted to account for the anticipated actual natural gas composition of 96.89 volume percent CH_4 and 0.24 volume percent CO_2, versus the INGAA defaults of 93.4 volume percent CH_4 and 2 volume percent CO_2. These compositions are based on historical data for natural gas through this section of pipeline.

Table 2-5 Normal Operation Emissions - Baseline

Normal Operating – Tons (per Year)			
	CO_2	CH_4	CO_2e
Pipeline Fugitives	0.003	0.03	0.77

2.3.2 Alternative 1

To evaluate potential emissions minimization options, the EPA Natural Gas STAR[5] program was reviewed. The Natural Gas STAR program was developed by EPA in 1993 to work in conjunction with the oil and natural gas industries to provide a framework to encourage partner companies to document and implement methane reduction strategies and practices. The Natural Gas STAR program hosts a list of technologies and methods that partner companies have utilized to reduce methane emissions. Tennessee continues to be a registered partner since the inception of the program in 1993.

The following are options which the Natural Gas STAR program lists as potentially applicable to normal operations of transmission pipelines. Because of the limited individual components of transmission pipelines, there are only a few options. A description of the applicability to the Project is included. Note that due to the very insignificant nature of emissions outlined in the Baseline and the nature of the minimization options, it is not practical to quantify any potential emission reductions.

Options which are applicable to the proposed Project:

- Test and Repair Pressure Safety Valves
  - Tennessee will test annually and repair if necessary.

- Composite Wrap for Non-Leaking Pipeline Defects
  - Tennessee repairs non-leaking pipeline defects per its Operating & Maintenance Procedure 213. If the defect cannot be removed by mechanical means such as sanding/buffing out, filling with a hardener, etc, coating will be reapplied or a composite wrap will be installed as appropriate. Repair sleeves fabricated out of pipe of similar design may also be used in lieu of composite wraps, if needed.

Options not applicable to the proposed Project:

- Convert Natural Gas-Driven Chemical Pumps
  - There are no natural gas-driven chemical pumps on the pipelines.

- Inject Blowdown Gas into Low Pressure Mains of Fuel Gas System
  - There are no low pressure mains or fuel gas systems on the pipelines.

The Massachusetts Legislature recently passed a bill (H.4164) and subsequently was signed by the Governor which amends Mass. General Laws Chapter 164 (Manufacture and Sale of Gas and Electricity). The amendments include provisions which require gas companies (as defined in the Chapter) to conform to certain actions within the bill. These actions can coincide with operational best practices. The provisions of H.4164, however, do not apply to Tennessee, as the definition of gas company in Section 1 of Chapter 164 is for *"a corporation organized for the purpose of making and selling or distributing and selling, gas within the commonwealth, even though subsequently authorized to make or sell electricity;*

[5] *http://www.epa.gov/gasstar/*

provided, however, that gas company shall not mean an alternative energy producer." Tennessee is not a natural gas distribution company which sells natural gas in the state of Massachusetts. Therefore, the provisions of H.4164 do not apply to Tennessee or the proposed Project.

2.3.3 Preferred Alternative

The Preferred Alternative is the Baseline with, odorizing gas, flyovers, repair of valves, and reduction of pipeline pressure (when possible) prior to performing maintenance activities. INGAA emission factors for transmission pipes do not account for leak reductions due to leak repairs and coated/composite-wrapped pipes. Even without taking these practices into account, the emissions from pipeline normal operations are shown to be minimal as seen in **Table 2-5**.

2.4 Non-Routine Operations

As previously described, non-routine operations include periodic in-line inspection/maintenance and unplanned blowdowns. These operations are considered non-routine because it is anticipated that these will occur only sporadically rather than annually.

2.4.1 Baseline

In-line inspections will occur approximately once every 5-7 years after commissioning the pipeline. It should be noted that the amount of launchers/receivers are the same as before the new pipeline is installed and there will be no increase in amount of in-line inspections. Thus there is no change in emissions from existing conditions. To illustrate, however, that emissions are minimal for in-line inspections, **Table 2-6** depicts the total amount of GHG emissions resulting from launching and receiving the inspection gauges/tools in Sandisfield and launching the devices in Agawam. These are the same emissions as the commissioning in-line inspections.

Table 2-6 In-Line Inspection Emissions – Baseline

In-Line Inspection – Tons (3 Launchers/Receivers)			
	CO_2	CH_4	CO_2e
In-Line Inspection	0.004	0.63	15.64

As described in **Section 1.4**, blowdowns may occur if there is a need to perform maintenance repair on a section of pipeline. These are not typical or planned occurrences, but for purposes of GHG estimation are included in this document. Blowdowns are expected to be a rare event, if they occur at all, as they only occur as an unplanned response to a discrete incident. Because of the nature of why a blowdown may be needed, there is no reasonable way to definitively determine the amount of natural gas and resulting GHG emissions that will be released. However, a conservative estimate is depicted in **Table 2-7**. The emissions shown in **Table 2-7** are considered conservative because they assume entire length of Project pipeline in Massachusetts (3.91 miles) needs to be vented. If a blowdown were required, the entire length of pipeline may not be vented.

Table 2-7 Blowdown Emissions – Baseline

Blowdown – Tons Per Event			
	CO_2	CH_4	CO_2e
Blowdown	0.38	56.21	1,405.59

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

2.4.2 Alternative 1

One potential minimization option for the sporadic in-line inspections that will occur is to recover the natural gas lost during this process. A recovery process would require that once the natural gas is captured, it would have to be compressed to be reintroduced into the pipeline. However, since just a very small amount of natural gas is lost during in-line inspections from the launcher and receiver barrels, it is not economically feasible to recover it. By recompressing the natural gas to try to recover it, potential new combustion emissions (NOx, CO, and additional GHG) would be introduced to the environment. The addition of these emissions would diminish the theoretical savings of approximately 16 tons of CO_2e.

For unplanned blowdowns, a minimization option would be to draw down the natural gas (reduce the pressure and amount of natural gas) prior to the required maintenance. This is also included in the Natural Gas STAR program as "Using Pipeline Pump-Down Techniques to Lower Gas Line Pressure Before Maintenance". Tennessee will draw down the natural gas before any maintenance is conducted, if this becomes necessary so long as it does not cause a reduction or loss of supply to customers. Tennessee is not in the business to lose gas un-necessarily since it is a loss of product. As a result, Tennessee will do what is practical and feasible to minimize any natural gas losses that could be released during maintenance and repair procedures. However if a blowdown is needed for safety or other practical reasons, there is typically no time to plan out and implement such controls due to the urgency to fix the issue that created the need for a blowdown and resupply gas to the pipeline that it needed by the public for their homes/businesses and by electrical generating plants to generate electricity needed for homes/businesses. Controlling a blowdown would require similar compression to put the natural gas back into the pipeline, as described in the above paragraph describing the alternative for controlling in-line inspection emissions. This process may emit more GHG in the form of combustion than it will save.

Another option to minimize blowdown emissions would be to capture the natural gas as explained above or use a flare to burn the gas. Flaring would have the benefit of converting CH_4 emissions into CO_2. This would be beneficial since the global warming potential of CO_2 is 25 times less than CH_4. However, this would result in the formation of additional pollutants such as NOx, CO, and VOC, resulting from combustion of the gas in the flare. Additionally, it would be difficult to transport a flare/compressor to the new pipe section due to the short notice, the forested remoteness, and variable topography of the pipeline location. As with the drawdown option, there is typically no time to plan out and implement such controls due to the urgency to fix the issue that created the need for a blowdown.

2.4.3 Preferred Alternative

Due to the evaluation of options provided in Alternative 1 as technically infeasible, the Preferred Alternative is the Baseline. It is understood that the emissions calculated for the blowdown operation are considered "worst case" since it assumes the full length of the Project pipeline is vented and no controls were implemented due to timing constraints.

2.5 Tree Removal

2.5.1 Baseline

The amount of carbon released due to tree removal is based on the projected amount of upland forest and forested wetland impacted due to construction access and new extended ROWs and the type/species of trees impacted. MEPA has developed a draft spreadsheet to calculate the amount of lost carbon due to land alterations and is specific to the type of trees affected. This spreadsheet was used to determine the amount of carbon lost from removal of the trees themselves (stock) as well as from the loss

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

of sequestration potential from areas permanently affected. The amount of carbon lost from above ground and below ground stock was set to equal the spreadsheet-calculated total carbon stock held within the acres of impacted upland forest and forested wetland, both from the permanent ROW and temporary workspace/construction access. To estimate loss of sequestration per year due to permanent impacts in Sandisfield, AECOM assumed the acreage impacted was solely the dominant tree species of the area (eastern white pine/hemlock). For Agawam, the dominant tree species used in the sequestration loss calculations was split between the species used for the above and below ground stock calculations. Detailed calculations are provided in **Appendix A**. AECOM adjusted the spreadsheet to include calculations of the volume of softwood and hardwood based on acreage of trees affected, the type of trees affected and factors taken from a United States Department of Agriculture technical report. AECOM also included a calculation to convert from metric tonnes of carbon to short ton of carbon.

The proposed pipeline route was chosen in part to minimize the amount of upland forest impacted by utilizing existing ROW as much as possible. Following construction, vegetation within a 10-foot corridor centered over the pipeline within the ROW will be maintained in an herbaceous state (grasses and small shrubs). Remaining ROW land will be allowed to revert to its pre-construction land use/cover, except trees located within 15 feet of the pipeline that are greater than 15 feet in height may be selectively cut and removed from the permanent ROW for safety and pipe integrity purposes. Any trees cleared from the ROW may be cut and stacked at the edge of the ROW for pick-up by landowners at their request.

The calculated amount of lost carbon due to direct tree removal is depicted in **Table 2-8** is a one-time effect from the carbon currently stored in the trees. The calculated amount of carbon not sequestered due to permanent tree removal is depicted in **Table 2-9.** This is an annual effect from the carbon not sequestered in the trees.

Table 2-8 Tree Removal – Carbon Loss from Tree Stocks

	Acres of Upland Forest Impacted	Carbon Loss – Tons C
Agawam	0.68	98.64
Sandisfield	43.25	5,911.70

Table 2-9 Tree Removal – Annual Carbon Loss from Sequestration

	Acres of Upland Forest Permanently Impacted	Carbon Loss – Tons C/yr
Agawam	0.27	0.06
Sandisfield	10.98	3.55

2.5.2 Alternative 1

Tennessee is committed to only removing trees necessary for construction accessibility and pipeline safety within the ROW. Tennessee will not remove any trees whose removal is not deemed essential. As stated with the Baseline, the route chosen for the new pipeline was chosen in part to reduce the impact to existing upland forest.

2.5.3 Preferred Alternative

The Preferred Alternative is the Baseline. Tennessee will only remove those trees which are essential for construction accessibility and long-term pipeline safety.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

3. Conclusions

The Project scope within Massachusetts is limited to the construction and operation of the proposed 3.9 miles of natural gas pipeline and appurtenant facilities. The proposed pipeline only transports natural gas for shippers pursuant to transportation service agreements from the upstream transmission network to the downstream transmission network. Thus, annual emissions of GHGs are primarily limited to fugitive leaks while non-routine in-line inspections and blowdown events are also presented for long-term operation. As described in the Sections above, annual emissions due to normal operating fugitive leaks are minimal, below 1 ton of CO_2e. There are some one-time emission releases due to necessary operations for construction and commissioning of the pipeline but those emissions will be limited to a three to four month timeframe and will not be reoccurring.

Preferred Alternative emissions for all phases of the Project are summarized below in **Table 3-1,** with carbon loss due to tree removal summarized in **Table 3-2**.

For the construction phase, Tennessee is planning on using the hot-tap methodology for connecting the pipelines which eliminates natural gas venting from this process. On- and-off road vehicles and engines used during the construction phase will minimize emissions by utilizing vehicles adhering to the more stringent Tier 3 and 4 emissions standards when available and practical. All construction vehicles will operate with ultra-low sulfur diesel fuel, and limit the amount of engine idling time.

For the commissioning phase, Tennessee is planning on pressure testing the pipeline using hydrostatic testing which eliminates the need to use, and then vent, natural gas to pressure test the pipes. Emissions from purging and in-line inspections of the pipeline are minimal enough to make any control attempt impractical.

For the normal operation of the pipeline, protected steel pipes will be installed, regular inspections will check for potential leaks, and all practical efforts will be made to fix leaks expeditiously to limit the amount of natural gas vented into the atmosphere. Locations of potential leaks are expected to be primarily limited to valves at either end of the new pipeline segments.

For non-routine operations, in-line inspection emissions will only occur approximately once every 5-7 years. Since just a very small amount of natural gas is lost during the in-line inspections from the launcher and receiver barrels, it is not economically feasible to recover. Blowdown emissions will only occur due to unplanned discrete incidents and thus may never need to occur. If blowdowns are needed, it is likely that no controls can be implemented due to timing constraints. Emissions calculated assume the worst case scenario where the entire length of the Project pipeline will be required to be vented.

Preferred alternative carbon loss due to tree removal and carbon loss due to loss of annual sequestration are re-listed below in **Table 3-2** and **Table 3-3**. Trees will only be removed for construction access or pipeline safety.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Table 3-1 GHG Emissions - Summary

		Emissions - Tons			
	Duration	CO_2	CH_4	N_2O	CO_2e
Construction	Once	1,070.00	0.01	0.05	1,085.93
Commissioning	Once	0.02	3.01	-	75.26
Normal Operation	**Annual**	**0.003**	**0.03**	**-**	**0.77**
Non-Routine Operation	Once per 5-7 years/ Sporadic	0.004	0.63	-	15.64
	Infrequent/ Only if Needed	0.41	60.89	-	1,522.72

Table 3-2 Tree Removal

	Acres of Upland Forest Impacted	Carbon Loss – Tons C
Agawam	0.68	98.64
Sandisfield	43.25	5,911.70

Table 3-3 Tree Removal – Annual Carbon Loss from Sequestration

	Acres of Upland Forest Impacted	Carbon Loss – Tons C/yr
Agawam	0.27	0.06
Sandisfield	10.98	3.55

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Tennessee Gas Pipeline - Connecticut Expansion Project (Massachusetts)
Construction Emissions - Combined Non-Road and Off-Road Engines

Note: Calculated pipeline Non-Road Equipment emissions assuming equipment quantity is for the full duration of that project phase. *For the CT loop, divided total emissions of the Loop by the ratio of miles in each county verses total miles for the CT loop.*

Note: Calculated pipeline On-Road emissions based on VMT, which in turn are based on assumed vehicle mi/hr and provided total hours of operation. *For the CT loop, divided total VMT by the ratio of miles in each county verses total miles for the CT loop.*

Pipeline Loop	County	Pipeline Length (miles)	Days	Months
Connecticut Loop	Hampden (MA)	0.20	3	0.11
	Hartford (CT)	7.95	129	4.29
Massachusetts Loop	Berkshire (MA)	3.80	91	3.03

Hours/Day of Manpower During Construction:	10

Tons per Construction Period - Hampden County, MA				
	CO_2	CH_4	N_2O	CO_2e
Diesel Non-Road Equipment	52.29	0.0004	0.0031	53.23
Diesel On-Road	11.73	0.0004	0.00004	11.76
Total	**64.02**	**0.0008**	**0.0032**	**64.99**

Tons per Construction Period - Berkshire County, MA				
	CO_2	CH_4	N_2O	CO_2e
Diesel Non-Road Equipment	831.0	0.006	0.049	845.7
Diesel On-Road	175.0	0.005	0.001	175.3
Total	**1,005.98**	**0.01**	**0.05**	**1,020.94**

Project	**Total Project Emissions (tons)**			
	CO_2	CH_4	N_2O	(CO_2e)
Total Project Emissions	**1,070.00**	**0.01**	**0.05**	**1,085.93**

Tennessee Gas Pipeline - Connecticut Expansion Project (Massachusetts)
Construction Emissions - Off-Road Engines - CT Pipeline Loop

Description	Equipment category based on NONROAD classification	SCC [1]	Fuel Type	Engine Technology Type	Equipment HP	Number of Equipment	Total Days	Total Weeks	Total Months	Hours per Day	Total Working hrs	BSFC [2]	EFss (g/hp-hr) [2]				Load Factor [2]
												lb/hp-hr	HC	CO	PM	NOx	
Pipeline Loop Construction																	
BH/LDR 416	Tractor/Loader/Backhoe	2270002066	Diesel	T2	94	2	75	11	4.40	10	1,500	0.481	0.84	6.08	0.47	5.19	0.21
Bnd - Tru-Bend	Other Construction Equipment	2270002081	Diesel	T2	0	1	0	0	4.40	10	0	0.412	0.58	6.29	0.61	4.07	0.59
Bnd Machine 22" - 36"	Other Construction Equipment	2270002081	Diesel	T2	180	1	24	4	4.40	10	240	0.371	0.32	1.14	0.16	3.79	0.59
Bore Mchn - 8" - 48"	Bore/Drill Rigs	2270002033	Diesel	T2	162	1	22	4	4.40	10	220	0.367	0.34	0.87	0.18	4.1	0.43
Chipper Cat 586 C	Logging Equipment Shredders >6 hp	2270007010	Diesel	T2	350	1	18	3	4.40	10	180	0.371	0.17	1.29	0.16	4.11	0.59
Comp - 15-185 CFM	Light Commerical Air Compressors	2270006015	Diesel	T2	49	2	13	2	4.40	10	260	0.408	0.2789	1.5323	0.3389	4.7279	0.43
Disc w/ LG Trac	Other Construction Equipment	2270002081	Diesel	T2	290	1	27	4	4.40	10	270	0.371	0.32	1.14	0.16	3.79	0.59
Disc w/ SM Trac	Other Construction Equipment	2270002081	Diesel	T2	210	2	27	4	4.40	10	540	0.371	0.32	1.14	0.16	3.79	0.59
Ditch Witch	Trencher	2270002030	Diesel	T2	23	1	23	4	4.40	10	230	0.412	0.46	3.31	0.33	4.21	0.59
Dozer D-7	Crawler Tractor	2270002069	Diesel	T2	237	6	26	4	4.40	10	1,560	0.371	0.32	1.14	0.16	3.79	0.59
Dozer D-8	Crawler Tractor	2270002069	Diesel	T2	317	9	26	4	4.40	10	2,340	0.371	0.17	1.29	0.16	4.11	0.59
Excavator 336	Excavators	2270002036	Diesel	T2	300	17	27	4	4.40	10	4,590	0.371	0.17	1.29	0.16	4.11	0.59
Excavator w/ Ham	Excavators	2270002036	Diesel	T2	300	2	21	3	4.40	10	420	0.371	0.17	1.29	0.16	4.11	0.59
Excavator w/ Pad	Excavators	2270002036	Diesel	T2	300	4	31	5	4.40	10	1,240	0.371	0.17	1.29	0.16	4.11	0.59
Excavator w/ Vac	Excavators	2270002036	Diesel	T2	300	2	23	4	4.40	10	460	0.371	0.17	1.29	0.16	4.11	0.59
Frklft - TH1055C	Forklifts	2270003020	Diesel	T2	101	1	75	11	4.40	10	750	0.371	0.35	1.33	0.22	3.88	0.59
J-Henry 265	Bore/Drill Rigs	2270002033	Diesel	T2	225	3	21	3	4.40	10	630	0.367	0.31	0.75	0.13	4	0.43
Light Plant	Light Commercial Generator Set	2270006005	Diesel	T2	12	2	13	2	4.40	10	260	0.408	0.44	2.16	0.27	4.44	0.43
Loader 930	Tractors/Loaders/Backhoes	2270002066	Diesel	T2	154	1	23	4	4.40	10	230	0.433	0.78	2.23	0.36	4.52	0.21
Pump 3"	Light Commercial Pumps	2270006010	Diesel	T2	5	8	13	2	4.40	10	1,040	0.408	0.5508	4.1127	0.5	4.3	0.43
Pump 6"	Light Commercial Pumps	2270006010	Diesel	T2	50	2	3	1	4.40	10	60	0.408	0.3672	2.3655	0.24	4.7	0.43
Rig - Mechanic	Light Commerical Welders	2270006025	Diesel	T2	390	6	28	4	4.40	10	1,680	0.433	0.38	2.17	0.26	4.78	0.21
Rig - Welding	Light Commerical Welders	2270006025	Diesel	T2	350	20	23	4	4.40	10	4,600	0.433	0.38	2.17	0.26	4.78	0.21
Sideboom 572	Cranes	2270002045	Diesel	T2	135	4	24	4	4.40	10	960	0.367	0.34	0.87	0.18	4.1	0.43
Sideboom 583	Cranes	2270002045	Diesel	T2	310	15	28	4	4.40	10	4,200	0.367	0.17	0.84	0.13	4.34	0.43
Sideboom 587	Cranes	2270002045	Diesel	T2	366	3	24	4	4.40	10	720	0.367	0.17	0.84	0.13	4.34	0.43
Tack Rig D-7	Bore/Drill Rigs	2270002033	Diesel	T2	237	3	23	4	4.40	10	690	0.367	0.31	0.75	0.13	4	0.43
Test - Fill Pump	Light Commercial Pumps	2270006010	Diesel	T2	150	1	3	1	4.40	10	30	0.367	0.3384	0.8667	0.18	4.1	0.43
Test - Low Head Pump	Light Commercial Pumps	2270006010	Diesel	T2	140	1	4	1	4.40	10	40	0.367	0.3384	0.8667	0.18	4.1	0.43
Test - Pres Pump	Light Commercial Pumps	2270006010	Diesel	T2	190	1	3	1	4.40	10	30	0.367	0.3085	0.7475	0.1316	4	0.43

AECOM assumed engines tiers for construction based on conservative assumptions regarding start date and length of time from effective dates of engine tiers

NOTES:

Note 1: SCC code based on Appendix A of "Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling", July 2010, EPA-420-R-10-016, NR-005d.

Note 2: Brake-specific fuel consumption, zero hour steady state emission factor (EFss; g/hp-hr), and load factor are from NMIM/NONROAD08 model factors dated May 4, 2009.

If factors weren't available in NONROAD08, factors taken from "Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression-Ignition", dated July 2010, EPA-420-R-10-018, NR-009d or

"Exhaust Emission Factors for Nonroad Engine Modeling: Spark-Ignition", July 2010, EPA420-R-10-019, NR-010f.

Tennessee Gas Pipeline - Co\Tennessee Gas Pipeline - Connecticut Expansion Project (Massachusetts)
Construction Emissions - Off\Construction Emissions - Off-Road Engines - CT Pipeline Loop

Description	Age	"A" [3]				Deterioration factor [3]				$S_{PM\ adj}$ [4]	Adjusted EF (g/hp-hr)						N_2O EF [8]
	Factor [3]	HC	CO	PM	NOx	HC	CO	PM	NOx	g/hp-hr	HC [5,9]	CO [5,9]	PM [4,9]	SO_2 [6,9]	NOx [5,9]	CO_2 [7]	g/MMBtu
Pipeline Loop Construction																	
BH/LDR 416	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.113	0.869	6.694	0.580	0.006	5.237	693.213	1.9
Bnd - Tru-Bend	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.097	0.600	6.925	0.802	0.005	4.107	594.231	1.9
Bnd Machine 22" - 36"	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.087	0.331	1.255	0.149	0.005	3.824	535.764	1.9
Bore Mchn - 8" - 48"	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.086	0.352	0.958	0.179	0.005	4.137	529.910	1.9
Chipper Cat 586 C	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.087	0.176	1.420	0.149	0.005	4.147	536.258	1.9
Comp - 15-185 CFM	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.096	0.288	1.687	0.404	0.005	4.770	589.437	1.9
Disc w/ LG Trac	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.087	0.331	1.255	0.149	0.005	3.824	535.764	1.9
Disc w/ SM Trac	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.087	0.331	1.255	0.149	0.005	3.824	535.764	1.9
Ditch Witch	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.097	0.476	3.644	0.390	0.005	4.248	594.627	1.9
Dozer D-7	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.087	0.331	1.255	0.149	0.005	3.824	535.764	1.9
Dozer D-8	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.087	0.176	1.420	0.149	0.005	4.147	536.258	1.9
Excavator 336	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.087	0.176	1.420	0.149	0.005	4.147	536.258	1.9
Excavator w/ Ham	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.087	0.176	1.420	0.149	0.005	4.147	536.258	1.9
Excavator w/ Pad	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.087	0.176	1.420	0.149	0.005	4.147	536.258	1.9
Excavator w/ Vac	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.087	0.176	1.420	0.149	0.005	4.147	536.258	1.9
Frklft - TH1055C	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.087	0.362	1.464	0.237	0.005	3.915	535.665	1.9
J-Henry 265	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.086	0.321	0.826	0.105	0.005	4.036	530.009	1.9
Light Plant	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.096	0.455	2.378	0.302	0.005	4.480	588.905	1.9
Loader 930	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.101	0.807	2.455	0.429	0.006	4.561	623.957	1.9
Pump 3"	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.096	0.570	4.528	0.641	0.005	4.339	588.540	1.9
Pump 6"	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.096	0.380	2.604	0.258	0.005	4.742	589.145	1.9
Rig - Mechanic	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.101	0.393	2.389	0.281	0.006	4.823	625.277	1.9
Rig - Welding	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.101	0.393	2.389	0.281	0.006	4.823	625.277	1.9
Sideboom 572	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.086	0.352	0.958	0.179	0.005	4.137	529.910	1.9
Sideboom 583	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.086	0.176	0.925	0.105	0.005	4.379	530.471	1.9
Sideboom 587	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.086	0.176	0.925	0.105	0.005	4.379	530.471	1.9
Tack Rig D-7	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.086	0.321	0.826	0.105	0.005	4.036	530.009	1.9
Test - Fill Pump	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.086	0.350	0.954	0.179	0.005	4.137	529.915	1.9
Test - Low Head Pump	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.086	0.350	0.954	0.179	0.005	4.137	529.915	1.9
Test - Pres Pump	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.086	0.319	0.823	0.108	0.005	4.036	530.014	1.9
																Construction Total (Tons)	

NOTES:

Note 3: Age factor and Deterioration factors calculated using Equation 4 from "Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression-Ignition", July 2010, EPA-420-R-10-018, NR-009d and for gas engines "Nonroad Spark-Ignition Engine Emission Deterioration Factors", July 2010, EPA-420-R-10-020, NR-011d.

Age Factor = LF * cumulative hours / median life {where Age factor is capped at 1. For this calculation, age factor is assumed to be 1 for simplification purposes}.

Deterioration Factor = 1 + (A * Age Factor^b), where b = 1 for diesel & gasoline engines and A is taken from Table A6 of referenced source. For 4-stroke gas engines A is taken from Table 2 of source

Note 4: Adjusted Emission Factors for PM are calculated using Equation 2 from, "Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression-Ignition", July 2010, EPA-420-R-10-018 and "Nonroad Spark-Ignition Engine Emission Deterioration Factors", July 2010, EPA-420-R-10-020.

The correction factor S_{PMadj} is made to account for fuel sulfur variations; inputs specific to this calculation are noted below

0.02247 soxcnv (fraction of fuel sulfur converted to direct PM) for Base, T0, T1, T2, T3, T3B, T4A, T4B

0.30 soxcnv (fraction of fuel sulfur converted to direct PM) for Base, T4 and T4N

0.03 soxcnv (fraction of fuel sulfur converted to direct PM) for gasoline engines

0.0015 soxdsl (weight percent of sulfur in diesel fuel)

0.33 soxbas (default certification fuel sulfur weight percent, 0.33 is default)

0.0339 soxbas (default for gas engines)

Note 5: Adjusted Emission Factors for HC, CO, and NOx are calculated using Equation 1 from, "Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression-Ignition", July 2010, EPA-420-R-10-018.

Adjusted EF = EFss * TAF * DF (EFss have TAFs built in so no need to determine separately)

Note 6: SO_2 Emissions are calculated using Equation 7 from, "Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression-Ignition", July 2010, EPA-420-R-10-018.

SO_2 = (BSFC * 453.6 * (1- soxcnv) - $HC_{adj\ EF}$) * 0.01 * soxdsl * 2

Note 7: CO_2 Emissions are calculated using Equation 6 from, "Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression-Ignition", July 2010, EPA-420-R-10-018.

CO_2 = (BSFC * 453.6 - $HC_{adj\ EF}$) * 0.87 * 44/12

Note 8: Emission factor for N_2O is taken from The Climate Registry General Reporting Protocol version 1.1, as updated 1/2/2013.

Non-Highway Veh Construction/Mining Diesel N_2O (g/MMBtu) = 0.26 N2O (g/gal) *(table 13.7)* * (42 gal/1 bbl) / (5.80 MMBtu/bbl)*(table 13.1)*

Non-Highway Veh Construction/Mining Gasoline N_2O (g/MMBtu) = 0.22 N2O (g/gal) *(table 13.7)* * (42 gal/1 bbl) / (5.25 MMBtu/bbl)*(table 13.1)*

Note 9: For gas water pump, adjusted emission factor from "Nonroad Spark-Ignition Engine Emission Deterioration Factors", July 2010, EPA-420-R-10-020.
Adjusted EF = EFss * TAF * DF (for pumps there is no TAFs since engines in these applications are less likely to experience transient operation)

Tennessee Gas Pipeline - Co\Tennessee Gas Pipeline - Connecticut Expansion Project (Massachusetts)
Construction Emissions - OffConstruction Emissions - Off-Road Engines - CT Pipeline Loop

Description	VOC [10] tons	CO [11] tons	PM [11]/ PM_{10} [12] tons	$PM_{2.5}$ [12] tons	SO_2 [11] tons	NOx [11] tons	CO_2 [11] tons	CH_4 [13] tons	N_2O [14] tons	GHG [15] tons of CO_2e
Pipeline Loop Construction										
BH/LDR 416	0.03	0.22	0.02	0.02	0.00	0.17	22.63	0.00	0.00	23.45
Bnd - Tru-Bend	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bnd Machine 22" - 36"	0.01	0.04	0.00	0.00	0.00	0.11	15.05	0.00	0.00	15.25
Bore Mchn - 8" - 48"	0.01	0.02	0.00	0.00	0.00	0.07	8.95	0.00	0.00	9.11
Chipper Cat 586 C	0.01	0.06	0.01	0.01	0.00	0.17	21.97	0.00	0.00	22.26
Comp - 15-185 CFM	0.00	0.01	0.00	0.00	0.00	0.03	3.56	0.00	0.00	3.62
Disc w/ LG Trac	0.02	0.06	0.01	0.01	0.00	0.19	27.28	0.00	0.00	27.64
Disc w/ SM Trac	0.03	0.09	0.01	0.01	0.00	0.28	39.51	0.00	0.00	40.03
Ditch Witch	0.00	0.01	0.00	0.00	0.00	0.01	2.05	0.00	0.00	2.07
Dozer D-7	0.08	0.30	0.04	0.03	0.00	0.92	128.83	0.00	0.01	130.51
Dozer D-8	0.09	0.69	0.07	0.07	0.00	2.00	258.71	0.00	0.01	262.05
Excavator 336	0.17	1.27	0.13	0.13	0.00	3.71	480.25	0.00	0.02	486.45
Excavator w/ Ham	0.02	0.12	0.01	0.01	0.00	0.34	43.94	0.00	0.00	44.51
Excavator w/ Pad	0.04	0.34	0.04	0.03	0.00	1.00	129.74	0.00	0.01	131.42
Excavator w/ Vac	0.02	0.13	0.01	0.01	0.00	0.37	48.13	0.00	0.00	48.75
Frklft - TH1055C	0.02	0.07	0.01	0.01	0.00	0.19	26.39	0.00	0.00	26.73
J-Henry 265	0.02	0.06	0.01	0.01	0.00	0.27	35.61	0.00	0.00	36.24
Light Plant	0.00	0.00	0.00	0.00	0.00	0.01	0.87	0.00	0.00	0.89
Loader 930	0.01	0.02	0.00	0.00	0.00	0.04	5.12	0.00	0.00	5.30
Pump 3"	0.00	0.01	0.00	0.00	0.00	0.01	1.45	0.00	0.00	1.48
Pump 6"	0.00	0.00	0.00	0.00	0.00	0.01	0.84	0.00	0.00	0.85
Rig - Mechanic	0.06	0.36	0.04	0.04	0.00	0.73	94.84	0.00	0.01	98.27
Rig - Welding	0.15	0.89	0.10	0.10	0.00	1.80	233.04	0.00	0.03	241.47
Sideboom 572	0.02	0.06	0.01	0.01	0.00	0.25	32.55	0.00	0.00	33.13
Sideboom 583	0.11	0.57	0.07	0.06	0.00	2.70	327.37	0.00	0.02	333.16
Sideboom 587	0.02	0.12	0.01	0.01	0.00	0.55	66.26	0.00	0.00	67.43
Tack Rig D-7	0.03	0.06	0.01	0.01	0.00	0.31	41.08	0.00	0.00	41.81
Test - Fill Pump	0.00	0.00	0.00	0.00	0.00	0.01	1.13	0.00	0.00	1.15
Test - Low Head Pump	0.00	0.00	0.00	0.00	0.00	0.01	1.41	0.00	0.00	1.43
Test - Pres Pump	0.00	0.00	0.00	0.00	0.00	0.01	1.43	0.00	0.00	1.46
	0.97	**5.59**	**0.63**	**0.61**	**0.02**	**16.29**	**2,100**	**0.01**	**0.13**	**2,138**

NOTES:

Note 10: Annual VOC Emissions are calculated using the following calculation (1.053 * Adj. HC emission factor (g/hp-hr) * horsepower * hours operated * load factor) / (2000 lb/ton * 453.6 g/lb)

1.053 is the ratio of VOC to THC (for diesel equipment) from "Conversion Factors for Hydrocarbon Components", July 2010, EPA-420-R-10-015.

0.933 is the ratio of VOC to THC (for diesel equipment) from "Conversion Factors for Hydrocarbon Components", July 2010, EPA-420-R-10-015.

Note 11: Annual CO, PM, SO_2, NOx and CO_2 Emissions are calculated using the following calculation (Adj. emission factor (g/hp-hr) * horsepower * hours operated * load factor) / (2000 lb/ton * 453.6 g/lb)

Note 12: For diesel engines all PM is considered to be PM_{10}, $PM_{2.5}$ is 97% of PM/PM_{10}. For gasoline engines all PM is considered to be PM10, PM2.5 is 92% of PM/PM10

Citations for both $PM_{2.5}$ speciations are found in the EPA documents referenced in Note 2.

Note 13: Annual CH_4 emissions are calculated using the following calculation (Adj. HC emission factor (g/hp-hr) * (1-0.984) * horsepower * hours operated * load factor) / (2000 lb/ton * 453.6 g/lb)

This equation is derived in part from subtracting methane from THC to calculate NMHC. THC - CH_4 = NMHC; THC - NMHC = CH_4; THC - (0.984 * THC) = CH_4; THC * (1-0.984) = CH_4

0.984 is the ratio of NMHC to THC for diesel and 0.900 is the ratio for 4-stroke gasoline; from "Conversion Factors for Hydrocarbon Components", July 2010, EPA-420-R-10-015.

Note 14: Emissions estimate for N2O is based on a higher heating value of 138,000 Btu/gallon and a density of 7.1 lb/gallon for diesel, 125,000 btu/gallon and 6.17 lb/gal for gasoline

Note 15: Greenhouse gasses (GHG) are converted to carbon dioxide equivalents (CO2) using 100-year Global Warming Potentials values from IPCC's Fourth Assessment Report (AR4)

Chapter 2, Table 2.14 of Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the IPCC

CO_2 = 1, CH_4 = 25, N_2O = 298

Tennessee Gas Pipeline - Connecticut Expansion Project (Massachusetts)
Construction Emissions - Off-Road Engines - MA Pipeline Loop

Description	Equipment category based on NONROAD classification	SCC [1]	Fuel Type	Engine Technology Type	Equipment HP	Number of Equipment	Total Days	Total Weeks	Total Months	Hours per Day	Total Working hrs	BSFC [2]	EFss (g/hp-hr) [2]				Load Factor [2]
												lb/hp-hr	HC	CO	PM	NOx	
Pipeline Loop Construction																	
BH/LDR 416	Tractor/Loader/Backhoe	2270002066	Diesel	T2	94	1	42	6	3.03	10	420	0.481	0.84	6.08	0.47	5.19	0.21
Bnd - Tru-Bend	Other Construction Equipment	2270002081	Diesel	T2	0	1	0	0	3.03	10	0	0.412	0.58	6.29	0.61	4.07	0.59
Bnd Machine 22" - 36"	Other Construction Equipment	2270002081	Diesel	T2	180	1	9	2	3.03	10	90	0.371	0.32	1.14	0.16	3.79	0.59
Bore Mchn - 8" - 48"	Bore/Drill Rigs	2270002033	Diesel	T2	162	1	8	2	3.03	10	80	0.367	0.34	0.87	0.18	4.1	0.43
Chipper Cat 586 C	Logging Equipment Shredders >6 hp	2270007010	Diesel	T2	350	1	6	1	3.03	10	60	0.371	0.17	1.29	0.16	4.11	0.59
Comp - 15-185 CFM	Light Commerical Air Compressors	2270006015	Diesel	T2	49	2	4	1	3.03	10	80	0.408	0.2789	1.5323	0.3389	4.7279	0.43
Disc w/ LG Trac	Other Construction Equipment	2270002081	Diesel	T2	290	1	12	2	3.03	10	120	0.371	0.32	1.14	0.16	3.79	0.59
Disc w/ SM Trac	Other Construction Equipment	2270002081	Diesel	T2	210	2	12	2	3.03	10	240	0.371	0.32	1.14	0.16	3.79	0.59
Ditch Witch	Trencher	2270002030	Diesel	T2	23	1	9	2	3.03	10	90	0.412	0.46	3.31	0.33	4.21	0.59
Dozer D-7	Crawler Tractor	2270002069	Diesel	T2	237	6	12	2	3.03	10	720	0.371	0.32	1.14	0.16	3.79	0.59
Dozer D-8	Crawler Tractor	2270002069	Diesel	T2	317	9	11	2	3.03	10	990	0.371	0.17	1.29	0.16	4.11	0.59
Excavator 336	Excavators	2270002036	Diesel	T2	300	16	12	2	3.03	10	1,920	0.371	0.17	1.29	0.16	4.11	0.59
Excavator w/ Ham	Excavators	2270002036	Diesel	T2	300	2	8	2	3.03	10	160	0.371	0.17	1.29	0.16	4.11	0.59
Excavator w/ Pad	Excavators	2270002036	Diesel	T2	300	4	14	2	3.03	10	560	0.371	0.17	1.29	0.16	4.11	0.59
Excavator w/ Vac	Excavators	2270002036	Diesel	T2	300	2	9	2	3.03	10	180	0.371	0.17	1.29	0.16	4.11	0.59
Frklft - TH1055C	Forklifts	2270003020	Diesel	T2	101	1	42	6	3.03	10	420	0.371	0.35	1.33	0.22	3.88	0.59
J-Henry 265	Bore/Drill Rigs	2270002033	Diesel	T2	225	3	8	2	3.03	10	240	0.367	0.31	0.75	0.13	4	0.43
Light Plant	Light Commercial Generator Set	2270006005	Diesel	T2	12	2	5	1	3.03	10	100	0.408	0.44	2.16	0.27	4.44	0.43
Loader 930	Tractors/Loaders/Backhoes	2270002066	Diesel	T2	154	1	9	2	3.03	10	90	0.433	0.78	2.23	0.36	4.52	0.21
Pump 3"	Light Commercial Pumps	2270006010	Diesel	T2	5	5	5	1	3.03	10	250	0.408	0.5508	4.1127	0.5	4.3	0.43
Pump 6"	Light Commercial Pumps	2270006010	Diesel	T2	50	2	1	1	3.03	10	20	0.408	0.3672	2.3655	0.24	4.7	0.43
Rig - Mechanic	Light Commerical Welders	2270006025	Diesel	T2	390	6	12	2	3.03	10	720	0.433	0.38	2.17	0.26	4.78	0.21
Rig - Welding	Light Commerical Welders	2270006025	Diesel	T2	350	18	9	2	3.03	10	1,620	0.433	0.38	2.17	0.26	4.78	0.21
Sideboom 572	Cranes	2270002045	Diesel	T2	135	2	10	2	3.03	10	200	0.367	0.34	0.87	0.18	4.1	0.43
Sideboom 583	Cranes	2270002045	Diesel	T2	310	11	12	2	3.03	10	1,320	0.367	0.17	0.84	0.13	4.34	0.43
Sideboom 587	Cranes	2270002045	Diesel	T2	366	3	11	2	3.03	10	330	0.367	0.17	0.84	0.13	4.34	0.43
Tack Rig D-7	Bore/Drill Rigs	2270002033	Diesel	T2	237	3	9	2	3.03	10	270	0.367	0.31	0.75	0.13	4	0.43
Test - Fill Pump	Light Commercial Pumps	2270006010	Diesel	T2	150	1	2	1	3.03	10	20	0.367	0.3384	0.8667	0.18	4.1	0.43
Test - Low Head Pump	Light Commercial Pumps	2270006010	Diesel	T2	140	1	3	1	3.03	10	30	0.367	0.3384	0.8667	0.18	4.1	0.43
Test - Pres Pump	Light Commercial Pumps	2270006010	Diesel	T2	190	1	2	1	3.03	10	20	0.367	0.3085	0.7475	0.1316	4	0.43

AECOM assumed engines tiers for construction based on conservative assumptions regarding start date and length of time from effective dates of engine tiers

NOTES:

Note 1: SCC code based on Appendix A of "Median Life, Annual Activity, and Load Factor Values for Nonroad Engine Emissions Modeling", July 2010, EPA-420-R-10-016, NR-005d.

Note 2: Brake-specific fuel consumption, zero hour steady state emission factor (EFss; g/hp-hr), and load factor are from NMIM/NONROAD08 model factors dated May 4, 2009.

If factors weren't available in NONROAD08, factors taken from "Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression-Ignition", dated July 2010, EPA-420-R-10-018, NR-009d or

"Exhaust Emission Factors for Nonroad Engine Modeling: Spark-Ignition", July 2010, EPA420-R-10-019, NR-010f.

Tennessee Gas Pipeline - Co\Tennessee Gas Pipeline - Connecticut Expansion Project (Massachusetts)
Construction Emissions - Off\Construction Emissions - Off-Road Engines - MA Pipeline Loop

Description	Age	"A" [3]				Deterioration factor [3]				$S_{PM\ adj}$ [4]	Adjusted EF (g/hp-hr)						N_2O EF [8]
	Factor [3]	HC	CO	PM	NOx	HC	CO	PM	NOx	g/hp-hr	HC [5,9]	CO [5,9]	PM [4,9]	SO_2 [6,9]	NOx [5,9]	CO_2 [7]	g/MMBtu
Pipeline Loop Construction																	
BH/LDR 416	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.113	0.869	6.694	0.580	0.006	5.237	693.213	1.9
Bnd - Tru-Bend	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.097	0.600	6.925	0.802	0.005	4.107	594.231	1.9
Bnd Machine 22" - 36"	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.087	0.331	1.255	0.149	0.005	3.824	535.764	1.9
Bore Mchn - 8" - 48"	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.086	0.352	0.958	0.179	0.005	4.137	529.910	1.9
Chipper Cat 586 C	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.087	0.176	1.420	0.149	0.005	4.147	536.258	1.9
Comp - 15-185 CFM	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.096	0.288	1.687	0.404	0.005	4.770	589.437	1.9
Disc w/ LG Trac	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.087	0.331	1.255	0.149	0.005	3.824	535.764	1.9
Disc w/ SM Trac	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.087	0.331	1.255	0.149	0.005	3.824	535.764	1.9
Ditch Witch	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.097	0.476	3.644	0.390	0.005	4.248	594.627	1.9
Dozer D-7	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.087	0.331	1.255	0.149	0.005	3.824	535.764	1.9
Dozer D-8	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.087	0.176	1.420	0.149	0.005	4.147	536.258	1.9
Excavator 336	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.087	0.176	1.420	0.149	0.005	4.147	536.258	1.9
Excavator w/ Ham	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.087	0.176	1.420	0.149	0.005	4.147	536.258	1.9
Excavator w/ Pad	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.087	0.176	1.420	0.149	0.005	4.147	536.258	1.9
Excavator w/ Vac	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.087	0.176	1.420	0.149	0.005	4.147	536.258	1.9
Frklft - TH1055C	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.087	0.362	1.464	0.237	0.005	3.915	535.665	1.9
J-Henry 265	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.086	0.321	0.826	0.105	0.005	4.036	530.009	1.9
Light Plant	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.096	0.455	2.378	0.302	0.005	4.480	588.905	1.9
Loader 930	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.101	0.807	2.455	0.429	0.006	4.561	623.957	1.9
Pump 3"	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.096	0.570	4.528	0.641	0.005	4.339	588.540	1.9
Pump 6"	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.096	0.380	2.604	0.258	0.005	4.742	589.145	1.9
Rig - Mechanic	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.101	0.393	2.389	0.281	0.006	4.823	625.277	1.9
Rig - Welding	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.101	0.393	2.389	0.281	0.006	4.823	625.277	1.9
Sideboom 572	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.086	0.352	0.958	0.179	0.005	4.137	529.910	1.9
Sideboom 583	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.086	0.176	0.925	0.105	0.005	4.379	530.471	1.9
Sideboom 587	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.086	0.176	0.925	0.105	0.005	4.379	530.471	1.9
Tack Rig D-7	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.086	0.321	0.826	0.105	0.005	4.036	530.009	1.9
Test - Fill Pump	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.086	0.350	0.954	0.179	0.005	4.137	529.915	1.9
Test - Low Head Pump	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.086	0.350	0.954	0.179	0.005	4.137	529.915	1.9
Test - Pres Pump	1	0.034	0.101	0.473	0.009	1.034	1.101	1.473	1.009	0.086	0.319	0.823	0.108	0.005	4.036	530.014	1.9
																Construction Total (Tons)	

NOTES:

Note 3: Age factor and Deterioration factors calculated using Equation 4 from "Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression-Ignition", July 2010, EPA-420-R-10-018, NR-009d and for gas engines "Nonroad Spark-Ignition Engine Emission Deterioration Factors", July 2010, EPA-420-R-10-020, NR-011d.

Age Factor = LF * cumulative hours / median life {where Age factor is capped at 1. For this calculation, age factor is assumed to be 1 for simplification purposes}.

Deterioration Factor = 1 + (A * Age Factor^b), where b = 1 for diesel & gasoline engines and A is taken from Table A6 of referenced source. For 4-stroke gas engines A is taken from Table 2 of source

Note 4: Adjusted Emission Factors for PM are calculated using Equation 2 from, "Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression-Ignition", July 2010, EPA-420-R-10-018 and "Nonroad Spark-Ignition Engine Emission Deterioration Factors", July 2010, EPA-420-R-10-020.

The correction factor S_{PMadj} is made to account for fuel sulfur variations; inputs specific to this calculation are noted below

0.02247 soxcnv (fraction of fuel sulfur converted to direct PM) for Base, T0, T1, T2, T3, T3B, T4A, T4B

0.30 soxcnv (fraction of fuel sulfur converted to direct PM) for Base, T4 and T4N

0.03 soxcnv (fraction of fuel sulfur converted to direct PM) for gasoline engines

0.0015 soxdsl (weight percent of sulfur in diesel fuel)

0.33 soxbas (default certification fuel sulfur weight percent, 0.33 is default)

0.0339 soxbas (default for gas engines)

Note 5: Adjusted Emission Factors for HC, CO, and NOx are calculated using Equation 1 from, "Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression-Ignition", July 2010, EPA-420-R-10-018.

Adjusted EF = EFss * TAF * DF (EFss have TAFs built in so no need to determine separately)

Note 6: SO_2 Emissions are calculated using Equation 7 from, "Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression-Ignition", July 2010, EPA-420-R-10-018.

SO_2 = (BSFC * 453.6 * (1- soxcnv) - $HC_{adj\ EF}$) * 0.01 * soxdsl * 2

Note 7: CO_2 Emissions are calculated using Equation 6 from, "Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling - Compression-Ignition", July 2010, EPA-420-R-10-018.

CO_2 = (BSFC * 453.6 - $HC_{adj\ EF}$) * 0.87 * 44/12

Note 8: Emission factor for N_2O is taken from The Climate Registry General Reporting Protocol version 1.1, as updated 1/2/2013.

Non-Highway Veh Construction/Mining Diesel N_2O (g/MMBtu) = 0.26 N2O (g/gal) *(table 13.7)* * (42 gal/1 bbl) / (5.80 MMBtu/bbl)*(table 13.1)*

Non-Highway Veh Construction/Mining Gasoline N_2O (g/MMBtu) = 0.22 N2O (g/gal) *(table 13.7)* * (42 gal/1 bbl) / (5.25 MMBtu/bbl)*(table 13.1)*

Note 9: For gas water pump, adjusted emission factor from "Nonroad Spark-Ignition Engine Emission Deterioration Factors", July 2010, EPA-420-R-10-020.

Adjusted EF = EFss * TAF * DF (for pumps there is no TAFs since engines in these applications are less likely to experience transient operation)

Tennessee Gas Pipeline - Co\Tennessee Gas Pipeline - Connecticut Expansion Project (Massachusetts)
Construction Emissions - OffConstruction Emissions - Off-Road Engines - MA Pipeline Loop

Description	VOC [10] tons	CO [11] tons	PM [11]/ PM_{10} [12] tons	$PM_{2.5}$ [12] tons	SO_2 [11] tons	NOx [11] tons	CO_2 [11] tons	CH_4 [13] tons	N_2O [14] tons	GHG [15] tons of CO_2e
Pipeline Loop Construction										
BH/LDR 416	0.01	0.06	0.01	0.01	0.00	0.05	6.34	0.00	0.00	6.57
Bnd - Tru-Bend	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Bnd Machine 22" - 36"	0.00	0.01	0.00	0.00	0.00	0.04	5.64	0.00	0.00	5.72
Bore Mchn - 8" - 48"	0.00	0.01	0.00	0.00	0.00	0.03	3.26	0.00	0.00	3.31
Chipper Cat 586 C	0.00	0.02	0.00	0.00	0.00	0.06	7.32	0.00	0.00	7.42
Comp - 15-185 CFM	0.00	0.00	0.00	0.00	0.00	0.01	1.10	0.00	0.00	1.11
Disc w/ LG Trac	0.01	0.03	0.00	0.00	0.00	0.09	12.13	0.00	0.00	12.28
Disc w/ SM Trac	0.01	0.04	0.00	0.00	0.00	0.13	17.56	0.00	0.00	17.79
Ditch Witch	0.00	0.00	0.00	0.00	0.00	0.01	0.80	0.00	0.00	0.81
Dozer D-7	0.04	0.14	0.02	0.02	0.00	0.42	59.46	0.00	0.00	60.23
Dozer D-8	0.04	0.29	0.03	0.03	0.00	0.85	109.45	0.00	0.00	110.87
Excavator 336	0.07	0.53	0.06	0.05	0.00	1.55	200.89	0.00	0.01	203.48
Excavator w/ Ham	0.01	0.04	0.00	0.00	0.00	0.13	16.74	0.00	0.00	16.96
Excavator w/ Pad	0.02	0.16	0.02	0.02	0.00	0.45	58.59	0.00	0.00	59.35
Excavator w/ Vac	0.01	0.05	0.01	0.01	0.00	0.15	18.83	0.00	0.00	19.08
Frklft - TH1055C	0.01	0.04	0.01	0.01	0.00	0.11	14.78	0.00	0.00	14.97
J-Henry 265	0.01	0.02	0.00	0.00	0.00	0.10	13.57	0.00	0.00	13.81
Light Plant	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.00	0.00	0.34
Loader 930	0.00	0.01	0.00	0.00	0.00	0.01	2.00	0.00	0.00	2.08
Pump 3"	0.00	0.00	0.00	0.00	0.00	0.00	0.35	0.00	0.00	0.35
Pump 6"	0.00	0.00	0.00	0.00	0.00	0.00	0.28	0.00	0.00	0.28
Rig - Mechanic	0.03	0.16	0.02	0.02	0.00	0.31	40.64	0.00	0.00	42.12
Rig - Welding	0.05	0.31	0.04	0.04	0.00	0.63	82.07	0.00	0.01	85.04
Sideboom 572	0.00	0.01	0.00	0.00	0.00	0.05	6.78	0.00	0.00	6.90
Sideboom 583	0.04	0.18	0.02	0.02	0.00	0.85	102.89	0.00	0.01	104.71
Sideboom 587	0.01	0.05	0.01	0.01	0.00	0.25	30.37	0.00	0.00	30.91
Tack Rig D-7	0.01	0.03	0.00	0.00	0.00	0.12	16.08	0.00	0.00	16.36
Test - Fill Pump	0.00	0.00	0.00	0.00	0.00	0.01	0.75	0.00	0.00	0.77
Test - Low Head Pump	0.00	0.00	0.00	0.00	0.00	0.01	1.05	0.00	0.00	1.07
Test - Pres Pump	0.00	0.00	0.00	0.00	0.00	0.01	0.95	0.00	0.00	0.97
	0.38	**2.21**	**0.25**	**0.24**	**0.01**	**6.43**	**831**	**0.01**	**0.05**	**846**

NOTES:

Note 10: Annual VOC Emissions are calculated using the following calculation (1.053 * Adj. HC emission factor (g/hp-hr) * horsepower * hours operated * load factor) / (2000 lb/ton * 453.6 g/lb)

1.053 is the ratio of VOC to THC (for diesel equipment) from "Conversion Factors for Hydrocarbon Components", July 2010, EPA-420-R-10-015.

0.933 is the ratio of VOC to THC (for diesel equipment) from "Conversion Factors for Hydrocarbon Components", July 2010, EPA-420-R-10-015.

Note 11: Annual CO, PM, SO_2, NOx and CO_2 Emissions are calculated using the following calculation (Adj. emission factor (g/hp-hr) * horsepower * hours operated * load factor) / (2000 lb/ton * 453.6 g/lb)

Note 12: For diesel engines all PM is considered to be PM_{10}, $PM_{2.5}$ is 97% of PM/PM_{10}. For gasoline engines all PM is considered to be PM10, PM2.5 is 92% of PM/PM10

Citations for both $PM_{2.5}$ speciations are found in the EPA documents referenced in Note 2.

Note 13: Annual CH_4 emissions are calculated using the following calculation (Adj. HC emission factor (g/hp-hr) * (1-0.984) * horsepower * hours operated * load factor) / (2000 lb/ton * 453.6 g/lb)

This equation is derived in part from subtracting methane from THC to calculate NMHC. THC - CH_4 = NMHC; THC - NMHC = CH_4; THC - (0.984 * THC) = CH_4; THC * (1-0.984) = CH_4

0.984 is the ratio of NMHC to THC for diesel and 0.900 is the ratio for 4-stroke gasoline; from "Conversion Factors for Hydrocarbon Components", July 2010, EPA-420-R-10-015.

Note 14: Emissions estimate for N2O is based on a higher heating value of 138,000 Btu/gallon and a density of 7.1 lb/gallon for diesel, 125,000 btu/gallon and 6.17 lb/gal for gasoline

Note 15: Greenhouse gasses (GHG) are converted to carbon dioxide equivalents (CO2) using 100-year Global Warming Potentials values from IPCC's Fourth Assessment Report (AR4)

Chapter 2, Table 2.14 of Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the IPCC

CO_2 = 1, CH_4 = 25, N_2O = 298

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Tennessee Gas Pipeline - Connecticut Expansion Project (Massachusetts)
Construction Emissions - On-Road Vehicles - Hampden County, MA

Description	Category Based on MOVES2010b Classification[1]	Number of Equipment	Total Days	Total Weeks	Total Months	Working Days	Hours per Day	Mi/hr [2]
Test-Van	31 - Passenger Truck - Diesel	1	10	2.00	0.11	0.2	10	15
TRK-1/2Ton 4X4	31 - Passenger Truck - Diesel	6	28	4.00	0.11	0.7	10	15
TRK-1Ton Flat Bed	32 - Light Commercial Truck - Diesel	3	28	4.00	0.11	0.7	10	15
TRK-2Ton Flat Bed	32 - Light Commercial Truck - Diesel	5	30	5.00	0.11	0.7	10	15
TRK-3/4Ton 4X4	32 - Light Commercial Truck - Diesel	18	30	5.00	0.11	0.7	10	15
TRK-3/4Ton Crew	32 - Light Commercial Truck - Diesel	8	30	5.00	0.11	0.7	10	15
TRK-Boom	52 - Single Unit Short-Haul Truck - Diesel	1	28	4.00	0.11	0.7	10	15
TRK-Bus	42 - Transit Bus - Diesel	6	26	4.00	0.11	0.6	10	15
TRK-Dump	52 - Single Unit Short-Haul Truck - Diesel	1	6	1.00	0.11	0.1	10	15
TRK-Fuel	53 - Single Unit Long-Haul Truck - Diesel	1	30	5.00	0.11	0.7	10	15
TRK-Grease	52 - Single Unit Short-Haul Truck - Diesel	1	30	5.00	0.11	0.7	10	15
TRK-Skid	52 - Single Unit Short-Haul Truck - Diesel	1	23	4.00	0.11	0.6	10	15
TRK-Sand Blaster	61 - Combination Short-Haul Truck - Diesel	1	23	4.00	0.11	0.6	10	15
TRK-Sweeper	52 - Single Unit Short-Haul Truck - Diesel	1	38	6.00	0.11	0.9	10	15
TRK-Vacuum	52 - Single Unit Short-Haul Truck - Diesel	1	23	4.00	0.11	0.6	10	15
TRK-Water	52 - Single Unit Short-Haul Truck - Diesel	2	27	4.00	0.11	0.7	10	15
TRK & Float	61 - Combination Short-Haul Truck - Diesel	5	38	6.00	0.11	0.9	10	15
TRK-LowBoy	62 - Combination Long-Haul Truck - Diesel	2	38	6.00	0.11	0.9	10	15
TRK & Pole Trailer	62 - Combination Long-Haul Truck - Diesel	5	23	4.00	0.11	0.6	10	15

Description	Category Based on MOVES2010b Classification	Calc. VMT [2]	CO[3] g/VMT	NOx[3] g/VMT	VOC[3] g/VMT	SO_2[3] g/VMT	PM_{10}[3] g/VMT	$PM_{2.5}$[3] g/VMT	CO_2[3] g/VMT	CH_4[3] g/VMT	N_2O[3] g/VMT	HAPs[3,4] g/VMT
Test-Van	31 - Passenger Truck - Diesel	37	3.82	5.61	0.73	0.03	0.33	0.32	962	0.03	0.004	0.10
TRK-1/2Ton 4X4	31 - Passenger Truck - Diesel	618	3.82	5.61	0.73	0.03	0.33	0.32	962	0.03	0.004	0.10
TRK-1Ton Flat Bed	32 - Light Commercial Truck - Diesel	309	3.95	5.78	0.76	0.03	0.34	0.33	957	0.03	0.005	0.10
TRK-2Ton Flat Bed	32 - Light Commercial Truck - Diesel	552	3.95	5.78	0.76	0.03	0.34	0.33	957	0.03	0.005	0.10
TRK-3/4Ton 4X4	32 - Light Commercial Truck - Diesel	1,988	3.95	5.78	0.76	0.03	0.34	0.33	957	0.03	0.005	0.10
TRK-3/4Ton Crew	32 - Light Commercial Truck - Diesel	883	3.95	5.78	0.76	0.03	0.34	0.33	957	0.03	0.005	0.10
TRK-Boom	52 - Single Unit Short-Haul Truck - Diesel	103	3.63	10.05	1.22	0.05	0.52	0.50	1732	0.08	0.006	0.17
TRK-Bus	42 - Transit Bus - Diesel	574	3.74	9.27	0.92	0.03	0.44	0.43	1081	0.04	0.006	0.13
TRK-Dump	52 - Single Unit Short-Haul Truck - Diesel	22	3.63	10.05	1.22	0.05	0.52	0.50	1732	0.08	0.006	0.17
TRK-Fuel	53 - Single Unit Long-Haul Truck - Diesel	110	3.54	9.78	1.21	0.05	0.49	0.47	1673	0.08	0.006	0.17
TRK-Grease	52 - Single Unit Short-Haul Truck - Diesel	110	3.63	10.05	1.22	0.05	0.52	0.50	1732	0.08	0.006	0.17
TRK-Skid	52 - Single Unit Short-Haul Truck - Diesel	85	3.63	10.05	1.22	0.05	0.52	0.50	1732	0.08	0.006	0.17
TRK-Sand Blaster	61 - Combination Short-Haul Truck - Diesel	85	4.99	15.75	0.97	0.08	0.89	0.87	2866	0.08	0.006	0.14
TRK-Sweeper	52 - Single Unit Short-Haul Truck - Diesel	140	3.63	10.05	1.22	0.05	0.52	0.50	1732	0.08	0.006	0.17
TRK-Vacuum	52 - Single Unit Short-Haul Truck - Diesel	85	3.63	10.05	1.22	0.05	0.52	0.50	1732	0.08	0.006	0.17
TRK-Water	52 - Single Unit Short-Haul Truck - Diesel	199	3.63	10.05	1.22	0.05	0.52	0.50	1732	0.08	0.006	0.17
TRK & Float	61 - Combination Short-Haul Truck - Diesel	699	4.99	15.75	0.97	0.08	0.89	0.87	2866	0.08	0.006	0.14
TRK-LowBoy	62 - Combination Long-Haul Truck - Diesel	280	5.13	16.20	0.90	0.09	0.96	0.93	2990	0.07	0.006	0.13
TRK & Pole Trailer	62 - Combination Long-Haul Truck - Diesel	423	5.13	16.20	0.90	0.09	0.96	0.93	2990	0.07	0.006	0.13

Description	Category Based on MOVES2010b Classification	CO ton/yr	NOx ton/yr	VOC ton/yr	SO_2 ton/yr	PM_{10} ton/yr	$PM_{2.5}$ ton/yr	CO_2 ton/yr	CH_4 ton/yr	N_2O ton/yr	GHG[5] tons of CO_2e	HAPs[4] ton/yr
Test-Van	31 - Passenger Truck - Diesel	1.6E-04	2.3E-04	3.0E-05	1.1E-06	1.3E-05	1.3E-05	3.9E-02	1.3E-06	1.8E-07	3.9E-02	4.0E-06
TRK-1/2Ton 4X4	31 - Passenger Truck - Diesel	2.6E-03	3.8E-03	5.0E-04	1.9E-05	2.2E-04	2.2E-04	6.6E-01	2.2E-05	3.0E-06	6.6E-01	6.8E-05
TRK-1Ton Flat Bed	32 - Light Commercial Truck - Diesel	1.3E-03	2.0E-03	2.6E-04	9.3E-06	1.2E-04	1.1E-04	3.3E-01	1.1E-05	1.6E-06	3.3E-01	3.5E-05
TRK-2Ton Flat Bed	32 - Light Commercial Truck - Diesel	2.4E-03	3.5E-03	4.6E-04	1.7E-05	2.1E-04	2.0E-04	5.8E-01	2.0E-05	2.8E-06	5.8E-01	6.3E-05
TRK-3/4Ton 4X4	32 - Light Commercial Truck - Diesel	8.6E-03	1.3E-02	1.7E-03	6.0E-05	7.4E-04	7.2E-04	2.1E+00	7.4E-05	1.0E-05	2.1E+00	2.3E-04
TRK-3/4Ton Crew	32 - Light Commercial Truck - Diesel	3.8E-03	5.6E-03	7.4E-04	2.7E-05	3.3E-04	3.2E-04	9.3E-01	3.3E-05	4.4E-06	9.3E-01	1.0E-04
TRK-Boom	52 - Single Unit Short-Haul Truck - Diesel	4.1E-04	1.1E-03	1.4E-04	5.6E-06	5.9E-05	5.7E-05	2.0E-01	8.6E-06	6.3E-07	2.0E-01	1.9E-05
TRK-Bus	42 - Transit Bus - Diesel	2.4E-03	5.9E-03	5.9E-04	2.0E-05	2.8E-04	2.7E-04	6.8E-01	2.8E-05	3.5E-06	6.9E-01	8.0E-05
TRK-Dump	52 - Single Unit Short-Haul Truck - Diesel	8.8E-05	2.4E-04	3.0E-05	1.2E-06	1.3E-05	1.2E-05	4.2E-02	1.8E-06	1.3E-07	4.2E-02	4.1E-06
TRK-Fuel	53 - Single Unit Long-Haul Truck - Diesel	4.3E-04	1.2E-03	1.5E-04	5.8E-06	6.0E-05	5.8E-05	2.0E-01	9.3E-06	6.7E-07	2.0E-01	2.0E-05
TRK-Grease	52 - Single Unit Short-Haul Truck - Diesel	4.4E-04	1.2E-03	1.5E-04	6.0E-06	6.3E-05	6.1E-05	2.1E-01	9.2E-06	6.7E-07	2.1E-01	2.1E-05
TRK-Skid	52 - Single Unit Short-Haul Truck - Diesel	3.4E-04	9.4E-04	1.1E-04	4.6E-06	4.8E-05	4.7E-05	1.6E-01	7.1E-06	5.1E-07	1.6E-01	1.6E-05
TRK-Sand Blaster	61 - Combination Short-Haul Truck - Diesel	4.7E-04	1.5E-03	9.1E-05	7.6E-06	8.3E-05	8.1E-05	2.7E-01	7.1E-06	5.1E-07	2.7E-01	1.3E-05
TRK-Sweeper	52 - Single Unit Short-Haul Truck - Diesel	5.6E-04	1.5E-03	1.9E-04	7.6E-06	8.0E-05	7.7E-05	2.7E-01	1.2E-05	8.5E-07	2.7E-01	2.6E-05
TRK-Vacuum	52 - Single Unit Short-Haul Truck - Diesel	3.4E-04	9.4E-04	1.1E-04	4.6E-06	4.8E-05	4.7E-05	1.6E-01	7.1E-06	5.1E-07	1.6E-01	1.6E-05
TRK-Water	52 - Single Unit Short-Haul Truck - Diesel	8.0E-04	2.2E-03	2.7E-04	1.1E-05	1.1E-04	1.1E-04	3.8E-01	1.7E-05	1.2E-06	3.8E-01	3.7E-05
TRK & Float	61 - Combination Short-Haul Truck - Diesel	3.8E-03	1.2E-02	7.5E-04	6.3E-05	6.9E-04	6.7E-04	2.2E+00	5.8E-05	4.2E-06	2.2E+00	1.1E-04
TRK-LowBoy	62 - Combination Long-Haul Truck - Diesel	1.6E-03	5.0E-03	2.8E-04	2.6E-05	3.0E-04	2.9E-04	9.2E-01	2.3E-05	1.7E-06	9.2E-01	3.9E-05
TRK & Pole Trailer	62 - Combination Long-Haul Truck - Diesel	2.4E-03	7.6E-03	4.2E-04	4.0E-05	4.5E-04	4.3E-04	1.4E+00	3.5E-05	2.6E-06	1.4E+00	5.9E-05
Total		**0.033**	**0.069**	**0.007**	**0.00034**	**0.0039**	**0.0038**	**11.73**	**0.00038**	**0.00004**	**11.76**	**0.0010**

NOTES:

Note 1: Estimated

Note 2: Speed to calculate distance for emissions estimate, hours/day, days/week, and total number of days estimated.

Note 3: Emissions estimates are based on EPA's MOVES2010b motor vehicle emissions estimation program. Year 2015 is used as the base year for MA, based on latest county-specific MOVES2010b input data available from Mass DEP.

Note 4: HAPs are aggregated for benzene, 1,3-butadiene, formaldehyde, acetaldehyde, and acrolein

Note 5: Greenhouse gasses (GHG) are converted to carbon dioxide equivalents (CO2) using 100-year Global Warming Potentials values from IPCC's Fourth Assessment Report (AR4) Chapter 2, Table 2.14 of Climate Change 2007: The Physical Science Basis. Contribution of Working Group I to the Fourth Assessment Report of the IPCC

CO_2 = 1, CH_4 = 25, N_2O = 298

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Tennessee Gas Pipeline - Connecticut Expansion Project (Massachusetts)
Construction Emissions - On-Road Vehicles - Berkshire, MA

Description[1]	Category Based on MOVES2010b Classification[1]	Number of Equipment	Total Days	Total Weeks	Total Months	Working Days	Hours per Day	Mi/hr [2]
Test-Van	31 - Passenger Truck - Diesel	1	8	2.00	3.03	8	10	15
TRK-1/2Ton 4X4	31 - Passenger Truck - Diesel	6	12	2.00	3.03	12	10	15
TRK-1Ton Flat Bed	32 - Light Commercial Truck - Diesel	3	12	2.00	3.03	12	10	15
TRK-2Ton Flat Bed	32 - Light Commercial Truck - Diesel	5	14	2.00	3.03	14	10	15
TRK-3/4Ton 4X4	32 - Light Commercial Truck - Diesel	14	14	2.00	3.03	14	10	15
TRK-3/4Ton Crew	32 - Light Commercial Truck - Diesel	5	14	2.00	3.03	14	10	15
TRK-Boom	52 - Single Unit Short-Haul Truck - Diesel	1	12	2.00	3.03	12	10	15
TRK-Bus	42 - Transit Bus - Diesel	6	11	2.00	3.03	11	10	15
TRK-Dump	52 - Single Unit Short-Haul Truck - Diesel	1	4	1.00	3.03	4	10	15
TRK-Fuel	53 - Single Unit Long-Haul Truck - Diesel	1	14	2.00	3.03	14	10	15
TRK-Grease	52 - Single Unit Short-Haul Truck - Diesel	1	14	2.00	3.03	14	10	15
TRK-Skid	52 - Single Unit Short-Haul Truck - Diesel	1	9	2.00	3.03	9	10	15
TRK-Sand Blaster	61 - Combination Short-Haul Truck - Diesel	1	9	2.00	3.03	9	10	15
TRK-Sweeper	52 - Single Unit Short-Haul Truck - Diesel	1	18	3.00	3.03	18	10	15
TRK-Vacuum	52 - Single Unit Short-Haul Truck - Diesel	1	9	2.00	3.03	9	10	15
TRK-Water	52 - Single Unit Short-Haul Truck - Diesel	2	12	2.00	3.03	12	10	15
TRK & Float	61 - Combination Short-Haul Truck - Diesel	4	18	3.00	3.03	18	10	15
TRK-LowBoy	62 - Combination Long-Haul Truck - Diesel	2	18	3.00	3.03	18	10	15
TRK & Pole Trailer	62 - Combination Long-Haul Truck - Diesel	4	9	2.00	3.03	9	10	15

Description	Category Based on MOVES2010b Classification	Calc. VMT [2]	CO^3 g/VMT	NOx^3 g/VMT	VOC^3 g/VMT	$SO_2{}^3$ g/VMT	$PM_{10}{}^3$ g/VMT	$PM_{2.5}{}^3$ g/VMT	$CO_2{}^3$ g/VMT	$CH_4{}^3$ g/VMT	N_2O^3 g/VMT	$HAPs^{3,4}$ g/VMT
Test-Van	31 - Passenger Truck - Diesel	1,200	2.47	3.90	0.46	0.02	0.18	0.17	833	0.03	0.004	0.06
TRK-1/2Ton 4X4	31 - Passenger Truck - Diesel	10,800	2.47	3.90	0.46	0.02	0.18	0.17	833	0.03	0.004	0.06
TRK-1Ton Flat Bed	32 - Light Commercial Truck - Diesel	5,400	2.63	4.12	0.50	0.02	0.20	0.19	840	0.03	0.004	0.07
TRK-2Ton Flat Bed	32 - Light Commercial Truck - Diesel	10,500	2.63	4.12	0.50	0.02	0.20	0.19	840	0.03	0.004	0.07
TRK-3/4Ton 4X4	32 - Light Commercial Truck - Diesel	29,400	2.63	4.12	0.50	0.02	0.20	0.19	840	0.03	0.004	0.07
TRK-3/4Ton Crew	32 - Light Commercial Truck - Diesel	10,500	2.63	4.12	0.50	0.02	0.20	0.19	840	0.03	0.004	0.07
TRK-Boom	52 - Single Unit Short-Haul Truck - Diesel	1,800	3.63	10.76	1.21	0.05	0.55	0.54	1617	0.07	0.005	0.17
TRK-Bus	42 - Transit Bus - Diesel	9,900	3.38	9.12	0.88	0.03	0.41	0.40	1053	0.04	0.005	0.12
TRK-Dump	52 - Single Unit Short-Haul Truck - Diesel	600	3.63	10.76	1.21	0.05	0.55	0.54	1617	0.07	0.005	0.17
TRK-Fuel	53 - Single Unit Long-Haul Truck - Diesel	2,100	3.78	11.43	1.29	0.04	0.59	0.57	1559	0.06	0.005	0.18
TRK-Grease	52 - Single Unit Short-Haul Truck - Diesel	2,100	3.63	10.76	1.21	0.05	0.55	0.54	1617	0.07	0.005	0.17
TRK-Skid	52 - Single Unit Short-Haul Truck - Diesel	1,350	3.63	10.76	1.21	0.05	0.55	0.54	1617	0.07	0.005	0.17
TRK-Sand Blaster	61 - Combination Short-Haul Truck - Diesel	1,350	7.06	24.66	1.32	0.08	1.45	1.41	2832	0.05	0.005	0.18
TRK-Sweeper	52 - Single Unit Short-Haul Truck - Diesel	2,700	3.63	10.76	1.21	0.05	0.55	0.54	1617	0.07	0.005	0.17
TRK-Vacuum	52 - Single Unit Short-Haul Truck - Diesel	1,350	3.63	10.76	1.21	0.05	0.55	0.54	1617	0.07	0.005	0.17
TRK-Water	52 - Single Unit Short-Haul Truck - Diesel	3,600	3.63	10.76	1.21	0.05	0.55	0.54	1617	0.07	0.005	0.17
TRK & Float	61 - Combination Short-Haul Truck - Diesel	10,800	7.06	24.66	1.32	0.08	1.45	1.41	2832	0.05	0.005	0.18
TRK-LowBoy	62 - Combination Long-Haul Truck - Diesel	5,400	7.62	26.47	1.25	0.09	1.60	1.56	2956	0.05	0.005	0.17
TRK & Pole Trailer	62 - Combination Long-Haul Truck - Diesel	5,400	7.62	26.47	1.25	0.09	1.60	1.56	2956	0.05	0.005	0.17

Description	Category Based on MOVES2010b Classification	CO ton/yr	NOx ton/yr	VOC ton/yr	SO_2 ton/yr	PM_{10} ton/yr	$PM_{2.5}$ ton/yr	CO_2 ton/yr	CH_4 ton/yr	N_2O ton/yr	GHG [6] tons of CO_2e	$HAPs^5$ ton/yr
Test-Van	31 - Passenger Truck - Diesel	3.3E-03	5.2E-03	6.0E-04	3.1E-05	2.4E-04	2.3E-04	1.1E+00	4.5E-05	4.9E-06	1.1E+00	8.5E-05
TRK-1/2Ton 4X4	31 - Passenger Truck - Diesel	2.9E-02	4.6E-02	5.4E-03	2.8E-04	2.1E-03	2.1E-03	9.9E+00	4.0E-04	4.4E-05	9.9E+00	7.6E-04
TRK-1Ton Flat Bed	32 - Light Commercial Truck - Diesel	1.6E-02	2.5E-02	2.9E-03	1.4E-04	1.2E-03	1.1E-03	5.0E+00	2.1E-04	2.3E-05	5.0E+00	4.1E-04
TRK-2Ton Flat Bed	32 - Light Commercial Truck - Diesel	3.0E-02	4.8E-02	5.7E-03	2.8E-04	2.3E-03	2.2E-03	9.7E+00	4.0E-04	4.5E-05	9.7E+00	8.0E-04
TRK-3/4Ton 4X4	32 - Light Commercial Truck - Diesel	8.5E-02	1.3E-01	1.6E-02	7.7E-04	6.4E-03	6.2E-03	2.7E+01	1.1E-03	1.2E-04	2.7E+01	2.2E-03
TRK-3/4Ton Crew	32 - Light Commercial Truck - Diesel	3.0E-02	4.8E-02	5.7E-03	2.8E-04	2.3E-03	2.2E-03	9.7E+00	4.0E-04	4.5E-05	9.7E+00	8.0E-04
TRK-Boom	52 - Single Unit Short-Haul Truck - Diesel	7.2E-03	2.1E-02	2.4E-03	9.2E-05	1.1E-03	1.1E-03	3.2E+00	1.4E-04	1.0E-05	3.2E+00	3.3E-04
TRK-Bus	42 - Transit Bus - Diesel	3.7E-02	1.0E-01	9.6E-03	3.3E-04	4.5E-03	4.4E-03	1.1E+01	4.2E-04	5.9E-05	1.2E+01	1.3E-03
TRK-Dump	52 - Single Unit Short-Haul Truck - Diesel	2.4E-03	7.1E-03	8.0E-04	3.1E-05	3.7E-04	3.5E-04	1.1E+00	4.6E-05	3.4E-06	1.1E+00	1.1E-04
TRK-Fuel	53 - Single Unit Long-Haul Truck - Diesel	8.8E-03	2.6E-02	3.0E-03	1.0E-04	1.4E-03	1.3E-03	3.6E+00	1.5E-04	1.2E-05	3.6E+00	4.1E-04
TRK-Grease	52 - Single Unit Short-Haul Truck - Diesel	8.4E-03	2.5E-02	2.8E-03	1.1E-04	1.3E-03	1.2E-03	3.7E+00	1.6E-04	1.2E-05	3.8E+00	3.9E-04
TRK-Skid	52 - Single Unit Short-Haul Truck - Diesel	5.4E-03	1.6E-02	1.8E-03	6.9E-05	8.2E-04	8.0E-04	2.4E+00	1.0E-04	7.7E-06	2.4E+00	2.5E-04
TRK-Sand Blaster	61 - Combination Short-Haul Truck - Diesel	1.1E-02	3.7E-02	2.0E-03	1.2E-04	2.2E-03	2.1E-03	4.2E+00	7.8E-05	8.2E-06	4.2E+00	2.7E-04
TRK-Sweeper	52 - Single Unit Short-Haul Truck - Diesel	1.1E-02	3.2E-02	3.6E-03	1.4E-04	1.6E-03	1.6E-03	4.8E+00	2.1E-04	1.5E-05	4.8E+00	5.0E-04
TRK-Vacuum	52 - Single Unit Short-Haul Truck - Diesel	5.4E-03	1.6E-02	1.8E-03	6.9E-05	8.2E-04	8.0E-04	2.4E+00	1.0E-04	7.7E-06	2.4E+00	2.5E-04
TRK-Water	52 - Single Unit Short-Haul Truck - Diesel	1.4E-02	4.3E-02	4.8E-03	1.8E-04	2.2E-03	2.1E-03	6.4E+00	2.8E-04	2.1E-05	6.4E+00	6.7E-04
TRK & Float	61 - Combination Short-Haul Truck - Diesel	8.4E-02	2.9E-01	1.6E-02	9.8E-04	1.7E-02	1.7E-02	3.4E+01	6.2E-04	6.5E-05	3.4E+01	2.1E-03
TRK-LowBoy	62 - Combination Long-Haul Truck - Diesel	4.5E-02	1.6E-01	7.4E-03	5.1E-04	9.6E-03	9.3E-03	1.8E+01	2.9E-04	3.3E-05	1.8E+01	1.0E-03
TRK & Pole Trailer	62 - Combination Long-Haul Truck - Diesel	4.5E-02	1.6E-01	7.4E-03	5.1E-04	9.6E-03	9.3E-03	1.8E+01	2.9E-04	3.3E-05	1.8E+01	1.0E-03
Total		**0.48**	**1.24**	**0.10**	**0.005**	**0.07**	**0.07**	**174.97**	**0.005**	**0.0006**	**175.28**	**0.014**

NOTES:

Note 1: Estimated

Note 2: Speed to calculate distance for emissions estimate, hours/day, days/week, and total number of days estimated.

Note 3: Emissions estimates are based on EPA's MOVES2010b motor vehicle emissions estimation program. Year 2015 is used as the base year for MA, based on latest county-specific MOVES2010b input data available from Mass DEP.

Note 4: HAPs are aggregated for benzene, 1,3-butadiene, formaldehyde, acetaldehyde, and acrolein

Note 5: Greenhouse gasses (GHG) are converted to carbon dioxide equivalents (CO2) using 100-year Global Warming Potentials values from IPCC's Fourth Assessment Report (AR4) Chapter 2, Table 2.14 of Climate Change 2007: The Physical Science Basis. Contribution of Working $CO_2 = 1$, $CH_4 = 25$, $N_2O = 298$

Tennessee Gas Pipeline - Connecticut Expansion Project
Commissioning Emissions - Baseline Venting

Released Volume (mcf)	CO_2 (mol fraction)	CH_4 (mol fraction)	CO_2 (scf)	CH_4 (scf)	Density of CO_2 at Standard Conditions (kg/scf)	Density of CH_4 at Standard Conditions (kg/scf)	CH_4 Emissions (tons)	CO_2 Emissions (tons)	CO_{2e} (tons)
6,863.9	0.0024	0.9689	16,473	6,650,388	0.0530	0.0193	143.75	0.98	**3594.85**

Input Data for Line Blowdown

Q = Blowdown volume (mcf)	**6,864**	=	Q (mcf)	
D = Diameter (internal) of pipeline (ft)	2.00	=	D (ft)	
L = Length of pipeline segment (ft)	52,800	=	L (ft)	(10 miles)
P = Absolute line pressure at start of blowdown (psia)	600	=	P (psia)	

$Q = (D/2)^2 \times 3.1416 \times L \times (P/14.5) / 1000$

Tennessee Gas Pipeline - Connecticut Expansion Project
Commissioning Emissions - Alternative 1 Venting

Released Volume (mcf)	CO_2 (mol fraction)	CH_4 (mol fraction)	CO_2 (scf)	CH_4 (scf)	Density of CO_2 at Standard Conditions (kg/scf)	Density of CH_4 at Standard Conditions (kg/scf)	CH_4 Emissions (tons)	CO_2 Emissions (tons)	CO_{2e} (tons)
1,716.0	0.0024	0.9689	4,118	1,662,597	0.0530	0.0193	35.94	0.24	**898.71**

Input Data for Line Blowdown

Q = Blowdown volume (mcf)	**1,716**	=	Q (mcf)	
D = Diameter (internal) of pipeline (ft)	2.00	=	D (ft)	
L = Length of pipeline segment (ft)	52,800	=	L (ft)	(10 miles)
P = Absolute line pressure at start of blowdown (psia)	150	=	P (psia)	

$Q = (D/2)^2 \times 3.1416 \times L \times (P/14.5) / 1000$

Tennessee Gas Pipeline - Connecticut Expansion Project
Commissioning Emissions - Purging

Released Volume (mcf)	CO_2 (mol fraction)	CH_4 (mol fraction)	CO_2 (scf)	CH_4 (scf)	Density of CO_2 at Standard Conditions (kg/scf)	Density of CH_4 at Standard Conditions (kg/scf)	CH_4 Emissions (tons)	CO_2 Emissions (tons)	CO_{2e} (tons)
114	0.0024	0.9689	273	110,292	0.0530	0.0193	2.38	0.02	**59.62**

Input Data (constant release) for Gas Purging During Commissioning

Q = Gas release volume (mcf)			**114**	**=**	Q (mcf)
A = Area of hole (sq in)	Diam (inches) =	6	28.27	**=**	A (sq in)
P = Absolute pressure near opening (psia=psig+15.0)			20	**=**	P (psia)
min = Duration of release (minutes)			9	=	(minutes)

GWPs	
CO_2	1
CH_4	25

***Q = 1.342 x A x P x min/60**

Tennessee Gas Pipeline - Connecticut Expansion Project
Commissioning Emissions - In-Line Inspections

Pigging Volume (mcf)	CO_2 (mol fraction)	CH_4 (mol fraction)	CO_2 (scf)	CH_4 (scf)	Density of CO_2 at Standard Conditions[1] (kg/scf)	Density of CH_4 at Standard Conditions[2] (kg/scf)	CH_4 Emissions (tons)	CO_2 Emissions (tons)	CO_{2e} (tons)
10.0	0.0024	0.9689	24	9,643	0.0530	0.0193	0.21	0.0014	**5.21**
						Total for Event (Launching and Receiving)	0.42	0.003	**10.43**
						Total for Project Sources (2 Launchers, 1 Receiver)	0.63	0.004	**15.64**

Input Data for Line Blowdown

Q = Pigging Volume (mcf)	**10**	=	Q (mcf)
D = Diameter (internal) of Pig Barrell (ft)	3.50	=	D (ft)
L = Length of Pig Barrell (ft)	25	=	L (ft)
P = Absolute pressure at start of venting (psia)	600	=	P (psia)

GWPs	
CO_2	1
CH_4	25

$Q = (D/2)^2 \times 3.1416 \times L \times (P/14.5) / 1000$

Tennessee Gas Pipeline - Connecticut Expansion Project
Normal Operating Emissions

	Activity Data	CO_2e (tons)
Project Pipeline Miles	3.91	**0.77**

GWPs	
CO_2	1
CH_4	25

Pipeline level gas composition	
CO_2	CH_4
0.24%	96.89%

(Based on average of all four MA stations)

Pipeline fugitive emissions will be calculated using Tier 3 emission factors referenced in INGAA GHG Guidelines [1].

Sector	Pipeline Type	GHG	Emission Factor	Basis	Emissions CH_4 (tons)	Emissions CO_2 (tons)
Transmission	Protected Steel	CH_4	15.1 lb/mile	93.4% CH_4	0.0306	
Transmission	Protected Steel	CO_2 (from leaks)	0.9 lb/mile	2% CO_2		0.0002
Transmission	Protected Steel	CO_2 (from oxidation)	1.3 lb/mile	93.4% CH_4		0.0026
				Total	**0.03**	**0.003**

Notes:

[1] Emission factors are from Table 4-4, *Volume 1 - GHG Emission Estimation Methodologies and Procedures* , Interstate Natural Gas Association of America (INGAA), September 28, 2005.

$$CH_4\ emissions(tons) = Emission\ Factor\ (lb/mile) \times Pipeline\ Length\ \ (mile) \times \frac{Actual\ \ CH_4\ \ mol\%}{Default\ \ CH_4\ mol\%} \times$$
$$\times \frac{1\ \ ton}{2{,}000\ lb}$$

$$CO_2\ emissions\ (tons) = Emission\ Factor\ (lb/mile) \times Pipeline\ Length\ \ (mile) \times \frac{Actual\ \ CO_2\ \ mol\%}{Default\ \ CO_2\ mol\%} \times$$
$$\times \frac{1\ \ ton}{2{,}000\ lb}$$

Tennessee Gas Pipeline - Connecticut Expansion Project
Non-Routine Emissions - In-Line Inspections

Pigging Volume (mcf)	CO_2 (mol fraction)	CH_4 (mol fraction)	CO_2 (scf)	CH_4 (scf)	Density of CO_2 at Standard Conditions[1] (kg/scf)	Density of CH_4 at Standard Conditions[2] (kg/scf)	CH_4 Emissions (tons)	CO_2 Emissions (tons)	CO_{2e} (tons)
10.0	0.0024	0.9689	24	9,643	0.0530	0.0193	0.2085	0.0014	**5.21**
				Total for Event (Launching and Receiving)			0.42	0.003	**10.43**
				Total for Project Sources (2 Launchers, 1 Receiver)			0.63	0.004	**15.64**

Input Data for Line Blowdown

Q = Pigging Volume (mcf)	**10**	**=**	Q (mcf)
D = Diameter (internal) of Pig Barrell (ft)	3.50	**=**	D (ft)
L = Length of Pig Barrell (ft)	25	**=**	L (ft)
P = Absolute pressure at start of venting (psia)	600	**=**	P (psia)

GWPs	
CO_2	1
CH_4	25

$Q = (D/2)^2 \times 3.1416 \times L \times (P/14.5) / 1000$

Tennessee Gas Pipeline - Connecticut Expansion Project
Non-Routine Emissions - Blowdowns

Blowdown Volume (mcf)	CO_2 (mol fraction)	CH_4 (mol fraction)	CO_2 (scf)	CH_4 (scf)	Density of CO_2 at Standard Conditions (kg/scf)	Density of CH_4 at Standard Conditions (kg/scf)	CH_4 Emissions (tons)	CO_2 Emissions (tons)	CO_{2e} (tons)
2,683.8	0.0024	0.9689	6,441	2,600,302	0.0530	0.0193	56.21	0.38	**1405.59**

Input Data for Line Blowdown

Q = Blowdown volume (mcf)	**2,684**	=	Q (mcf)	
D = Diameter (internal) of pipeline (ft)	2.00	=	D (ft)	
L = Length of pipeline segment (ft)	20,645	=	L (ft)	(3.91 miles)
P = Absolute line pressure at start of blowdown (psia)	600	=	P (psia)	

$Q = (D/2)^2 \times 3.1416 \times L \times (P/14.5) / 1000$

Tennessee Gas Pipeline - Connecticut Expansion Project
Tree Removal (Sandisfield)
red = input site-specific data

Upland Forest	37.26	acres of temporary + permanent removal
Forested Wetlands	5.99	acres of temporary + permanent removal
	43.25	

STOCK
Aboveground stock

Forest-type group	Fraction of growing stock volume that is softwood [1]	Timber volume based on maximum 125 years of growth (cuft/ac)[1]	Volume of all softwood (cuft/ac)	Volume of all softwood tops (cuft/ac)	Specific gravity of softwoods[1]	Volume of all hardwood (cuft/ac)	Volume of all hardwood tops (cuft/ac)	Specific gravity of hardwoods[1]	Aboveground carbon (tonnes C/ac)	Acres	Total aboveground stock (tonnes C)
White & red pine / Hemlock	0.794	3,389.0	2,691	0	0.361	698	0	0.510	37.57	28.35	**1064.87**
Spruce / Fir / Tamarack / Cedar	0.870	3,532.0	0	0	0.353	0	0	0.481	0	0	**0**
Pitch pine / Oak[2]			0	0	0.470	0	0	0.494	0	0	**0**
Scots pine / Norway spruce / Other exotic softwoods[3]			0	0	0.355	0	0	0.496	0	0	**0**
White pine / Red oak / White ash	0.511	4,222.0	2,157	0	0.361	2,065	0	0.510	51.84	7.45	**386.30**
Oak / Hickory / Poplar / Blk. Walnut; Cherry / W. ash / Ylw. poplar	0.039	5,983.0	0	0	0.388	0	0	0.534	0	0	**0**
Atlantic white cedar[4]			0	0	0.441	0	0	0.484	0	0	**0**
Elm / ash / cottonwood / river birch / sycamore	0.047		0	0	0.358	0	0	0.470	0	0	**0**
Maple / beech / birch / basswood	0.132	4,047.0	534	0	0.369	3,513	0	0.518	57.07	7.45	**425.32**
Aspen / birch	0.247	5,001.0	0	0	0.353	0	0	0.428	0	0	**0**
Other hardwoods[5]			0	0	0.367	0	0	0.488	0	0	**0**
Nonstocked			0	0	-	0	0	-	1.95	0	**0**
Total										43.25	**1,876.49**

Belowground stock

Forest-type group	Standard understory stock (tonnes/ac)[6]	Belowground live carbon (tonnes/ac)[7]	Soil carbon (tonnes C/ac)[8] Normal productivity[9]	Soil carbon (tonnes C/ac)[8] Low productivity[9]	Acres Normal productivity	Acres Low productivity	Total belowground stock (tonnes C)	Total stock, above & belowground (tonnes C)	Total stock, above & belowground (tons C)
White & red pine / Hemlock	0.063	7.58	87	64	23.88	4.47	**2,585.59**	3,650.46	4,023.94
Spruce / Fir / Tamarack / Cedar	0.056	0.06	86	62	0	0	**0**	0	0
Pitch pine / Oak	0.127	0.13	41	30	0	0	**0**	0	0
Scots pine / Norway spruce / Other exotic softwoods[3]	0.063	0.06	87	63	0	0	**0**	0	0
White pine / Red oak / White ash	0.101	10.47	37	27	7.45	0	**351.89**	738.20	813.72
Oak / Hickory / Poplar / Blk. Walnut; Cherry / W. ash / Ylw. poplar	0.074	0.07	38	28	0	0	**0**	0	0
Atlantic white cedar[4]	0.069	0.07	68	49	0	0	**0**	0	0
Elm / ash / cottonwood / river birch / sycamore	0.072	0.07	53	38	0	0	**0**	0	0
Maple / beech / birch / basswood	0.068	11.48	62	45	7.45	0	**549.04**	974.35	1,074.04
Aspen / birch	0.084	0.08	106	77	0	0	**0**	0	0
Other hardwoods[5]	0.070	0.07	44	32	0	0	**0**	0	0
Nonstocked	0.082	0.47	44	32	0	0	**0**	0	0
Total						43.25	**3,486.52**	**5,363.01**	**5,911.70**

1. From Smith et al, 2006. *Methods for Calculating Forest Ecosystem and Harvested Carbon with Standard Estimates for Forest Types of the United States* . USDA Forest Service General Technical Report NE-343.
2. Pitch pine / oak forest type uses hardwood specific gravity from loblolly-shortleaf pine southeastern type
3. Scots pine/Norway spruce/other exotics forest type uses hardwood specific gravity and understory stock from average of Spruce-fir and White-red-jack pine forest types. Soil carbon values are an average of white/red pine and spruce/fir
4. Atlantic white cedar fores type uses specific gravity and understory values from the oak-gum-cypress southeastern forest type
5. Other hardwoods uses average values for hardwood dominated forest types
6. An average of understory stock in all stand size classes. (FIA)
7. Calculated as 20% of aboveground (Barford et al, 2001)
8. Values from Heath et al., 2003. Carbon Trends in U.S.Forestlands: A Context for the Role of Soils in Forest Carbon Sequestration. In: *The Potential of U.S. Forest Soils to Sequester Carbon and mitigate the Greenhouse Effect* . (JM Kimble, LS Heath, RA Birdsey, and R Lal, Eds.) CRC Press. 2003.
9. Normal/low productivity soils from MA DOER Renewable Energy Portfolio Stanard - 225 CMR 14.00 Forest Derived Eligible Biomass Woody Fuel Guideline (see soil tab), which used NRCS soil data.

Low productivity soils are estimated to have soil carbon content 20% lower than values in Heath et al. Normal productivity soils are all soils not classified as low productivity by DOER RPS; soil carbon content is estimated to be 10% above values in Heath et al.

LOST SEQUESTRATION POTENTIAL (50 YEARS) 10.98 acres of permanent removal (upland forest and forested wetland)

Future aboveground sequestration

County	Soil map unit symbol	Soil name	Soil component	Tree species[1]	Site index (avg height tree would reach in 50yrs)[2]	Productivity (expected vol produced by important trees (cuft/ac/yr))[2,3]	Annual aboveground C sequestration in major trees (tonnes C/ac/yr)	Annual aboveground sequestration in nondominant trees (tonnes C/ac/yr)[4]	Acres	Total annual aboveground sequestration (tonnes C/yr)	x50 years (tonnes C)
Berkshire	75B	Pillsbury loam, 0 to 8 percent slopes, extremely stony	Pillsbury	eastern white pine	60	100	0.05670	0.1064	0.92	0.06	2.92
Berkshire	901E	Berkshire-Marlow association, 15 to 45 percent slopes, steep, extremely stony	Berkshire	eastern white pine	72	129	0.07314	0.1373	1.16	0.09	4.73
Berkshire	904E	Lyman-Tunbridge association, steep, very stony	Tunbridge	eastern white pine	50	86	0.04876	0.0915	1.39	0.07	3.60
Berkshire	905C	Peru-Marlow association, rolling, extremely stony	Peru	eastern white pine	67	114	0.06464	0.1213	7.05	0.46	23.18
Berkshire	909C	Tunbridge-Lyman association, rolling, extremely stony	Tunbridge	eastern white pine	50	86	0.04876	0.0915	0.46	0.03	1.35

Multiple tree species in a stand may be calculated separately. Do not overcount acres.

1. Use dominant species present on site prior to project activities. If species not present, use dominant species normally present in forest type group. If other species normally found in forest type group not present, use nearest hardwood or softwood.
2. From NRCS soils tab. Site index will be used only in cases where current stocking information is unavailable.
3. "Yield likely to be produced by the most important tree species. This number, expressed as cubic feet per acre per year and calculated at the age of culmnination of the mean annual increment, indicates the amount of fiber produced in a fully stocked, even-aged, unmanaged stand." United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://soils.usda.gov/technical/nfmanual/
4. Nondominant and nonmerchantable timber volume calculated from percent of forest type group that is sawtimber. From sawtimber% tab.

Future belowground sequestration

Forest type group	County	Soil map unit symbol	Soil component	Soil productivity	Soil seqestration (tonnes C/ac/yr)[1]	Belowground live sequestration (tonnes C/ac/yr)[2]	Acres	Total annual belowground sequestration (tonnes C/yr)	x50 years (tonnes C)	Total annual above & below ground sequestration (tonnes C/yr)	Total annual above & below ground sequestration (tons C/yr)
White & red pine / hemlock						0.1431		**2.50**	**125.23**	**3.22**	**3.55**
	Find soil type in Soil productiviy tab.			Normal productivity	0.09		9.59				
	If listed, use Low Productivity; all others use Normal			Low productivity	0.06		1.39				
Spruce/fir/tamarack/cedar								**0**	**0**	**0**	**0**
				Normal productivity	0.09						
				Low productivity	0.06						
Pitch pine/oak								**0**	**0**	**0**	**0**
				Normal productivity	0.09						
				Low productivity	0.06						
Scots pine/Norway spruce/other exotic softwoods								**0**	**0**	**0**	**0**
				Normal productivity	0.09						
				Low productivity	0.06						
White pine/red oak/white ash								**0**	**0**	**0**	**0**
				Normal productivity	0.09						
				Low productivity	0.06						
Oak / Hickory / Poplar / Blk. Walnut; Cherry / W. ash / Ylw. poplar								**0**	**0**	**0**	**0**
				Normal productivity	0.09						
				Low productivity	0.06						
Atlantic white cedar								**0**	**0**	**0**	**0**
				Normal productivity	0.09						
				Low productivity	0.06						
Elm/ash/cottonwood/river birch/sycamore								**0**	**0**	**0**	**0**
				Normal productivity	0.09						
				Low productivity	0.06						
Maple/beech/birch/basswood								**0**	**0**	**0**	**0**
				Normal productivity	0.09						
				Low productivity	0.06						
Aspen/birch								**0**	**0**	**0**	**0**
				Normal productivity	0.09						
				Low productivity	0.06						
Other hardwoods								**0**	**0**	**0**	**0**
				Normal productivity	0.09						
				Low productivity	0.06						
Nonstocked								**0**	**0**	**0**	**0**
				Normal productivity	0.09						
				Low productivity	0.06						
TOTAL						**0**	10.98	**2.50**	**125.23**	**3.22**	**3.55**

1. Soil carbon sequestration estimated at 0.08 tonnes C/ac/yr (Post and Kwon, 2000; Hooker and Compton, 2003; O'Donnell 2007). Soils classified in DOER biomass harvest restrictions as Normal productivity soils +10%; low productivity soils -20%.
2. Belowground sequestration is 20% of aboveground sequestration (Barford et al., 2001).

Tennessee Gas Pipeline - Connecticut Expansion Project
Tree Removal (Agawam)
red = input site-specific data

	Upland Forest	0.36	acres of temporary + permanent removal
STOCK	Forested Wetlands	0.32	acres of temporary + permanent removal
Aboveground stock		0.68	

Forest-type group	Fraction of growing stock volume that is softwood[1]	Timber volume based on maximum 125 years of growth (cuft/ac)[1]	Volume of all softwood (cuft/ac)	Volume of all softwood tops (cuft/ac)	Specific gravity of softwoods[1]	Volume of all hardwood (cuft/ac)	Volume of all hardwood tops (cuft/ac)	Specific gravity of hardwoods[1]	Aboveground carbon (tonnes C/ac)	Acres	Total aboveground stock (tonnes C)
White & red pine / Hemlock	0.794	3,389.0	2,691	0	0.361	698	0	0.510	37.57	0.32	**12.02**
Spruce / Fir / Tamarack / Cedar	0.870	3,532.0	0	0	0.353	0	0	0.481	0	0	**0**
Pitch pine / Oak[2]			0	0	0.470	0	0	0.494	0	0	**0**
Scots pine / Norway spruce / Other exotic softwoods[3]			0	0	0.355	0	0	0.496	0	0	**0**
White pine / Red oak / White ash	0.511	4,222.0	0	0	0.361	0	0	0.510	0	0	**0**
Oak / Hickory / Poplar / Blk. Walnut; Cherry / W. ash / Ylw. poplar	0.039	5,983.0	0	0	0.388	0	0	0.534	0	0	**0**
Atlantic white cedar[4]			0	0	0.441	0	0	0.484	0	0	**0**
Elm / ash / cottonwood / river birch / sycamore	0.047		0	0	0.358	0	0	0.470	0	0	**0**
Maple / beech / birch / basswood	0.132	4,047.0	534	0	0.369	3,513	0	0.518	57.07	0.36	**20.55**
Aspen / birch	0.247	5,001.0	0	0	0.353	0	0	0.428	0	0	**0**
Other hardwoods[5]			0	0	0.367	0	0	0.488	0	0	**0**
Nonstocked			0	0	-	0	0	-	1.95	0	**0**
Total										0.68	**32.57**

Belowground stock

Forest-type group	Standard understory stock (tonnes/ac)[6]	Belowground live carbon (tonnes/ac)[7]	Soil carbon (tonnes C/ac)[8] Normal productivity[9]	Soil carbon (tonnes C/ac)[8] Low productivity[9]	Acres Normal productivity	Acres Low productivity	Total belowground stock (tonnes C)	Total stock, above & belowground (tonnes C)	Total stock, above & belowground (tons C)
White & red pine / Hemlock	0.063	7.58	87	64	0.32	0	**30.39**	42.41	46.75
Spruce / Fir / Tamarack / Cedar	0.056	0.06	86	62	0	0	**0**	0	0
Pitch pine / Oak	0.127	0.13	41	30	0	0	**0**	0	0
Scots pine / Norway spruce / Other exotic softwoods[3]	0.063	0.06	87	63	0	0	**0**	0	0
White pine / Red oak / White ash	0.101	0.10	37	27	0	0	**0**	0	0
Oak / Hickory / Poplar / Blk. Walnut; Cherry / W. ash / Ylw. poplar	0.074	0.07	38	28	0	0	**0**	0	0
Atlantic white cedar[4]	0.069	0.07	68	49	0	0	**0**	0	0
Elm / ash / cottonwood / river birch / sycamore	0.072	0.07	53	38	0	0	**0**	0	0
Maple / beech / birch / basswood	0.068	11.48	62	45	0.36	0	**26.52**	47.07	51.89
Aspen / birch	0.084	0.08	106	77	0	0	**0**	0	0
Other hardwoods[5]	0.070	0.07	44	32	0	0	**0**	0	0
Nonstocked	0.082	0.47	44	32	0	0	**0**	0	0
Total						0.68	**56.91**	**89.48**	**98.64**

1. From Smith et al, 2006. *Methods for Calculating Forest Ecosystem and Harvested Carbon with Standard Estimates for Forest Types of the United States* . USDA Forest Service General Technical Report NE-343.
2. Pitch pine / oak forest type uses hardwood specific gravity from loblolly-shortleaf pine southeastern type
3. Scots pine/Norway spruce/other exotics forest type uses hardwood specific gravity and understory stock from average of Spruce-fir and White-red-jack pine forest types. Soil carbon values are an average of white/red pine and spruce/fir
4. Atlantic white cedar fores type uses specific gravity and understory values from the oak-gum-cypress southeastern forest type
5. Other hardwoods uses average values for hardwood dominated forest types
6. An average of understory stock in all stand size classes. (FIA)
7. Calculated as 20% of aboveground (Barford et al, 2001)
8. Values from Heath et al., 2003. Carbon Trends in U.S.Forestlands: A Context for the Role of Soils in Forest Carbon Sequestration. In: *The Potential of U.S. Forest Soils to Sequester Carbon and mitigate the Greenhouse Effect* . (JM Kimble, LS Heath, RA Birdsey,
9. Normal/low productivity soils from MA DOER Renewable Energy Portfolio Stanard - 225 CMR 14.00 Forest Derived Eligible Biomass Woody Fuel Guideline (see soil tab), which used NRCS soil data.

Low productivity soils are estimated to have soil carbon content 20% lower than values in Heath et al. Normal productivity soils are all soils not classified as low productivity by DOER RPS; soil carbon content is estimated to be 10% above values in Heath et al.

LOST SEQUESTRATION POTENTIAL (50 YEARS) 0.27 acres of permanent removal

Future aboveground sequestration

County	Soil name	Soil map unit symbol	Soil component	Tree species[1]	Site index (avg height tree would reach in 50yrs)[2]	Productivity (expected vol produced by important trees (cuft/ac/yr))[2,3]	Annual aboveground C sequestration in major trees (tonnes C/ac/yr)	Annual aboveground sequestration in nondominant trees (tonnes C/ac/yr)[4]	Acres	Total annual aboveground sequestration (tonnes C/yr)	x50 years (tonnes C)
Hampden, Central Part	250B	Pollux fine sandy loam 3 to 8 percent slopes	Pollux	sugar maple	60	43	0.024381	0.04577	0.11	0.004	0.19
Hampden, Central Part	736A	Scantic Variant silt loam, 0 to 3 percent slopes	Scantic Variant	eastern white pine	58	100	0.056699	0.23107	0.16	0.02	1.11

Multiple tree species in a stand may be calculated separately. Do not overcount acres.

1. Use dominant species present on site prior to project activities. If species not present, use dominant species normally present in forest type group. If other species normally found in forest type group not present, use nearest hardwood or softwood.
2. From NRCS soils tab. Site index will be used only in cases where current stocking information is unavailable.
3. "Yield likely to be produced by the most important tree species. This number, expressed as cubic feet per acre per year and calculated at the age of culmnination of the mean annual increment, indicates the amount of fiber produced in a fully stocked, even-aged, unmanaged stand." United States Department of Agriculture, Natural Resources Conservation Service. National forestry manual. http://soils.usda.gov/technical/nfmanual/
4. Nondominant and nonmerchantable timber volume calculated from percent of forest type group that is sawtimber. From sawtimber% tab.

Future belowground sequestration

Forest type group	County	Soil map unit symbol	Soil component	Soil productivity	Soil seqestration (tonnes C/ac/yr)[1]	Belowground live sequestration (tonnes C/ac/yr)[2]	Acres	Total annual belowground sequestration (tonnes C/yr)	x50 years (tonnes C)	Total annual above & below ground sequestration (tonnes C/yr)	Total annual above & below ground sequestration (tons C/yr)
White & red pine / hemlock						0.0045		**0.01**	**0.75**	**0.02**	**0.02**
	Find soil type in Soil productiviy tab.			Normal productivity	0.09		0.16				
	If listed, use Low Productivity; all others use Normal			Low productivity	0.06		0				
Spruce/fir/tamarack/cedar								**0**	**0**	**0**	**0**
				Normal productivity	0.09						
				Low productivity	0.06						
Pitch pine/oak								**0**	**0**	**0**	**0**
				Normal productivity	0.09						
				Low productivity	0.06						
Scots pine/Norway spruce/other exotic softwoods								**0**	**0**	**0**	**0**
				Normal productivity	0.09						
				Low productivity	0.06						
White pine/red oak/white ash								**0**	**0**	**0**	**0**
				Normal productivity	0.09						
				Low productivity	0.06						
Oak / Hickory / Poplar / Blk. Walnut; Cherry / W. ash / Ylw. poplar								**0**	**0**	**0**	**0**
				Normal productivity	0.09						
				Low productivity	0.06						
Atlantic white cedar								**0**	**0**	**0**	**0**
				Normal productivity	0.09						
				Low productivity	0.06						
Elm/ash/cottonwood/river birch/sycamore								**0**	**0**	**0**	**0**
				Normal productivity	0.09						
				Low productivity	0.06						
Maple/beech/birch/basswood						0.0007		**0.01**	**0.48**	**0.03**	**0.04**
				Normal productivity	0.09		0.11				
				Low productivity	0.06		0				
Aspen/birch								**0**	**0**	**0**	**0**
				Normal productivity	0.09						
				Low productivity	0.06						
Other hardwoods								**0**	**0**	**0**	**0**
				Normal productivity	0.09						
				Low productivity	0.06						
Nonstocked								**0**	**0**	**0**	**0**
				Normal productivity	0.09						
				Low productivity	0.06						
TOTAL						**0**	0.27	**0.02**	**1.23**	**0.05**	**0.06**

1. Soil carbon sequestration estimated at 0.08 tonnes C/ac/yr (Post and Kwon, 2000; Hooker and Compton, 2003; O'Donnell 2007). Soils classified in DOER biomass harvest restrictions as Normal productivity soils +10%; low productivity soils -20%.
2. Belowground sequestration is 20% of aboveground sequestration (Barford et al., 2001).

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

DRAFT ENVIRONMENTAL IMPACT REPORT

Filed under 301 CMR 11.00
Massachusetts Environmental Policy Act Regulations
for the

CONNECTICUT EXPANSION PROJECT

Agawam, Sandisfield and Tyringham, Massachusetts

EEA # 15205

September 30, 2014

Submitted to:
Executive Office of Environmental Affairs
MEPA Office
100 Cambridge Street, Suite 900
Boston, MA 02114

Submitted by:
Tennessee Gas Pipeline Company, L.L.C.
1001 Louisiana Street
Houston, TX 77002

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

September 29, 2014

Secretary Maeve Vallely Bartlett
Executive Office of Energy and Environmental Affairs
Attn: MEPA Unit
100 Cambridge Street
Suite 900
Boston, MA 02114

Re: Draft Environmental Impact Report
EEA Number 15205
Tennessee Gas Pipeline Company. L. L.C.
Connecticut Expansion Project
Agawam, Sandisfield and Tyringham, MA

Dear Madam Secretary:

Tennessee Gas Pipeline Company, L. L. C. ("Tennessee""), is submitting this Draft Environmental Impact Report ("DEIR") pursuant to the Massachusetts Environmental Policy Act ("MEPA") Office for the proposed Connecticut Expansion Project ("Project"). This DEIR has been prepared in response to your Certificate, issued on July 11, 2014 requiring the preparation of a DEIR for the Project.

Tennessee has operated pipelines in Massachusetts as part of its interstate pipeline network for more than 60 years and is now proposing this Project to expand a small section adjacent to the existing pipeline network to serve an existing demand for natural gas in the service area. This Project will involve construction of pipelines and related facilities in three states – New York, Connecticut and Massachusetts. In Massachusetts, the Project consists of approximately 3.81 miles of new 36-inch outside diameter ("OD") pipeline, co-located within or adjacent to Tennessee's existing "200 Line" right-of-way ("ROW") in Sandisfield, Massachusetts, and 0.11 miles of 24-inch OD pipeline co-located within or adjacent to Tennessee's "300 Line" ROW in Agawam, Massachusetts. Tennessee filed an application for a Certificate of Public Convenience and Necessity (the "Certificate") from the Federal Energy Regulatory Commission ("FERC") on July 31, 2014. Upon completion, the Project will increase delivery capability to New York, Connecticut and southern Massachusetts by approximately 72.1 million dekatherms per day by looping the existing pipeline.

The Project is needed to meet the current demand for increased natural gas in the region and is not related to or contingent upon other potential projects or expansions by Tennessee in Massachusetts. Tennessee has evaluated alternative routes to serve the increased demand for the area served by the existing pipeline network, and is proposing the route that minimizes impacts to the environment and has made every effort to utilize the existing ROW.

As referenced above, in addition to MEPA and other state environmental protection regulatory programs, the Project is subject to the jurisdiction of FERC which requires a comprehensive environmental review process under the National Environmental Policy Act ("NEPA"). As part of its FERC application, Tennessee submitted an Environmental Report ("ER") that provides detailed information regarding existing conditions, potential project-related impacts and proposed impact avoidance and minimization measures for a number of environmental resources including land use, wetlands, threatened and endangered species, soils, geology and vegetation. The information submitted to FERC, within the ER, is provided in the attached

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

detailed DEIR project narrative. Public input and comments are accepted by FERC throughout the review process.

The Project is also subject to the jurisdiction of the USACE, a 401 Water Quality Certification from MassDEP and the Wetlands Protection Act, administered jointly by MassDEP and the Agawam, Tyringham and Sandisfield Conservation Commissions. Each of these agencies will be reviewing the Project relative to compliance with applicable standards and regulations for work within wetlands and waterways. Tennessee will be utilizing an existing pipeline easement, to the extent practicable, during construction to minimize impacts and will restore and revegetate both upland and wetland areas disturbed during construction. Tennessee is currently in the process of preparing the various permit applications and will be coordinating with each agency relative to its review process.

Should you have any questions regarding this request or the materials submitted within the DEIR, please do not hesitate to contact Suzan Lacey at 713-420-6360 or Mark Gardella, Vice President, AECOM Technical Services, Inc., at 401-854-2807 or via email at Mark.Gardella@aecom.com. Tennessee appreciates your review of this project and looks forward to working with MEPA Office staff.

Sincerely,

Suzan Lacey
Project Manager, Tennessee Gas Pipeline Company, L.L.C.

Mark Gardella
Vice President, AECOM Technical Services

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

TABLE OF CONTENTS

CERTIFICATE ON THE EENF

1.0 EXECUTIVE SUMMARY 1-1

1.1 INTRODUCTION 1-1
1.1.1 Purpose and Need 1-1
1.2 SUMMARY OF PROJECT DESCRIPTION 1-4
1.3 SUMMARY OF ALTERNATIVES 1-6
1.4 CHANGES SINCE THE EENF FILING 1-6
1.5 SUMMARY OF IMPACTS 1-6
1.6 SUMMARY OF MITIGATION MEASURES 1-9
1.7 REQUIRED PERMITS 1-10

2.0 PROJECT DESCRIPTION 2-1

2.1 EXISTING SYSTEM FACILITIES 2-1
2.2 PROJECT ELEMENTS 2-2
2.2.1 Pipeline Looping 2-2
2.2.2 Land Requirements 2-5
2.3 CONSTRUCTION METHODOLOGY 2-11
2.3.1 Pipeline Construction 2-12
2.3.2 Specialized Construction Procedures 2-19
2.3.3 Compressor Station/Appurtenant Facilities (Aboveground) 2-27
2.3.4 Construction Timing and Scheduling 2-28
2.3.5 Supervision and Inspection 2-28
2.4 OPERATION AND MAINTENANCE 2-28
2.4.1 Cleared Areas 2-30
2.4.2 Erosion Control 2-31
2.4.3 Periodic Pipeline and ROW Patrols 2-31
2.5 FUTURE PLANS AND ABANDONMENT 2-32
2.6 LANDOWNER/AGENCY CONSULTATION 2-32
2.6.1 Landowner Consultation/Public Participation 2-33
2.6.2 Agency Consultation 2-33
2.6.3 Interagency and Other Review/Resource Agency Meetings 2-34
2.7 EASEMENTS AND LAND ACQUISITION 2-34
2.7.1 Article 97 Land Disposition 2-34
2.8 CONSTRUCTION SCHEDULING AND COSTS 2-37

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

3.0 PROJECT ALTERNATIVES 3-1

3.1 REGIONAL INFRASTRUCTURE 3-1

3.2 SYSTEM ALTERNATIVES 3-2
3.2.1 Major System Alternative 3-3
3.2.2 Options for Efficiency Improvements 3-4
3.2.3 Pipeline Looping Options 3-4
3.2.4 Compression Option 3-5

3.3 ROUTE ALTERNATIVES 3-5
3.3.1 Alternatives to Limit DCR Property Encroachment 3-6
3.3.2 Route Variations 3-11

3.4 ALTERNATIVE SITES FOR NEW COMPRESSION AND METER STATIONS 3-12

3.5 NO-ACTION ALTERNATIVE 3-12

3.6 ALTERNATIVE SUMMARY 3-13

4.0 EXISTING ENVIRONMENT 4-1

4.1 PRIMARY SCOPED RESOURCES 4-1
4.1.1 Wetland Protection Act Resources 4-1
4.1.2 Vernal Pools 4-11
4.1.3 Rare Species 4-15
4.1.4 Historic and Archaeological Resources 4-18

4.2 OTHER RESOURCES 4-22
4.2.1 Topography, Geology and Soils 4-22
4.2.2 Groundwater Resources 4-30
4.2.3 Vegetation and Wildlife 4-32
4.2.4 Scenic Qualities, Open Space and Recreational Resources 4-36
4.2.5 Air and Noise 4-41
4.2.6 Environmental Screening – Potential Contaminated Sites 4-42

5.0 ASSESSMENT OF IMPACTS 5-1

5.1 PRIMARY SCOPED RESOURCES 5-1
5.1.1 Wetland Protection Act Resources 5-1
5.1.2 Conservation Land (DCR Property) 5-15

5.2 OTHER RESOURCES 5-16
5.2.1 Topography and Geology 5-16
5.2.2 Soils 5-22
5.2.3 Minimization of Impacts 5-23
5.2.4 Plant and Animal Species Habitat 5-24
5.2.5 Land Use, Recreation, and Visual Resources 5-28

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

5.2.6 Air Quality and Noise 5-31
5.2.7 Scenic Qualities, Open Space and Recreational Resources 5-33
5.2.8 Traffic 5-34

6.0 MITIGATION MEASURES 6-1

6.1 PRIMARY SCOPED RESOURCES 6-1
6.1.1 Wetland Protection Act Resource Areas 6-1
6.1.2 Vernal Pools 6-10
6.1.3 Rare Species 6-12
6.1.4 Historic and Archaeological Resources 6-14
6.2 OTHER RESOURCES 6-14
6.2.1 Topography, Geology and Soils 6-14
6.2.2 Groundwater Impact and Mitigation Measures 6-18
6.2.3 Vegetation and Wildlife 6-19
6.2.4 Air Quality 6-22
6.2.5 Noise 6-23
6.2.6 Scenic Qualities, Open Space and Recreational Resources 6-23
6.2.7 DCR State Property 6-23
6.2.8 Traffic, Transit and Pedestrian and Bicycle Transportation 6-23

7.0 DEMONSTRATION OF STATUTORY AND REGULATORY COMPLIANCE 7-1

7.1 MASSACHUSETTS WETLANDS PROTECTION ACT 7-1
7.1.1 Limited Project Provision 7-1
7.1.2 Bordering Vegetated Wetlands 7-2
7.1.3 Land Under Waterbodies and Waterways 7-3
7.1.4 Inland Bank 7-4
7.1.5 Riverfront Area 7-4
7.1.6 Bordering Land Subject to Flooding 7-4
7.1.7 Compliance with the Massachusetts Stormwater Policy 7-5
7.2 MASSACHUSETTS PUBLIC WATERFRONT ACT 7-5
7.3 WATER QUALITY CERTIFICATION 7-5
7.4 MASSACHUSETTS ENDANGERED SPECIES ACT 7-6
7.5 ARCHAEOLOGICAL AND HISTORIC PRESERVATION 7-6
7.6 GREENHOUSE GAS EMISSIONS POLICY 7-7
7.7 FEDERAL PROGRAMS 7-7
7.7.1 Federal Energy Regulatory Commission 7-8
7.7.2 US Army Corps of Engineers 7-8
7.7.3 EPA 7-8

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

7.8 LOCAL PROGRAMS 7-9

8.0 RESPONSE TO COMMENTS 8-1

8.1 MASSACHUSETTS DCR LETTER 8-2

8.2 MASS AUDUBON LETTER 8-16

8.3 PIONEER VALLEY PLANNING COMMISSION LETTER 8-25

8.4 BERKSHIRE REGIONAL PLANNING COMMISSION LETTERS – JUNE AND JULY 2014 8-28

8.5 SANDISFIELD TAXPAYERS OPPOSING PIPELINE LETTER 8-56

8.6 BERKSHIRE ENVIRONMENTAL ACTION TEAM LETTER 8-77

8.7 MADEP WESTERN REGION LETTER 8-98

8.8 DIVISION OF FISH & WILDLIFE LETTER 8-114

8.9 BOARD OF UNDERWATER ARCHAEOLOGY LETTER 8-116

8.10 SANDISFIELD SELECTMAN EMAIL 8-117

8.11 THELMA ESTEVES LETTER 8-119

9.0 DRAFT SECTION 61 FINDINGS 9-1

10.0 REFERENCES 10-1

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Appendices

Appendix A
- USGS Topographic Maps

Appendix B
- Project Alignment Sheets
- Access Road Drawings

Appendix C
- Agency Consultation Responses
- Agency Response Table

Appendix D
- Compensatory Mitigation Plan
- Invasive Species Management Plan

Appendix E
- Tennessee Best Management Practices
- FERC Upland Erosion Control, Revegetation and Maintenance Plan
- FERC Wetland and Waterbody Construction and Mitigation Procedures
- Site Specific Wetland and Waterbody Crossing Drawings
- Erosion Control Drawings
- Silt Fence Calculation Report
- Access Road Hydraulic Report

Appendix F
- Spill Prevention and Response Procedures
- Traffic and Transportation Management Plan
- Waste Management Plan
- Blasting Plan
- Unanticipated Discovery Plan

Appendix G
- Hydrostatic Test Water Withdrawal Detail
- Tyringham Pipeyard Storage Layout
- Natural Heritage Endangered Species Program Project Review Checklist Filing

Appendix H
- Land Deed for Audubon Property Transfer

Appendix I
- Alternatives Mapping for the Department of Conservation and Recreation Property

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Appendix J

- Wetland Protection Act Resource Area Mapping
- Shallow Depth to Bedrock and Stone Wall Mapping
- FEMA Mapping

Appendix K

- Vernal Pool Report
- Vernal Pool Workspace Mapping
- Wetland Delineation Report
- Greenhouse Gas Report

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

List of Tables

Table 1-2 Summary of Temporary and Permanent Wetland Impacts by Municipality for Massachusetts... 1-8
Table 2-1 Proposed Facilities of the Connecticut Expansion Project 2-2
Table 2-2 Proposed Appurtenant Facilities of the Connecticut Expansion Project 2-3
Table 2-3 Summary of Land Requirements for the Connecticut Expansion Project Pipeline Loops..... 2-5
Table 2-4 Proposed Pipeyards / Contractor Yards..... 2-8
Table 2-5 Massachusetts Access Roads Associated with the Connecticut Expansion Project 2-9
Table 2-6 Tennessee Minimum Specifications for Depth of Cover (inches) 2-15
Table 2-7 Potential Sources of Hydrostatic Test Water for the Connecticut Expansion Project 2-18
Table 2-8A Steep Slopes (15-30 percent) Crossed by the Connecticut Expansion Project[1]..... 2-19
Table 2-8B Steep Slopes (>30 percent) Crossed by the Connecticut Expansion Project[1,3]..... 2-20
Table 2-9a Steep Side Slopes (15-30 percent) Crossed by the Connecticut Expansion Project[1] 2-21
Table 2-9B Steep Side Slopes (>30 percent) Crossed by the Connecticut Expansion Project[1] 2-22
Table 2-10 Maximum Interval Between Patrols..... 2-31
Table 3-1 Impacts from Two Alternative Pipeline Routes versus the Proposed Route for the Massachusetts Loop 3-10
Table 4-1 Wetlands Occurring within or in Close Proximity to the Project..... 4-2
Table 4-2 Waterbodies associated with the Connecticut Expansion Project in Massachusetts 4-9
Table 4-3 Potential vernal pools identified along the Project alignment in Massachusetts 4-14
Table 4-4 State-listed Species Potentially associated with Project Activities 4-17
Table 4-5 Geologic Conditions within the Connecticut Expansion Project Area..... 4-23
Table 4-6 Soil Associations and Series Crossed by the Connecticut Expansion Project 4-24
Table 4-7 Characteristics of Soil Series Associated with the Connecticut Expansion Project 4-26
Table 4-8 State Lands Located in the Vicinity([a]) of the Connecticut Expansion Project..... 4-38
Table 5-1 Landuse Acreage Affected by Construction and Operation of the Connecticut Expansion Project 5-2
Table 5-2 Summary of Temporary and Permanent Wetland Impacts by Municipality for Massachusetts... 5-3
Table 5-3 Wetlands Associated with the Connecticut Expansion Project – Massachusetts 5-4
Table 5-4 Waterbodies Associated with the Connecticut Expansion Project – Massachusetts Loop 5-6
Table 5-5 Impacts to Potential Vernal Pools associated with the Connecticut Expansion Project 5-12
Table 5-6 Potential Bedrock Blasting Locations Along Proposed Pipeline Route..... 5-17
Table 5-7 Agricultural Land Crossed by the Connecticut Expansion Project..... 5-24

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Table 5-8 Road Crossings for the Connecticut Expansion Project 5-29
Table 5-9 GHG Emissions – Tons 5-32
Table 5-10 Carbon Loss – Tons 5-32
Table 8-1 Response to Comments from Department of Conservation and Recreation (7/3/2014) 8-8
Table 8-2 Response to Comments from Mass Audubon (7/1/2014) 8-20
Table 8-3 Response to Comments from Pioneer Valley Planning Commission (7/2/2014) 8-26
Table 8-4 Response to Comments from Berkshire Regional Planning Commission Clearinghouse Review Report (6/26/2014, 7/15/2014) 8-48
Table 8-5 Response to Comments from Sandisfield Taxpayers Opposing the Pipeline (6/26/2014) 8-72
Table 8-6 Response to Comments from Berkshire Environmental Action Team (7/3/2014) 8-84
Table 8-7 to Comments from DEP Western Regional Office (6/20/2014) 8-105
Table 9-1 Summary of Proposed Mitigation 9-1

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

CONNECTICUT EXPANSION PROJECT
DRAFT ENVIRONMENTAL IMPACT REPORT
CIRCULATION LIST

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Massachusetts Department of Transportation Public/Private Development Unit 10 Park Plaza Boston, MA 02116	Massachusetts DOT District #1 Attn: MEPA Coordinator 270 Main Street Lenox, MA 01240
Massachusetts DOT District #2 Attn: MEPA Coordinator 811 North King Street Northampton, MA 01060	Berkshire County Regional Planning Commission 1 Fenn Street, Suite 201, 2nd Floor Pittsfield, MA 01201-6229
Pioneer Valley Planning Commission 60 Congress Street Springfield, MA 01104-3419	Natural Heritage and Endangered Species Program Commonwealth of Massachusetts Route 135 Westborough, MA 01581
DCR Attn: MEPA Co-ordinator 251 Causeway St. Suite 600 Boston, MA 02114	Massachusetts Historical Commission The MA Archives Building 220 Morrissey Boulevard Boston, MA 02125
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Sandisfield Board of Selectmen PO Box 90 66 Sandisfield Road Sandisfield, MA 01255	Sandisfield Conservation Commission PO Box 90 66 Sandisfield Road Sandisfield, MA 01255

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Sandisfield Planning Board PO Box 90 66 Sandisfield Road Sandisfield, MA 01255	Sandisfield Board of Health PO Box 90 66 Sandisfield Road Sandisfield, MA 01255
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Tyringham Public Library 118 Main Road, P.O. Box 440 Tyringham, MA 01264	

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

ABBREVIATIONS AND ACRONYMS

ACEC	Area of Critical Environmental Concern
ANFO	Ammonium Nitrate Fuel Oil
API	American Petroleum Institute
APE	Area of Potential Effect
ASME	American Society of Mechanical Engineers
ATF	Bureau of Alcohol, Tobacco, Firearms, and Explosives
ATWS	Additional Temporary Work Space
BCEP	Berkshires Climate and Energy Plan
BLSF	Bordering Land Subject to Flooding
BMP	Best Management Practice
BVW	Bordering Vegetated Wetlands
Certificate Order	Certificate of Public Convenience and Necessity
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CMP	Compensatory Mitigation Plan
CMR	Code of Massachusetts Regulations
Commission	Federal Energy Regulatory Commission
CVP	Certified Vernal Pool
CWA	Clean Water Act
CWF	Cold Water Fishery
CZM	Coastal Zone Management
DCR	Massachusetts Department of Conservation and Recreation
DEIR	Draft Environmental Impact Report
Dth	dekatherms
EEA	Energy and Environmental Affairs
EI	Environmental Inspector
EENF	Expanded Environmental Notification Form
EOEEA	Executive Office of Energy and Environmental Affairs
ESA	Endangered Species Act
FEIR	Final Environmental Impact Report
FEMA	Federal Emergency Management Act

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

FERC	Federal Energy Regulatory Commission
FIRM	Flood Insurance Rate Maps
GHG	Greenhouse Gas
GIS	Geographic Information Systems
GPS	Global Positioning System
HDD	Horizontal Directional Drilling
INGAA	Interstate Natural Gas Association of America
ILFP	In Lieu Free Program
ILSF	Isolated Land Subject to Flooding
ISMP	Invasive Species Management Plan
LEDPA	Least Environmentally Damaging Practicable Alternative
LEI	Lead Environmental Inspector
LNG	Liquefied Natural Gas
LUWW	Land Under Waterbodies and Waterways
MADEP	Massachusetts Department of Environmental Protection
MADFG	Massachusetts Department of Fish and Game
MADFW	Massachusetts Division of Fisheries and Wildlife
MAOP	Maximum Allowable Operating Pressure
MBTA	Migratory Bird Treaty Act
MEPA	Massachusetts Environmental Policy Act
MESA	Massachusetts Endangered Species Act
MHC	Massachusetts Historical Commission
MLV	Main Line Valve
MP	Milepost
MRPA	Massachusetts River Protection Act
National Register	National Register of Historic Places
NED	Northeast Energy Direct
NEPA	National Environmental Policy Act
NFPA	National Fire Protection Association
NGA	Natural Gas Act
NHESP	Massachusetts Natural Heritage and Endangered Species Program
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

NOI	Notice of Intent
NOT	Notice of Termination
NPDES	National Pollutant Discharge Elimination System
NPS	United States National Parks Service
NRCS	Natural Resources Conservation Service
NWI	National Wetland Inventory
OD	Outer Diameter
OHM	Oil and/or Hazardous Materials
ORW	Outstanding Resource Water
OSHA	Occupation Safety and Health Administration
OW	Open Water
PAL	Public Archaeological Laboratory, Inc.
PEM	Palustrine Emergent
PFO	Palustrine Forested
PHMSA	Pipeline and Hazardous Safety Administration
pig launcher	Internal Inspections Facility
Plan	Erosion Control, Revegetation and Maintenance Plan
Procedures	Commission Wetland and Waterbody Construction and Mitigation Procedures
Project	Tennessee Gas Pipeline Company, L.L.C, Connecticut Expansion Project
PSS	Palustrine Scrub/Shrub
PVC	Polyvinyl Chloride
PVP	Potential Vernal Pool
RAM	Release Abatement Measure
RFA	Riverfront Area
ROW	Right-of-Way
SFHA	Special Flood Hazard Area
SHPO	State Historic Preservation Office
SPRP	Spill Prevention and Response Plan
SWAP	Source Water Assessment and Protection Program
SWPPP	Stormwater Pollution Prevention Plan
Tcf	trillion cubic feet
Tennessee	Tennessee Gas Pipeline Company, L.L.C.
The Act	Wetlands Protection Act

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

TWS	Temporary Workspace
UMAS	University of Massachusetts Archaeological Services
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USDOT	United States Department of Transportation
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geologic Service
WPA	Wetland Protection Act

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

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July 11, 2014

CERTIFICATE OF THE SECRETARY OF ENERGY AND ENVIRONMENTAL AFFAIRS
ON THE
EXPANDED ENVIRONMENTAL NOTIFICATION FORM

PROJECT NAME	: Connecticut Expansion Project
PROJECT MUNICIPALITY	: Agawam, Sandisfield, and Tyringham
PROJECT WATERSHED	: Farmington River and Connecticut River
EEA NUMBER	: 15205
PROJECT PROPONENT	: Tennessee Gas Pipeline Company, L.L.C.
DATE NOTICED IN MONITOR	: May 21, 2014

Pursuant to the Massachusetts Environmental Policy Act (G. L. c. 30, ss. 61-62I) and Section 11.06 of the MEPA regulations (301 CMR 11.00), I hereby determine that this project **requires** the preparation of a Draft Environmental Impact Report (DEIR).

Project Description

As described in the Expanded Environmental Notification Form (EENF), the project consists of the construction of 3.8 miles of new 36-inch outside diameter (OD) pipeline within or adjacent to the existing Tennessee Gas right-of-way (ROW) in Sandisfield and 0.11 miles of new 24-inch OD pipeline within or adjacent to the Tennessee Gas ROW in Agawam. The project will also construct appurtenant facilities, to be located within the existing ROW, including one pig launcher at the western end of the project in Sandisfield; one pig receiver and one mainline valve at the eastern end of the project in Sandisfield; and one pig receiver associated with the 24-inch

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

OD pipeline at the existing Agawam Compressor Station.[1] An area of two acres in a field in Tyringham will be used as a staging area/pipeyard. The project will require withdrawal of more than one million gallons of water from Lower Spectacle Pond in Sandisfield for a hydrostatic test of the assembled pipeline. Construction of the pipeline loops is expected to last for three to four months.

The new pipeline in Sandisfield will create a pipeline loop (the "Massachusetts Loop") along the existing Tennessee Gas 200 Line Mainline. The pipeline in Agawam will be part of an 8.1-mile long pipeline loop extending into Connecticut (the "Connecticut Loop") along the Tennessee Gas 300 Line Mainline. A third loop will be constructed in New York. The purpose of a loop is to increase the volume of gas that can be transported along an existing section of pipeline. It is an alternative to constructing a new pipeline to increase supply within a service area. The location of the loop is dependent on the destination of the gas and flow dynamics of the pipeline system. The project is designed to increase gas flow by 72,100 dekatherms (72,100,000 cubic feet) per day. It will serve three natural gas utility companies in Connecticut.

I note that this project is separate and distinct from the Tennessee Gas Pipeline Northeast Energy Direct project to extend gas supply through the northeast. The Northeast Energy Direct project would consists of construction of a new pipeline in Massachusetts that would extend from existing infrastructure in Wright, New York, enter Massachusetts in Richmond and extend across the state to Dracut. Based on the scope and scale of the project, it will be subject to a transparent and rigorous review including the filing of a mandatory EIR with the MEPA Office which will include opportunities for public review and comment at each stage of the process.

Project Site

The project will occur in three distinct areas. The pipeyard and staging area for the work in Sandisfield will be located in a field off Main Road in Tyringham. The site was used approximately 25 years ago to provide access for the construction of a pipeline through the site. The ~~project~~ pipeyard will occupy an area of approximately two acres that is accessible by an existing unpaved access road. South and west of the pipeyard area, the field consists of an emergent marsh associated with a perennial stream. The field surrounds the remainder of the pipeyard area, with Hopp Brook located approximately 600 feet to the north. The area is located within mapped Priority Habitat and Estimated Habitat for the Sedge Wren (*Cistothorus platensis*), American Bittern (*Botaurus lentiginosus*), and Wood Turtle (*Glyptemys insculpta*). The pipeyard is located approximately four miles from the start of the proposed pipeline loop in Sandisfield.

The Massachusetts Loop will begin at an existing valve site, designated as Milepost (MP) 0.0, off Town Hill Road in Sandisfield. It will be located within or adjacent to the ROW of the existing Tennessee Gas 200 Line Mainline that runs from New York to Boston. The 200 line includes a 24-inch diameter pipeline and a 30-inch diameter pipeline within the generally 75-foot wide ROW. Except for an approximately quarter-mile long segment between MP 0.32 and MP

[1] "Pigs" are devices inserted into the pipeline that clean and help maintain the inside of the pipe. "Pig launchers" and "pig receivers" are above-ground connections to the pipeline in which the pigs are inserted and removed, respectively, from the pipeline.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

0.59, the first 2.26 miles of the ROW are located within the Otis State Forest which is owned and managed by the Department of Conservation and Recreation (DCR). The remainder of the ROW passes through privately owned land, with the exception of crossings of Cold Spring Road, Hammertown Road, South Beech Plain Road, which are public roads owned by the Town of Sandisfield. The project will withdraw water for hydrostatic testing from Lower Spectacle Pond, a 70 acre pond located within the Otis State Forest on the east side of Cold Spring Road. Lower Spectacle Pond includes mapped Priority Habitat and Estimated Habitat of the Umber Shadowdragon dragonfly (*Neurocordulia obsoleta*).

The Connecticut Loop includes 0.1 miles of pipeline in Agawam. The loop will begin at the existing Tennessee Gas compressor station on Suffield Street. The pipeline loop will be located within or adjacent to the ROW of the existing Tennessee Gas 300 Line Mainline that originates in Pennsylvania and extends to Boston. The 300 line includes a 16-inch diameter pipeline within the generally 75-foot wide ROW. The entire ROW for the portion of the Connecticut Loop in Massachusetts is located on land owned by Tennessee Gas.

Environmental Impacts

According to the EENF, the project will impact an area of 58.8 acres. Of the 58.8 acres of construction workspace, 11.85 acres will be maintained as a new permanent ROW that will extend 25 feet from the pipeline loop. Approximately two miles of the pipeline will pass through Otis State Forest and will impact a total of 30.23 acres; approximately six acres is associated with new ROW that will be permanently impacted, 7.2 acres is located within the existing maintained ROW, and 17 acres will be cleared and regraded during construction.

Construction activities will impact wetlands resource areas, including 9.43 acres of Bordering Vegetated Wetlands (BVW), 0.42 acres of Isolated Vegetated Wetlands (IVW), and 2.2 acres of Riverfront Area. Pipeline construction will impact approximately 39 lf of Bank and Land Under Water (LUW) in connection with four stream crossings. The EENF did not quantify impacts to LUW. The project will withdraw 1,025,100 gallons of water from Lower Spectacle Pond for use in a hydrostatic test of the pipeline.

Maintenance of the new ROW will occur within six acres of the Otis State Forest. Maintenance of the ROW will result in the conversion of 2.2 acres of BVW from forested wetland to herbaceous/scrub-shrub wetland types, and permanent impacts to 0.57 acres of Riverfront Area. Maintenance of the 11.85-acre ROW will convert 8.02 acres of forested land to low-growing herbaceous and shrub vegetation.

Jurisdiction and Permitting

This project is subject to MEPA review and requires the preparation of a mandatory EIR pursuant to 301 CMR 11.03(1)(a)(1) and 301 CMR 11.03(3)(a)(1)(a) because it requires State Agency Permits and, respectively, involves the direct alteration of 50 or more acres of land and alteration of one or more acres of BVW. The project also meets or exceeds several ENF thresholds, including: conversion of land held for natural resources purposes in accordance with Article 97 of the Articles of Amendment to the Constitution of the Commonwealth to any

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

purpose not in accordance with Article 97 (301 CMR 11.03(1)(b)(3)); release of an interest in land held for conservation, preservation, agricultural or watershed preservation purposes (301 CMR 11.03(1)(b)(5)); and alteration of one-half or more acres of any other wetlands (301 CMR 11.03(3)(b)(1)(f)). The project will require a 401 Water Quality Certification (WQC) from the Massachusetts Department of Environmental Protection (MassDEP). The project requires a Construction and Access Permit and a new easement from the Massachusetts Department of Conservation and Recreation (DCR). In addition, the project must demonstrate compliance with the EEA Article 97 Land Disposition Policy.

The project will require Orders of Conditions (OC) from the Tyringham, Agawam and Sandisfield Conservation Commissions (or in the case of an appeal, a Superseding Order of Conditions from MassDEP). This project is subject to review under the Massachusetts Endangered Species Act (MESA) and will require consultation with the Massachusetts Historical Commission (MHC) in accordance with Section 106 of the National Historic Preservation Act. The project will require a National Pollutant Discharge Elimination System (NPDES) Construction General Permit (CGP) from the United States Environmental Protection Agency (EPA), an Individual Permit from the Army Corps of Engineers (ACOE) under Section 404 of the Clean Water Act, and a Certificate of Public Convenience and Necessity from the Federal Energy Regulatory Commission (FERC). The project is subject to the MEPA Greenhouse Gas (GHG) Emissions Policy and Protocol.

The project requires a Land Transfer from DCR along approximately two miles of the pipeline in Sandisfield. In accordance with 301 CMR 11.01(2)(a)(1), MEPA jurisdiction is broad in scope within the area of the Land Transfer. Within the remainder of the project area, MEPA jurisdiction extends to those aspects of the project that are within the subject matter of required or potentially required State Agency Actions and that may cause Damage to the Environment as defined in the MEPA regulations. In this case, MEPA jurisdiction extends to wetlands, stormwater, water quality, rare species, and GHG emissions.

Single EIR Request

In accordance with Section 11.05(7) of the MEPA regulations, the Proponent has submitted an EENF with a request that I allow the Proponent to fulfill its EIR obligations under MEPA with a Single EIR, rather than the usual process of a Draft and Final EIR. According to 301 CMR 11.06(8), I may allow a Single EIR provided that the EENF:

- Describes and analyzes all aspects of the project and all feasible alternatives, regardless of any jurisdictional or other limitation that may apply to the Scope;
- Provides a detailed baseline in relation to which potential environmental impacts and mitigation measures can be assessed; and
- Demonstrates that the planning and design of the project use all feasible measures to avoid potential environmental impacts.

Two EIR thresholds are applicable to the project: direct alteration of 50 or more acres of land (301 CMR 11.03(1)(a)(1)) and alteration of one or more acres of BVW (301 CMR 11.03(3)(a)(1)(a)). In support of the waiver request, the EENF notes that of the 58.8 acres of

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

land disturbance, 12.5 acres are located within the existing ROW and are already disturbed. With respect to the BVW alteration threshold, the EENF states that most of the BVW impacts are temporary and all wetlands impacts will be mitigated through a wetlands mitigation plan. The 2.2 acres of permanent impacts do not involve a loss of wetlands but rather the conversion of BVW from forested to herbaceous/shrub scrub wetlands types. The EENF provided an alternatives analysis, provided a baseline of potential impacts and proposed mitigation related to wetlands, water quality, and stormwater. The EENF does not provide any specific information regarding compliance with the EEA Article 97 Policy or identify mitigation associated with the easement. At the Proponent's request, the review period was extended to 51 days, including a public comment period of 43 days. The Proponent's request for a Single EIR was discussed at the consultation session held on June 10, 2014.

Review of the Expanded ENF

The EENF provided information about the existing conditions along the length of the project route, including soils, geology, vegetation, wildlife, land use, and cultural resources. The EENF included an inventory of wetlands and watercourses along the project route and a report describing the wetlands delineated in the project area. The EENF described and illustrated the pipeline construction process, identified potential environmental impacts and mitigation measures, and reviewed alternatives to the project. The EENF also included a document describing standard construction mitigation measures required by FERC.

Alternatives Analysis

The purpose of the project is to meet market demand for natural gas. The EENF included an analysis of alternatives within the context of this project purpose including energy conservation, use of other energy sources, and system alternatives. Energy conservation measures could potentially meet the project goal by reducing demand for gas. According to the EENF, the Proponent has programs in place to encourage conservation, but these programs have not sufficiently reduced demand. The EENF also reviewed the use of renewable and other energy sources to meet the demand, but these alternatives were deemed infeasible, unreliable, or unacceptable due to greater environmental impacts (such as the use of coal and oil as fuel).

The Proponent considered a number of system alternatives that involve greater efficiencies of the existing pipeline system, different configuration of looping or compression facilities, and expanded pipeline facilities. The Greenfield Pipeline alternative would involve the construction of a 100-mile long pipeline from New York to Connecticut along a new ROW. This option was rejected because it would have greater impacts than a loop, take longer to permit and construct, and would have a much greater cost. The EENF also reviewed an alternative loop design using a 42-inch OD pipeline. The use of a larger diameter pipe would shorten the length of the loop by 0.3 miles. This alternative was rejected due to the need for transition pipes between the existing 36-inch pipeline that terminates at MP 0.0, a wider ROW, and additional above-ground structures such as pig launchers and receivers, as well as its higher cost.

The EENF also identified alternative routes for the loops. Major route deviations from the existing pipeline corridor were rejected as these options have the same drawbacks as the

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Greenfield alternative. The EENF described minor route variations adjacent to the existing corridor which were incorporated into the Preferred Alternative. The Massachusetts Loop will start on the south side of the ROW, where it will essentially extend the 36-inch pipe that terminates at MP 0.0. At MP 1.5, the route of the loop will switch to the north side of the corridor to avoid an area of open water on the south side. Another route change will occur at MP 2.9, where the loop will switch back to the south side of the corridor to minimize impacts to a stream and to utilize more advantageous grades. DCR's comments suggest that additional route variations of this sort may reduce impacts by using the existing ROW to a greater extent.

Land Alteration/Construction Process

At MP 0.0 in Sandisfield, the 36-inch loop pipeline will be connected to the existing 36-inch pipeline that terminates at the valve site. The pig receiver currently at the terminus of the existing 36-inch pipeline will be removed and relocated to the terminus of the 36-inch loop pipeline at MP 3.8. Also at MP 3.8, the 36-inch loop pipeline will be connected, through underground tie-in piping, to the existing 30-inch and 24-inch pipelines that continue east. The connection for the Agawam section will be made through an existing valve at the compressor station.

An area of 58.8 acres, including 11.85 acres of new permanent ROW, will be impacted by the construction of the project. Pipeline construction activities will take place within a construction workspace extending away from the centerline of the existing pipeline closest to the location of the proposed loop pipeline. In upland areas, the construction workspace will be 100 feet wide for the 24-inch pipeline loop in Agawam and 125 feet wide for the 36-inch pipeline loop in Sandisfield. For the 36-inch pipeline, the construction workspace will include 25 feet within the existing permanent ROW, 25 feet within an area of new permanent pipeline ROW, and a temporary workspace (TWS) of 75 feet. The width of these zones may be slightly reduced for the 24-inch pipeline loop in Agawam. A typical workspace in an upland area will include a 25-foot wide zone between the centerlines of the existing pipeline and the trench for the loop pipeline. This side of the loop pipeline trench is called the "spoils side" of the workspace because the trench spoils will be deposited and stored within this area. The other side of the 15-foot wide trench is called the "working side" of the workspace and will total approximately 100 feet from the trench. The working side will include space parallel to the trench for welding together pipe joints; a zone for operating the side boom, excavator and other equipment; space for vehicular and construction equipment access; and an area for topsoil to be stored. Along some sections of the pipeline, additional workspace ("Additional Temporary Workspace" or ATWS) will be required adjacent to the construction ROW.

An Environmental Inspector will be employed to ensure that mitigation measures will be installed and maintained. The EENF describes sedimentation and erosion control, soil stabilization and revegetation measures, and work practices that will be employed to minimize impacts during pipeline construction. Specialized clearing equipment will be used to limit the amount of time required for clearing activities. Woody vegetation will be cut as close to the ground as possible or removed, then chipped and either hauled off-site and composted or left in the ROW in a manner that does not inhibit re-growth. Non-woody vegetation will be mowed to

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

ground level. In wetlands, no rubber tire equipment will be used in areas where damage to root systems or compaction may occur; in these areas, clearing will be done by hand.

Construction along the pipeline will proceed in an assembly-line fashion, with site preparation, trenching, pipeline installation, and backfilling operations moving along the pipeline route as they are completed, rather than each activity taking place sequentially from one end of the pipeline to the other. Construction activities will proceed in the following sequence:

1. Clearing and grading of the new workspace
2. Trenching
3. Delivery and assembly of pipe joints
4. Inspection and repair of pipeline welding and coating
5. Lowering of the pipeline into the trench
6. Backfilling
7. Hydrostatic testing

Clearing and grading will be done within the construction workspace. In addition to removing trees within this zone, the workspace will be regraded if necessary to provide a level grade for construction activities. Where the pipeline crosses a steep side slope, a side slope construction procedure will be used. It involves cutting into the hillside to provide a level surface for construction equipment and a shallower trench on the downhill side. Excavated material will then be used to cover the pipeline to the desired grade. Where the ROW climbs a steep hill with slopes greater than 30 percent, winches at the top of the hill may be used to pull the construction equipment up the hill or lower it down the hill.

An excavator will be used to dig an approximately six-to-seven foot deep trench. The trench will be 14-15 feet wide at ground surface and six feet wide at the bottom. The trench will be dug 25 feet away from the nearest existing pipeline in the ROW and trench spoils will be deposited within this 25-foot spoils side zone. Topsoil will be stored separately within the workspace so that it can be reused for backfilling.

According to the EENF, blasting is not expected to be required for the project because the U.S. Department of Agriculture-Natural Resources Conservation Service (USDA-NRCS) Web Soil Survey did not identify areas of shallow depth to bedrock along the project route. However, the EENF states that the need for blasting can only be confirmed based on actual field conditions encountered during construction. The EENF notes that if blasting is required, it will be conducted in accordance with the regulations concerning the use of explosives at 527 CMR 13, and will be conducted by a person who holds a Massachusetts Blasters License issued by the State Fire Marshall. The Proponent will develop a Blasting Plan to be implemented if bedrock is encountered. The Blasting Plan will outline safety and impact minimization measures, including installing blasting mats in sensitive locations to prevent impacts from flying rock, posting warning signals, following procedures for safe handling and use of explosives, having emergency response measures in place, and controlling excessive vibration by planning the size and timing of explosive charges. DCR and others note the presence of bedrock throughout the area and suggest that blasting will be necessary.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

The project includes four crossings of public roads and one crossing of an unnamed access road within Otis State Forest. The crossings of Hammertown Road and the access road will use the open-cut method, in which a trench for the pipeline will be dug across the road. The project will minimize traffic disruptions by keeping half of the road open to traffic and using steel plates to cover the trench in case of an emergency. The crossings of Cold Spring Road and South Beech Plain Road will be constructed using a conventional bore method that will install the pipeline under the roadway without disturbing the road surface. Traffic will be allowed to travel on the road during construction.

For the Sandisfield loop, access to the ROW for pipe delivery and construction vehicles will occur at four temporary access roads. Additional access roads are not necessary in Agawam, where access can be provided from the existing compressor station and other land owned by the Proponent. Pipe joints, either 40 or 80 feet in length, will be laid end to end along the trench and welded together. The welds will be wrapped in a rubberized material and inspected, then the pipe will be lowered into the trench with a side boom. The trench will then be backfilled with at least three feet of soil covering the pipe. Topsoil will be replaced over the trench. Any remaining soil will be spread evenly over the construction workspace. Upon completion of construction, disturbed areas and drainage patterns will be restored to preconstruction contours and elevations.

Once the pipeline is in place, it will be hydrostatically tested for leaks. According to the EENF, approximately 1,025,100 gallons of water will be withdrawn from Lower Spectacle Pond to be used for this purpose. The water will be withdrawn at a rate of 2,000 gallons per minute (gpm). The water will be stored in the pipe for 24 hours at 1.5 times the normal pressure, then discharged into an upland area through an energy dissipating device.

The project will use an approximately two-acre site within a field on Main Road in Tyringham as a staging area and pipeyard. Trucks will deliver 40-foot or 80-foot long pipe joints to the site, where they will be stored until needed at the construction site in Sandisfield.

Once installed, the pipeline and ROW will be subject to regular maintenance. Pipeline maintenance will include the use of a cathodic protection system to prevent corrosion of the pipeline. The ROW maintenance will include periodic seasonal mowing, periodic inspections of waterway crossings, and backfill replacement. According to the ENF, herbicides or pesticides will not be used within 100 feet of a wetland or waterbody unless approved by state and local agencies.

Wetlands

The project will directly impact 9.85 acres of vegetated wetlands, including 9.43 acres of BVW and 0.42 acres of IVW located in 17 distinct wetlands areas. Of this total, all but 2.2 acres of BVW, including areas within the footprint of the pipeline trench, will be temporarily impacted by construction activities and allowed to revert to natural conditions after construction. The 2.2 acres of permanently impacted BVW will be located within the new permanent ROW. This BVW will be converted from forested wetlands to emergent or scrub shrub wetland types due to vegetation management within the permanent ROW. As noted by MassDEP, IVW is not

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

regulated by the Wetlands Protection Act, but activities in IVW are subject to the WQC regulations. Wetlands in the Agawam section of the project account for 0.58 acres of these impacts, including approximately 0.2 acres of permanent impact resulting from ROW maintenance practices. The remaining wetlands impacts are located along the pipeline route in Sandisfield. The EENF also identifies one certified vernal pool near the existing pipeline ROW that will not be impacted by the project. The pipe-yard/staging area in Tyringham is located within the Buffer Zone of BVW associated with Hopp Brook, but the EENF does not identify direct impacts to wetlands in Tyringham. According to MassDEP, the limited project provisions may apply to the project. In addition, portions of the work in the Riverfront Area currently within the pipeline ROW may be subject to the redevelopment standards of the Riverfront Area regulations.

The project will employ mitigation measures to reduce wetlands impacts during construction. In wetlands areas, the construction workspace will be limited to 75 feet extending from the centerline of the adjacent existing pipeline, including 25 feet on the spoils side and 50 feet on the working side. A 12-inch layer of wetlands topsoil will removed, stored directly adjacent to the trench and reused as the top layer of backfill over the trench. The remainder of the trench spoil will be stored in the spoil side of the workspace and used to backfill the trench. The standard pipeline construction method described above will be used where wetlands soils are non-saturated and able to support construction equipment. In saturated conditions, timber mats will be used to provide a stable surface for construction equipment. The spoils pile will be managed to allow for natural circulation or drainage of water. The pipeline will be assembled in an adjacent upland area and lowered into the trench, then backfilled with trench spoils and a top layer of wetlands topsoil.

In order to promote recovery of wetlands impacted during construction, all wetland areas will be restored to pre-construction grades, contours, and drainage patterns. These areas will then be reseeded or replanted with native wetlands plant species. According to the EENF, a detailed wetlands mitigation plan describing additional measures to avoid, minimize, and mitigate temporary and permanent wetlands impacts will be developed in consultation with federal and state agencies during permitting. Mitigation for permanent impacts to wetlands will include off-site wetlands restoration and conservation of existing wetland areas. The Proponent will also develop an Invasive Species Management Plan to prevent colonization of disturbed wetland areas by invasive species. Wetlands within the permanent ROW will be subject to ROW maintenance practices. Within an area of 10 feet centered on the pipelines, wetlands will be maintained as low-growing emergent or scrub-shrub wetlands types. Woody wetlands vegetation will be allowed to become reestablished in the remainder of the ROW, except that trees within 15 feet of a pipeline that are taller than 15 feet high may be cut and removed from the ROW.

The EENF also identifies impacts to streams and associated Riverfront Areas in Sandisfield. The project includes four stream crossings, totaling 39 lf, and approximately 2.8 acres of Riverfront Area that will be directly impacted by construction, including approximately 0.57 acres of permanent impacts associated with active vegetation management in the ROW. The project includes two intermittent stream crossings of three lf and 5.5 lf, and two perennial stream crossings of approximately 10 lf and 20 lf. The project will use either the dam-and-pump

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

system or flume pipes to cross the streams with a perceptible flow at the time of construction. These methods will maintain downstream flow during construction. A flumed crossing redirects flow through one or more pipes to allow trenching to occur in dry conditions and allows for passage of aquatic organisms. This technique will be used where stream bank soils will remain stable during trenching and where the flow volume can be accommodated by pipes. The dam-and-pump method will be employed where pumps and hoses can transfer stream flow from the upstream area to the downstream side but do not provide for passage of aquatic organisms. This technique involves the construction of a cofferdam to prevent material from entering the waterbody. To minimize the duration of impact to streams, the stream crossings will be avoided during high flow and spawning periods, will be constructed separately from the rest of the pipeline by a separate crew, and will be restored immediately upon installation of the pipeline across the stream. Upon completion of construction, the stream channels and bottoms will be restored to their original configurations and contours and stream banks will be stabilized.

The pipeyard in Tyringham will be located within the Buffer Zone of BVW associated with Hopp Brook. The EENF does not provide a detailed description of the activities planned in this area or the potential impacts of the activities.

Water Quality

The project includes a withdrawal of 1,025,100 gallons of water from Lower Spectacle Pond for hydrostatic testing of the Massachusetts Loop pipeline. I recommend that the Proponent consult MassDEP as to whether Lower Spectacle Pond is a Great Pond and whether a Chapter 91 authorization is required for the withdrawal. The hydrostatic test will involve filling the pipe with water to 1.5 times its normal operating pressure for a period of 24 hours to detect leaks. The test water will not be chemically treated. Pond water will be withdrawn at a rate of 2,000 gallons per minute (gpm) for eight hours. The water will be withdrawn at an easily accessible part of the pond where it is located close to Cold Spring Road, and carried through a hose along Temporary Access Road #3 to the ROW. After the test, water will be discharged to a vegetated upland area at a rate of 2,000 gpm. The water will be discharged through a dewatering structure that will filter the water and dissipate the energy of the discharge to prevent erosion and water quality impacts. According to the EENF, the discharge will be monitored and the rate of discharge slowed if any impacts are observed. The water is expected to infiltrate into the ground before reaching any downstream surface waters.

Lower Spectacle Pond includes mapped Priority Habitat and Estimated Habitat for the Umber Shadowdragon, a species of Special Concern. According to the EENF, water will be withdrawn from the surface of the pond to avoid impacts to bottom sediments where the larval form of the dragonfly may live. The Proponent will also consult with NHESP as to any additional measures necessary to prevent impacts, such as the timing of the withdrawal.

Conservation Land/Article 97

The Commonwealth purchased approximately 904 acres of land around Lower Spectacle Pond in 2007. Prior to the purchase, the land had long been identified as a priority for protection due its important ecological habitat for native and rare species, old growth forests, historic mill

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

sites, frontage along Clam River, and Lower Spectacle Pond itself. The property is a key link connecting the Otis State Forest to the Clam River Flood Control Area and over 8,500 acres of protected open space. The property includes Spectacle Pond Farm, contains a variety of unique and important natural features such as mature forests, wetlands, bedrock outcrops, seeps, and springs. The land also has high recreational value for hiking, canoeing, kayaking, snowmobiling, cross-country skiing, fishing, and hunting. Historical resources within Otis State Forest in the vicinity of the pipeline ROW include the G. Dunham Foundation Site and the site of the discovery of an Archaic Period projectile point.

Approximately two miles of the existing pipeline and the proposed loop pass through Otis State Forest. The project will require the use of approximately 30.23 acres during construction, including three temporary access roads. Approximately 7.2 acres of this area will be located within the existing ROW and 17 acres will be located within a temporary ROW that will be allowed to revegetate naturally and will remain under DCR control and management after construction. The remaining six acres consists of an additional permanent 25-foot wide ROW easement. Within DCR property, the Project will impact approximately 0.4 acres of IVW and 3.7 acres of BVW, including approximately one acre of BVW that will be maintained within the new permanent BVW. The project will impact 1.13 acres of Riverfront Area and three stream crossings will be located on DCR property. In addition, the project proposes a one-time withdrawal of over one million gallons of water for hydrostatic testing of the pipeline loop.

Disposition of state land within the Otis State Forest through a permanent easement requires a 2/3 vote of the legislature, pursuant to Article 97 of the Articles of Amendment to the Massachusetts Constitution. The EEA Article 97 Land Disposition Policy (the Policy) was established to ensure no net loss of Article 97 lands. It states that EEA agencies should, as a general rule, not dispose of Article 97 land. The Policy establishes six criteria for determining when "exceptional circumstances" exist such that a disposition of Article 97 land may be appropriate:

- The Proponent of the disposition must conduct an analysis of alternatives, commensurate with the type and size of the proposed disposition, that achieve the purpose of the disposition without the use of Article 97 land, such as the use of other land available within the appropriate market area;
- The disposition of the subject parcel and its proposed use may not destroy or threaten a unique or significant resource (e.g., significant habitat, rare or unusual terrain, or areas of significant public recreation);
- Real estate of equal or greater value, and of significantly greater resource value is granted to the disposing agency;
- The minimum necessary area of Article 97 should be included in the disposition and the existing resources continue to be protected to the maximum extent possible;
- The disposition serves an Article 97 purpose or another public purpose without detracting from the mission, plans, policies and mandates of EEA and its appropriate department or division; and
- The disposition is not contrary to the express wishes of the person(s) who donated or sold the parcel or interests to the Commonwealth.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

The EENF does not specifically address the project's consistency with the Article 97 policy or address the requirement to provide compensatory land. With respect to the last criteria, I note that according to MassAudubon, it transferred its interests in this land to the Commonwealth with the understanding that the property would be permanently protected under Article 97. MassAudubon's letter states that it objects to the proposed land disposition.

Rare Species and Fisheries

Portions of the project are located within Priority Habitat of Rare Species and Estimated Habitat of Rare Wildlife as indicated in the 13th Edition of the *MA Natural Heritage Atlas*. The pipeyard includes habitat associated with the Sedge Wren and American Bittern, bird species that are listed as "Endangered," and the Wood Turtle, a species of "Special Concern." According to NHESP, it appears that the proposed activities at the pipe yard could be conditioned through the MESA review process to avoid a prohibited "take" of the species.

In addition, Lower Spectacle Pond includes mapped Priority Habitat and Estimated Habitat for the Umber Shadowdragon, a species of Special Concern. According to the EENF, water will be withdrawn from the surface of the pond to avoid impacts to bottom sediments where the larval form of the dragonfly may live. The project will also consult with NHESP as to any additional measures necessary to prevent impacts, such as the timing of the withdrawal.

The pipeline loop in Sandisfield will cross four streams that are tributary to the Clam River. Surveys of the river conducted by the Division of Fisheries and Wildlife (DFW) have documented 14 species of fish, and the river is stocked annually with Brook Trout (*Salvelinus fontinalis*), Brown Trout (*Salmo trutta*), Rainbow Trout (*Oncorhynchus mykiss*), and/or Tiger Trout (*Salmo trutta x Salvelinus fontinalis*). According to DFW, the Clam River is a coldwater fisheries resource that is highly susceptible to impacts associated with siltation, water level fluctuations, loss of riparian habitat, stream fragmentation, and temperature changes.

Greenhouse Gas (GHG) Emissions

According to the EENF, the project is not expected to generate significant levels of GHG emissions after its completion. The EENF indicates that a small amount of gas may be released into the atmosphere in an emergency situation and for non-routine required maintenance. It does not identify how the project will be designed and constructed to avoid leakage nor does it address long-term inspection and maintenance procedures to identify and address leaks.

Cultural and Historical Resources

The EENF includes the results of an archaeological survey conducted on the project area. The survey identified two archaeological sites and 38 stone walls that are likely the remnants of historical property boundaries. According to the EENF, the project alignment was adjusted during the planning phase to avoid the archaeological sites, and any unavoidable impacts to the stone walls will be mitigated by rebuilding the walls after construction.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

According to the Board of Underwater Archaeological Resources (BUAR), no record exists of underwater cultural resources exists within the project area. If any heretofore unknown resources are detected during construction, the Proponent should take appropriate measures to prevent impacts to the resources and contact BUAR.

Public Comments

Comments from State Agencies, including MassDEP and DCR, indicated the need to further review alternatives that avoid or minimize impacts, and to provide additional characterization of wetlands, upland habitats, wildlife, and historic resources such as stone walls. Comments were provided by BRPC, the Sandisfield Board of Selectmen, MassAudubon, the Berkshire Environmental Action Team (BEAT) and residents. These comments focused on the impacts of the project on public land and natural resources in the area; the potential need for blasting; maintenance practices along the existing pipeline impacts associated with the water withdrawal for hydrostatic testing; and GHG emissions. Comments from the Board of Selectmen and residents expressed strong opposition to the project due to concerns about its impacts on the environmental resources and natural beauty of the area and on public use of Otis State Forest. In addition, I note that the Sandisfield Annual Town Meeting held in May, 2014 unanimously adopted a non-binding resolution banning the expansion of the pipeline.

Conclusion

Based on review of the EENF, consultation with public agencies and consideration of public comments, I hereby require the Proponent to file a Draft EIR and Final EIR. I acknowledge that the EENF provides a detailed project description, identifies baseline environmental conditions and supports public understanding of the project and its potential impacts. In addition, I appreciate the Proponent's willingness to provide additional review of this document in response to requests from municipalities and the public. However, significant issues have not been addressed to a level commensurate with the request for a Single EIR. In particular, the EENF does not include any substantive discussion of the impacts to public lands in the Otis State Forest that are protected under Article 97. The EENF does not specifically address these impacts or address the Proponent's obligation to comply with the requirements of the EEA Article 97 Policy. In addition, I note the significant concerns expressed by the BRPC, municipalities and residents. The Proponent and the public will be well-served through the development of a Draft and a Final EIR that will provide a transparent public process and meaningful opportunities for public comment and response by the Proponent.

The Scope below identifies additional analysis and information that should be provided in the DEIR. The primary emphasis of this Scope is to identify how the project will be proposed consistent with the EEA Article 97 process and to demonstrate that impacts to wetlands and parkland have been avoided and mitigated to the maximum extent feasible. In addition, review of the project will be facilitated by a more detailed description of the project need, regional demand for natural gas capacity and supply and how this project would contribute to these needs.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

SCOPE

The DEIR should follow Section 11.07 of the MEPA regulations for outline and content, as modified by this scope.

Project Description and Permitting

The DEIR should include a detailed description of the proposed project and describe any changes to the project since the filing of the EENF. The DEIR should provide additional information about the project need and purpose, quantify the regional benefits of the project in terms of increasing natural gas capacity and supply, and describe why and how the location of the Massachusetts Loop was selected with respect to regional infrastructure. It should provide additional information regarding commissioning and gasification of the pipeline and operation and maintenance procedures including leak detection and repair. The DEIR should include updated site plans at a legible scale. To facilitate its review, the DEIR should provide additional narrative to explain and support the analysis of the project's impacts and mitigation, and extract relevant documentation and tables from the appendices to supplement the narrative. The DEIR should include large-scale maps of the pipeline construction corridor and temporary workspaces that depict construction activities in relation to DCR property, rare species habitat, geological features such as bedrock or other subsurface conditions that may require blasting, wetlands resource areas, vernal pools, floodplains, topographic features, and historic resources, including stone walls on DCR property.

The DEIR should provide a brief description and analysis of applicable State statutory and regulatory standards and requirements, and a description of how the project will meet those standards. The DEIR should identify required State permits, Financial Assistance, or other State approvals and provide an update on the status of each of these pending actions, including the filing of legislation relative to the disposition of Article 97 land. It should specifically address how the project will be developed consistent with the EEA Article 97 Policy and associated criteria. The DEIR should review the status of the FERC filing, describe data showing need for the project, and describe the criteria FERC may use to issue a Certificate of Public Convenience and Necessity. The BRPC notes that the EENF reviewed the Comprehensive Economic Plan for Berkshire County and requested that the DEIR include an assessment of consistency with the Sustainable Berkshires Plan as well.

Alternatives Analysis

The DEIR should include an evaluation of all feasible alternatives, including a review of alternative loop locations and alignments that were considered, and describe how the Preferred Alternative will avoid, minimize and mitigate the use of Article 97 land. The DEIR should clearly demonstrate that the Proponent has sought to avoid, minimize and mitigate Damage to the Environment to the maximum extent feasible, including an alternative that complies with the EEA Article 97 Land Disposition Policy and Wetlands Protection Act performance standards. The alternatives analysis should include a clear comparison, quantified to the extent possible, of the impacts of each alternative in a tabular format with supporting narrative and conceptual site plans. The DEIR should provide a rationale to explain why certain alternatives were selected and

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

others ruled out for further consideration. The DEIR should assess the impacts of the project and its alternatives, pursuant to 301 CMR 11.07(6)(h). At a minimum, the DEIR should evaluate the following alternatives for avoiding or minimizing temporary and permanent impacts to Article 97 land and wetlands:

- Routes that avoid or minimize the use of DCR property;
- Use of a narrower construction cross-section, such as that employed in wetlands areas;
- Maximize the siting of the pipeline loop within the existing easement; and
- The use of Horizontal Directional Drilling (HDD).

Wetlands and Water Quality

MassDEP recommends that an Abbreviated Notice of Resource Area Delineation (ANRAD) be filed to confirm the location and area of wetlands to be impacted. Based on any changes or refinements to the project or the delineation of wetlands, the DEIR should identify and quantify impacts to all wetlands resource areas, including BVW, Bank, Riverfront Area, Land Under Water (LUW), Bordering Land Subject to Flooding (BLSF), and Isolated Land Subject to Flooding, as well as IVW and vernal pools. For any wetlands mitigation or replication that will be required through local, state, and federal permitting requirements, the DEIR should describe the general standards, possible locations of wetlands mitigation and replication, and typical monitoring requirements that may be required.

The DEIR should provide additional details about the location of the water withdrawal in Lower Spectacle Pond and the pond conditions in the area of the withdrawal. The DEIR should identify any measures to be implemented to reduce impingement and entrainment of larval or juvenile organisms, including the proposed depth of the withdrawal. I recommend that the Proponent consult with DCR, NHESP, and the Division of Fisheries and Wildlife.

Conservation Land/Article 97

The DEIR should review the project's consistency with the EEA Article 97 Land Disposition Policy. The DEIR should specifically address each criteria listed in the Policy, including an alternatives analysis and identification of mitigation for impacts to Article 97 land, including land of equal or greater resource value. The DEIR should specifically address the comments from MassAudubon regarding the land disposition. The DEIR should include a map showing land to be affected by this project that was transferred to the Commonwealth by MassAudubon.

The DEIR should provide more detail regarding the construction impacts to DCR property located within temporary workspace areas and describe measures to minimize these impacts. As discussed below, the DEIR should also provide more information regarding potential blasting and associated impacts to DCR property.

Greenhouse Gas Emissions

This project is subject to review under the May 5, 2010 MEPA Greenhouse Gas Emission Policy and Protocol (GHG Policy). The GHG Policy is one element of a comprehensive effort to

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

meet the Commonwealth's obligations under the Global Warming Solutions Act (GWSA) which include reducing carbon emissions by between 10% and 25% below 1990 emissions levels by the year 2020, and by 80% below 1990 emissions levels by the year 2050. Consistent with MEPA's overall purpose to evaluate alternatives that avoid, minimize and mitigate environmental impacts to the maximum extent practicable (301 CMR 11.01), the Policy requires that GHG impacts of projects have been carefully considered and that all feasible means and measures to reduce those impacts are adopted. The Policy requires that all projects that are subject to preparation of an EIR quantify GHG emissions, evaluate measures that could reduce GHG emissions and quantify potential reductions of mitigation measures. This is a case-by-case inquiry that allows project proponents to select mitigation measures that are determined to be feasible for the particular project being proposed, thereby providing project proponents with maximum flexibility to design their projects.

The Policy includes a *de minimis* exception for projects that have little or no GHG emissions. The EENF indicates that his project should be exempt from the GHG analysis and indicates that the pipeline will not produce GHG emissions; however, it does not address methane emissions associated with transmission facilities and infrastructure, including natural gas leaks from pipelines. Natural gas is composed of methane which is a potent GHG. Although these emission sources may be relatively small compared to lifecycle emissions associated with the production and transmission of natural gas, they may be significant when considered in the context of Massachusetts GHG inventory.

The DEIR should include a GHG analysis that quantifies potential emissions, identifies measures to avoid, minimize and mitigate emissions and quantifies potential reductions. The DEIR should identify how the project is designed to avoid and minimize natural gas leakage during transmission and evaluate reductions associated with proposed measures. It should identify sources of GHG emissions associated with commissioning, operation and maintenance of the pipeline, including leaks, describe measures to be implemented to minimize or eliminate emissions from these sources and, to the extent feasible, quantify potential reductions. In addition, it should consider measures to reduce emissions during the construction period, such as reducing idling of construction equipment or using alternative fuels to power construction vehicles.

The DEIR should indicate whether the Proponent participates or will participate in the EPA Natural Gas STAR Program and identify which measures identified through this program may be applicable to the transmission lines. In addition, I note that legislation (H. 4164, An Act Relative to Natural Gas Leaks) was recently passed that establishes a natural gas leak classification standard and requirements for repair and reporting. The DEIR should include a discussion of the applicability of this legislation to the project and how the project will comply with it.

The Proponent should refer to the GHG Policy for general guidance; however, because this project is distinct from those typically reviewed under the Policy (e.g. residential or commercial buildings), I encourage the Proponent to consult with the MEPA Office and the Department of Energy Resources regarding the development of the GHG analysis prior to submission of the DEIR.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Construction

The DEIR should include additional information regarding construction activities and impacts, including blasting and gasification of the system. It should describe the gasification process and identify any associated impacts, including fugitive emissions and odor. The EENF states that blasting is not expected to be necessary during construction; however, comments from DCR and others suggest that bedrock is widespread in the project area. In addition, review of the USDA-NRCS Web Soil Survey rates portions of the area in or near the pipeline route as "very limited" for shallow excavations due in part to unfavorable depth to hard bedrock. The EENF documents the presence of Lyman-Tunbridge association (map unit 904E) and Tunbridge-Lyman association (map unit 909C), which are both characterized by a depth to bedrock within the six-foot depth of the pipeline trench. The DEIR should review existing data on bedrock and other subsurface conditions that may require blasting to confirm whether these conditions are found where pipeline trenching is to occur. Field verification of bedrock conditions should be performed to help interpret the USDA-NRCS Web Soil Survey results so that potential blasting impacts to residences, DCR land and wetlands can be assessed. The DEIR should describe the nature of blasting impacts in general as compared to typical pipeline construction impacts documented in the EENF. If possible, the DEIR should identify areas of DCR property, wetlands, and water bodies that may be affected by blasting and quantify these impacts based on field verification of the location of hard subsurface conditions.

The use of perchlorate-containing explosives should be avoided to prevent potential contamination of surface water or groundwater. The DEIR should describe how groundwater and surface water will be protected from potential contaminants. MassDEP has developed recommendations for the use of explosives. The document titled "Potential Environmental Contamination from the Use of Perchlorate-Containing Explosive Products" may be found at: http://www.mass.gov/eea/agencies/massdep/cleanup/regulations/contamination-perchlorate-containing-explosive-products.html.

The DEIR should provide additional detail regarding construction activities at the Tyringham staging area, including measures to avoid impacts to wetlands and rare species habitat, and the installation of appurtenances. The DEIR should identify any special measures that may be necessary to transport pipe joints, such as road widening or clearing of trees or structures adjacent to roads.

The project must comply with MassDEP's Solid Waste and Air Pollution Control regulations, pursuant to M.G.L. c.40, s.54. I strongly encourage the Proponent to incorporate construction and demolition (C&D) recycling activities as a sustainable measure for the project. The DEIR should provide more information regarding the project's generation, handling, recycling, and disposal of construction and demolition debris. The DEIR should quantify and characterize the material to be generated and define waste management goals to be implemented by the contractors constructing the project. The DEIR should discuss how these materials are to be managed during building demolition and how and where they may be reused. The DEIR should discuss the solid waste and air quality regulatory requirements raised in MassDEP's comment letter. As recommended by MassDEP, the DEIR should also discuss the project's

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

waste management and diversion goals that will be specified to contractors engaged on this project.

The DEIR should describe the project's commitment to MassDEP's Clean Air Construction initiative. The DEIR should confirm that the project will require its construction contractors to use Ultra Low Sulfur Diesel fuel, and should include this as a mitigation measure in the Section 61 findings. The DEIR should address how the project will ensure compliance with the Massachusetts Idling regulation at 310 CMR 7.11.

Mitigation

The DEIR should include a separate chapter summarizing proposed mitigation measures. This chapter should also include draft Section 61 Findings for each State Agency that will issue permits or transfer land for the project. The DEIR should contain clear commitments to implement mitigation measures, estimate the individual costs of each proposed measure, identify the parties responsible for implementation, and contain a schedule for implementation.

In order to ensure that all GHG emissions reduction measures adopted by the Proponent as the Preferred Alternative are actually constructed or performed by the Proponent, the Secretary requires proponents to provide a self-certification to the MEPA Office indicating that all of the required mitigation measures, or their equivalent, have been completed. The commitment to provide this self-certification in the manner outlined above should be incorporated into the draft Section 61 Findings included in the DEIR.

Responses to Comments/Circulation

The DEIR should contain a copy of this Certificate and a copy of each comment letter received. In order to ensure that the issues raised by commenters are addressed, the DEIR should include direct responses to comments to the extent that they are within MEPA jurisdiction. This directive is not intended to, and shall not be construed to, enlarge the scope of the DEIR beyond what has been expressly identified in this certificate. I recommend that the Proponent use either an indexed response to comments format, or a direct narrative response.

In accordance with Section 11.16 of the MEPA Regulations and as modified by this Certificate, the Proponent should circulate a hard copy of the DEIR to each State and Town Agency from which the Proponent will seek permits. The Proponent must circulate a copy of the DEIR to all other parties that submitted individual written comments. Per 301 CMR 11.16(5), the Proponent may circulate copies of the DEIR to these other parties in CD-ROM format or by directing commenters to a project website address. However, the Proponent should make available a reasonable number of hard copies to accommodate those without convenient access to a computer and distribute these upon request on a first-come, first-served basis. The Proponent should send correspondence accompanying the CD-ROM or website address indicating that hard copies are available upon request, noting relevant comment deadlines, and

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

appropriate addresses for submission of comments. A CD-ROM copy of the filing should also be provided to the MEPA Office. Copies of the DEIR should be made available for review at the Agawam, Sandisfield, and Tyringham Public Libraries.

July 11, 2014
Date

Maeve Vallely Bartlett

Comments received:

06/26/2014	Board of Underwater Archaeological Resources (BUAR)
06/26/2014	Berkshire Regional Planning Commission
06/26/2014	Massachusetts Department of Environmental Protection (MassDEP)/Western Regional Office (WERO)
06/26/2014	Massachusetts Department of Fish and Game (DFG)/Natural Heritage and Endangered Species Program (NHESP) and Division of Fisheries & Wildlife (DFW)
07/01/2014	Sandisfield Board of Selectmen
07/01/2014	Sandisfield Taxpayers Opposing the Pipeline (S.T.O.P.) and 101 co-signers
07/01/2014	MassAudubon
07/02/2014	Berkshire Environmental Action Team
07/02/2014	Thelma Esteves
07/02/2014	Pioneer Valley Planning Commission
07/03/2014	Department of Conservation and Recreation (DCR)

MVB/AJS/ajs

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1.0 EXECUTIVE SUMMARY

1.1 INTRODUCTION

This Draft Environmental Impact Report ("DEIR") concerns the Connecticut Expansion Project (the "Project") natural gas pipeline proposed by Tennessee Gas Pipeline Company, L.L.C. ("Tennessee" or "TGP"), an indirect, wholly-owned subsidiary of Kinder Morgan, Inc.

The Massachusetts portion of the Project includes 3.81 miles of new 36-inch outside diameter ("OD") pipeline, co-located within or directly adjacent to TGP's existing natural gas pipeline "200 Line" right-of-way ("ROW") in Sandisfield, Massachusetts, and 0.11 mile of 24-inch OD pipeline co-located within or directly adjacent to TGP's "300 Line" ROW in Agawam, Massachusetts, as well as modifications at an existing compressor station in Agawam, Massachusetts and related appurtenant facilities. Upon completion, the Project will increase delivery capability to the New York, Connecticut and southern Massachusetts service area by approximately 72,100 dekatherms ("Dth") per day through the expansion of the existing pipeline system.

Tennessee initiated Massachusetts Environmental Policy Act ("MEPA") review by filing an Expanded Environmental Notification Form ("EENF") on May 15, 2014. After considering public comments, the Secretary of the Executive Office of Energy and Environmental Affairs (Secretary of "EEA") issued an EENF Certificate dated July 11, 2014 requiring Tennessee to proceed with the filing of a DEIR and a Final EIR ("FEIR"). A copy of the EENF Certificate is provided before this section. The EENF Certificate identified and scoped the information that needed to be addressed in the DEIR, including a more detailed Project description, alternatives to the Project, traffic and construction impacts, mitigation measures, Conservation lands/Article 97, Greenhouse Gas Emissions Policy ("GHG Policy"), soils and bedrock, wetlands, and regulatory compliance.

1.1.1 Purpose and Need

Tennessee, a major supplier of natural gas to utilities, local distribution companies, and power generators in the northeast U.S., plans to construct, install, and operate the Project to increase its interstate natural gas pipeline transportation capacity in order to provide additional firm natural gas transportation service into northeast markets for three Project shippers. The Project involves the construction, installation, and operation of three pipeline looping segments (including the pipeline facilities in Massachusetts described above), minor modifications at one existing compressor station in Agawam, Massachusetts, and appurtenant work, including one new mainline valve ("MLV"), minor tie-in piping, and relocating certain pigging facilities.[1] This DEIR covers the Project facilities that are located within Massachusetts.

Tennessee has signed binding, long-term precedent agreements with three shippers, Connecticut Natural Gas Corporation, The Southern Connecticut Gas Company, and Yankee Gas Services Company, for all of the incremental firm transportation capacity, 72,100 dekatherms per day ("Dth per day") that will result from the Project, which demonstrates the immediate need for all of the Project capacity. In order to meet the Project shippers' demand for transportation service as evidenced by the executed precedent agreements,

[1] "Pig" is an industry specific term for an internal pipeline tool that is used to inspect and/or clean a pipeline.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Tennessee proposes to construct the Project facilities, including the facilities in Massachusetts. By constructing and installing the Project facilities, and using certain existing transportation capacity on the Tennessee system that has been reserved for the Project, Tennessee will be able to transport the increased natural gas volumes through its existing 200 Line and 300 Line systems for delivery to the Project shippers. This Project and its in-service date of November 1, 2016 are fully supported by the shippers committed to the Project's transportation capacity.

The Project facilities will be constructed predominantly along an existing Tennessee pipeline corridor and within the fenceline of Tennessee's existing Agawam Compressor Station (also referred to as "Station 261"). The proposed method of providing the new incremental capacity through the construction of pipeline loops within and directly adjacent to existing ROWs for existing pipelines, modifications within the fenceline at one existing compressor station, and existing transportation capacity that has been reserved for use by the Project is an efficient use of existing pipeline infrastructure and previously-impacted resources, allowing Tennessee to avoid and minimize adverse environmental impacts from the Project to the greatest extent practicable. Tennessee intends to keep the acquisition of new permanent easements to a minimum, with the new permanent easements located directly adjacent to existing ROWs.

Tennessee, an interstate natural gas pipeline company subject to the Federal Energy Regulatory Commission's ("Commission") jurisdiction under the Natural Gas Act, 15 U.S.C. § 717, et seq. ("NGA"), submitted to the Commission an application, pursuant to Section 7(c) of the NGA, 15 U.S.C. § 717f(c) and the Commission's regulations, 18 C.F.R. §§ 157.5 et seq. (2014), seeking issuance of a Certificate of Public Convenience and Necessity ("Certificate") for the Project in Docket No. CP14-529-000 on July 31, 2014.[2] As discussed in the certificate application, Tennessee believes that the Project is fully consistent with the public convenience and necessity standard of Section 7(c) of the NGA and with the Commission's Statement of Policy on the Certification of New Interstate Natural Gas Facilities, 88 FERC ¶ 61,227 (1999); order clarifying Statement of Policy, 90 FERC ¶ 61,128 (2000); order further clarifying Statement of Policy, 92 FERC ¶ 61,094 (2000) ("Policy Statement"). To demonstrate market support for the proposed Project, Tennessee submitted as part of the certificate application the firm, long-term precedent agreements with the three Project shippers for all of the transportation capacity to be created by the Project. In the Policy Statement, the Commission recognized that if an applicant for a certificate of public convenience and necessity for new interstate pipeline facilities has precedent agreements for most of the new capacity, then that would be strong evidence of market demand and public benefits which would outweigh the limited need to obtain new ROWs for pipeline facilities (Policy Statement, 88 FERC ¶ 61,227 at 61,749). The executed precedent agreements with the Project shippers, for 100 percent of the Project capacity provide evidence of the market demand for the Project. As Tennessee discussed in more detail in the certificate application filed with the Commission, Tennessee believes that the public benefits of the Project far outweigh any potential adverse effects. Tennessee also noted in its certificate application that the Project is not related to or contingent upon any other potential projects or expansions that may be proposed by Tennessee in the Commonwealth of Massachusetts. Please see Section IX, Public Convenience and Necessity, of the certificate application filed by Tennessee with the Commission for further discussion of the purpose and need for the Project.

[2] The Commission, among other things, is responsible for authorizing the siting and construction of interstate natural gas pipeline facilities.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Construction of the Project will help to alleviate the natural gas pipeline constraints in the northeast United States[3] by increasing pipeline capacity in these high-demand markets. Multiple studies have concluded that additional pipeline infrastructure is needed in the region to serve increasing demand from LDCs and the power sector.[4]

The northeast, including Massachusetts and Connecticut, has the "highest natural gas prices" and price volatility in the United States because of a significant lack of pipeline capacity. The rise in natural gas prices experienced in the New England region over the past two winters "suggest a natural gas delivery system that is stretched significantly" and is inadequate to meet the growing demand in the New England region, gas prices in New England are the highest in the United States.[5]

High energy prices put significant strain on both businesses and residential consumers throughout New England. ISO New England has stated that "[u]ntil new infrastructure alleviates these pipeline constraints, prices for natural gas and wholesale electricity are likely to remain volatile." The lack of natural gas supply to New England's power generation plants is exacerbated by the recent closings of the Salem Harbor coal-powered plant and the Mt. Tom coal-powered plant in June 2014, and the expected closure of the Somerset Brayton Point coal-powered plant in 2017.

The weather conditions and price spikes for natural gas during the winter of 2013-2014 clearly demonstrate the need for increased reliable natural gas transportation capacity within the service area of the Project. Tennessee has evaluated alternative routes to serve the increased demand for the area served by the existing pipeline network, and is proposing pipeline routing and facilities, as well as use of existing reserved capacity, that minimize impacts to the environment and has made every effort to co-locate the proposed work within the existing ROW where practicable. The alternatives that Tennessee considered are discussed in more detail in Section 3.0 of this DEIR.

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[3] Existing interstate natural gas pipeline systems in the Project area are at or near capacity. The U.S. Energy Information Administration, in a 2013 report, noted that key natural gas pipelines from supply areas to New England are full or nearly full. The report stated that the Algonquin Gas Transmission system and Tennessee's system transport most of the natural gas into the New England market and that both systems have been constrained. See Short-Term Energy Outlook Supplement: Constraints in New England likely to affect regional energy prices this winter, U.S. Energy Information Administration, January 18, 2013, available at http://www.eia.gov/forecasts/steo/special/pdf/2013_sp_01.pdf; see also Gas-Fired Power Generation in Eastern New York and its Impact on New England's Gas Supplies, ICF International, dated November 18, 2013, p. 2; Seizing the Historic Opportunity to Cut New England Energy Costs by Eliminating Gas Pipeline Bottlenecks, Anthony W. Buxton, Industrial Energy Consumer Group, p. 4.

[4] Current natural gas transportation infrastructure is inadequate to meet the growing demand in the New England region. *See*, e.g., U.S. Dept. of Energy, Quadrennial Energy Review Meeting, Statement of Gordon van Welie, President and Chief Executive Officer of ISO New England, at pp. 4-5 (Apr. 21, 2014), available at www.iso-ne.com/pubs/pubcomm/pres_spchs/2014/van_welie_statement_4-21-14.pdf; U.S. Dept. of Energy, Energy Information Administration, High Prices Show Stresses in New England Natural Gas Delivery System at 1 (Feb. 7, 2014), available at www.eia.gov/naturalgas/issuesandtrends/deliverysystem/2013/pdf/newengland_natgas.pdf. *Id.* at 8; *see also* U.S. Dept. of Energy, Energy Information Administration, Natural Gas Explained: Natural Gas Prices (Jun. 29, 2010), available at www.eia.gov/energyexplained/index.cfm?page=natural_gas_prices.

[5] *See* ISO New England, *2013 Wholesale Electricity Prices in New England Rose on Higher Natural Gas Prices: Pipeline Constraints and Higher Demand Pushed Up Prices for Both Natural Gas and Power* at 1 (Mar. 18, 2014), available at http://www.iso-ne.com/nwsiss/pr/2014/2013_price%20release_03182014_final.pdf.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

1.2 SUMMARY OF PROJECT DESCRIPTION

The pipeline loop in Sandisfield, Massachusetts consists of approximately 3.81 miles of new 36-inch OD pipeline co-located within or directly adjacent to Tennessee's existing 24-inch 200-1 Line and 30-inch 200-2 Line ROW (referred to as the "Massachusetts Loop"). The loop segment commences near Tennessee's existing MLV 258 and extends 3.81 miles southeast to the terminus of the loop. The proposed pipeline is designed for a Maximum Allowable Operating Pressure ("MAOP") of 880 psig and will be constructed of carbon steel. An existing pig receiver at milepost ("MP") 0.0 will be relocated to the terminus point of the newly extended pipeline looping segment to allow for tie-in back to the existing 24-inch 200-1 Line and 30-inch 200-2 Line. A new pig receiver will also be installed at this location. Crossover piping will be installed at the upstream mainline valve.

The pipeline loop in Agawam, Massachusetts and Suffield and East Granby, Connecticut consists of approximately 8.10 miles of new 24-inch OD pipeline co-located within or directly adjacent to Tennessee's existing 16-inch 300-1 Line ROW, with the exception of one segment of Horizontal Directional Drill ("HDD") of approximately 1,000 feet, from MP 7.86-8.05, at the end of the loop (the entire loop is referred to as the "Connecticut Loop"). The loop segment commences in the yard of Station 261 and extends approximately 8.10 miles southward to the East Granby Meter Station, at the terminus of the loop. Approximately 580 feet of this loop is located within Agawam, Massachusetts. The proposed pipeline is designed for a MAOP of 800 psig and will be constructed of carbon steel. Two new bi-directional pig launcher/receivers, with valves, will be installed, one at the starting point within Tennessee's existing Station 261 and one at the terminus point within Tennessee's existing East Granby Meter Station, located in East Granby, Connecticut. The new 24-inch pipeline loop segment will tie into Tennessee's existing 300-1 Line.

The pipeline loop segments will be located within, or directly adjacent to, Tennessee's existing permanent ROW in Sandisfield and Agawam, Massachusetts. Additional permanent ROW will be required, along with temporary workspace ("TWS"), and additional temporary workspace ("ATWS") to facilitate construction of the pipeline. The routing for the pipeline loop was designed to maximize use of the existing ROW, avoid and minimize impacts to the environment, avoid residential development, and minimize the number of affected landowners.

A summary of the proposed Project's pipeline facilities, including pipe diameters, approximate length, and MPs is provided in Table 1-1. Appendix A contains United States Geological Survey ("USGS") topographical maps and Project Alignment Sheets are provided in Appendix B, providing a graphical overview of the Project.

Appurtenant facilities associated with the Project will include two pig launchers, one pig receiver and one relocated mainline valve. For the Massachusetts Loop, one existing pig receiver will be relocated and one new pig receiver valve will be installed. For the Connecticut Loop, one new MLV assembly will be installed at MP 4.15, as well as two new bi-directional pig launchers/receivers and pig receiver (one at the beginning within the fence line of Station 261 and one at the terminus of the Connecticut Loop). At Station 261, in addition to the new bi-directional pig launcher/receiver, Tennessee will also install miscellaneous station piping, valves, fittings, and an insertion meter. Each of the appurtenant facilities (pig launchers and receivers, and MLV) will have an associated blowdown valve. Tennessee is proposing to relocate the existing valve site, located off of Town Hill Road, to the terminus at MP 3.81 in order to avoid and minimize impacts to state lands and place the valve site on private property at the terminus of the loop. All appurtenant facilities will be constructed within the proposed workspace, and within the pipeline ROW and

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

will not require additional impacts. The pig launcher/receivers will be designed in accordance with 49 CFR Part 192 (U.S. Department of Transportation ["USDOT"] regulations),[6] Kinder Morgan specifications and standards for pipeline launcher and receiver assemblies, and other applicable safety and environmental regulations. The pig launcher/receivers also will be designed with dimensions adequate to accommodate PII MagneScan, TranScan, or other in-line inspection tools. Tennessee will utilize state of the art techniques to construct the aboveground facilities, and work will be conducted in accordance with the Commission's Upland Erosion Control, Revegetation and Maintenance Plan ("Plan", May 2013 version) and the Commission's Wetland and Waterbody Construction and Mitigation Procedures ("Procedures", May 2013 version) (Appendix E) and Tennessee's Construction Best Management Practices ("BMP's) (Appendix E) to avoid and minimize any impacts.

Pipeyards and contractor yards will be required to facilitate construction of the Project. Locations in the vicinity of the proposed pipeline loops have been identified for potential use as pipeyards and contractor yards during construction of the Project. Tennessee has identified the approximate acreage necessary for use as staging areas and pipeyards for each of the pipeline loops, and has included these acreages in the overall land requirements for the Project. These areas will be used for equipment, pipe, and material storage, as well as temporary field offices and pipe preparation/field assembly areas. Final site selection and acquisition will continue throughout the planning and permitting stages of the Project, however avoiding sensitive environmental resources is the number one site selection criteria. Currently one pipeyard has been identified for use in Tyringham and a portion of a second pipeyard is located in Agawam. Tennessee will advise all contractors that they shall not establish a staging or warehouse yard for this Project without prior review and approval by Tennessee. Tennessee will be responsible for the final location of all areas to be used during construction and will avoid impacts to wetlands and other sensitive receptors for locating pipeyards.

TABLE 1-1
PROPOSED PIPELINE FACILITIES OF THE CONNECTICUT EXPANSION PROJECT

Facility ID	Outside Diameter	Milepost		Length (miles)	Town	County	State
		Begin	End				
Massachusetts Loop	36-inch	0	3.81	3.81	Sandisfield	Berkshire	MA
Massachusetts Loop Total				**3.81**	-	-	-
Connecticut Loop (portion in Massachusetts)	24-inch	0	0.11	0.11	Agawam	Hampden	MA
Connecticut Loop in Massachusetts Total				**0.11**	-	-	-
TOTAL IN MASSACHUSETTS				**3.92**	-	-	-

[6] In addition to the Commission's NGA jurisdiction, Tennessee is also subject to the exclusive federal jurisdiction of the USDOT, pursuant to the Natural Gas Pipeline Safety Act of 1968. The USDOT's Pipeline and Hazardous Material Safety Administration ("PHMSA"), acting through the Office of Pipeline Safety ("OPS"), administers the USDOT's natural gas regulatory program to assure the safe transportation of natural gas by pipeline. The OPS is responsible for governing design, construction (integrity of the pipeline structure itself), inspection, testing, operation, and maintenance of interstate pipelines. As with the Commission, the OPS retains jurisdiction over an interstate natural gas pipeline facility for the entirety of the lifetime of such a pipeline.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

1.3 SUMMARY OF ALTERNATIVES

Tennessee undertook a needs and alternative routing analysis for the Project. Tennessee's primary objective in performing this analysis was to develop a project that would accomplish Tennessee's objective to meet the current market demand for natural gas transportation service, as evidenced by the executed, long-term precedent agreements with the Project shippers for all of the transportation capacity to be created by the Project, while avoiding and minimizing potential adverse environmental impacts to the greatest extent practicable. As discussed below, Tennessee evaluated pipeline routing options based on regional topography, sensitive environmental receptors, population density, existing land usage, construction safety and feasibility considerations. Tennessee also considered route alternatives as directed in the Secretary's certificate and 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 (2014). Tennessee specifically evaluated two additional alternatives and a roadway alternative to avoid and minimize the crossing of Massachusetts Department of Recreation and Conservation ("DCR") property. A detailed description of the alternatives analysis and routing alignments is located in Section 3.0.

1.4 CHANGES SINCE THE EENF FILING

The EENF was filed on May 15, 2014 and posted in the Environmental Monitor on May 21, 2014. The Project team has evaluated the Project as it relates to the EENF Certificate, public comments, landowner concerns, sensitive environmental resources, constructability, and conducted a site visit in preparation of the DEIR. Project changes included in this DEIR include:

- Expansion of the pipeyard in Tyringham, Massachusetts (Section 2.2.2.3);
- Identification of a portion of a pipeyard in Agawam, Massachusetts (Section 2.2.2.3);
- Evaluation of additional routing alternatives (Section 3);
- In addition to ROW mitigation and mitigation associated with normal construction permitting activities, a proposed mitigation plan for temporary and permanent impacts to Article 97 lands (Section 6);
- Access road status changing from temporary to permanent (three permanent access roads now proposed for the Project in Massachusetts) (Section 2.2.2.4); and,
- Modification of Project workspace to avoid impacts to potential vernal pool habitat (Sections 4.1.2, 5.1.1.5, and 6.1.2).

The Project changes listed above have been captured in the impact calculations, minimization and mitigation, and overall discussion for the Project in this DEIR. Additional information can be found in the corresponding sections below.

1.5 SUMMARY OF IMPACTS

The proposed Project is predominantly sited within and directly adjacent to existing ROWs, resulting in the least damaging impacts to the environment. When compared to alternative new or greenfield ROW routing options, which would have significant impacts to sensitive resources and other routing alternatives, we believe that the proposed Project avoids and minimizes environmental impacts, while meeting the overall Project purpose. Additionally, effects to wetlands and waterbodies have been avoided and minimized by locating structures, access roads and staging areas outside of resource areas to the maximum extent practicable. The Project will not traverse any watercourses that are designated as navigable or otherwise

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

subject to jurisdiction under Section 10 of the Rivers and Harbors Act of 1899, or that are designated as a National Wild and Scenic River under the National Wild and Scenic Rivers Act (16 U.S.C. 1271-1287). Unavoidable, temporary impacts from construction activities will occur to jurisdictional wetlands under the Massachusetts Wetlands Protection Act and implementing regulations (310 CMR 10.00) and Waters of the United States (i.e., those regulated under Sections 401 and 404 of the Federal Clean Water Act ("CWA") – 33 U.S.C. § 1341 and 33 U.S.C. § 1344), and wetlands and streams will be restored following construction with replanting affected areas and mitigation will be provided for these temporary impacts. Proposed pipeyards and appurtenant facilities (including pig launchers/receivers and mainline valves) will completely avoid impacts to wetlands and other sensitive environmental resource areas. Construction techniques will also be employed to ensure that appropriate BMPs will be implemented to control sediments and to prevent the disturbance of adjacent areas and any sensitive receptors.

The temporary construction impacts will include soil disturbance, temporary alteration of hydrology and loss of vegetation during the construction period. Upon completion of construction, topsoil, contour elevations and hydrologic patterns will be restored in all wetland areas, and all disturbed areas will be stabilized by reseeding or replanting to promote the re-establishment of native hydrophytic vegetation and substantial restoration of applicable wetland functions. All TWS and ATWS areas will be restored to pre-construction grades and contours, and reseeded and/or replanted during restoration activities.

Construction of the Project pipeline facilities will temporarily alter approximately 10.23 acres of Bordering Vegetated Wetlands ("BVW") wetlands in Massachusetts (9.64 acres of temporary impacts in Sandisfield and 0.59 acres of temporary impacts in Agawam). A total of 2.24 acres of BVW will be permanently impacted; of these wetlands, 2.21 acres of palustrine forested wetland ("PFO") and 0.03 acres of scrub-shrub wetlands ("PSS") will be converted to emergent or low scrub-shrub vegetated cover type after construction of the pipeline. The Project will result in the filling of 0.11 acres (4,792 square feet) of wetland and these impacts will be mitigated by providing wetland replication areas for these impacts. Table 1-2 below presents the impacts anticipated to wetlands in Massachusetts as a result of the proposed Project. No certified vernal pools will be impacted by the Project.

TABLE 1-2
SUMMARY OF TEMPORARY AND PERMANENT WETLAND IMPACTS BY MUNICIPALITY FOR MASSACHUSETTS

	Pipeline Impacts (acres)		Pipeyard / Contractor Yard Impacts (acres)		Wetland Tree Removal (acres)[1,2]		Access Roads in Wetlands (acres)		Non-Wetland Tree Removal (acres)[3]	
Municipality	**Temporary**	**Permanent[1]**	**Temporary**	**Permanent**	**Temporary**	**Permanent**	**Temporary**	**Permanent[5]**	**Temporary**	**Permanent**
Agawam	0.59	0.13	0.00	0.00	0.32	0.13	0.00	0.00	0.36	0.14
Sandisfield	9.64	2.11	0.00	0.00	5.99	2.08	0.11	0.11	37.26	8.75
Tyringham	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total[4]	**10.23**	**2.24**	**0.00**	**0.00**	**6.31**	**2.21**	**0.11**	**0.11**	**37.62**	**8.89**

Note: Impact areas are of federal wetlands and do not include impacts to the state-regulated upland review areas, buffer areas, Riverfront Area, or floodplains.

[1] - These impacts include numbers of acres converted from forested wetland to scrub-shrub or emergent wetland and from scrub-shrub to emergent during operation of the pipeline.

[2] - These impacts represent the number of acres of wetland forest impacted during construction and operation. These wetland forest impacts are a total of all Project facilities (pipeline, access roads, pipeyards) constructed and operated as part of the Project.

[3] - These impacts represent numbers of acres of secondary upland impacts due to vegetation removal.

[4] - Minor apparent discrepancies between totals and sums of individual impacts are a result of rounding.

[5] -These impacts represent the only permanent fills proposed for the Project.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

1.6 SUMMARY OF MITIGATION MEASURES

To avoid and mitigate any minor localized and temporary impacts on air quality, noise, and traffic during the construction process, construction equipment will be required to use appropriate air and noise abatement measures. Construction operations near sensitive receptors will be timed to occur at hours when the receptors are least likely to be affected. Impacts from disturbed soils will be mitigated by minimizing the amount of soils disturbed, and the design and implementation of the Stormwater Pollution Prevention Plan ("SWPPP") to avoid impacts and control sediments within the construction areas. Pre-filing consultations and meetings with Natural Heritage & Endangered Species Program ("NHESP") personnel have indicated that a "take" of threatened and endangered species can be avoided by Tennessee given the proposed mitigation measures for each species; copies of all consultations are provided in Appendix C.

In developing and preparing the wetland mitigation strategy for the Project, Tennessee considered the 2010 United States Army Corps of Engineers New England District ("USACE") Compensatory Mitigation Guidance document as well as In-Lieu Fee Programs ("ILFP") offered by USACE and Massachusetts Department of Fish and Game ("MADFG"). These programs/guidelines incorporate both the 2008 federal Compensatory Mitigation for Losses of Aquatic Resources; Final Rule (4/10/08; 33 CFR Parts 325 and 332 ("Mitigation Rule")) and the USACE Regulatory Guidance Letter 08-03: Minimum Monitoring Requirements for Compensatory Mitigation Projects Involving the Restoration, Establishment, and/or Enhancement of Aquatic Resources. Wetland mitigation/replication requirements under the Commonwealth of Massachusetts wetland regulatory programs (both Section 401 and the Wetlands Protection Act, (310 CMR 10.00) are also being incorporated into the wetland mitigation strategy.

In designing and providing compensatory mitigation, Tennessee's overall goal for the Project is to provide for no net loss of existing wetland functional values and statutory interests within the affected areas through the preservation, restoration, enhancement, and/or creation of wetlands. As detailed in the Compensatory Mitigation Guidance, the USACE has developed standard compensatory mitigation ratios to provide a framework for compensatory mitigation. The compensation ratios focus on direct permanent impacts, with additional mitigation required to address temporary fill impacts and secondary impacts, such as conversion of forested wetlands to scrub-shrub or emergent wetlands. Tennessee is committed to working with the Conservation Commissions, USACE, and MADEP to design, permit and implement a wetland mitigation plan that satisfies local, state and federal standards.

As part of the overall compensation package for the unavoidable impacts proposed to wetlands associated with the Project, the following measures are proposed:

- In-Situ restoration and plantings within areas of temporary impacts in the ROW in accordance with state and USACE wetland compensation guidelines and monitoring of restoration success. Tennessee will restore (via regrading, re-vegetating using an appropriate New England seed mix and plantings) 3.60 acres of palustrine emergent ("PEM") wetlands, 6.31 acres of PFO wetlands and 0.32 acres of PSS wetlands.
- Application of the Massachusetts ILFP, administered by the MADFG, provided that the accounting process for this type of project can be developed in an acceptable manner. Application of this mitigation option is considered primarily to address the compensatory mitigation burden for the 2.21 acres of PFO habitat that will be permanently converted to PSS habitat. Mitigation for 0.11 acres of permanent fill within WMA-23 will also be addressed by

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

replication in accordance with 310 CMR 10.55, and can also be addressed via the ILFP should additional compensation be warranted.

- All state wetland resources per 310 CMR 10.00 will be fully compensated in accordance with these regulatory requirements.

Tennessee and the USACE are currently working to develop a compensatory mitigation plan ("CMP") that is acceptable to offset the unavoidable impacts associated with construction of the Project. A copy of the draft CMP that was submitted to the USACE as part of the Section 404 permit application package, see Appendix D. Tennessee is also conferring with MassDEP regarding wetland mitigation requirements pursuant to both the Wetlands Protection Act and Section 401 Water Quality Certification.

Tennessee has met with the DCR to develop a mitigation package for the impacts to DCR property. A mitigation package for impacts to DCR property has not been finalized but is anticipated to include the following:

- Compensation for the new permanent ROW easement, as determined by DCAM;
- Compensation for the construction permit for 17 acres of temporary workspace;
- Forest products to be harvested and delivered to a "yard" for DCR to manage and use;
- Compensation for 6 acres of permanent impacts to Article 97 land, and,
- Mitigation routinely associated with the various permitting processes which would include gated access roads, ATV control, ROW monitoring, and invasive species control and monitoring.

1.7 REQUIRED PERMITS

Tennessee has or will file to obtain the necessary certificate of public convenience and necessity for the Project, as well as other permits, licenses and clearances relating to the placement of the pipeline across or under roads, drainage facilities, waterbodies, wetlands and through any other sites or places that a governmental license or permit may be required. Construction, operation, and maintenance of the Project will be conducted in accordance with applicable federal, state, and local statutes, regulations, and permit requirements. The environmental permits, licenses, approvals, and certificates that have been or will be sought for the Project are identified in Table 1-3. Tennessee and its representatives have consulted federal, state, and local regulatory officials and government agencies regarding this Project. Tennessee will include copies of relevant environmental permits and approvals in all of the construction bid packages and contracts. The contractor will also be required to be familiar with all permits and licenses obtained by Tennessee and will be required to comply with all the requirements related to the construction of the pipeline and related facilities and to the restoration of any areas disturbed by the construction of the pipeline.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

TABLE 1-3
LIST OF POTENTIALLY REQUIRED PERMITS (INCLUDES CONSULTATIONS)

Regulatory Agency	Program & Permit	Status
Federal		
Federal Energy Regulatory Commission	Certificate of Public Convenience and Necessity	Application submitted July 2014
U.S. Army Corps of Engineers (USACE)	Individual Clean Water Act Section 404 Permit	Application submitted July 2014
U.S. Fish & Wildlife Service (USFWS)	Federal Endangered Species Act Review	Consultation initiated in September 2013 and are ongoing
NPDES General Permit for Stormwater Discharges from Construction Activities	US Environmental Protection Agency	Anticipated submittal June 2015
NPDES General Permit for Remediation – Hydrostatic Testing	US Environmental Protection Agency	Anticipated submittal June 2015
Tribal Historic Preservation Offices	Executive Order 13175 – Consultation and Co-ordination with Indian Tribal Governments	Consultations are ongoing
Massachusetts State		
Executive Office of Energy and Environmental Affairs (EOEEA MEPA)	Massachusetts Environmental Policy Act (MEPA) Review	Application submitted May 2014
Massachusetts Department of Conservation and Recreation	Construction Access Permit	Ongoing consultations with DCR
Article 97 for Easements on State Lands; EEA Article 97 Land Disposition Policy	Massachusetts State Legislature and Governor	Ongoing consultations with DCR; Legislation anticipated to be submitted in January 2015
Massachusetts Department of Environmental Protection	Section 401 of the Clean Water Act (314 CMR 9.00); Massachusetts Clean Water Act; Individual Water Quality Certificate; Water Withdrawal Permit; Surface Water Quality Standards (314 CMR 4.00).	Application will be submitted upon completion of the state MEPA process
Natural Heritage and Endangered Species Program, Massachusetts Division of Fish & Wildlife	Massachusetts Endangered Species Act	Consultations initiated September 2013 and are ongoing

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

TABLE 1-3
LIST OF POTENTIALLY REQUIRED PERMITS (INCLUDES CONSULTATIONS)

Massachusetts Historical Commission	So-called "Antiquities Act" Authorization; National Historic Preservation Act of 1966 Authorization	Consultations are ongoing
Local and County		
Agawam Conservation Commission/MADEP	Order of Conditions; Site Plan Review; Earth removal	Anticipated submittal January 2015
Sandisfield Conservation Commission/MADEP	Order of Conditions; Site Plan Review; Earth removal	Anticipated submittal January 2015
Tyringham Conservation Commission/MADEP	Order of Conditions; Site Plan Review; Earth removal	Anticipated submittal January 2015
Local Departments of Public Works	Road Crossing Permits	TBD

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

2.0 PROJECT DESCRIPTION

Tennessee is seeking all necessary certificates and permits for the construction and operation of the Project, in Albany County, New York, Berkshire and Hampden Counties, Massachusetts and Hartford County, Connecticut. As discussed above, the proposed Project involves:

(1) the construction of two sections of new, 36-inch OD pipeline looping segments, totaling 1.35 miles in New York and 3.81 miles in Massachusetts, and one section of new, 24-inch OD pipeline looping totaling 8.10 miles in Massachusetts and Connecticut;

(2) minor modifications at existing Station 261 in Agawam, Massachusetts; and

(3) construction of appurtenant facilities, including a MLV, cathodic protection, and pig launchers and receivers.

To the extent that it is practicable, feasible, and in compliance with existing law, Tennessee is proposing to locate the pipeline looping segments within or directly adjacent to the ROW associated with its existing natural gas pipeline designated as the 200 Line in New York and Massachusetts and 300 Line in Connecticut. Tennessee proposes to begin construction of the Project facilities in the fourth quarter of 2015 and to place the facilities in-service by November 1, 2016 to meet the demands of the winter 2016/2017 season.

2.1 EXISTING SYSTEM FACILITIES

Tennessee's existing pipeline infrastructure consists of approximately 14,000 miles of pipeline designated as the 100, 200, 300, 400, 500, and 800 Lines, based on the region they serve. The proposed Project focuses on the existing 200 and 300 Lines. The 200 Line consists of multiple pipelines varying from 24-inch to 36-inch in diameter beginning at the suction of Compressor Station 200 in Greenup County, Kentucky, and extends east through Ohio, Pennsylvania, New York, Massachusetts, and New England. The 300 Line system consists of a 24-inch and 30-inch diameter pipeline starting at the discharge of Compressor Station 219 in Mercer County, Pennsylvania, traveling east through Pennsylvania, New Jersey, New York, Connecticut and ending as a 16-inch-diameter pipeline at Compressor Station 261 in Hampden County, Massachusetts. In Massachusetts, the Project involves the section of existing 200 Line originating at MLV 258 and extending southeastward; and in Massachusetts and Connecticut, the Project involves the section of the existing 300 Line from the meter station in East Granby, Connecticut upstream to Compressor Station 261 in Hampden County, Massachusetts.

The Project facilities are described geographically in a general west-to-east direction and by category. MP notations are used throughout the DEIR to identify resources and facilities along the proposed pipeline looping segments and are included on the aerial photography maps for ease of identification and location. Tennessee designates project MPs according to existing system MPs which start at MP 0.0 at MLVs. The pipeline looping segments have been assigned geographical designations by Tennessee to provide for identification of each of the different loop segments. The Project facilities are summarized in Table 2-1 below. The existing 200 and 300 Line pipeline will be referred to as the "existing pipeline", "200 Line" or "300 Line", and the proposed pipeline looping segments will be discussed using the assigned geographic

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

designations. For the purposes of this DEIR, only those facilities located in Massachusetts will be discussed and evaluated.

2.2 PROJECT ELEMENTS

2.2.1 Pipeline Looping

The pipeline loop in Sandisfield, Massachusetts, the Massachusetts Loop, consists of approximately 3.81 miles of new 36-inch OD pipeline co-located within or directly adjacent to Tennessee's existing 24-inch 200-1 Line and 30-inch 200-2 Line ROW (Appendix A). The loop segment commences near Tennessee's existing MLV 258 and extends approximately 3.81 miles southeast to the terminus of the loop. The proposed pipeline is designed for an MAOP of 880 psig and will be constructed of carbon steel. An existing pig receiver at MP 0.0 will be relocated to the terminus point of the newly extended pipeline looping segment. This will allow for a tie-in back to the existing 24-inch 200-1 Line and the 30-inch 200-2 Line and a new pig receiver valve will also be installed at this location. Crossover piping will be installed at the upstream mainline valve.

The pipeline loop in Agawam, Massachusetts consists of approximately 0.11 miles of new 24-inch OD pipeline co-located within or adjacent to Tennessee's existing 16-inch 300-1 Line ROW (part of the Connecticut Loop). Two new bi-directional pig launcher/receivers with valves will be installed, one at the starting point within Tennessee's existing Station 261 in Agawam, Massachusetts and one at the terminus point within Tennessee's existing East Granby Meter Station, located in East Granby, Connecticut. The new 24-inch ipeline loop segment will tie into Tennessee's existing 300-1 Line.

A summary of the individual pipeline loops in Massachusetts, as well as the Station 261 facilities discussed in Section 2.2.1.1 below, is provided in Table 2-1 below.

Appendix A to this DEIR provides Project location figures, including Project components in Massachusetts and the pipeline loop alignments on 7.5-minute USGS topographic map excerpts.

TABLE 2-1
PROPOSED FACILITIES OF THE CONNECTICUT EXPANSION PROJECT

Facility ID	Outside Diameter ("OD")	Milepost[a]		Length (miles)	Town	County	State
		Begin	End				
Massachusetts Loop	36-inch	0.00	3.81	3.81	Sandisfield	Berkshire	MA
Massachusetts Loop Total				**3.81**	-	-	-
Connecticut Loop	24-inch	0.00	0.11	0.11	Agawam	Hampden	MA
Connecticut Loop Total				**0.11**	-	-	-

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

TABLE 2-1
PROPOSED FACILITIES OF THE CONNECTICUT EXPANSION PROJECT

Facility ID	Outside Diameter ("OD")	Milepost[a]		Length (miles)	Town	County	State
		Begin	End				
Station 261[b]	N/A	0.00	0.00	0.00	Agawam	Hampden	MA
PROJECT TOTAL				**3.92**	-	-	-

[a] Milepost location is based upon the existing Tennessee facilities.

[b] The pipeline will traverse approximately 30 feet within the Station 261 fence line and is included in the Connecticut Loop length.

2.2.1.1 Station 261 – Agawam, Massachusetts

The minor modifications proposed for Station 261, located in Agawam, Massachusetts, involve the installation of a new bi-directional launcher/receiver, miscellaneous station piping, valves, fittings, and insertion meter to interconnect the new Connecticut Loop with the existing Station 261 station piping. All of the minor modification work at Station 261 will be performed within the existing fence line and result in no additional impacts to sensitive resources.

2.2.1.2 Appurtenant Facilities

As discussed above with respect to each proposed pipeline loop and the Station 261 modifications, the Project includes installation of certain appurtenant facilities. For the Massachusetts Loop, one existing pig receiver will be relocated and one new pig receiver will be installed. A new bi-directional pig launcher/receiver and pig receiver will be installed at the beginning of the Connecticut Loop line within the fence line of Station 261 in Agawam, Massachusetts. At Station 261, in addition to the new bi-directional pig launcher/receiver, Tennessee will also install miscellaneous station piping, valves, fittings, and insertion meter. Table 2-2 provides a summary, by location, of the appurtenant aboveground facilities, including internal inspection facilities (e.g., pig launchers and receivers) associated with the Project. Each of the appurtenant facilities (pig launchers and receivers) will have an associated blowdown valve. These facility locations are depicted on the Project Alignment sheets in Appendix B.

TABLE 2-2
PROPOSED APPURTENANT FACILITIES OF THE CONNECTICUT EXPANSION PROJECT

Facility[a]	Milepost	Approximate Area (acres)	Town	County	State
Pipeline Facility Appurtenances					
Relocate existing pig receiver and install new pig receiver valve	3.81	0.24	Sandisfield	Berkshire	MA

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

TABLE 2-2
PROPOSED APPURTENANT FACILITIES OF THE
CONNECTICUT EXPANSION PROJECT

Facility[a]	Milepost	Approximate Area (acres)	Town	County	State
Station 261					
Bi-directional pig launcher/receiver	0.00	0.06	Agawam	Hampden	MA
PROJECT TOTAL		**0.30**	-	-	-

[a] All proposed appurtenant facilities are new. Land impacts for the appurtenant facilities are included in workspace totals for the pipeline facilities.

To limit environmental and landowner impacts, appurtenant aboveground facilities will be installed within the proposed permanent ROW. The Project has been designed to incorporate appurtenant facilities to accommodate internal inspection of the proposed pipeline loops. For this purpose, as noted above, existing pig launcher/receivers will be relocated and installed at the terminus point of Massachusetts Loop.

The pig launcher/receiver facilities to be installed will consist of items listed below. In addition, the pig launchers/receivers will be installed within Tennessee's ROW and will include gravel bases, site access, chain-link fence enclosures for security purposes, and identification and emergency signage.

The design MAOP of the pig launchers/receivers will be 880 psig, and the facilities will include:

- Launcher/receiver barrel assembly, complete with American Society of Mechanical Engineers (ASME)-stamped quick-opening closures;
- Pig passage indicators;
- Pig launcher/receiver isolation valve complete with actuator and power gas piping;
- Block-valve blowdown assembly;
- Side valve complete with actuator and power-gas piping;
- Barrel blowdown assembly;
- Kicker line/drawdown line;
- Drain lines;
- Associated piping and valves;
- Pipe supports, piers, and clamps;
- Protective coatings for both above/below ground piping;
- Full bore pig launcher/receiver isolation-valves on the mainline; and
- Barred-tees on all branch connections from the mainline.

2.2.1.3 Location Maps, Detailed Route Maps, Plot/Site Plans

The regional location of the Project is shown in this DEIR. Alignment sheets with aerial photography background are provided as full-size drawings in Appendix B.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

2.2.2 Land Requirements

The construction workspace (including TWS, ATWS, permanent ROW, access roads, and contractor/pipeyards) for the Massachusetts portion of the Project will total approximately 70.21 acres. Operation of the Project facilities will require approximately 13.45 acres to be maintained as new permanent ROW or permanent access roads. Table 2-3 includes a summary of Project-related land requirements that will be affected by construction and operation, including access roads and pipeyards. The photo-based alignment sheets in Appendix B depict the location and configuration of all temporary and permanent construction workspace and access roads required for the Project. Typical construction workspace configurations are also provided with the Tennessee BMPSs in Appendix E.

TABLE 2-3
SUMMARY OF LAND REQUIREMENTS FOR THE CONNECTICUT EXPANSION PROJECT PIPELINE LOOPS

Facility[1]	Land Affected During Construction[2] (acres)	Land Affected During Operation[3] (acres)
Massachusetts Loop[4]		
Pipeline Loop	47.13	12.94
Additional Temporary Workspace	10.69	0.00
Access Roads	1.66	0.43
Contractor/Pipeyard	6.76	0.00
Massachusetts Total	**66.25**	**13.37**

[1] Appurtenant facilities are located within the operational ROW of the pipeline and do not contribute additional acres affected.

[2] Land Affected During Construction for the Pipeline Loops includes Land Affected During Operations.

[3] Land Affected During Operation includes only the new permanent ROW that is in addition to the existing easement of Tennessee's existing pipeline and includes the entire width of the permanent ROW. It does not reflect the reduction of workspace in wetlands to 75 feet.

[4] Includes the Massachusetts portion of the Connecticut Loop

The construction work area for the proposed pipeline facilities in Massachusetts including the Massachusetts portion of the Connecticut Loop is estimated at approximately 66.3 acres for the Massachusetts portion of the Project. The construction work area consists of TWS, ATWS, access roads, pipeyards and contractor yards, and new permanent ROW required for the approximately 3.99 miles, including the portion of the Connecticut Loop in Agawam. The additional land required for the post-construction operation of the pipeline (new permanent ROW) is approximately 12.94 acres, with an additional 0.43 acres for permanent access roads. Typically, pipeline construction will require up to 100 feet of workspace for a 24-inch pipeline and 125 feet of workspace for a 36-inch pipeline. The proposed construction ROW widths are based on minimum separation distance between the existing and proposed new pipelines and the guidelines for safe construction of similarly sized pipelines developed by the Interstate Natural Gas Association of America ("INGAA") (INGAA 1999). The proposed standard construction ROW widths allow for safe installation of the pipeline facilities based on the variable topographic terrain and diverse land use types crossed by the Project. Currently, Tennessee does not anticipate the need for the expansion of the

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

construction ROW workspace widths in excess of those currently identified for the Project. However, should the need for ATWS occur due to unforeseen occurrences such as implementing full ROW topsoil segregation outside of currently identified locations, or complications during construction due to unstable terrain, excessive bedrock, soil limitations, or safety concerns, Tennessee will submit additional requests for workspace modifications in compliance with Section IV.A.2 of the Commission's Plan. A detailed discussion of construction and operational (permanent) acreage requirements by land use type is presented in Section 5 of this DEIR.

Vegetation within the permanent ROW will be maintained in an herbaceous state, except in wetlands and adjacent to perennial streams, where maintenance clearing of woody vegetation will be limited. For this Project, a 10-foot wide corridor centered over the pipeline looping segments will be permanently maintained in an herbaceous state and trees within a 30-foot wide corridor centered over the pipeline looping segments that may compromise the integrity of the pipeline coating, will be selectively removed while the remaining temporary and permanent ROW will revert to its pre-construction land use/land cover once construction is complete. Crop production will be allowed to continue in agricultural areas. Typical cross sections for pipeline construction/operation and topsoil segregation are shown in Tennessee's BMPs located in Appendix E.

2.2.2.1 Operation / Permanent Easement

Approximately 12.94 acres of the Project area will be maintained by Tennessee after construction for the operation of the Massachusetts Loop segment and the portion of the Connecticut Loop located in Agawam. Tennessee is seeking to install the new looping segments, wherever possible immediately adjacent to the existing permanent ROW established for Tennessee's existing pipeline facilities. Along the proposed looping segments, Tennessee proposes to acquire additional new permanent ROW due to insufficient space within the existing ROW to co-locate the additional pipeline.

2.2.2.2 Temporary Workspace / Additional Temporary Workspace

Tennessee is proposing TWS and ATWS totaling approximately 46.11 acres along the Massachusetts Loop and the Massachusetts portion of the Connecticut Loop. These areas will not be permanently maintained after construction, but will be returned to landowners for their use or allowed to revegetate naturally after construction and restoration is complete. TWS for the Massachusetts Loop and the Massachusetts portion of the Connecticut Loop will account for 35.42 acres of this total and ATWS will account for the remaining 10.69 acres.

The typical construction ROW width for the Project will be 125 feet for the 36-inch loop section in Massachusetts and 100 feet for the 24-inch loop section in Connecticut and Massachusetts, and will generally consist of 25 feet of existing, permanently maintained ROW associated with the Tennessee's 200 and 300 Line, 25 to 35 feet of new permanent ROW, and 50 to 75 feet of temporary construction workspace. TWS within the majority of wetlands will be limited to avoid and minimize adverse impacts. Vegetation within the entire width of permanent ROW will be maintained in an herbaceous state, except in wetlands and adjacent to perennial streams, where maintenance clearing of woody vegetation will be limited to a 10-foot-wide strip centered directly over the pipeline and clearing of trees will be limited to a 30-foot-wide strip centered directly over the pipeline. Tree clearing and maintenance within the new permanent ROW will result in the permanent conversion of forested upland to open land within upland portions of the new

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

permanent ROW, and the permanent conversion of forested wetland to scrub shrub and emergent wetland where new permanent ROW crosses wetlands. Crop production will continue in agricultural areas; therefore, conversion of crop lands to other land uses is not anticipated. Pipeline ROW workspace configurations and dimensions are indicated on the aerial alignment sheets in Appendix B as well as on the typical ROW configuration drawings in Appendix E.

In addition to the typical 125-foot and 100-foot wide construction ROWs, ATWS will be required to facilitate construction at road, railroad, utility, wetlands, and waterbody crossings and for areas requiring specialized construction techniques, including steep side slopes or bedrock outcrops. The configuration of ATWS areas are based upon site-specific conditions and vary in accordance with the construction methodology and crossing type.

2.2.2.3 Pipe / Equipment Storage Yards and Contractor Yards

Tennessee has identified an approximately 3.50 acre site for use as a staging area and pipeyard for the Massachusetts Loop, and has included this acreage in the overall land requirements for the Project, as detailed in Tables 2-3 and 2-4. In addition, 3.26 acres of the Hickory Street pipeyard, identified for use with the Connecticut Loop will be located in Agawam, Massachusetts. These areas will be used for equipment, pipe, and material storage, as well as pipe preparation/field assembly areas. Site selection and acquisition will continue throughout the planning and permitting stages of the Project. Tennessee will advise all contractors that they shall not establish a staging or warehouse yard for this Project without Tennessee first being advised and the Commission granting permission to use the area; any necessary additional permits or permit modifications required for such instances will also be obtained. Locations of proposed pipeyards and contractor yards are included on the USGS topographic map excerpts included in Appendix A. Limits of the pipeyards are shown for illustration purposes only. Tennessee will locate the final areas to be used during construction and will avoid impacts to wetlands and other sensitive resources from the use of these pipeyards that are located nearby.

2.2.2.4 Access Roads

Although some public roads and the construction ROW will be used for primary access to the pipeline looping segments during construction, non-public access roads have also been identified for potential use during construction of the Project. Tennessee plans to utilize temporary and permanent access roads to facilitate construction and installation of the facilities, and will utilize the permanent access roads for operations and maintenance of the facilities once constructed. Access road travel lanes in straight sections are anticipated to be approximately 20 feet wide, except where required for corners. Access road entrances off of main roads are not anticipated to require additional clearing. All access roads designated for temporary use during construction and permanent use during operation and maintenance are listed in Table 2-5 by MP. Minor improvements are anticipated to allow for passage of construction vehicles on some access roads. Site-specific designs of the access roads proposed for temporary and/or permanent use for the Project, detailing locations for road dimensions, pull-offs, and storm water management facilities will be provided to the applicable regulatory agencies for review and are located in Appendix B. Locations of proposed access roads are also shown on the alignments sheets located in Appendix B.

TABLE 2-4
PROPOSED PIPEYARDS / CONTRACTOR YARDS

Name / Purpose	Approximate Location	Address	Existing Land Use Classification	Size (acres)	Comments
Massachusetts Loop					
Massachusetts Loop Contractor Yard	4.41 miles northeast of pipeline Loop	196 Main Road Tyringham, MA	Agricultural	3.50	Site improvements anticipated are the installation of soil erosion and sediment control devices and the installation of a construction mat base.
			Massachusetts Loop Subtoatal	**3.50**	
Connecticut Loop					
Connecticut Loop Contractor Yard	MP 0.00--.11	Hickory Street	Agriculture	3.26	Site improvements anticipated are the installation of soil erosion and sediment control devices.
			Connecticut Loop Subtotal	**3.26**	
			PROJECT TOTAL	**6.76**	

TABLE 2-5
MASSACHUSETTS ACCESS ROADS ASSOCIATED WITH THE CONNECTICUT EXPANSION PROJECT

Access Road ID	Approx. Milepost[a]	Town	Modification Required	Road Type	Existing Land Use[b]	Approx. Length (feet)	Affected Area (acres)	Justification
MA-1	0.77	Sandis-field	Existing access road that will need to be widened to 20 feet and gravel installed. It will also need the entrance widened to 40 feet for truck access. Gravel to remain, rubber-tired non-tandem vehicles only.	Existing dirt road	OL, UF	231	0.19	Permanent access for operations activities
MA-2	1.37	Sandis-field	Existing access road, light duty pick-up trucks only. No improvements necessary.	Existing dirt road	OL, UF	356	0.27	Temporary access for construction activities
MA-3	1.73	Sandis-field	Existing access road, no improvements necessary. Rubber-tired non-tandem vehicles only.	Existing dirt road	OL, RD, UF	901	0.66	Temporary access for construction activities and hydrostatic test water withdrawal hose location
MA-4	2.73	Sandis-field	Existing access road, no widening add gravel for stability. Gravel to remain, rubber-tired non-tandem vehicles only.	Existing dirt road	OL, RD, UF	181	0.12	Permanent access for operations activities

TABLE 2-5
MASSACHUSETTS ACCESS ROADS ASSOCIATED WITH THE CONNECTICUT EXPANSION PROJECT

Access Road ID	Approx. Milepost[a]	Town	Modification Required	Road Type	Existing Land Use[b]	Approx. Length (feet)	Affected Area (acres)	Justification
MA-5	3.81	Sandis-field	Pre-existing town road that will need to be widened to 20 feet in some areas. The entrance will accommodate truck traffic as is no widening needed. This will be a permanent access road to the relocated receiver.	Pre-existing dirt road	OL, PEM, PSS, WB	708	0.43	Permanent access for construction activities and operational and maintenance activities for pig receiver
						Massuchusetts Loop Subtotal	**1.66**	
						PROJECT TOTAL	**1.66**	

[a] Milepost indicates the point at which the access road connects with the pipeline ROW, or closest Milepost to ROW if there is no direct connection.

[b] AG= Agricultural; CI= Commercial/Industrial; OL= Open Land; PEM= Palustrine Emergent wetland; PFO= Palustrine Forested wetland; PSS= Palustrine scrub-shrub wetland; RD= Roadways; RE= Residential; ROW= Right-of-Way; RR= Railroad; SP= Other (Including Sand/Gravel); UF= Upland Forest; WB= Waterbody.

[c] Access roads MA-2 and MA-3 are temporary and therefore have an area affected by operation of 0.00 acre. MA-1 has an area affected by operation of approximately 0.19 acres, MA-4 has an area affected by operation of approximately 0.12 acres, MA-5 has an area affected by operation of approximately 0.35 acres

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

2.2.2.5 Station 261

Within the existing Station 261 fence line, Tennessee is proposing a TWS area totaling approximately 1.73 acres and 0.08 acres of permanent easement. These numbers are included in the overall assessment of land use and impact estimates in Table 2-3 and throughout this DEIR.

2.3 CONSTRUCTION METHODOLOGY

The Project facilities will be designed, constructed, tested, operated, and maintained to conform with applicable federal, state, and local requirements, including USDOT regulations at 49 CFR Part 192, "Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards" and Commission regulations at 18 CFR Section 380.15, "Siting and Maintenance Requirements". In addition, unless otherwise authorized through a variance granted by the Commission, Tennessee will comply with the Commission's Plan and Procedures (Appendix E), and will also follow Tennessee's Spill Prevention and Response Procedures ("SPRP") (Appendix F), Unanticipated Discovery Plan for cultural resources (Appendix F), Waste Management Plan (Appendix F), and typical construction workspace layout drawings (Appendix E).

In addition to federal, state, and local requirements, the Project facilities will be constructed in accordance with established pipeline practices, BMPs, final engineering plans, Tennessee's specifications and the conditions specified in certificates and permits obtained for the Project. The following subsections describe the land requirements for the development of the Project and the typical procedures that will be used to construct the Project facilities. During actual construction, certain work activities and sequences may vary, based on factors such as site-specific conditions, final Project designs, and the requirements of regulatory approvals.

The construction workspace (including TWS, ATWS, permanent ROW, temporary and permanent access roads, and contractor/pipeyards) for the Project in Massachusetts will total approximately 66.3 acres. Operation of the Project facilities in Massachusetts will require approximately 12.94 acres that will be maintained as new permanent ROW, with an additional 0.43 acres associated with permanent access roads. Of the 66.3 acres, approximately 13.1 acres of temporary impacts will occur within existing permanent easement for Tennessee's existing pipeline. Table 2-3 includes a summary of all Project-related land requirements that will be affected by construction and operation, including access roads and staging areas. The photo-based alignment sheets in Appendix B depict the location and configuration of all temporary and permanent construction workspace and access roads required for the Project. Typical construction workspace configurations are provided in Appendix E.

Typically, pipeline construction will require between 100 to 125 feet of workspace depending on the size of the pipeline to be installed. The varying construction ROW widths for this Project, for the 36-inch Massachusetts Loop in Sandisfield and the 24-inch Connecticut Loop in Agawam are based on guidelines for safe construction of similarly sized pipelines developed by INGAA. The proposed standard construction ROW widths are expected to allow for safe installation of the pipeline facilities based on the variable topographic terrain and diverse land use types crossed by the Project. Currently, Tennessee does not anticipate the need for the expansion of the construction ROW workspace widths in excess of those currently identified for the Project. However, should the need for additional temporary workspace occur, due to unforeseen occurrences such as implementing full ROW topsoil segregation outside of currently

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

identified locations, or complications during construction due to unstable terrain, excessive bedrock, soil limitations, or safety concerns, Tennessee will ensure that additional requests for workspace modifications are performed in compliance with Section IV.A.2 of the Commission's Plan, as well as in accordance with all state and federal regulatory requirements. Pipeline ROW workspace configurations and dimensions are indicated on the aerial alignment sheets in Appendix B and in the Typical Construction Workspace Configurations in Appendix E.

Following construction, vegetation within the permanent ROW will be maintained in an herbaceous state, except in wetlands and adjacent to perennial streams, where maintenance clearing of woody vegetation will be limited. For this Project, a 10-foot wide corridor centered over the pipeline will be permanently maintained in an herbaceous state while the remaining temporary and permanent ROW will revert to its pre-construction land use/land cover once construction is complete. In addition, trees that are located within 15 feet of the pipeline that may compromise the integrity of the pipe coating will be selectively cut and removed from the permanent ROW. Crop production will continue in agricultural areas. Typical cross sections for pipeline construction/operation and topsoil segregation are shown in Appendix E. Approximately 13.1 acres of workspace will occur within previously disturbed and cleared ROW on Tennessee's existing ROW.

Tennessee estimates the construction staff for the Project to include approximately 75-100 workers. Pending receipt of all necessary approvals, Tennessee plans to commence tree felling activities in the winter of 2015/2016 and construction of the Project in the spring of 2016, with all construction anticipated to be completed by the fall of 2016. It is anticipated that one contractor will be used for construction of the Project pipeline looping, Station 261 modifications, and appurtenant facilities. Construction constraints will require that the pipeline installation be performed utilizing numerous crews that will vary in size, on a daily basis depending on location and task. Construction will take place over a period of approximately six months, from initial clearing through ROW restoration. If necessary, landscaping may take an additional two to four weeks to complete beyond the normal final ROW cleanup and restoration.

2.3.1 Pipeline Construction

The general procedures for pipeline construction that will be followed for the Project are described in this section. Tennessee will use conventional techniques for buried pipeline construction and will follow the requirements set forth in the Commission's Plan and Procedures (Appendix E), to ensure safe, stable, and reliable transmission facilities consistent with Commission and USDOT specifications. At a minimum, Tennessee will perform the following procedures:

- Marking the corridor;
- Clearing and grading;
- Trenching;
- Stringing;
- Pipe preparation (bending, welding, X-ray, weld coating and coating repair) and lowering in;
- Backfilling and grade restoration;
- Hydrostatic testing and tie-ins; and
- Cleanup and restoration.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

The above-listed procedures will typically follow in the sequence listed. Areas requiring special construction plans and techniques may include: road or utility crossings, waterbodies and wetlands, unusual topographies such as unstable soils and trench conditions, residential or urban areas, agricultural areas, areas requiring rock removal, and permanent recreation facilities.

2.3.1.1 Marking the Corridor

Land survey crews will mark the centerline of Tennessee's existing 200 and 300 Line pipeline with stakes prior to construction. The centerline will be marked at frequent intervals as well as at known crossings of foreign lines and utilities, at road crossings, and at points of inflection. Additionally, avoidance areas including wetland boundaries, cultural resource sites, and rare species habitat, as applicable, will be marked with appropriate fencing, signage, and/or flagging, based on environmental and archaeology surveys and environmental permit conditions, prior to construction.

2.3.1.2 Erosion and Sediment Control

Temporary soil erosion and sediment control measures will be installed along the proposed construction ROW, ATWS areas, access roads, and other work areas, as applicable, in accordance with the Commission's Plan and Procedures as well as all other applicable permits and approvals. Typically, staked straw bales, silt fence barriers, erosion control tubes or comparable measures are positioned along the limit of wetland boundaries within the construction workspace. To ensure that appropriate erosion and sediment control measures are maintained until the construction workspace is fully stabilized, a full time Environmental Inspector ("EI") will be assigned to the Project and will inspect all disturbed areas of the construction spread(s) (e.g., construction ROW, pipe storage yards, temporary contractor yards) that have not been permanently stabilized in accordance with the following schedule: 1) on a daily basis in areas of active construction; 2) on a weekly basis in areas with no construction or equipment operation; or 3) within 24 hours of the end of a storm event that is 0.5 inch or greater.

2.3.1.3 Clearing, Grading, and Fencing

The construction corridor will be cleared and graded to remove brush, trees, roots, and other obstructions such as large rocks and stumps. Non-woody vegetation may be mowed to ground level. Temporary fences and gates will be installed as needed. No cleared material will be placed within wetland areas.

Tennessee anticipates disposal of trees cleared from the ROW using several different methods. Trees, if suitable, may be taken off-site by the clearing contractor and used for timber, chipped on-site and removed. Chipped material not removed may be spread across the ROW within upland areas in a manner that does not inhibit revegetation. Wood chips will not be left within agricultural lands, wetlands or within 50 feet of wetlands. Also, wood chips will not be stockpiled in a manner that they may be transported into a wetland.

Should individual landowners wish to utilize the trees cleared from the ROW, the timber will be left and will be neatly stacked at the edge of the ROW in areas identified by the EI prior to the commencement of clearing activities and directly accessible to the landowner in accordance with individual landowner agreements. Timber shall only be stacked along the ROW at the specific request of a landowner, under the condition that it is in an already cleared upland area that will be accessible to the landowner without disturbing the restored ROW. Timber not designated for other uses will be disposed of by Tennessee's

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

contractor in accordance with applicable laws and regulations pertaining to timber transport and disposal, as designated by the Lead Environmental Inspector ("LEI") or contract agreement. Timber will not be stacked in drainage ways or left within wetlands. Tennessee does not plan to use timber stacks as wildlife habitat.

Grading activities will be scheduled to minimize the time between initial clearing operations and the actual installation of pipe. Access to the construction corridor will normally be obtained via public roads that intersect the ROW. Permission will be obtained from landowners for the use/upgrade of access roads across their property to the construction corridor. At the request of a landowner, Tennessee shall erect temporary gates along access roads where necessary.

Grading of the construction workspace will allow for the movement of heavy equipment and the safe passage of work crews. Grading will include removing rock outcrops, tree stumps, ridges and topographic irregularities. Generally, machinery will operate on one side of the trench (working side) with excavated materials stockpiled on the other (non-working side).

As appropriate, the clearing and grading operations will incorporate special construction procedures to minimize the amount of vegetation removed from stream banks and slopes, prevent undue disturbance of the soil profile, restore the original contours of the natural ground, and prevent topsoil erosion. To minimize impact to the soil profile on agricultural lands, up to 12 inches of topsoil will be segregated from subsoil during trenching and will remain segregated during construction to avoid loss due to mixing with subsoil material. Tennessee will utilize either full ROW topsoil segregation or ditch plus spoil side topsoil segregation, as requested by the landowner, as required by the applicable USDA National Resource Conservation Service ("NRCS") District, or as appropriate based upon site-specific conditions. Upon the completion of backfilling operations, the topsoil will be properly replaced over the graded area. Grading activities will be scheduled to minimize the time between initial clearing operations and the actual installation of pipe.

2.3.1.4 Trenching

In most areas characterized by normal soils, the trench for the pipeline is excavated by crawler-mounted, rotary wheel-type trenching machines or track-mounted excavators. The trench generally will be approximately 14 inches wider than the diameter of the pipe and of sufficient depth to allow for the minimum cover requirements to the top of the pipe in accordance with USDOT regulations pursuant to the Natural Gas Pipeline Safety Act of 1968. Landowner requests or permitting requirements may dictate greater depth.

Except as depicted on site-specific plans, the depth of cover for the proposed pipeline loops, as well as the depth of cover for other, non-typical conditions, such as horizontal directional drills ("HDD"), will be in accordance with Tennessee's minimum specifications, as set forth in Table 2-6. Scour analysis and potential for external damage may increase these depths. In actively cultivated agricultural lands, Tennessee plans to install the pipeline with 48 inches of cover, except where rock prevents this depth. In these cases, Tennessee's minimum specifications for depth of cover will be used.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

TABLE 2-6
TENNESSEE MINIMUM SPECIFICATIONS FOR
DEPTH OF COVER (INCHES)

Location[a]	Normal Soil	Consolidated Rock
USDOT PHMSA Class 1	36	24
USDOT PHMSA Class 2, 3, and 4	36	24
Land in Agriculture	48	24
Drainage ditches of public roads or railroad crossings	60	24
Navigable river, stream, or harbor	60	24
Minor stream crossings	60	24

[a] As defined by USDOT Pipeline and Hazardous Materials Safety Administration (PHMSA) at 49 CFR 192.5.

Class 1: offshore areas and areas within 220 yards of a pipeline with ≤10 buildings intended for human occupancy.

Class 2: areas within 220 yards of a pipeline with >10 but <46 buildings intended for human occupancy.

Class 3: areas within 220 yards of a pipeline with >46 buildings intended for human occupancy and areas within 100 yards of either a building or a small, well defined outside area (such as a playground, recreation area, outdoor theater, or other place of public assembly) that is occupied by 20 or more persons on at least five days a week for 10 weeks in any 12-month period.

Class 4: areas within 220 yards of a pipeline where buildings with four or more stories are prevalent.

Pipeline burial depths in areas requiring special construction techniques through rock will be in accordance with DOT requirements, 49 CFR Part 192. Prior to the commencement of construction activities, the "Dig-Safe" call system for Massachusetts, as well as the national "811" call system, will be contacted to have underground utilities and foreign pipelines identified and marked. Trenching in the vicinity of these foreign utilities will begin only after completing the appropriate notification procedures.

In accordance with the Commission's Plan and Procedures, measures will be employed to minimize erosion during trenching operations and construction activities. Measures also will be taken to minimize the free flow of water into the trench and through the trench into waterbodies. Compacted earth for temporary trench breakers and sandbags or foam for permanent trench breakers may be installed within the trench to reduce erosion.

2.3.1.5 Trench Dewatering

Trench dewatering may be required in certain locations to prevent the pipe from floating and also to perform certain limited activities in the trench. Trench dewatering will be performed in accordance with the Commission's Plan and Procedures and in accordance with the requirements of applicable permits and regulations, such as the EPA NPDES General Permit for Dewatering Activity Discharges. Tennessee plans to utilize filtration bags located in upland areas to dewater the pipeline trench, if necessary. Residual silt/sediment collected inside the filtration bags will be disposed off-site at an appropriately designated disposal facility as described in CMR 310 19.00.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

2.3.1.6 Pipe Stringing

The stringing operation involves moving the pipe into position along the prepared ROW. Pipe will be delivered to the Project area's pipeline storage areas typically by truck and will then be moved by truck from the pipeline storage areas to the construction zone, where it will be placed along the ROW in a continuous line in preparation for subsequent lineup and welding operations. Individual joints of pipe will be strung along the ROW parallel to the centerline and arranged so they are easily accessible to construction personnel. The amount of pipe necessary for stream or road crossings will be stockpiled in pipeline storage areas in the vicinity of each crossing. Stringing activities will be coordinated with the advance of the trenching and pipe laying crews to minimize the potential impact to the resources.

2.3.1.7 Pipe Bending

The pipe will be delivered to the Project site in straight sections. However, bending of the pipe will be required to allow the pipeline to follow natural grade changes and direction changes of the ROW. For this purpose, prior to line-up and welding, selected joints will be field-bent by track-mounted hydraulic bending machines. For larger horizontal changes of direction, manufactured induction bends may be used.

Pipe bending in the field will be utilized for turns involving slight deflections and/or large radii. For turns involving larger deflections and/or small radii, often related to spatial limitations due to easement and topographic constraints, prefabricated elbow fitting (ells) will be utilized, rather than pipe bending on-site.

2.3.1.8 Pipe Assembly and Welding

Following stringing and bending, the joints of pipe will be placed on temporary supports adjacent to the trench. The ends will be carefully aligned and welded together using multiple passes for a full penetration weld. Only welders qualified according to applicable ANSI, ASME, and American Petroleum Institute ("API") Standards will be permitted to perform the welding. A Tennessee-approved welding inspector will conduct the welder qualification testing and document all test results. A welder failing to meet acceptance criteria of the Kinder Morgan Company Standard Welder Qualification Test – API 1104 will be disqualified. Bending, welding, and coating in the field will comply with DOT regulations (49 CFR Part 192).

It has not yet been determined if automated welding will be implemented during pipe assembly. Tennessee believes that automated welding may be appropriate for portions of the proposed route, although the use of automated welding may prove impractical for steep construction areas. Tennessee will allow the construction contractor to determine during construction whether automated welding is appropriate for portions of the Project.

2.3.1.9 X-Ray and Weld Repair

To ensure that the assembled pipe meets or exceeds the design strength requirements and to ensure weld quality and integrity, the welds will be inspected visually and tested non-destructively using radiographic (x-ray) or another approved test method, in accordance with API Standards. Welds displaying inclusions (void spaces) or other defects will be repaired, or they will be cut out (removed) and new welds will be installed and retested.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

2.3.1.10 Coating Field Welds, Inspection and Repair

Following welding, the previously uncoated ends of the pipe at the joints will be field-coated with a Tennessee and industry approved anti-corrosion coating. Prior to lowering the pipe into the trench, the coating on the entire pipe section will be inspected and any damaged areas repaired.

2.3.1.11 Pipe Preparation and Lowering-In

Once the pipeline has been welded together, coated and inspected, the pipe is lowered into the trench. If the bottom of the trench is rocky, methods to protect the pipe will be used, including the possible use of sandbags or support pillows at designated intervals along the trench. Trench dewatering may be required in certain locations to prevent the pipe from floating and also to perform certain limited activities in the trench as described above in Section 2.2.1.5. Trench dewatering will be performed in accordance with the Commission's Plan and Procedures. Tennessee plans to utilize filtration bags located in upland areas to dewater the pipeline trench, if necessary. Residual silt/sediment collected inside the filtration bags will be disposed off-site at an appropriately designated disposal facility as described in CMR 310 19.00.

2.3.1.12 Tie-Ins

At select locations, such as waterbody crossings, road crossings, and terrain changes along the pipeline system, the pipe will be lowered into the trench in segments. The segments then will be welded together or tied-in prior to backfilling. A crew will be assigned to make these tie-ins at designated locations ahead of the backfill operations.

2.3.1.13 Backfilling and Grade Restoration

After lowering the pipe into the trench, the trench will be backfilled. Backfill usually consists of the material originally excavated from the trench; however, in some cases, additional backfill from other sources may be required. Any excess excavated materials or materials unsuitable for backfill will be handled, as approved by landowner or land management agency, or disposed of in accordance with applicable regulations. In areas where topsoil has been segregated, the subsoil will be placed in the trench first and then the topsoil will be placed over the subsoil. Backfilling will occur to approximate grade. However, a soil crown may be placed above the trench at the discretion of the Tennessee inspector to accommodate any future soil settlement.

2.3.1.14 Clean-up and Restoration

After the completion of backfilling, disturbed areas will be graded, and any remaining trash and debris will be properly disposed of in compliance with federal, state, and local regulations. The construction corridor will be protected through the implementation of erosion control measures including site specific contouring, permanent slope breakers, mulching, and reseeding or sodding with soil-holding vegetation. Contouring will be accomplished using acceptable excess soils from construction. If sufficient soils are not available, additional soil will be imported and inspected by Tennessee prior to use.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Tennessee will restore the construction workspace in accordance with the Commission's Plan and Procedures, applicable seed mix requirements from the NRCS or applicable agency recommendations and relevant landowner agreements.

2.3.1.15 Hydrostatic Testing and Tie-Ins

In compliance with USDOT specifications, Tennessee will conduct hydrostatic testing on all segments of the pipeline prior to placement of those facilities in service. Tennessee anticipates using water from Lower Spectacle Pond for hydrostatic pressure testing as identified in Table 2-7. Tennessee will access the pond from an existing boat ramp off Cold Spring Road and install a pump at the end of the ramp in a secondary containment structure to avoid the potential for a spill (Appendix G).

TABLE 2-7
POTENTIAL SOURCES OF HYDROSTATIC TEST WATER FOR THE CONNECTICUT EXPANSION PROJECT

Facility	Potential Source	Approximate Milepost[1]	Area of Discharge / Quantity of Water Required (gallons)
36" diameter pipeline	Lower Spectacle Pond	N/A	Upland / 1,025,100

[1] Location of hydrostatic discharge to be determined based on consultation with the Town of Sandisfield and MADEP. Proposed location at the intersection of Proposed Access Road #3 and Cold Spring Road.

Hydrostatic testing procedures are described in Section VII of the Commission's Procedures (Appendix E). Tennessee will seek coverage under Title 33 Water Withdrawal Permit, and Massachusetts Water Resources Management Program (310 CMR 36.00). Hydrostatic test water will be discharged within an upland area through a filter structure in compliance with USDOT specifications.

The pipeline will be tested hydrostatically in accordance with the USDOT's regulations, 49 CFR Part 192. The pipeline will be filled with water and maintained at a test pressure and duration in compliance with Tennessee's engineering standards and applicable federal regulations. After the completion of a satisfactory test, the water will be discharged to the ground through a filter or containment structure to a vegetated upland area. The discharge rate of the test water will be regulated using valves and energy dissipation devices to prevent erosion. Tie-in locations will be cleaned and restored after hydrostatic testing.

Tennessee anticipates filing applications with the appropriate Massachusetts state agencies for hydrostatic testing water uptake and discharge. In accordance with Sections VII.C.2 and VII.D.2 of the Commission's Procedures, hydrostatic test water will not be obtained from, or discharged to, designated high quality streams unless approved by the applicable state permitting agency. Tennessee does not anticipate the use of any additives within the hydrostatic testwater. Should it be determined that additives are necessary based on the source and composition of the testwater, Tennessee shall submit detailed information on any chemicals to the Commission and appropriate agencies for review and approval prior to use.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

2.3.1.16 Alternating Current Mitigation and Cathodic Protection

During the design phase of the Project, if determined to be necessary by Tennessee's technical services group and cathodic protection consultant, field work would be conducted to determine how soil conditions may affect the need for alternating current mitigation measures. Specifically, soil resistivity measurements would be obtained at various locations along the proposed pipeline looping segments in the vicinity of existing transmission lines. Additionally, information about the adjacent power lines would be obtained from the utility company including voltage levels, available fault current, and the location of transformers. Special software modeling techniques would then be applied to predict potential induced voltages and determine if mitigation measures are needed for safety and cathodic protection.

Cathodic protection equipment needed for the pipeline looping segments will be determined in the design phase of the Project. Where additional equipment is required, it is expected to consist of rectifiers and anode beds that are routinely located within the permanent ROW of the pipeline. Even where subsurface conditions include rock and prevent deep well designs, alternate designs that include multiple, more shallow anode beds have also been contained within the permanent pipeline easement. In some cases, there may be a need for anode beds to be located outside of the permanent easement, but that determination cannot be made until the system design is complete. Every effort will be made to design a system which does not require off-easement equipment. In the event off-easement equipment would be deemed necessary, Tennessee would seek the appropriate approvals from landowners, regulatory agencies, and the Commission.

2.3.2 Specialized Construction Procedures

Dependent upon site conditions, Tennessee may implement the following special pipeline construction methods in residential, agricultural, and environmentally sensitive areas. Typical construction drawings for each of these specialized construction procedures are included in Appendix E, as applicable.

2.3.2.1 Rugged Topography

Rugged topography is present along portions of the Massachusetts Loop (see Table 2-8A and Table 2-8B below for specific locations of rugged topography). Permanent trench breakers consisting of sandbags or foam will be installed in the ditch over and around the pipeline looping segments in areas of slope with high erosion potential (though gravel sacks may also be used). Trench breakers will be used to isolate wet areas and to minimize channeling of groundwater along the ditch line.

TABLE 2-8A
STEEP SLOPES (15-30 PERCENT) CROSSED BY THE CONNECTICUT EXPANSION PROJECT[1]

Begin Milepost	End Milepost	Distance (miles)[2]
Massachusetts Loop		
0.02	0.06	0.04
1.21	1.22	0.01
1.23	1.29	0.06

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

TABLE 2-8A
STEEP SLOPES (15-30 PERCENT) CROSSED BY THE CONNECTICUT EXPANSION PROJECT[1]

Begin Milepost	End Milepost	Distance (miles)[2]
1.84	1.85	0.01
1.86	1.88	0.02
2.03	2.08	0.05
2.14	2.16	0.02
2.17	2.21	0.04
1.37	1.38	No contours available
Massachusetts Loop Subtotal		**0.25**
PROJECT TOTAL[3]		**0.25**

[1] Steep slopes are defined as the pipeline running perpendicular to the slope contours.
[2] The slope locations were identified utilizing 2 foot contours that were created utilizing survey data. The locations indicate areas along the Project where the centerline crosses slopes between 15% and 30%.
[3] Includes Massachusetts portion of Connecticut loop. No steep slopes in Agawam.

TABLE 2-8B
STEEP SLOPES (>30 PERCENT) CROSSED BY THE CONNECTICUT EXPANSION PROJECT[1,3]

Begin Milepost	End Milepost	Distance (miles)[2]
Massachusetts Loop		
1.22	1.23	0.01
2.08	2.14	0.06
3.636	3.800	No contours available
Massachusetts Loop Subtotal		**0.07**
PROJECT TOTAL		**0.07**

[1] Steep slopes are defined as the pipeline running perpendicular to the slope contours.
[2] The slope locations were identified utilizing 2 foot contours that were created utilizing survey data. The locations indicate areas along the Project where the centerline crosses slopes >30%.
[3] Includes Massachusetts portion of Connecticut loop. No steep slopes in Agawam.

In the areas of construction where the slope exceeds 30 percent, a special means of manipulating the construction equipment must be utilized. The preferred method will be "winching" the equipment. This process consists of placing and anchoring a tractor at the top of the slope and using a winch to manipulate the equipment up and down the slope. Tables 2-8A-B above and Tables 2-9A-B below identify areas along the proposed pipeline loops where slopes 15 to 30 percent and greater than 30 percent, respectively, are encountered and the specialized construction techniques noted above may be implemented.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

In areas along the ROW where steep side slopes are encountered, the two-tone cut and fill construction methods will be utilized for equipment and/or personnel safety considerations. ATWS will be needed at these locations to accommodate excavated material from the temporary cut and fill areas, while allowing for the temporary storage of trench spoil, excess rock material, cut timber, and, in some cases, salvageable topsoil. Table 2-9A and Table 2-9B below include specific locations where two-tone cut and fill construction methods are anticipated to be required. When side slopes that require special construction are encountered, the two-tone construction technique will be employed, which entails benching into the side-slope to provide a level work surface. During grade restoration of side slope locations, the spoil will be placed back in the cut and compacted. Any springs or seeps found in the cut will be carried down-slope through polyvinyl chloride ("PVC") pipe and/or gravel French drains installed as part of the cut restoration.

TABLE 2-9A
STEEP SIDE SLOPES (15-30 PERCENT) CROSSED BY THE CONNECTICUT EXPANSION PROJECT[1]

Begin Milepost	End Milepost	Distance (miles)[2]
Massachusetts Loop		
0.30	0.31	0.01
0.36	0.36	0.00
0.61	0.62	0.01
0.70	0.71	0.01
0.81	0.86	0.05
1.20	1.21	0.01
1.27	1.27	0.00
1.29	1.31	0.02
1.37	1.38	0.01
1.72	1.73	0.01
1.90	1.92	0.02
1.98	2.04	0.06
2.27	2.29	0.02
3.64	3.80	No contours available
Massachusetts Loop Subtotal		**0.23**
PROJECT TOTAL[3]		**0.32**

[1] Side slopes are defined as the pipeline running parallel to the slope contours.
[2] The slope locations were identified utilizing 2 foot contours that were created utilizing survey data. The locations indicate areas along the Project where the centerline crosses slopes between 15% and 30%.
[3] Includes Massachusetts portion of Connecticut Loop. No steep side slopes in Agawam.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

TABLE 2-9B
STEEP SIDE SLOPES (>30 PERCENT) CROSSED BY THE CONNECTICUT EXPANSION PROJECT[1]

Begin Milepost	End Milepost	Distance (feet)
Massachusetts Loop		
1.92	1.95	0.03
3.64	3.80	No contours available
Massachusetts Loop Subtotal		**0.03**
PROJECT TOTAL		**0.03**

[1] Side slopes are defined as the pipeline running parallel to the slope contours.
[2] The slope locations were identified utilizing 2 foot contours that were created utilizing survey data. The locations indicate areas along the Project where the centerline crosses slopes over 30%.

In areas of rugged topography, ROW restoration will begin within 10 days of final pipeline installation to minimize potential erosion and sedimentation control problems. Tennessee will attempt to restore workspace locations within rugged terrain to pre-construction grades and contours. Excavated locations will be backfilled with the original substrate material and if necessary, permanent erosion control devices will be installed following site grading. To facilitate revegetation of the ROW, restored workspace locations will be seeded, fertilized and mulched in accordance with the Commission's Plan and Procedures (Appendix E).

2.3.2.2 Residential Areas

No residences are located within 50 feet of the construction work area. Construction through or near residential areas will be done in a manner to ensure that all construction activities minimize adverse impacts on residences and that cleanup is prompt and thorough. Affected landowners will be notified at least three to five days before construction commences, unless more advance notice is required pursuant to a landowner agreement. Access to homes would be maintained, except for the brief periods essential for laying the new pipeline.

To ensure that the trench is backfilled within 10 days after pipeline installation, Tennessee will use a typical pipeline construction sequence in which the pipeline installation crew is followed by a separate backfill crew. Tennessee will require its contractor, by contractual agreement, to backfill trenches in residential areas as soon as practical after the installation of the pipeline. The minimal length of each construction spread will not require construction crews to be separated by significant distances during pipeline construction. Pipeline construction crews will be in close proximity to each other and will be able to efficiently communicate during the entire construction phase of the Project.

Private property such as mailboxes, fences, gates, and other structures that have been removed will be restored. Sidewalks, driveways, and roads disturbed by pipeline construction will be restored to original or better condition upon completion of construction activities. Additionally, with landowner approval, Tennessee will test water wells within 200 feet of the construction workspace, both before and after construction. Any damage complaints during construction will be handled by Tennessee's ROW and land group. After restoration is complete, a Tennessee representative will contact landowners to ensure that

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

conditions of all agreements have been met and that the landowner has been compensated for damage incurred during construction.

If the construction ROW crosses a road or driveway, Tennessee will maintain existing access, or provide alternative access so residents have ingress/egress to their homes. If the road is open cut, one lane will remain open during construction, or traffic will be detoured around the work area through the use of adjacent roadways. Traffic safety personnel will be present during construction periods, and signage and safety measures will be developed in compliance with applicable state and local roadway crossing permits. To the maximum extent practicable, Tennessee will schedule work within roadways to avoid commuter traffic and impacts on school bus schedules.

2.3.2.3 Agricultural Lands

To preserve soil productivity in agricultural lands, up to 12 inches of topsoil will be segregated and stored separately from subsoil during construction. Tennessee will utilize full ROW topsoil segregation as required by landowner agreement, as required by the NRCS District, or as appropriate based upon site-specific conditions. Rock shall be removed from the top 12 inches (topsoil layer) or to the existing subsoil horizon during initial clean-up to a level such that the construction ROW is similar to surrounding areas. During the backfilling and restoration phases, topsoil will be replaced, and any stones approximately greater than four inches in diameter uncovered during construction will be removed or handled in accordance with individual landowner agreements. Any drain tiles damaged during construction will be repaired or replaced, and a crop-monitoring program will be implemented to ensure that crop productivity is restored to pre-construction conditions.

Tennessee plans to use 3.50 acres of active hay field in Tyringham and 3.26 acres in Agawam, as pipeyards to store equipment and materials in support of construction. The areas to be used for the pipelines are entirely within uplands and therefore no wetland areas will be impacted by the use of the pipeyards. Additionally, no woody vegetation will need to be cleared to accommodate the pipeyards. In late winter or very early spring 2015, Tennessee anticipates placing construction mats over a portion of the 3.50 acre proposed pipeyard and associated access road in Tyringham, while simultaneously installing a perimeter of property dug in silt fencing. The specific type of mat material will be selected during the final design of the pipeyard. No topsoil segregation will occur within the boundaries of the Tyringham pipeyard or the portion of the pipeyard located in Agawam.

2.3.2.4 Road and Rail Crossings

Prior to construction, Tennessee will locate all existing underground utilities and make provisions for traffic management in work areas as necessary. The majority of road crossings will be completed using standard open cut or conventional boring methods. Conventional boring entails drilling a hole beneath travel arteries through which the pipe will pass. No rail crossings are proposed in Massachusetts. Tennessee proposes open cut road crossings at Hammertown Road and South Beech Plain Road in Sandisfield.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

2.3.2.5 Trenchless Construction Methods

2.3.2.5.1 Conventional Bore

Conventional boring consists of creating a shaft/tunnel for a pipe or conduit to be installed to minimize surface disturbance. This is accomplished by first excavating a bore pit and a receiving pit. The bore pit is excavated to a depth slightly deeper than the depth of the associated trench and is graded such that the bore will follow the proposed angle of the pipe. A boring machine is then lowered to the bottom of the bore pit to tunnel using a cutting head mounted on an auger. The auger rotates through a bore tube, both of which are pushed forward as the hole is cut. The pipeline is then installed through the bored hole and welded to the adjacent pipeline. The typical workspace configurations required for boring operations consists of staging areas (50 foot by 100 foot) for boring machine setup, cuttings/return settlement and storage pits, pipe storage, entrance and exit pit spoil storage and construction equipment necessary to support the operation.

Major factors limiting the success of a boring operation include the crossing distance, subsurface soil and geologic conditions, and existing topography. Boring operations typically occur over crossing distance of 50 to 60 feet. The maximum length a bore could achieve in ideal soil conditions typically does not exceed 400 feet. Subsurface soil and geologic conditions must be conducive to establishing and maintaining a safe bore pit excavation, as well as provide the capabilities for the boring equipment to conduct a successful bore. Loose packed sediment, free of rock material is preferred when conducting boring operations. The topographic conditions at a site may also limit the use of this method, as preferred locations are generally consistent with level or moderately convex terrain, such that the depth of the bore pit does not present concerns relative to constructability or safety constraints. Most roads along the proposed pipeline loops are expected to be crossed via conventional bore. Tennessee anticipates two road borings during construction located at both crossings of Cold Spring Road in Sandisfield.

2.3.2.5.2 Horizontal Directional Drill

HDD is a trenchless method of installing pipelines in areas where traditional open cut excavations are not feasible due to sensitive resource areas or logistical reasons. The greatest advantage of the HDD crossing technique is the fact that open cut trenching and equipment disturbance within sensitive resource areas are not necessary, and, as a result, environmental impacts on sensitive resource areas are minimized. However, a greater amount of equipment staging is required for HDD than for the open cut crossing method, and typical installation of an HDD segment generally occurs at durations two to three times slower than a conventional open cut crossing.

A minimum workspace footprint of 200 feet wide by 250 feet long is required at the entry and exit points to support the drilling operation. The amount of workspace required can vary significantly from site to site based on site specific conditions. The entry-side equipment and operations typically will include the drilling rig and entry hole, control cab, drill string pipe storage, site office and tool storage trailers, power generators, bentonite storage, bentonite slurry mixing equipment, slurry pump, cuttings separation equipment, cuttings return/settlement pit, water trucks and water storage, and the heavy construction equipment necessary to support the operation.

Exit-side equipment and operations typically will include the exit point and slurry containment pit, cuttings return/settlement pit, cuttings separation and slurry reclamation equipment, drill string pipe storage, and the

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

heavy construction equipment necessary to support the operation. In addition to the drilling operations to be conducted within this workspace footprint, ATWS will be required along the working side ROW. ATWS in the form of "false" ROW may be required to provide a straight corridor for handling pipe at HDD locations where the ROW changes direction, in which to prefabricate the pipeline into one continuous section in preparation for the pull-back. Because this "false" ROW must be relatively straight to accommodate a long section of pipe before it is pulled through the annulus, a significant area of ATWS would be required outside of the standard pipeline construction workspace. Once assembled, the pipeline will be placed on pipe rollers so that it may be conveyed into the drill hole during the pull-back operation.

Risks associated with a HDD crossing technique included:

- Potential inadvertent returns of fluids during HDD drilling operations;
- Potential hole collapse during construction or subsequent settlement of HDD locations following installation;
- Pipeline inaccessibility for visual inspection and repairs; and
- Uneven cathodic protection on the pipeline.

Uneven cathodic protection across a pipeline segment can occur due to the effects of geologic strata changes and difficulty in identifying interference with cathodic protection due to external forces. Due to the depth of the HDD pipe, pipeline anomalies, external pipeline coating, stress corrosion cracking, and external corrosion cannot be visually inspected or repaired. Therefore, the pipe utilized for HDD operations is generally a thicker-walled diameter pipe that is subject to x-ray inspection following assembly, and is treated with fusion-boned epoxy coating and or an abrasion resistant epoxy coating such as ARO or Powercrete prior to installation. These measures are expected to minimize the potential for damage or corrosion occurring to the pipeline. The longest successful land-based 30-inch HDD is just under 7,000 feet in length. The longer the length, the more forces are applied to the pipe and the larger potential for failures. Additionally, in lieu of visual integrity inspections, HDD pipe segments will undergo internal corrosion inspections through use of the internal inspection facilities (e.g., pig launchers and receivers) constructed as part of the Project.

The feasibility of using HDD along the Massachusetts Loop to avoid specific resource areas is evaluated in Section 3.3.1.3 of this DEIR.

2.3.2.6 Rock Removal

Rock encountered during trenching will be removed using one of the techniques detailed below. The technique selected is dependent on relative hardness, fracture susceptibility, expected volume, and location. While some of this rock may be rippable by conventional excavation equipment, some of it may require blasting. Techniques include:

- Conventional excavation with a backhoe;
- Ripping with a bulldozer followed by backhoe excavation;
- Hammering with a pointed backhoe attachment or a pneumatic rock hammer, followed by backhoe excavation;
- Blasting followed by backhoe excavation; or
- Blasting surface rock prior to excavation.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Any blasting activity will be performed according to strict guidelines designed to control energy release. Proper safeguards will be taken to protect personnel and property in the area. Please refer to Section 5.2.1.1 of this DEIR for details relative to blasting. Mats made of heavy steel mesh or other materials will be used as necessary to prevent scattering of rock and debris. Tennessee will strictly adhere to all local, state, and federal regulations applicable to controlled-blasting and blast vibration limits with regard to structures and underground utilities while performing these activities. Special care will be taken to monitor and assess blasting within 150 feet of dwellings and private or public water supply wells.

Tennessee has developed a Project-specific Blasting Plan for the Project that establishes procedures and safety measures that Tennessee's contractor will be required to adhere to while implementing blasting activities along the pipeline ROW during the Project. Tennessee's contractor will be required to submit a detailed Blasting Specification Plan to Tennessee that is consistent with the provisions of the Blasting Plan and Kinder Morgan Construction Specifications. The contractor's plan, when approved by Tennessee, will be incorporated into the contractor's scope of work. Tennessee's Blasting Plan is included in Appendix F.

Excess rock is defined as all rock that cannot be returned to the existing rock profile in the trench or graded cuts or is not needed to restore the ROW surface to a condition comparable to that found adjacent to the ROW. Excess rock will be hauled off the ROW and disposed of at an approved landfill or recycling facility unless approved for use as slope stabilization, windrowing or for some other use on the construction work areas as approved by the landowner or land managing agency.

2.3.2.7 Wetland Crossing Construction

Wetland locations along the pipeline looping segments are described in Section 5.11 of this DEIR and shown on the aerial alignment sheets and site-specific wetland plans. Pipeline construction across wetlands will be performed in accordance with the Commission's Plan and Procedures (Appendix E).

Tennessee will utilize one of the following methods for installing the pipeline within wetlands during construction. The wetland impact summary tables (see Section 5.1.1 of this DEIR) and alignment sheets (Appendix B) identify the proposed crossing technique for each wetland. The construction methods are:

- Standard Pipeline Construction (non-saturated wetland)
- Conventional Wetland Construction (saturated wetland)
- Conventional bore
- HDD

These wetland crossing techniques are described in detail in Section 6.1.1.2 of this DEIR. Typical drawings depicting these construction methods are located in Appendix E and Table 5-3 identifies the proposed crossing technique for each wetland. Site-specific wetland crossing details are provided in Appendix E.

2.3.2.8 Waterbody Crossing Construction

Waterbody crossing locations along the pipeline looping segments are provided in Table 5-4 and shown on the aerial alignment sheets (Appendix B) and site-specific waterbody crossing plans (Appendix E). Pipeline construction across waterbodies will be performed in accordance with the Commission's Procedures and with applicable permit conditions. If any crossings are required to take place outside of the specified

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

timeframes, Tennessee will consult with the applicable state agencies to obtain concurrence to proceed with construction outside of the specified timeframes. The waterbody tables and alignment sheets identify the proposed crossing technique for each major waterbody. Typical drawings depicting these crossing techniques are located in Appendix E.

Tennessee will utilize one of the following methods for installation of the pipeline across waterbodies:

- Wet Open Cut Method
- Dry Crossing Method
- Flume crossing
- Dam and pump
- Cofferdam
- Dry Open Cut (conventional trenching waterbodies that are dry or frozen at the time of crossing during periods of no flow)
- Conventional Bore

These waterbody crossing techniques are described in detail in Section 6.1.1.3.1 of this DEIR.

2.3.3 Compressor Station/Appurtenant Facilities (Aboveground)

The appurtenant facilities will be constructed in accordance with industry standards. Construction of appurtenant facilities will coincide with construction of the looping segments.

2.3.3.1 Clearing and Grading

The sites for the appurtenant facilities will be cleared of vegetation and graded as necessary to create level surfaces for the movement of construction vehicles on the sites and to prepare the areas for the building foundations. Tennessee will install silt fence and/or hay bales around disturbed areas, as appropriate to the land, soil, and weather conditions, to minimize the potential for erosion and for impacts to off-site wetlands and waterbodies. Erosion and sediment controls will conform to Commission requirements.

2.3.3.2 High Pressure Piping

Tennessee proposes to design and construct the high pressure piping to meet the requirements of the USDOT, 49 CFR Part 192. Tennessee proposes to design the high pressure gas piping in the Station 261 yard for a MAOP of 800 psig, which is consistent with the MAOP of the existing 300 Line in the area. Tennessee proposes to coat the station piping for protection against corrosion. In addition, Tennessee anticipates the installation of a cathodic protection system to protect the buried piping.

2.3.3.3 Pressure Testing

Prior to placing the modified compressor station and appurtenant facilities in-service, Tennessee proposes to conduct pressure testing of the piping system. Tennessee proposes to conduct this test in accordance with applicable state and local code or regulatory requirements.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

2.3.3.4 Final Grading and Landscaping

Prior to construction, Tennessee will develop plans for the final grading and landscaping of the areas that will be disturbed during construction. These final grading and landscaping plans will be consistent with the Commission's Plan for the restoration of uplands. No new visual screening is proposed for the existing compressor station modifications.

2.3.3.5 Erosion Control Procedures

During the construction of the modifications at the existing compressor station, Tennessee will adhere to the applicable provisions of the Commission's Plan and Procedures. As set forth in the above-referenced documents, Tennessee proposes to install appropriate erosion controls (e.g., silt fence and/or hay bales) to minimize the potential for erosion from construction of the facilities.

2.3.4 Construction Timing and Scheduling

Construction of the Project will commence after all necessary private ROWs, state ROWs, and permits have been acquired for the Project, and Tennessee has obtained a Certificate and a notice to proceed with construction for the Project from the Commission. The construction activities for the Project are scheduled to begin in late 4th quarter 2015, depending on the specific construction windows imposed on the Project. All Project facilities are anticipated to be placed in-service no later than November 1, 2016.

Tennessee does not anticipate the need for additional permanent staff for operation of the new Project facilities, and no new operations offices or district offices will be required for operation of the Project facilities.

2.3.5 Supervision and Inspection

Tennessee will use a minimum of one qualified, full-time EI for each pipeline loop during Project construction, as well as a minimum of one LEI to oversee the EI staff. Modifications at Station 261 will utilize the same EI as the Connecticut Loop. The EI's duties will be consistent with those contained in paragraph II.B (*Responsibilities of Environmental Inspectors*) of the Commission's Plan and will include ensuring compliance with environmental conditions from the certificate of public convenience and necessity, Tennessee's environmental designs and specifications, and other permits or authorizations. Tennessee conducts in-house Environmental Inspector training to ensure that the EIs will be able to carry out their duties and that construction activities will be in compliance with the requirements of applicable federal, state, and local environmental permits and approvals and environmental requirements in landowner easement agreements. Additionally, Tennessee will conduct environmental training in advance of construction. The level of training will be commensurate with the type of duties of the Project personnel.

2.4 OPERATION AND MAINTENANCE

The Project will be owned, operated, and maintained by Tennessee. Tennessee will operate and maintain the newly constructed pipeline looping segments in the same manner as it currently operates and maintains its major interstate pipeline facilities, in accordance with the requirements of the Commission, the USDOT's PHMSA pursuant to 49 CFR Part 192, and industry-proven practices and techniques. The facilities will be

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

operated and maintained in a manner such that pipeline integrity is protected to ensure that a safe, continuous supply of natural gas reaches its ultimate destination. Maintenance activities will include regularly scheduled gas-leak surveys and measures necessary to repair any potential leaks. The latter may include repair or replacement of pipe segments. All fence posts, signs, marker posts, aerial markers, and decals will be painted or replaced to ensure that the pipeline locations will be visible from the air and ground. The pipeline will be patrolled on a routine basis, and personnel well qualified to perform both emergency and routine maintenance on interstate pipeline facilities will handle maintenance.

During the pre-commissioning phase, a detailed job evaluation will be conducted and the appropriate purge and load plan will be developed prior to the facility commissioning. This phase of the Project will include the final modifications to Tennessee's current Operations and Maintenance Procedures, including modifications to the Emergency Response procedures to incorporate the new Project facilities.

The Project's pipeline facilities, similar to Tennessee's existing pipeline system, will be marked aboveground to indicate the presence of the pipeline, as required by 49 C.F.R. Part 192. Regular patrols, generally once a month and more often in the New England states, of the pipeline facilities are performed to monitor and control encroachment by third parties as well as to monitor the pipeline ROW for abnormal conditions including leaks. Any unusual situation or condition is reported and investigated immediately. These patrol frequencies exceed the requirements specified in CFR 49 Part 192. The facilities constructed by Tennessee as described in this DEIR will be constructed and operated under the same Operation and Maintenance Procedures. Natural gas in this area of the country on the Tennessee system is odorized with a chemical agent to make any release of gas readily detectable. All indications of a leak reported by the public or identified during our normal operations procedures are investigated and repaired immediately.

As a key component of its damage prevention program, Tennessee is a member of the one-call system for pre-excavation notification in all the states that it operates within. Tennessee is nationally and regionally active in the Common Ground Alliance which has pushed to develop the use of a common "811" call before you dig program. Through these organizations, contractors provide notification to a central agency of proposed excavation, and Tennessee is then informed of the excavation locations. In the event that Tennessee's facilities are located in the area of proposed excavation activity, a representative of Tennessee is dispatched to mark the area, consult with the excavator as needed, and witness the excavation as necessary to prevent damage to the pipeline.

Though its public awareness program, Tennessee educates the public on how to identify a pipeline facility, the use of the one-call notification system prior to excavation and other damage prevention activities, possible hazards associated with unintended releases from a pipeline facility, physical indications that such a release may have occurred, steps that should be taken for public safety in the event of a pipeline release and procedures to report such an event. All of these efforts will continue following the construction of the Project facilities.

The Project facilities will be patrolled on a periodic basis, as are Tennessee's existing facilities. This will provide information on possible leaks, construction activities, erosion, exposed pipe, population density, possible encroachment, and any other potential problems that may affect the safety and operation of the pipeline.

Other maintenance functions will include:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

(1) periodic seasonal mowing of the ROW in accordance with the Commission's mowing timing restrictions;

(2) terrace repair, backfill replacement, and drain tile repair as necessary;

(3) periodic inspection of water crossings; and

(4) maintenance of a supply of emergency pipe, leak repair clamps, sleeves, and other equipment needed for repair activities.

Tennessee will not use herbicides or pesticides within 100 feet of a wetland or waterbody unless approved by applicable state and local agencies to control invasive species.

Cathodic protection of the pipeline will be conducted with impressed current systems that employ rectifier / groundbed systems. Units will be installed along the pipeline and aboveground test stations will be installed at various locations along the pipeline to gather accurate information for potential current adjustments. The cathodic protection system will be regularly monitored to maintain required pipe-to-soil potential and will be achieved in accordance with the specifications set forth by Tennessee that meet or exceed USDOT regulations.

2.4.1 Cleared Areas

A typical post-construction permanent ROW of 75 to 100 feet will be maintained for the existing pipeline and new loop segments in accordance with the Commission's Plan and Procedures. Maintaining a cleared ROW is necessary for the following reasons:

- Access for routine pipeline patrols and corrosion surveys;
- Access in the event that emergency repairs of the pipeline are needed;
- Visibility during aerial patrols; and
- To serve as a visual indicator to the public of an underground pipeline utility and easement.

Operational vegetation maintenance of Tennessee's permanent ROW in uplands will be conducted on a frequency of approximately once every five to seven years to maintain the vegetative community in an herbaceous to low scrub-shrub cover state. Tennessee will annually maintain a 10-foot corridor centered over the pipeline within both uplands and wetlands to facilitate route patrols and emergency access.

Within wetlands, Tennessee will only maintain the 10-foot corridor centered over the pipeline, allowing the balance of Tennessee's permanent easement to revert back to its natural, pre-construction vegetated cover state. Additionally, within wetlands, Tennessee reserves the right to selectively cut and remove trees that could damage the pipeline coating within 15 feet of the pipeline.

Post-construction management of the ROW will be conducted in accordance with the procedures outlined in the Project-specific Invasive Species Management Plan ("ISMP") (Appendix D). Vegetation maintenance (with respect to the control of invasive species), as well as yearly monitoring and mitigation measures are detailed in the ISMP (Appendix D).

Following construction of the pipeline facilities, areas used during construction for TWS and ATWS will be allowed to revert to their pre-construction land use/land cover with no further vegetation maintenance by

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Tennessee. Additionally, crop production will be allowed to continue in agricultural areas, immediately following construction or the following growing season.

2.4.2 Erosion Control

Erosion problems on the pipeline ROW will be reported to the local operations supervisor. These reports may originate from landowners or Tennessee personnel performing routine patrols. Corrective measures will be conducted as needed.

2.4.3 Periodic Pipeline and ROW Patrols

The pipeline and ROW will be patrolled on a periodic basis. The frequency of the patrol of the pipeline by either aerial or ground surveys is determined by the size, operating pressure, class, terrain, weather and other relevant factors. The interval between patrols may not be longer than prescribed in the Table 2-10:

TABLE 2-10
MAXIMUM INTERVAL BETWEEN PATROLS

Class Location of Line[a]	At Highway and Railroad Crossings	At All Other Places
1 & 2	7-1/2 months, but at least twice each calendar year	15 months, but at least once each calendar year
3	4-1/2 months, but at least four times each calendar year	7-1/2 months, but at least twice each calendar year
4	4-1/2 months, but at least four times each calendar year	4-1/2 months, but at least four times each calendar year

[a] As defined by USDOT PHMSA at 49 CFR 192.5:

Class 1: offshore areas and areas within 220 yards of a pipeline with ≤10 buildings intended for human occupancy.

Class 2: areas within 220 yards of a pipeline with >10 but <46 buildings intended for human occupancy.

Class 3: areas within 220 yards of a pipeline with >46 buildings intended for human occupancy; and areas within 100 yards of either a building or a small, well defined outside area (such as a playground, recreation area, outdoor theater, or other place of public assembly) that is occupied by 20 or more persons on at least five days a week for 10 weeks in any 12-month period.

Class 4: areas within 220 yards of a pipeline where buildings with four or more stories are prevalent.

Additional ground surveys are conducted on an as needed basis to respond to issues such as landowner concerns and third-party encroachments. During ROW patrols, all permanent erosion control devices that are installed during construction will be inspected to ensure that they are functioning properly. Additionally, attention will be given to:

- Existing stormwater outfalls along the alignment;
- Erosion and washouts along the ROW;
- Water control devices such as diversions;
- Condition of banks at drainage ditch crossings;
- Fallen timber or other threats to the pipeline;

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

- Shrubs and other vegetation planted during construction; and
- Any other conditions that could endanger the pipeline.

2.5 FUTURE PLANS AND ABANDONMENT

The Project was developed in direct response to increased demand for natural gas transportation capacity in the northeast U.S. In order to provide increased capacity of 72,100 Dth per day on its existing pipeline system for three Project shippers, Tennessee is proposing to add the Project facilities discussed herein, as well as using existing transportation capacity reserved for this Project to meet the market needs of the three Project shippers (Connecticut Natural Gas Corporation, The Southern Connecticut Gas Company, and Yankee Gas Services Company). The three Project shippers have each executed binding, long-term precedent agreements for all of the firm transportation capacity resulting from the Project. As discussed above, on July 31, 2014, Tennessee filed an application with the Commission in Docket No. CP14-529-000, seeking issuance of a certificate of public convenience and necessity from the Commission for the Project and requesting that the certificate order approving this Project be issued by July 31, 2015. Issuance of a certificate for the Project by that date will allow Tennessee to complete the Project facilities and place the Project in-service by November 1, 2016, a date requested by the three Project shippers.

The Project is a stand-alone project, and does not require or necessitate the construction of any pipeline or compression facilities proposed as part of any pending or current project or anticipated to be proposed for any future project, including the proposed Northeast Energy Direct ("NED") Project. The proposed NED Project involves the construction of new pipeline facilities (approximately 420 miles) and compression facilities in the states of Pennsylvania, New York, Massachusetts, Connecticut, and New Hampshire. Tennessee is continuing discussions with potential shippers for the NED Project. Tennessee filed a letter with the Commission on September 15, 2014 in Docket No. PF14-22-000, requesting to use the Commission's pre-filing procedures for the NED Project. Tennessee anticipates that it will submit an application seeking issuance of a certificate of public convenience and necessity for the NED Project following the pre-filing process in September 2015. The anticipated in-service for the proposed NED Project is November 2018, a full two years following the requested in-service date for this Project.

Tennessee will proceed with the Project even if no other expansion projects are proposed and implemented, including the NED Project. Any future expansion of the facilities proposed as part of the Project would be dependent upon a showing of additional demand for gas service. There are no plans to abandon these pipelines and any planned abandonment of natural gas pipeline facilities would need to be approved by the Commission.

2.6 LANDOWNER/AGENCY CONSULTATION

Tennessee has made significant efforts since April 2013 to inform the public, including affected landowners and governmental officials, about the proposed Project. The objective in implementing a comprehensive stakeholder outreach strategy has been to identify and potentially resolve issues raised by stakeholders in a timely fashion. To that end, Tennessee met with governmental officials in advance of or nearly simultaneously with landowner notification beginning in April 2013 in Massachusetts. As discussed herein, Tennessee has been interacting with and informing the public and receiving feedback on the Project through meetings and discussions with landowners and other affected stakeholders and written materials.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Key components of the outreach program include:

- Timely notification to federal, state, county and municipal government officials, state legislative and U.S. Congressional delegation members, and leaders of tribal nations in advance of or simultaneously with notification to affected landowners to ensure that all parties have access to Project information in a timely fashion;
- Active coordination among all specialties within the Project team to facilitate information exchange and dissemination to interested stakeholders; and
- Ongoing communication with interested parties as facility designs are reviewed and modifications considered based on the response to the open season and stakeholder feedback.

For the Project, Tennessee has proposed facilities that seek to balance landowner and community concerns, environmental resource issues, and Project requirements. In accordance with the guidelines adopted by the Commission, Tennessee encourages landowners; federal, state, county, and municipal, government officials; environmental groups; and other stakeholders to discuss their concerns with Tennessee as well as the Commission and to provide input on the most appropriate locations for the pipeline loops and related facilities associated with the Project. Tennessee has attempted to address the concerns raised by various stakeholders and where it has not been possible to modify the Project facilities in the manner requested, to clearly identify the basis for that conclusion. Moreover, in certain instances, Tennessee is continuing to collect the data necessary to evaluate fully various alternatives that have been advanced so that an informed decision may be reached.

2.6.1 Landowner Consultation/Public Participation

As noted above, since April 2013, Tennessee has been in contact with (a) federal, state, county, and municipal government officials; (b) state legislators in the communities located along the proposed Project facilities; (c) state executive offices, state administration officials, state legislative leadership; and (d) the U.S. Congressional delegations and their staffs regarding the Project. During meetings and telephone conversations and in correspondence, Tennessee provided these governmental officials with information regarding the open season, the proposed facilities, the status of the requests to landowners for survey permission, the timing and permitting process for the Project, and the Commission's certificate process, including the National Environmental Policy Act ("NEPA") environmental review process. In addition, periodic updates have been provided to governmental officials and other stakeholders since the initial contact.

Landowners were contacted beginning in April 2013 to request access for civil and environmental surveys (wetland/waterbody delineations, habitat evaluations, cultural resources) for the pipeline routes, access roads, contractor/pipeyards, and aboveground facility sites. Surveys have been completed for all properties along the Project area in Massachusetts where access permission has been granted.

2.6.2 Agency Consultation

In addition to public outreach efforts with landowners and governmental officials described in Sections 2.6, 2.6.1 and 2.6.2, Tennessee has been conducting an extensive planning and consultation process with federal and state regulatory agencies, resource agencies, Native American Tribes, and other groups having a stake in the Project. The consultation process has involved briefings, meetings, letter requests for resource

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

information, and telephone discussions and emails. This section provides a brief description of the more significant agency and stakeholder consultations that have occurred.

2.6.2.1 Threatened and Endangered Species Consultations

As required under Section 7 of the U.S. Endangered Species Act ("ESA") and the Endangered Species Act of Massachusetts, Tennessee has initiated informal consultations with federal and state resource agencies to update the known locations of federal- or state-listed threatened or endangered species and species of special concern, if any, that could potentially be affected by construction or operation of the Project. Responses have been received and follow-up consultations have occurred, which are discussed further in Section 4.1.3 of this DEIR. Copies of all correspondence and related information regarding threatened or endangered species and sensitive habitats are provided in Appendix C.

2.6.3 Interagency and Other Review/Resource Agency Meetings

Beginning in December 2013, Tennessee contacted federal and state regulatory agencies in Massachusetts with respect to the relevant permitting requirements for the Project. Tennessee provided preliminary information regarding the Project, including a Project description, aerial alignment sheets and USGS 7.5-minute quadrangles. Copies of consultations with federal, state and local agencies are included in Appendix C.

2.7 EASEMENTS AND LAND ACQUISITION

2.7.1 Article 97 Land Disposition

The preferred route of the Project would require a permanent easement across 6 acres of land owned by DCR along the existing ROW. This land was acquired by the Commonwealth, through DCR, for natural resource purposes.

EEA is the agency charged with ensuring appropriate review of such dispositions and has developed a policy to direct that review. The goal of the policy is to ensure no net loss of lands owned by the Commonwealth for natural resource purposes ("Article 97 Lands"). The policy provides that EEA will recommend approval of the disposition of Article 97 Lands when the policy conditions support a conclusion that exceptional circumstances exist to warrant the disposition. The following discussion addresses how each of the six policy conditions are satisfied relative to the Project.

This analysis applies to the permanent easement through Commonwealth property that would be necessary for the Project along the existing right of way. This new permanent easement would be along approximately 10,470 feet of existing ROW, would be between 15 to 35 feet wide (directly adjacent to the existing natural gas pipeline and easement on DCR property), and would total approximately 6 acres of property ("Article 97 Easement").

No feasible and substantial equivalent option

As discussed in Section 3.0, Project Alternatives, Tennessee analyzed its system alternatives, energy alternatives and the "no action" alternative as part of its Project development. Additionally, as directed in

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

the Secretary's EENF Certificate, Tennessee also analyzed additional route alternatives. This analysis indicates that there is no feasible and substantial equivalent option alternative to the Project.

After establishing that the Project expansion should commence at Town Hill Road at the terminus of the existing 36-inch pipeline, Tennessee evaluated two separate greenfield alternatives (new ROW) and an alternative adjacent to a roadway. These alternatives were chosen for evaluation, after consultations with DCR staff, to avoid DCR property and minimize impacts to sensitive resources.

Alternative 1 was evaluated to the north of the existing ROW and Alternative 2 was evaluated along a route located to the south of the existing ROW, both shown on Figure 1 in Appendix I. While avoiding DCR property, each of these alternatives results in greater environmental impacts because they lack a co-located utility easement which results in activities occurring in previously unimpacted areas.

Therefore, when comparing overall environmental impacts of each alternative route, the fact that the preferred route maximizes use of existing ROW, results in the preferred route having the least amount of environmental impact and is consistent with the overall sequencing to avoid, minimize and mitigate impacts.

Tennessee also evaluated an additional route that would avoid DCR property partially following area roadways. While longer than the preferred route, this route would result in less impact to DCR property but would necessitate stream crossings. Additionally, this alternative would be located within 100 feet of 12 residences and would cause significant disruption during construction and require complete closure of residential streets. Although this route avoids impacts to DCR property, it would impact wetlands off DCR property and would result in extensive impacts to residences and roadways during construction.

As more fully described in Section 3.0, Project Alternatives, the alternatives analysis discussion of the no-action alternative does avoid the impacts of the infrastructure development and therefore would obviate the need for the Article 97 Easement, however, it does not meet the project objective of providing sufficient energy sources to the project customers. As noted in the Alternatives Analysis, while the Commonwealth has made substantial investments in alternative energy sources and conservation, these alone will not provide sufficient energy capacity in the time frame needed to maintain reliability and to meet customer needs.

Disposition does not destroy or threaten a "unique or significant resource"

Tennessee has consulted with the DCR to evaluate the resources in the Article 97 Easement and has conducted a site visit with Commonwealth wetlands, forestry and species experts to evaluate resources in the Article 97 Easement. The results of these ongoing consultations are discussed in Section 2.6, and indicate that there are no endangered species impacts in the Article 97 Easement, no certified vernal pools will be impacted, unique natural landscape features have been identified, including boulders and rock walls, which will be avoided during construction. Potential vernal pools that have been identified will also be avoided through Project planning, to the extent practicable. In addition, DCR staff will be flagging "trophy trees" along the proposed route that will be avoided if at all possible. Discussions will continue with DCR to ensure that unique or significant resources in the Article 97 Easement will not be destroyed or threatened.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Real Estate of greaterorequal value is granted to the disposing agency

- Compensation for the new permanent easement 6 acres value to be established by DCAM;
- Compensation for the construction permit for 17 acres of temporary workspace;
- Forest products to be delivered to a DCR designated location for DCR use, control, sale and management;
- Additional compensation for 6 acresof permanent impacts to Article 97 land, to address No Net Loss of Article 97 Land Policy; and,
- Other mitigation associated with permitting conditions (e.g., gated access roads, ATV control, invasive species control and monitoring, wetlands replication and monitoring).

Minimum impact necessary for the proposed use, and the resources continued to be protected, to the maximum extent possible

As discussed in Section 2.6, Tennessee's consultations with DCR, MADGF, and MADAR have allowed it to avoid, minimize and mitigate any impacts necessary for the proposed use. The Article 97 Easement will remain available for passive recreation, gates will be installed to reduce any ATV access, forest that agencies had planned to harvest will be harvested and managed pursuant to DCR direction, wetlands will be maintained in the Article 97 Easement. These efforts ensure that only the minimum impacts necessary for the Project will occur and that the resources continue to be protected to the maximum extent possible.

Disposition serves a public purpose

As more fully discussed in Section 1.1.1, Purpose and Needs, natural gas is a critical component to meeting energy demands in the northeast region. To meet identified market demands and to manage increased need for infrastructure capacity, Tennessee determined that it is necessary to install additional pipeline capacity along an existing pipeline known as the 200 Line. This determination was made based upon the market demands of the Project customers as evidenced by executed contracts with Tennessee and of the northeast region generally.

If the Project is constructed, it will result in increased transportation capacity for natural gas in the Commonwealth and thereby lowering energy costs for both the consumers and businesses. Commentators have noted that Massachusetts will be in a much better position to attract and retain business if its energy cost structure is lower and more predictable. Additionally, natural gas is a clean and reliable form of energy and has lower carbon emissions than coal-burning plants. New England's increasing use of natural gas in place of coal and oil has contributed to reduction in regional carbon-dioxide emissions. This Project helps ensure that this trend continues so that energy reliability in Massachusetts is met without increases in coal, oil or nuclear supplied power.

Disposition is not contrary to the "express wishes" of the party who donated or sold the land to the state

The Article 97 Easement is located on land that was a transfer to DCR from Mass Audubon of an undivided half interest in 2007. Tennessee's existing 200-2 and 200-1 Lines are currently sited on the Property as they were at the time of transfer. The deed transferring the underlying property from Mass Audubon to DCR does not include any use restrictions, though it does include the existing ROW easement. A copy of the

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

recorded deed recorded with the Berkshire Southern Registry of Deeds in Book 254, Page 428 is provided in Appendix H.

While there are no other documents available from the transaction which would suggest an additional permanent easement along the existing ROW would be opposed, Mass Audubon submitted a letter to MEPA on July 1, 2014 that expressed opposition to the disposition of the Article 97 Easement citing a lack of thorough alternatives analysis in the EENF. Tennessee has now completed a comprehensive alternatives analysis which is included in this DEIR as directed by the Secretary's EENF Certificate and scope, has taken steps to preserve unique features in the area, continues to work with DCR as the Project proceeds, all of which it believes fully satisfies the public policy purpose of EEA's Article 97 review. Additionally, this public review will be further addressed in the FEIR, through the FERC review process and through the environmental permitting of the Project.

2.8 CONSTRUCTION SCHEDULING AND COSTS

Tennessee estimates that it will use one construction spread for the Massachusetts portion of the Project. The spread will include between 100 to 250 personnel, and will take approximately 14 to 26 weeks to complete, depending upon site-specific conditions. The proposed modifications at Station 261 in Agawam will occur as part of the Connecticut Loop construction. The estimated cost for the entire Project is $85.7 million dollars.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

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20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

3.0 PROJECT ALTERNATIVES

Tennessee evaluated alternatives, including pipeline routing options, based on regional topography, potential adverse environmental impacts, population density, existing land usage, and construction safety and feasibility considerations. Tennessee also considered route alternatives as directed in the Secretary's EENF Certificate and 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 (2014). Described below are the alternatives that have been considered for the Project.

3.1 REGIONAL INFRASTRUCTURE

Looping involves building or expanding the existing pipeline system by maximizing existing facilities and utilizing existing ROW to allow more volumes of gas to be delivered without having to build a completely new pipeline to customers. Looping generally consists of a segment of pipeline installed parallel and adjacent to an existing pipeline and connected to the existing pipeline at both ends. Looping allows more gas to be transported through an already installed existing pipeline system. Smaller sections of a pipeline looping segment that tie-in to the existing pipeline system allow added transportation capacity while minimizing new pipeline length and cost. Based on commitments from the Project shippers, the Project will create additional transportation capacity of approximately 72,100 Dth per day (approximately 40,100 Dth per day to be created by installing the three proposed pipeline looping segments, modifying facilities at an existing compressor station, and minor appurtenant work, and approximately 32,000 Dth day of existing capacity reserved for the Project). Due to system configuration and needed pressures at various delivery points, Tennessee evaluated its existing facilities to determine the locations on its existing pipeline system where additional facilities could be installed to accommodate the expressed needs of the Project shippers while continuing to meet existing firm transportation obligations to Tennessee's existing shippers. The construction and installation of the pipeline loops and the compressor station modifications, and the use of existing reserved capacity will allow Tennessee to minimize the amount of pipeline looping segments to be installed and deliver the incremental volumes requested by the Project shippers and reflected in the binding precedent agreements, while maintaining service to existing shippers and pressure profiles along its system.

The existing flow dynamics and transportation obligations through the existing pipeline dictate where these loops need to be constructed. As natural gas leaves a compressor station and is transported through the pipeline, pressure is lost due to turbulence and friction between the pipeline and the natural gas. The pressure decreases at a faster rate as the gas is transported farther from the compressor station. The pressure will continue to decrease until the natural gas is recompressed at the next compressor station on the pipeline system. There is a lower limit to which the pressure is allowed to drop, which is determined by Tennessee's contractual and operational requirements. Therefore, each pipeline section between compressor stations is treated as its own individual pipeline for purposes of evaluating the addition of new facilities. The fact that one section is optimized to operate at the maximum capacity of the existing facilities does not necessarily translate to a benefit to the next section. The locations of compression additions or pipeline looping within a pipeline section are determined with the objective to maintain an inlet pressure which will allow the next compression station to discharge at the maximum allowable operating pressure.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

The proposed Project route for the pipeline looping facilities in Sandisfield, Massachusetts was chosen as the Least Environmentally Damaging Practicable Alternative ("LEDPA") due to the proposed pipeline looping segments being co-located and parallel to an existing natural gas pipeline. To meet the three Project shippers' demand for natural gas transportation capacity in the region, Tennessee analyzed its system and determined that additional pipeline looping segments would be required between existing Station 254 in Nassau, New York and existing Station 261 in Agawam, Massachusetts, to meet system operating requirements regarding minimum pressure and capacity and proposed the Project facilities, as discussed in Section 1.1.1. Based on Tennessee's existing pipeline infrastructure in the region and required hydraulics, approximately four miles of pipeline looping needs to be added in western Massachusetts to accommodate the additional demand. Beginning at existing Station 254, three pipelines extend southeast into Massachusetts with one of these pipelines (36-inch diameter) ending at Town Hill Road in Sandisfield while the remaining two pipelines (24-inch diameter and 30-inch diameter) continue southeast to existing Station 261 in Agawam. Proposing an extension of the existing 36-inch diameter pipeline that currently ends at Town Hill Road assures that there would not be a stand-alone 4-mile section of pipeline in the system if installed in another location.

3.2 SYSTEM ALTERNATIVES

System alternatives would make use of other existing, modified or proposed natural gas pipeline systems, or existing compression to meet the stated objectives of the proposed Project. A viable system alternative would make it unnecessary to construct all, or part, of the proposed Project. A system alternative would involve the transportation of all, or a portion of, the additional natural gas volumes by expansion of another existing pipeline system or the construction of a new pipeline system. Such modifications or additions would result in environmental impacts.

A viable system alternative must be technically and economically feasible and practicable to satisfy the Project's purposes, including meeting the necessary demands and contractual commitments made with Project Shippers.

Tennessee, because it currently operates an interstate natural gas pipeline system in the northeast, evaluated its ability to supply the increased demand for natural gas transportation service in this area using efficiencies afforded by its existing system. Additionally, Tennessee considered system alternatives involving different configurations of pipeline looping and compression facilities within its own transmission system, as well as efficiency improvements. These alternatives are described in the following sections. Tennessee used the following evaluation criteria when selecting reasonable and potentially environmentally preferable system alternatives to the Project:

- technical and economic feasibility and practicality;
- extent of environmental impacts; and
- ability to meet the Project purpose of providing increased capacity for natural gas transportation service from Wright Meter Station, located in Schoharie County, New York with deliveries to established markets in the northeast in the time frame requested by the Project shippers, given that alternative energy sources or conservation are not able to satisfy this demand.

In evaluating options for the construction and operation of the proposed pipeline loops and the modifications at Station 261, Tennessee determined that given the existing pipeline, any pipeline looping should be co-

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

located with the existing pipeline ROW to the maximum extent practicable, feasible, and as legally permitted. Co-locating new pipeline loops with an existing line is a preferred option as it minimizes the environmental impacts, numbers of affected landowners, constructability issues and limits the extent of disruption to the communities that would be affected during construction. The modifications at Station 261 are entirely within the fence line of the existing compressor station, thus creating no additional impacts at that station or on sensitive environmental receptors.

Once the Project objectives were established, technical system alternatives were designed using hydraulic modeling and analysis utilizing software to calculate the balanced steady state pressure-flow relationship for Tennessee's pipeline. The results provided by the hydraulic model were used in combination with Tennessee's vast experience with pipeline and compression installation and operations to design technically feasible system alternatives to satisfy the Project objectives.

Tennessee evaluated options for increased efficiency within its pipeline and compression systems to determine if incremental capacity to transport natural gas volumes could be added through the implementation of efficiency upgrades or modifications. While these options could be implemented to achieve a limited amount of benefit relative to the Project objectives, Tennessee determined that these measures alone would not be sufficient to provide the required capacity to transport the volumes of natural gas requested by the Project shippers, or meet the Project purpose.

3.2.1 Major System Alternative

In lieu of the proposed Project facilities that were selected to meet the Project objectives, Tennessee evaluated the alternative of constructing a new greenfield pipeline ("new ROW") to be routed from Tennessee's existing Wright Meter Station, located in Schoharie County, New York, to the East Granby Sales Meter Station, located in Hartford County, Connecticut. This new greenfield alternative route would include approximately 100 miles of 20-inch OD pipeline and would include associated appurtenant aboveground facilities. This alternative is the shortest and most direct route from the Project supply receipt point in New York to the requested market points in Connecticut that does not use or follow Tennessee's existing pipeline facilities and ROW. This new ROW would avoid DCR property and not require the installation of any new compressor stations or modifications to any existing compressor stations. This alternative would require Tennessee to acquire new permanent ROW and would have significant impacts to the environment and to landowners for approximately 100 miles of primarily previously undisturbed land. None of the impacted land would be co-located within existing utility corridors.

Federal and state permitting for this alternative would be extensive, with overall environmental impacts associated with 100 miles of new pipeline significantly greater than the proposed approximately four miles pipeline looping and compressor station modifications for the Project. The impacts to environmental resources would far exceed the impacts that would be anticipated when looping the approximately four miles of existing lines and using the existing permanent ROW for construction workspace, as well as modifying facilities within an existing compressor station fenceline.

Tennessee did not select this alternative because, when compared to the proposed Project alternative, this alternative has:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

(1) a much longer overall route length and land requirements;

(2) far greater environmental and landowner impacts; and

In short, this option is not the LEDPA and does not avoid and minimize environmental impacts and therefore has been eliminated as a viable alternative.

3.2.2 Options for Efficiency Improvements

Tennessee evaluated the use of installing internally coated pipe as an energy saving alternative to determine if the length of the pipeline looping segments could be reduced for the Project. The use of internal pipeline coating reduces the roughness of the pipe's internal wall. A smooth internal wall reduces the resistance or internal friction between the flowing gas stream and the wall of the pipe. Therefore, reducing internal friction reduces energy loss and also reduces required horsepower and fuel consumption to transport a given quantity of gas. This evaluation reduced the overall pipeline construction footprint by 0.10 miles of pipeline looping, thus resulting in less environmental impact to the affected areas. For the Massachusetts Loop, 3.81 miles of pipeline looping will be installed versus a calculated 3.91 miles of pipeline without internal coating, thus avoiding and minimizing impacts to the environment.

3.2.3 Pipeline Looping Options

For this Project, Tennessee evaluated its existing system to determine where pressure losses would occur to determine where added compression or looping would be needed to accommodate the required gas volumes and the delivery points. The proposed looping segments for this Project in Massachusetts, as well as the proposed looping segments in New York and Connecticut, will reduce pressure losses per mile and restore the pressure at the next compressor station, while allowing Tennessee to transport the additional volumes requested by the Project's shippers. In summary, system design needs and pressure considerations dictate where loops need to be constructed along the existing pipeline system.

Tennessee evaluated the market needs of the Project along with its existing system configuration, which consists of the completed sections of the 200-1 and 200-2 Lines (24-inch and 30-inch OD pipelines, respectively) and a partial loop 200-3 Line (36-inch OD diameter pipeline). Tennessee is proposing to install a continuous 36-inch diameter OD pipeline loop for the Massachusetts Loop. Tennessee selected this looping segment since the existing Line 200-3 already consists of 36-inch OD diameter pipeline, and the selection of this option represents the most logical and efficient choice in terms of hydraulic modeling evaluations as well as prudent pipeline operations to continue these existing looped sections with similar pipe diameter selections.

Tennessee selected the 24-inch OD diameter pipeline looping size for the Connecticut Loop, including the portion in Agawam, Massachusetts, along the existing 16-inch diameter Line 300-1 in an effort to eliminate the possibility of having to install additional or new compression equipment at existing or new locations. By selecting a 24-inch OD diameter pipeline loop for the Connecticut Loop, Tennessee is able to reduce friction losses along this new pipeline looping section and continue to maintain adequate pressure in its lines to support the needs of its existing shippers as well as meeting the needs of the Project shippers.

Tennessee did evaluate an option of installing a 42-inch OD pipeline looping segment as an alternative to the proposed Massachusetts Loop (a 36-inch OD pipeline looping segment) to determine if that option

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

would minimize overall environmental impacts. Installing a 42-inch OD pipeline looping segment would allow for a shorter distance of pipeline looping and would reduce the overall amount of required new permanent easement. However, additional temporary workspace would be needed during construction to accommodate constructing this larger diameter pipeline. The calculated length of the 42-inch OD pipeline looping required to fulfill the Project objectives would be 3.5 miles in Massachusetts. This would result in the reduction of approximately 0.3 miles of length of new ROW in Massachusetts.

Tennessee did not select this option as it did not offer significant environmental advantages over the proposed option. Installing 42-inch OD pipeline loop, which would be directly connected to an existing 36-inch OD pipeline, would require additional temporary workspace, thereby offsetting any reduction in overall impacts by the reduced length and also would require the installation of pieces of pipeline to transition from the current smaller diameter pipe to the larger diameter pipe for construction purposes. Operationally, the need to internally inspect the pipelines through the use of in-line inspection tools would require Tennessee to install more aboveground facilities, including two additional pig launchers and receivers, which would result in more environmental impacts than with the proposed route. Tennessee would need to keep all existing aboveground facilities in place for the existing pipeline and also install a total of two additional aboveground facilities than currently proposed for the Project. The financial cost to the Project's customers would also be increased since the anticipated cost to install the required amount of 42-inch OD pipeline looping would exceed the estimated cost required to install the Project's scope of 36-inch diameter pipeline looping in those same areas.

3.2.4 Compression Option

Tennessee also evaluated an option to install additional compression horsepower at existing compressor station locations along its pipeline system in lieu of the proposed pipeline looping segments to satisfy the objectives of the Project. Tennessee evaluated one option that would involve the installation of a an additional 3,500 horsepower of compression, as well as replacing existing facilities, at existing Station 261 in Agawam, Massachusetts to achieve the Project objectives in place of installing the proposed Massachusetts Loop. However, Tennessee did not select this option because adding horsepower to the existing compressor station would result in higher atmospheric emissions (Greenhouse Gas Emissions) from the compressor units, which is not allowed by the current air permit granted by the Massachusetts Department of Environmental Protection for this compressor station. If this option were selected, Tennessee would be required to replace existing compression units and reduce total emissions from this source. Further, the addition of incremental horsepower at Station 261would result in higher Project and operating fuel costs to its shippers, higher carbon and greenhouse gas emissions, and increased friction losses along the existing pipeline system.

3.3 ROUTE ALTERNATIVES

Alternatives to the proposed pipeline loops and modifications at Station 261 were evaluated as part of the planning and design process for this Project. The alternatives analysis for the Project facilities were based on environmental and land use impacts, as well as permanent easement acquisitions and number of property owners affected. The following steps were used in the selection of the route alternatives discussed in the below sections:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

1. development of routing criteria;
2. identification of potential routing alternatives;
3. collection of data relative to each alternative;
4. evaluation of potential environmental and land use impacts; and
5. evaluation of routing alternatives against routing criteria.

Existing information sources such as field reconnaissance, aerial photography, topographic maps from the USGS, MassGIS and National Wetland Inventory ("NWI") maps were used during the desk top analsis route identification and evaluation processes.

As discussed above, in evaluating routing options for the three proposed pipeline loops, Tennessee determined that given the existing pipeline, and in order to avoid and minimize environmental impacts, the loops should be co-located with the existing pipeline ROW to the maximum extent practicable, feasible, and as legally permitted. The use of co-location as a principle design element by Tennessee is necessitated by the existing land use characteristics in the area of the loops and the Commission guidelines which stress the corridor concept. The utility corridor created by Tennessee's existing pipeline infrastructure avoids and minimizes further environmental impacts and disturbance to residences and the public. Locating pipeline facilities along the existing corridor reduces the establishment of new corridors in previously undisturbed areas, while limiting the number of affected landowners.

The main determinants used to select the proposed route, over the other routes evaluated, pertained to minimizing environmental impacts and the number of affected landowners, constructability issues, and to limit the extent of disruption on the communities potentially being affected during construction.

In response to comments received and the MEPA Certificate and Scope, Tennessee evaluated two additional route alternatives and a roadway alternative in an attempt to entirely avoid DCR properties. These alternatives are discussed in Section 3.3.1.4.

3.3.1 Alternatives to Limit DCR Property Encroachment

3.3.1.1 Alternative Loop Location

In lieu of the proposed location for the Massachusetts Loop, Tennessee evaluated the approximately 20 mile section of existing pipeline between Town Hill Road and Station 261 in Agawam for a location to add an approximately four mile looping segment without impacting DCR property, protected open space, or be located within residential areas, but did not find any such locations. The landscape adjacent to the existing Tennessee ROW becomes more congested and densely populated in Southwick and Agawam, limiting the possibility of locating the pipeline looping segment further east without increased impacts to residential areas and numerous property owners. The four mile section of required pipeline looping cannot be moved west because three existing pipeline facilities are already located along this section of ROW. Tennessee would have to construct a fourth stand-alone four mile section of pipeline adjacent to the existing pipelines and ROW, resulting in system in-efficiencies. Operationally, this design is not optimal when compared to the extension of the existing third pipeline in Sandisfield which allows for additional gas to be transported into the looping segment and then back into the two existing pipelines at the end of the loop. Siting the

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

pipeline looping segment as an extension to the existing 36-inch pipeline also eliminates the need for an additional set of aboveground appurtenant facilities (pig launcher and pig receiver) that are required for operations and maintenance purposes if a stand-alone section were constructed. An existing pig launcher is located at the beginning of the 36-inch pipeline at existing Station 254 and a single pig receiver is located at Town Hill Road, at the end of the existing 36-inch loop. If the pipeline were moved further east or west, a second set of pig launchers and receivers would need to be constructed for this stand-alone section of pipe, requiring additional aboveground facilities to accommodate these facilities for operations and maintenance purposes, as opposed to relocating the existing pig receiver on the 36-inch line from Town Hill Road to the end of the line. Based on these considerations, along with operation and maintenance factors of the pipeline, locating the new pipeline looping segment in Sandisfield offered the best alternative for system needs and efficiency while also minimizing the overall length of new pipeline, which also avoids and minimizes impacts to the environment.

3.3.1.2 Narrower Construction Corridor and Maximizing ROW

The Project has been designed to maximize the use of the existing 200 Line ROW. The proposed construction ROW widths are based on minimum separation distance between the existing and proposed new pipelines and the guidelines for safe construction of similarly sized pipelines developed by INGAA (1999). The proposed Project maximizes the siting of the pipeline looping segments within the existing ROW for the 200 Line to the maximum extent practicable. The proposed standard construction ROW widths will allow for safe construction and operation of the pipeline facilities based on the variable topographic terrain and diverse land use types crossed by the Project. Additional discussions on land requirements for the Project are included in Section 2.2.2.

3.3.1.3 Horizontal Direction Drilling of SMA-14

For a HDD of this stream crossing, a steerable rock cutting drill head would be used to extend an initial pilot hole from an HDD entry point to an HDD exit point, passing a sufficient distance below Stream SMA-14. The pilot borehole would be successively enlarged (reaming) by multiple passes of larger drill bits, until the drill hole was adequately sized to accept pullback of the assembled 36-inch pipeline. The HDD segment would then be integrated into the conventionally-built trenched pipeline on either end.

The feasibility evaluation consisted of viewing potential HDD entry and exit locations in the field and examining the Project alignment sheets, combined with evaluating the general advantages and limitations of HDD construction methodology.

Critical factors to consider in determining the feasibility of an HDD and enable the owner/constructor to successfully manage the construction risks inherent in the technique include:

- The vertical geometry of the drill path, which is typically controlled by the safe bending radius of the steel product pipeline (approximately 3,600 foot minimum radius curvature) and site topography/access constraints.

- Horizontal bends in the drill path to stay within a given alignment, such as the existing pipeline ROW.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

- Adequate workspaces to create the HDD entry and HDD exit drilling locations, and a continuous, linear laydown space to assemble the pipe string for pullback (requiring transport, welding, inspection, coating and testing each pipe piece added to pipe string).

- Favorable subsurface geology.

- Depth of the feature to be crossed (Stream SMA-14).

- Control of pressurized drilling fluid to prevent or minimize inadvertent fluid returns to the ground surface or into the stream.

- Construction feasibility of mobilizing/demobilizing the appropriate machinery and support materials to the work locations.

- Duration of work.

Based on an initial evaluation of the feasibility of constructing an HDD below the stream conducted by Tennessee's consultant, Haley & Aldrich, an HDD does not present the best option for minimizing short- and long-term risks to the environment along pipeline route. An HDD crossing at this location would be very difficult and complicated to construct. It presents discrete risks that would be a challenge to execute successfully and control, and does not qualify as a "best management" or "best method" option when compared to a conventional, narrow trench, common construction method that would otherwise be used to cross SMA-14. The key reasons supporting this determination are as follows:

- Based on a minimum radius curvature and accommodating variations in topography, the HDD entry and HDD exit points may need to be between 2,000 and 2,500 feet apart. Construction equipment will likely need to pass over the stream multiple times to build the HDD entry and HDD exit workspaces.
- The majority of the drill will be in hard crystalline bedrock, requiring a large drill rig with sufficient capacity for rock drilling and pullback of the assembled steel pipeline. The condition of the rock, and presence of fractures/faults that may transmit pressurized drilling fluid, is unknown.
- Access into almost any location along the pipeline route will be challenging due to limited access roads and the need to mobilize a heavy drill rig. The HDD drill set up requires approximately eight to twelve trailer loads of specialized equipment (both mobilized in and demobilized out) that have to cross over the existing pipelines or require a large footprint of newly cleared ROW.
- The HDD entry and exit side set ups are typically 150 feet x 150 feet in plan dimension and need to be constructed as level and stable pads. These areas will require permanent regrading (and possibly rock blasting) to construct.
- The HDD entry and HDD exit pads cannot be established directly above the current pipelines due to the risk of damage. Therefore, the required set ups will extend beyond/outside the current easement and require TWS or ATWS.
- To minimize inadvertent drill fluid returns into the SMA-14 stream or adjacent wetlands, the drill depth below the stream to be crossed requires between 25 feet and 35 feet of rock cover. Unintentional drill fluid returns along other segments of the HDD are also a possibility.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

- Pipe assembly will require approximately the length of the HDD drill string, plus approximately 30 feet at either end for connections. The pipe string cannot be supported on top of the existing buried pipelines due to potential damage; hence additional workspace outside the current easement will likely be needed. Pipe stringing up the topographic ridge at Sta 116+80 may not be safely constructed without further evaluation, due to the excessively steep slopes.
- The HDD drill alignment will require both vertical and horizontal (compound) curves. Based on the minimum bend radius of the new pipeline, the drill path may extend beyond/outside the current ROW, requiring additional permanent easements and possible land taking.
- Generated drill mud and drill cuttings will need to be transported by truck from the HDD work zones and disposed of off-site.
- Increased duration and amount of traffic on limited county roads.
- Assuming an HDD production rate of 25 feet/day average, a 2,000 foot drill would require approximately 80 days to complete, not including mobilization, set-up, pipe pull back and demobilization. In contrast, conventional open cut trench construction across SMA-14 using a dry crossing method (dam and pump or flumes) would only require 1-2 days to complete the crossing, at a comparatively far lower risk of potential problems.

For these reasons, an HDD crossing of this location was not selected as the proposed crossing method.

3.3.1.4 Alternative Pipeline Routes

After establishing that the Massachusetts Loop should commence at Town Hill Road at the terminus of the existing 36-inch pipeline, Tennessee evaluated two separate alternatives with new ROW that were selected to avoid DCR property, as directed in the Secretary's EENF Certificate and Scope. These alternatives were chosen, after consultations with DCR staff, to avoid DCR property and minimize impacts to sensitive resources.

To avoid impacts to DCR properties, Tennessee evaluated two alternative routes -- Alternative 1 located to the north of the existing ROW and Alternative 2 located to the south of the existing ROW. An overview map of the two alternative routes, compared to the proposed route and existing 200 Line infrastructure is provided in Appendix I. A table comparing the impacts from each of the two alternative routes and the proposed route is provided in Table 3-1 below.

For comparison between the two alternatives and the proposed route, all three routes were evaluated using MADEP wetland data and assumed impacts from the full width of the permanent ROW. Therefore, it is important to note that the impacts presented in Table 3-1 for the proposed Massachusetts Loop do not match the impacts presented elsewhere in this DEIR. The impacts presented elsewhere in this DEIR have been estimated using actual survey data and a reduction in the permanent pipeline ROW width through wetland areas. Accordingly, the impact estimates for the two alternative routes, which primarily occur in undisturbed areas, or greenfield areas likely underestimates actual wetland impacts.

Table 3-1 compares the impacts of the proposed route for the Massachusetts Loop to the two alternative routes that avoid DCR property. Not only does the preferred route avoid and minimize impacts to the environment, it is the shortest alternative and it limits impacts by maximizing co-location and limits impacts to previously disturbed areas within the existing ROW. The preferred route does impact DCR property; however, a vast majority of the proposed construction and operations activities are within and directly

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

adjacent to the existing ROW. Therefore, when comparing overall environmental impacts and the fact that use of the existing ROW is being maximized, the proposed alternative presents the least amount of environmental impacts and is consistent with the overall intent to avoid, minimize, and mitigate Project impacts. In addition, both alternative routes increase impacts to roadway crossings, residential land use, occupied dwellings, and waterbody crossings, when compared to the proposed route. Therefore, based on the increased impacts associated with the two alternative routes that avoid DCR property (see Table 3-1), along with system configuration, the proposed route, minimizes overall environmental impacts as compared to the alternative routes that avoid DCR property.

TABLE 3-1
IMPACTS FROM TWO ALTERNATIVE PIPELINE ROUTES VERSUS THE PROPOSED ROUTE FOR THE MASSACHUSETTS LOOP

Route Element	Alternative 1	Alternative 2	Proposed
Length (miles)	14.05	11.43	3.81
Length Adjacent to Existing ROW (miles)	0	0	3.81
Construction Land Requirements (acres)	212.59	173.85	58.03
Permanent ROW (acres) – Operation	85.15	69.31	11.56
Steep Slopes = 25-35% (feet)	15,330	25,058	4,681
Number of Property Owners Affected	152	59	20
Parks and Recreational Areas (linear distance crossed in feet)	631	319	10,545
Waterbody Crossings (number)	26	14	4
Major Waterbody Crossings	7	3	0
Construction Impact on Forest (temporary) (acres)	173.63	153.92	39.62
Operational Impact on Forest (permanent) (acres)	69.04	61.24	7.22
Linear Distance of Contiguous Forest Crossed (feet)	60,238	53,379	11,687
Construction Impact on Wetlands (temporary) (acres)	23.02	15.13	1.89
Operational Impact on Wetlands (permanent) (acres)	9.46	6.21	0.54
Wetland Crossings (number)	19	17	5
Road Crossings (number)	22	14	4
Access Roads Required (number)	NA	NA	5
Environmental Hazards and / or Concerns	NA	NA	NA
Occupied Structures within 50 feet of ROW	46	16	0
Public Lands Impacted (number and total feet)	0	1 and 319 ft	2 and 10,545 ft

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

3.3.1.5 Roadway Alternative

Because DCR property is present on both sides of the existing ROW, the only remaining viable alternative option available in the area to avoid DCR land would be locating the pipeline looping segment in local roadways. With the Massachusetts Loop commencing at Town Hill Road, Tennessee evaluated an additional route to avoid DCR property beginning at Town Hill Road partially paralleling area roadways. This roadway alternative would begin at Town Hill Road, proceed north for approximately ½ mile, turn right onto Route 23, proceed for approximately ¼ mile, turn right onto Cold Spring Road and proceed southeast for approximately three miles, until rejoining the existing Tennessee ROW at the Cold Spring Road crossing. The overall length of this partial roadway alternative would be approximately 4.5 miles in length. Although this alternative would result in less impact to wetlands and forested areas on DCR land, Spectacle Pond Brook and other streams would need to be crossed by the alternative route, as these streams cross under Cold Spring Road. Also, Tennessee notes that general pipeline practice is to minimize impacts to landowners and minimize disruption to local communities from construction and operation. Construction of a pipeline in roadways would require road closings during construction and re-routing traffic around the construction site. During operation and maintenance activities, area roadways would again be required to be closed to uncover and access the pipeline for operations and maintenance purposes. Additionally, locating a pipeline in a roadway offers increased opportunities for third-party damage from construction or excavation activities occurring in proximity to the road and pipeline. This would create a safety concern during operation of the pipeline as a result of encroachments by outside sources potentially damaging the pipeline. Finally, local residents that would not otherwise be affected by the Project would be impacted if the pipeline were located within area roadways as a result of road closures and re-routes.

The primary advantage of this alternative route would be avoiding impacting DCR property and associated wetlands and forested areas. During initial open houses held in Sandisfield, significant concern was raised about the Project, including its proximity to residences and impacts on area roadways during construction. Currently, there are no residences located within 100 feet of the proposed pipeline looping segment in Massachusetts or workspace along the proposed route following the existing Tennessee ROW. However, 12 residences would be located within 100 feet of the construction workspace along this alternative route. This alternative route would also impact residential streets and cause significant disruption during construction requiring complete closure of these residential streets for approximately six months. Although this alternative minimizes impacts to DCR property, wetlands and forested areas, Tennessee did not adopt this alternative due to extensive impacts to residences and disruption to area roadways and the general public during construction.

3.3.2 Route Variations

Minor route variations were evaluated to further minimize impacts along the existing Tennessee pipeline ROW. These variations primarily focus on which side of the ROW the new pipeline should be located to avoid and minimize impacts to sensitive environmental receptors. Due to the linear nature of the Project, Tennessee's preferred design criteria is to locate the new loop on one side of the existing ROW and remain on that side to minimize cross-overs that would otherwise complicate construction and increase impacts due to the need for additional workspace and tree clearing to accommodate the crossover locations. One route variation was identified and evaluated for the Massachusetts Loop.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Massachusetts Loop - MP 1.40 to 2.90

The existing 200-3 Line 36-inch OD pipeline loop in New York and Massachusetts is located on the south side of the existing ROW. Following prudent design criteria led to beginning the proposed Massachusetts Loop on the south side of the existing ROW and proceeded east. At approximate MP 2.7, an open water area (pond) exists on the south side of the existing ROW that would be impacted by the new pipeline loop and workspace. Tennessee evaluated a cross-over of the Massachusetts Loop to the north side of th existing ROW (including relocating the corresponding section of the construction ROW) for a distance of approximately 1.5 miles to avoid impacting the pond. Tennessee identified a suitable crossing location upstream of the pond that would provide suitable workspace to accommodate the cross-over, took into consideration other factors such as slope, other wetlands, and road crossings, and determined that the most suitable location for the cross-over would begin at approximate MP 1.4. At this point, the pipeline is located on the north side of the ROW until approximately MP 2.9. At this location, Tennessee crosses back over the existing pipelines after crossing Cold Spring Road and proceeds easterly on the south side of the existing ROW to minimize impacts to an existing stream and simplify construction due to side slope constraints. From this point, the Massachusetts Loop remains on the south side of the ROW to the terminus at MP 3.8 east of South Beech Plain Road. No new landowners or wetlands/streams will be impacted by this modification. Since this variation avoids and minimized impacts to wetlands and provides adequate workspace to safely construct the pipeline, Tennessee incorporated this variation into the proposed pipeline route.

As proposed, the routing of the pipeline looping segments minimizes impacts to the environment and optimizes Project constructability. Other minor alternative routes that were evaluated did not avoid or minimize environmental conditions or potential impacts over the proposed alignment. Tennessee notes that streams and wetlands along the existing pipeline ROW generally are perpendicular to the proposed pipeline looping. Tennessee would achieve limited reduction in environmental and landowner impacts by moving the pipeline looping segments from one side of the existing ROW to the other side because these resources existing on both sides of the existing ROW. Therefore, additional deviations or modifications within the existing 200 and 300 Line corridors were not considered practicable and were not adopted as part of this Project.

3.4 ALTERNATIVE SITES FOR NEW COMPRESSION AND METER STATIONS

Although Tennessee is proposing modifications at existing Station 261, Tennessee is not proposing new compressor or meter stations as part of this Project. Therefore, an analysis of new or alternative sites is not applicable.

3.5 NO-ACTION ALTERNATIVE

While the no-action alternative would avoid the need for the Article 97 Easement, it would not avoid the impacts of the infrastructure development. This result is because demand in the northeast region for increased natural gas capacity is high and no-action would mean that Tennessee would not be able to provide the infrastructure for the identified natural gas need in the region. No-action would divert the impacts of this expansion to other locations that may result in greater impacts.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

While other sources of fuel are available, they either produce greater environmental impacts than natural gas or are not available in sufficient supplies to meet reliability demands and economic growth demands in the near future. Use of coal in the region is decreasing as demonstrated by the planned shut-down of Mount Tom and Brayton Point coal fired power plans. Additionally, Vermont Yankee is scheduled to shut down at the end of 2014, further limiting the nuclear power available in the region.

Energy conservation is an important part of the regional energy planning and Federal and Massachusetts energy policy encourages conservation to reduce energy demands. While progress in conservation is ongoing, projections indicate that even with currently expected energy conservation measures, increased natural gas capacity in the northeast region is needed (Section 1.1.1).

Other clean energy alternatives have also increased in recent years. Massachusetts efforts to increase solar power capacity have resulted in approximately 643 MW of solar power generation in Massachusetts in 2013 with a goal of generating 1,600 by 2020. Wind power capacity is also increasing in the Commonwealth, encouraged through streamlined citing and permitting, authorized in Massachusetts regulations and in 2014 generated 103 MW. Additionally, the Commonwealth's Hydropower Program represents public investment through development of low impact hydropower but this energy sector is limited. Despite these efforts and the identification by the Commonwealth of areas where wind speeds represent a viable energy source, capacity is slow to develop and subject to its own environmental issues.

Additionally, while the first federally approved off-shore wind farm is approved off the coast of Massachusetts, it has yet to complete financing and construction is not yet scheduled. According to www.eia.com, in 2013 9.3% of Massachusetts' net electrical generation came from renewable energy resources. While these efforts represent increases in non-fossil fuel energy production, they do not represent sufficient capacity to support reliability and economic growth in the region without additional energy sources. Coal, oil and nuclear power are other energy sources that could potentially be expanded to supply the northeast region but at greater environmental impact than natural gas expansion. As such, relying on the available and projected clean energy alternatives and other energy alternatives does not support no-action on this project.

3.6 ALTERNATIVE SUMMARY

As detailed in previous sections, Tennessee has conducted a thorough evaluation of alternatives to meet the Project purpose which is to address the Project Shippers' current market demand for natural gas transportation services, while avoiding and minimizing potential adverse environmental impacts to the greatest extent practicable. Tennessee evaluated pipeline routing options based on regional topography, potential adverse environmental impacts, population density, existing land usage, and construction safety and feasibility considerations. Tennessee also considered route alternatives as described in the Secretary's EENF Certificate and 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 (2014). Tennessee has also considered construction, fuel source, system, and the no-action alternatives. Tennessee conducted a detailed system alternatives analysis, including consideration of efficiency improvements, two greenfield pipeline options, and pipeline looping and compression options. This detailed system alternatives analysis allowed Project designers to select the best configuration of proposed facilities, including preferred routes and siting for new pipeline loops to meet existing customer demands and increase the volume of natural gas available to the existing service area.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Based upon the extensive and comprehensive alternatives analysis evaluation, Tennessee believes that the proposed Project is the Least Environmentally Damaging Practicable Alternative, and is also therefore the preferred alternative. If the proposed Project is not constructed to meet shipper demand (i.e., the No-Action Alternative is selected), the market served by the Project may experience energy shortages in times of peak demand, or users may revert to the consumption of alternative fuels that have greater air quality and greenhouse gas impacts, including oil and coal. Use of these alternative fuels to supply the energy needs of Tennessee's natural gas shippers is not the preferred or best practicable alternative, as compared to the use of cleaner-burning natural gas. While increases in alternative fuels such as solar and wind power are encouraged by Massachusetts policy and public funding, these increases will not be able to offset the need for the Project. In addition, although energy conservation is a valuable measure as part of an overall energy plan, energy conservation alone and in concert with alternative fuels will not satisfy the current energy demand of consumers, or the growth demands, served by this Project. Accordingly, Tennessee concludes that the proposed Project facility locations meet the Project's purpose and need.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

4.0 EXISTING ENVIRONMENT

4.1 PRIMARY SCOPED RESOURCES

Primary Scoped Resources are those resources noted in the Secretary's EENF Certificate as being subject to State permitting and approvals.

4.1.1 Wetland Protection Act Resources

Desktop surveys and field studies were conducted to identify and delineate local, state, and federal wetlands and other resource areas along the Project route. The desktop survey utilized the following resources to identify potential areas where wetlands may be located along the Project ROW: U.S. Fish & Wildlife Service National Wetlands Inventory (NWI) Mapping, MassDEP Wetlands Mapping, and USDA/NRCS Soil Surveys.

Following the desktop survey, field studies were conducted in 2013 and 2014 to further identify jurisdictional wetlands and other resource areas. Field surveys were preformed according to the *U.S. Army Corps of Engineers Wetland Delineation Manual* ("1987 Corps Manual", USACE, Environmental Laboratory 1987), the *Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region Version 2.0* ("NC/NE Regional Supplement"; USACE 2011a), *Delineating Bordering Vegetated Wetlands Under the Massachusetts Wetlands Protection Act* (MassDEP, 1995), and other applicable federal, state, and municipal wetland guidance documents. Each jurisdictional vegetated wetland, water body, and waterway boundary was demarcated by numbered flagging, which was subsequently surveyed in the field using a Trimble Global Positioning System (GPS) survey unit with sub-meter accuracy. The resulting Resource Area boundaries were used to calculate project impacts and are shown on the plans and drawings located in Appendix J.

Although no lakes or ponds are crossed by the Project, a number of Massachusetts-designated wetland resource areas and jurisdictional federal wetlands were identified and surveyed along or in the immediate vicinity of the Project route (see Appendices B and J), including:

- Bordering Vegetated Wetlands ("BVW")
- Land Under Water Bodies and Waterways
- Inland Bank
- Riverfront Area
- Bordering Land Subject to Flooding (i.e. 100-year Floodplains)
- Isolated Wetlands (federal, non-state, jurisdictional wetlands)
- Vernal Pools

Discussions of these resource areas are provided below.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

4.1.1.1 Bordering Vegetated Wetlands

In Massachusetts, wetlands and watercourses are regulated by the MADEP under the Massachusetts Wetlands Protection Act ("WPA" MGL c.131 s.40) ("The Act") and implementing regulations (310 CMR 10.00). The Act defines a BVW as "freshwater wetlands which border on creeks, rivers, streams, ponds and lakes and includes wet meadows, marshes, swamps and bogs. BVWs are areas where the soils are saturated and/or inundated such that they support a predominance of wetland indicator plants."

The existing ROWs along the Project route encompass a variety of wetlands. Most of these wetlands have been historically affected by the routine management associated with maintenance and safe operation of the pipeline facilities. The wetlands identified along the existing ROWs include a mix of forested, scrub-shrub, emergent marsh, or wet meadow vegetation. For classification purposes, wetlands were categorized in the field as palustrine scrub-shrub (PSS), palustrine emergent (PEM), palustrine forested (PFO), or riverine systems in accordance with Cowardin et al. (1979). In locations where a wetland could be characterized by more than one wetland classification type, an attempt was made to distinguish between wetland cover types to facilitate impact calculations for each cover type and for each wetland.

Isolated wetlands are not jurisdictional resource areas under the Massachusetts Wetlands Protection Act unless they hold enough water to meet the definition of Isolated Land Subject to Flooding (310 CMR 10.57). However, given the often unclear definition of an "isolated" wetland, the derivation of impacts to bordering vegetated wetlands presented in Table 5-3 and throughout this document actually represent the total impacts proposed to all vegetated wetlands, whether assumed by Tennessee to be "isolated" or not. BVWs and Land Under Water Bodies and Waterways ("LUWW"), are generally all considered "waters of the United States", subject to Section 404 and Section 401 of the Federal Clean Water Act, and equal weight is generally afforded to these wetland types in terms of protection under these programs.

Table 4-1 below contains a list of the subject wetlands identified along the ROW. All wetlands identified within the construction workspace are shown on the alignment sheets in Appendix B.

TABLE 4-1
WETLANDS OCCURRING WITHIN OR IN CLOSE PROXIMITY TO THE PROJECT

Municipality	Wetland ID[1]	Wetland Class[2]	Comments
Agawam	WMA-01	PFO/PEM	
Agawam	WMA-01A	PFO	
Agawam	WMA-01B	PFO	
Agawam	WCT-01B	PFO	
Agawam	WMA-02	PEM	
Sandisfield	WMA-3	PEM/PFO	
Sandisfield	WMA-4	PFO	
Sandisfield	WMA-5	PEM/PFO	
Sandisfield	WMA-6	PEM/PFO	

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

TABLE 4-1
WETLANDS OCCURRING WITHIN OR IN CLOSE PROXIMITY TO THE PROJECT

Municipality	Wetland ID[1]	Wetland Class[2]	Comments
Sandisfield	WMA-7	PEM/PFO	
Sandisfield	WMA-8	PFO	
Sandisfield	WMA-9	PFO	
Sandisfield	WMA-10	PEM/PFO	
Sandisfield	WMA-11	PFO	
Sandisfield	WMA-12	PEM/PFO	
Sandisfield	WMA-13	PEM	
Sandisfield	WMA-14	PEM/PFO	
Sandisfield	WMA-15	PEM/PFO	
Sandisfield	WMA-16	PEM/PFO	
Sandisfield	WMA-17	OW	
Sandisfield	WMA-18	PEM/PFO	
Sandisfield	WMA-19	PEM/PFO	
Sandisfield	WMA-20	PEM/PFO	
Sandisfield	WMA-21	PEM/PFO	
Sandisfield	WMA-23	PEM/PFO	
Sandisfield	WMA-24	PEM	
Pipeyard			
Tyringham	WMA-22	PEM	

[1] Wetland series number generated by AECOM to identify wetlands within and adjacent to the Project corridor;
[2] Wetlands classification according to Cowardin et al 1979:
PEM = Palustrine Emergent Wetland
PFO = Palustrine Forested Wetland
PSS = Palustrine Scrub-Shrub Wetland
OW = Open Water

A description of the wetland cover types and associated vegetative communities crossed by the Project facilities in Massachusetts are detailed below.

4.1.1.1.1 Palustrine Forested Wetlands

Forested wetlands are characterized by woody vegetation that is six meters (approximately 18 feet) tall or taller with diameters of 4 inches or more, and normally include a moderate to dense canopy or overstory layer of trees, an understory of young trees or shrubs, and an herbaceous layer. All or a portion of 15

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

wetlands identified within and adjacent to the Project alignment during the field surveys in fall 2013 and spring 2014 were palustrine forested wetlands ("PFO"). Species within these wetlands included red maple, white oak (*Quercus alba*), American elm (*Ulmus americana*), Eastern white pine and American hornbeam (*Caarpinius caroliniana*) in the canopy and subcanopy layers, with silky dogwood and northern arrowwood in the understory. Dominant plants in the herbaceous layer included sensitive fern, cinnamon fern, Canada mayflower, spotted touch-me-not and poison ivy.

Hemlock Hardwood Swamp

Hemlock swamps occur in poorly drained basins throughout Massachusetts. The soil is typically characterized by organic peat or muck, and is saturated throughout the year. Hemlock dominate the canopy and often times is associated with a mixture of white pine, red maple, and yellow birch. The dense canopy allows little light to penetrate through to the subcanopy and shrub species are sparse, but can form dense thickets in canopy gaps. Typical shrubs include winterberry and mountain laurel (*Kalmia latifolia*). Cinnamon fern, goldthread (*Coptis trifolia*), partridgeberry, and wild sarsaparilla are common. The ground layer is hummocky and often covered with sphagnum moss (Swain and Kearsely, 2011).

4.1.1.1.2 Palustrine Scrub-Shrub Wetlands

All or a portion of three wetlands identified along the Project alignment were classified as Palustrine scrub-shrub ("PSS") wetlands. Scrub-shrub wetlands are generally dominated by woody vegetation less than six meters (approximately 18 feet) tall. Scrub-shrub wetland types may represent a successional stage leading to a forested wetland and include shrubs, young trees, and trees or shrubs that are small and/or stunted due to environmental conditions. Shrub swamps are widespread, highly variable communities with shrub-dominated wetlands that occur on mineral or mucky mineral soils that are either seasonally or temporarily flooded. They are typically found in flat areas in which the water table is at or above the soil surface for most of the year. Shrub swamps are generally found on the transition zone of emergent and forested wetland areas that have been previously disturbed by vegetation control practices or past land use patterns. Shrub swamps are primarily found within and along the edge of the existing ROW in the Massachusetts portion of the project area. Dominant vegetation within shrub swamps include red maple, speckled alder, highbush blueberry (*Vaccinium corymbosum*), silky dogwood (*Cornus amomum*), cinnamon fern (*Osmunda cinnamomea*), New York fern (*Thelypteris noveboracensis*), royal fern (*Osmunda regalis*), arrow-wood (*Viburnum dentatum*), northern spicebush, sensitive fern, and skunk cabbage.

Shrub Swamp

Shrub swamps are common and widespread. They occur in basin depressions, at pond margins, and along river and streamsides. They can be found in any flat area where the water table is at or above the soil surface for most of the year. Soils are generally well-decomposed organic mucks that are permanently saturated but only seasonally or temporarily inundated. Shrub swamps are often found in the transition zone between emergent marshes and swamp forests.

Shrub swamps are highly variable communities that probably can be divided into several types; however, there is currently not enough information available to separate vegetation types. Shrub swamps typically have a mixture of the following shrub species: speckled alder, smooth alder (*Alnus serrulata*), highbush blueberry, meadowsweet, buttonbush, winterberry, sweet gale (*Myrica gale*), swamp azalea, silky dogwood

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

(*Cornus amomum*), northern arrowwood (*Viburnum dentatum* var. *lucidum*), maleberry (*Lyonia ligustrina*), and the non-native shrub European alder-buckthorn (*Rhamnus frangula*). Scattered red maple or gray birch (*Betula populifolia*) saplings also occur. Richer shrub swamps in areas with circumneutral water are often dominated by spicebush. Some shrub swamps are dominated by a single species, such as black willow (*Salix nigra*) riverside thickets [which may best be included with floodplain forests], highbush blueberry thickets, or buttonbush swamps. A mixture of the following species is typical: common arrowhead (*Sagittaria latifolia* var. *latifolia*), skunk cabbage (*Symplocarpus foetidus*), cinnamon fern, sensitive fern, and royal fern *(Osmunda regalis*), sedges (*Carex* spp.), and Sphagnum spp. moss (Swain and Kearsely 2011).

4.1.1.1.3 Palustrine Emergent Wetlands

Emergent wetlands are characterized by erect, rooted, herbaceous hydrophytes not including mosses and lichens. These wetlands maintain the same appearance year after year, are typically dominated by perennial plants, and the vegetation of these wetlands is present for the majority of the growing season. Persistent emergent wetlands are characterized by species that typically remain standing until the beginning of the next growing season. Dominant vegetation within the persistent PEM wetlands along the alignment of the proposed loop included wool grass (*Scirpus cyperinus*), bluejoint (*Calamagrostis canadensis*), skunk cabbage (*Syplocarpus foetidus*), tussock sedge, beaked sedge (*Carex rostrata*) and witchgrass species (*Dichanthelium spp.*).

All or a portion of all 17 wetlands identified along the Project alignment were classified as Palustrine emergent ("PEM"). Emergent wetlands are primarily found within the existing ROW in Massachusetts. Emergent wetlands are non-tidal wetlands characterized by erect, rooted, herbaceous hydrophytes. Emergent wetlands are generally dominated by perennial plants and maintain the same appearance through the years. Plant species commonly found in Palustrine emergent wetlands along the Project alignment included soft rush (*Juncus effusus*), common reed (*Pragmites australis*), broad-leaved cattail (*Typha latifolia*), purple loosestrife (*Lythrum salicaria*), woolgrass, lurid sedge (*Carex lurida*), sensitive fern (*Onoclea sensibilis*), spotted touch-me-not (*Impatiens capensis*), skunk cabbage, reed canary grass (*Phalaris arundinacea*) and blue flag (*Iris versicolor*).

Shallow Emergent Marsh

Shallow emergent marshes occur in similar settings to deep emergent marshes, i.e., in broad, flat areas bordering low-energy rivers and streams, often in backwater sloughs, or along pond and lake margins. Unlike deep emergent marshes, shallow marshes commonly occur in abandoned beaver flowages, and in some states they are named "Abandoned beaver meadows" or "beaver flowage communities." The soils are a mixture of organic and mineral components. There is typically a layer of well-decomposed organic muck at the surface overlying mineral soil. There is standing or running water during the growing season and throughout much of the year, but water depth is less than deep emergent marshes and averages less than 6 inches.

Vegetation composition is similar to deep emergent marshes except that shorter grasses, sedges and rushes dominate. Cat-tails, phragmites, and wool-grass, the dominants of deep emergent marshes, can occur but are never dominant. Tussock forming species, like tussock sedge and Canada bluejoint (*Calamagrostis canadensis* var. *canadensis*), often cover broad areas and form a hummock-hollow topography. Reed

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

canary grass can also occur. It is common to see tussock sedge-dominated marshes in old beaver flowages mixed with scattered shrubs like alder and spiraea. The shallow water typically has a mixture of bur-reeds (*Sparganium* spp.), sedges (*Carex* spp.), and rice cut-grass. Floating leaved plants, like the water-lilies (*Nymphaea odorata* and *Nuphar* spp.), and submergents, like pondweeds (*Potamogeton* spp.), occur in open areas, and duckweed (*Lemna* spp.) is abundant in still water. Based on species composition alone, it can be difficult to differentiate shallow emergent marshes and wet meadows, but they occur in different physical settings and hydrologic regimes (see concept description for wet meadows (Swain and Kearsely 2011)).

Deep Emergent Marsh

Deep emergent marshes generally form in broad, flat areas bordering low-energy rivers and streams or along pond and lake margins. The soils are a mixture of organic and mineral components. There is typically a layer of well-decomposed organic muck at the surface overlying mineral soil. There is standing or running water during the growing season and throughout much of the year. Water depth averages between 6 inches and 3 feet. Deep emergent marshes are associated with shrub swamps, and the two communities intergrade.

Tall graminoids, like broad-leaved cat-tail (*Typha latifolia*) and phragmites (*Phragmites australis*), often form extensive dense stands. Narrow-leaved cat-tail (*Typha angustifolia*) occurs in more alkaline sites or in saline areas along roads (Weatherbee 1996). Other characteristic graminoids include wool-grass, common threesquare (*Scirpus pungens*), Canada bluejoint, rice cut-grass, and tussock-sedge. Herbaceous associates include arrow-leaf tearthumb (*Polygonum sagittatum*), bulblet water-hemlock (*Cicuta bulbifera*), swamp-candles (*Lysimachia terrestris*), beggar-ticks (*Bidens* spp.), bedstraw (*Galium* spp.), common arrowhead, slender-leaved goldenrod (*Euthamia tenuifolia*), and marsh fern. Nutrient-rich sites in Berkshire County typically have cat-tails mixed with soft-stemmed bulrush (*Scirpus tabernaemontani*), hard-stemmed bulrush (*S. acutus*), river-horsetail (*Equisetum fluviatile*), marsh-cinquefoil (*Comarum palustre*), sweet-flag, bristly sedge (*Carex comosa*), lakeside sedge (*C. lacustris*), and giant bur-reed (*Sparganium eurycarpum*) among others (Weatherbee, 1996) (Swain and Kearsely 2011).

Wet Meadow

Wet meadows occur in lake basins, wet depressions, along streams, and in sloughs and other backwater areas with impeded drainage along rivers. The mucky mineral soils are permanently saturated and flood occasionally; standing water is not present throughout the growing season as in deep and shallow emergent marshes. As these communities flood only temporarily, continued disturbance is necessary to prevent encroachment by woody plants.

Tussock-forming sedges, such as tussock-sedge or marsh-sedge (*Carex lacustris*), are often dominant, with over 50% of the cover, with variable proportions of other graminoids and herbaceous species. Canada bluejoint, wool-grass, slender woolly-fruited sedge (*Carex lasiocarpa* var. *americana*), slender spike-sedge (*Eleocharis tenuis*), stalked wool-grass (*Scirpus pedicellatus*), rice cut-grass, and brown beak-sedge (*Rhynchospora capitellata*) are typical of wet meadows. Characteristic herbaceous associates include erect water smartweed (*Polygonum amphibium* var. *emersum*), pickerel-weed (*Pontederia cordata* var. *cordata*), river-horsetail, nodding bur-marigold (*Bidens cernua*), spotted joe-pye-weed (*Eupatorium maculatum*), northern blue flag (*Iris versicolor*), and sweet flag (*Acorus calamus*). Calcareous wet meadows have calciphilic species, including red-footed spike-sedge (*Eleocharis erythropoda*), delicate sedge (*Carex leptalea*), fen-sedge (*Carex tetanica*), and beaked sedge (*Carex utriculata*). Wet meadows are very closely

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

related to shallow emergent marshes, but typically have more uniform vegetation, i.e., often a single sedge species dominates. Wet meadows are called "sedge meadows" in many other states, but "wet meadow" is used in Massachusetts because of known occurrences of meadows dominated by rice cut-grass and other non-sedge species (Swain and Kearsely 2011).

Woodland Vernal Pool

Woodland vernal pools are small, shallow depressions that are isolated from other surface waters. These pools flood in the spring and sometimes in the fall, and are typically dry in the summer. These pools often have hydric soils. When dry, woodland vernal pools can often be recognized by a layer of stained leaves covering the dry depression. Woodland vernal pools often have little or no vegetation, but they are ringed by upland trees or shrubs, such as sweet pepperbush (*Clethra alnifolia*). Other forested and non-forested wetland community types can function as vernal pool habitat if they have long periods of standing water, i.e., 2 to 3 months (Swain and Kearsely 2011).

4.1.1.2 Land Under Waterbodies and Waterways (LUWW) and Bank

The pipeline route in Massachusetts is located within two different watersheds: the Connecticut River Basin and the Farmington River Basin. The Connecticut River Basin spans 11,263 square miles and includes the states of Vermont, New Hampshire, Massachusetts, and Connecticut. This drainage basin covers approximately 2,728 square miles within Massachusetts and drains all or part of 45 municipalities within the Commonwealth. A small portion of the Project, in Agawam, is situated within the Connecticut River Basin.

The Massachusetts Loop in Sandisfield is located entirely within the Farmington River Watershed. The total drainage area of the Farmington River Watershed is approximately 602 mi², 156 mi² of which are located in Massachusetts. A major portion of the Massachusetts section of the watershed drains the West Branch Farmington River and its tributaries. Originating in Becket in the southern Berkshire Mountains of southwestern Massachusetts, the West Branch Farmington River runs for approximately 16 miles before entering northwestern Connecticut. Just over the border in Connecticut it is impounded to form Colebrook Reservoir, a back-up drinking water supply for the City of Hartford. In Massachusetts, the West Branch Farmington River flows through a predominately undeveloped and rural area with the watershed encompassing major portions of the towns of Becket, Otis, Sandisfield, Tolland, and Granville. Small areas of the watershed also reach into the towns of Southwick, Blandford, Tyringham, Monterey, and New Marlborough. Over 85% of the watershed in Massachusetts is forested, providing timber resources for related industries for over two centuries. Approximately 31% of the watershed area is characterized as having greater than 25% slope. The hilly terrain contributes to the basin's rugged beauty, but it also has discouraged development. Development in the watershed is low density and often aggregated around village centers. Becket, with a population density of 32 persons per square mile, and Otis, with a density of 30 persons per square mile, are generally the hilliest and most forested communities in the watershed. Sandisfield and Tolland, with population densities of 13 and 9 persons per square mile, respectively, are also heavily forested, and also contain more rolling hills and areas of agricultural open spaces (BRPC 1997).

Field surveys conducted in 2013 and 2014 identified all surface waters located along the Project alignment in Massachusetts. Desktop review of USGS topographic maps and field observations were used to determine flow status of each surface water and categorize each as either intermittent or perennial. Of the

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

ten streams identified and delineated along the Project alignment in Massachusetts, four are perennial. The status of each surface water is provided in Table 4-2.

In Massachusetts, surface waters are given a designation based on the following criteria:

- Class A. These waters include waters designated as a source of public water supply and their tributaries. They are designated as excellent habitat for fish, other aquatic life and wildlife, including for their reproduction, migration, growth and other critical functions, and for primary and secondary contact recreation, even if not allowed. These waters shall have excellent aesthetic value. These waters are protected as Outstanding Resource Waters.
- Class B. These waters are designated as a habitat for fish, other aquatic life, and wildlife, including for their reproduction, migration, growth and other critical functions, and for primary and secondary contact recreation. Where designated in 314 CMR 4.06, they shall be suitable as a source of public water supply with appropriate treatment ("Treated Water Supply"). Class B waters shall be suitable for irrigation and other agricultural uses and for compatible industrial cooling and process uses. These waters shall have consistently good aesthetic value.
- Class C. These waters are designated as a habitat for fish, other aquatic life and wildlife, including for their reproduction, migration, growth and other critical functions, and for secondary contact recreation. These waters shall be suitable for the irrigation of crops used for consumption after cooking and for compatible industrial cooling and process uses. These waters shall have good aesthetic value.

The Massachusetts Rivers Protection Act ("MRPA") provides additional protection to land adjacent to perennial streams (riverfront area). The riverfront area is "…a 200-foot wide corridor on each side of a perennial river or stream, measured from the mean annual high-water line of the river" (MAEEA 2014). Impacts to riverfront areas associated with the Project are provided in Section 5.1.1.3.

The West Branch Farmington River is unique in Massachusetts as the only major river that does not receive a single municipal or industrial surface wastewater discharge. In addition, there are no major water withdrawals for consumptive use in the Massachusetts portion of the basin. Due to the very rural character of the watershed and the absence of any point source discharges any water quality problems in the basin will be the result of non-point sources of pollution.

All surface waters in the Farmington River Basin in Massachusetts are Class B, cold water fishery (CWF), high quality waters. Coldwater fisheries are defined in 314 CMR 4.00 as, "Waters in which the mean of the maximum daily temperature over a seven day period generally does not exceed 68 degrees Fahrenheit (20 degrees Celsius) and, when other ecological factors are favorable (such as habitat), are capable of supporting a year-round population of stenothermal aquatic life, such as trout (*Salmonidae* spp.). Only one stream along the Project alignment is categorized as a CWF; Spectacle Pond Brook.

TABLE 4-2
WATERBODIES ASSOCIATED WITH THE CONNECTICUT EXPANSION PROJECT IN MASSACHUSETTS

Waterbody ID	Municipality	Waterbody Name[a]	Type[b]	Riverfront Area (acres)	Water Quality Designation / Fishery Classification[c]	Comment
SMA-03	Sandisfield / Berkshire	Unnamed tributary to Clam River	I	-	B / Not Specified	
SMA-05	Sandisfield / Berkshire	Unnamed tributary to Clam River	I	-	B / Not Specified	
SMA-07	Sandisfield / Berkshire	Unnamed tributary to Clam River	I	-	B / Not Specified	
SMA-08	Sandisfield / Berkshire	Unnamed tributary to Clam River	I	-	B / Not Specified	
SMA-10	Sandisfield / Berkshire	Unnamed tributary to Clam River	I	-	B / Not Specified	
SMA-14	Sandisfield / Berkshire	Spectacle Pond Brook	P	12.21	B / Cold Water Fishery	
SMA-16	Sandisfield / Berkshire	Unnamed tributary to Clam River	P	2.37	B / Not Specified	
SMA-20	Sandisfield / Berkshire	Unnamed tributary to Clam River	P	7.33	B / Not Specified	
SMA-21	Sandisfield / Berkshire	Unnamed tributary to Clam River	P	5.35	B / Not Specified	
SMA-23	Sandisfield / Berkshire	Unnamed Tributary	I	-	B / Not Specified	Associated with access road only

TABLE 4-2
WATERBODIES ASSOCIATED WITH THE CONNECTICUT EXPANSION PROJECT IN MASSACHUSETTS

Waterbody ID	Municipality	Waterbody Name[a]	Type[b]	Riverfront Area (acres)	Water Quality Designation / Fishery Classification[c]	Comment
SMA-30	Sandisfield / Berkshire	Lower Spectacle Pond	POW	-	Not Specified	Associated with Hydrostatic Test Withdrawal

N/A = Not Applicable

a: Unnamed tributary: Unnamed tributary name was identified based on review of USGS topographical mapping

b: P = perennial; I = intermittent; POW = open water

c: All surface waters in the Farmington River Basin are designated Class B, unless otherwise specified. Water quality classifications were identified through a desktop review of available GIS data layers and published literature.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

The designation of Outstanding Resource Waters ("ORW") is applied to those waters with exceptional socio-economic, recreational, ecological and/or aesthetic values. ORWs have more stringent requirements than other waters because the existing use is so exceptional or the perceived risk of harm is such that no lowering of water quality is permissible. ORWs include certified vernal pools ("CVP"); all designated Class A Public Water Supplies; and may include surface waters found in National Parks, State Forests and Parks, ACECs and those protected by special legislation (MADEP 1993). Wetlands that border ORWs are designated as ORWs to the boundary of the wetland resource area.

4.1.1.3 Riverfront Area

Under the Wetlands Protection Act, perennial streams have an associated Riverfront Area which runs along each bank. In most communities, the Riverfront Area is a 200-feet-wide band on each side of the river with the inner edge defined by the first observable break in slope or means annual high water line, whichever is higher. In the Project area, the community Riverfront Area is a 200-feet-wide band on either side of perennial streams. Table 4-2 provides the amount of Riverfront Area associated with each perennial stream along the Project alignment.

4.1.1.4 Lands Subject to Flooding (Bordering and Isolated)

No Federal Emergency Management Agency ("FEMA") designated flood zones or flood plains are crossed by the proposed pipeline alignments in Massachusetts. Tennessee reviewed National Flood Insurance Program, Flood Insurance Rate Maps ("FIRM") issued by FEMA to identify proposed crossings of areas subject to flooding and high volume flows. Tennessee will continue to consult with federal, state, and local agencies to identify any other areas where flooding is a concern that may not be currently mapped by FEMA. FEMA Special Flood Hazard Areas ("SFHAs") are those areas subject to flooding by the one percent annual chance flood (100-year flood).

Review of the FEMA floodplain information available through MassGIS indicated that the one access road associated with the Massachusetts Loop crosses the flood zone for Spectacle Pond Brook and Lower Spectacle Pond, and is within mapped areas of Bordering Land Subject to Flooding ("BLSF"). In addition, a portion of the Tyringham Pipeyard is located within BLSF, in association with Hop Brook. These areas are mapped as Zone A (areas of 100-year flooding) as depicted on the drawings in Appendix J.

Isolated Land Subject to Flooding ("ILSF") per 310 CMR 10.57 is defined as an isolated depression or a closed basin without an inlet or an outlet. It is an area which at least once a year confines standing water to a volume of at least ¼ acre-feet and to an average depth of at least six inches. There were no ILSF identified within the workspace. As discussed previously in this DEIR, all wetland areas not meeting the criteria of ILSF but consisting of wetland vegetation and soils have been categorized as BVW for the purposes of determining impacts. The overall impacts to BVW associated with the Project represent the total impacts proposed to all wetlands associated with the Project.

4.1.2 Vernal Pools

The Massachusetts Wetlands Protection Act (310 CMR 10.00) defines vernal pool habitat as "confined basin depressions, which, at least in most years, hold water for a minimum of two continuous months during

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

the spring and/or summer, and which are free of adult fish populations. These areas are essential breeding habitat, and provide other extremely important wildlife habitat functions during the non-breeding season as well, for a variety of amphibian species such as wood frogs (*Lithobates sylvatica*) and the spotted salamander (*Ambystoma maculatum*) and are important habitat for other wildlife species."

Massachusetts has a vernal pool certification process as well as a state-wide GIS layer maintained by the NHESP, which identifies certified vernal pools as well as areas suspected to be functioning as vernal pool habitat (i.e., potential vernal pools). One "Certified" Vernal Pool ("CVP") was identified by MassGIS as occurring along the Project route and multiple "Potential" vernal pools ("PVP") were identified during 2014 spring vernal pool surveys conducted by Tennessee.

Vernal pool determinations for each wetland were conducted in spring 2014 in accordance with NHESP-approved protocols and *A Field Guide to the Animals of Vernal Pools* (Massachusetts Division of Fisheries & Wildlife, 2000) to confirm whether wetlands previously identified during field delineations, but not initially surveyed during the amphibian-breeding period, function as vernal pools.

Many organisms rely upon vernal pool habitat for reproductive success. These species are referred to as obligate vernal pool species and in Massachusetts include wood frogs, spotted salamander, blue-spotted salamander (*Ambystoma laterale*), Jefferson salamander (*Ambystoma jeffersonianum*), marbled salamander (*Ambystoma opacum*), and fairy shrimp (*Branchiopoda anostraca*).

Facultative vernal pool species are fauna that utilize, but do not necessarily require, vernal pools for reproductive success. Examples of facultative species include spring peeper (*Pseudacris crucifer*), spotted turtle (*Clemmys guttata*), red-spotted newt (*Notophthalmus viridescens viridescens*), green frog (*Rana clamitans*) and bull frog (*Rana catesbeiana*). Facultative species such as those mentioned above can utilize vernal pool habitats. However, these species can also breed successfully in the margins of permanent water bodies including streams, rivers, and lakes.

4.1.2.1 Field Survey Methodology

Wetland areas associated with the Project ROWs were surveyed to identify the presence or absence of obligate vernal pool species (presence/absence surveys). Where obligate species were observed, the area was further investigated to identify whether the state and federal vernal pool criteria had been satisfied. Observed facultative species were noted on the Vernal Pool Data Forms located in the Vernal Pool Report (Attachment K), but these species were not used to identify an area as a vernal pool.

For the purposes of the ROW investigations, a potential vernal pool was defined as an area that held obligate species in the 2014 breeding season and that met the majority of the vernal pool criteria discussed above. Given access constraints to off ROW areas and the temporally limited nature of the observations, it was not possible to be sure every aspect of the criteria was being met in all cases.

In addition, obligate vernal pool species were sometimes observed breeding in perennial water bodies. Areas where this occurred were not identified as vernal pools due to the presence of a fish population. In cases where large wetland systems exhibited expansive flooded areas within which obligate vernal pool species were documented as breeding, the breeding evidence was recorded and, if appropriate based upon the observed vernal pool criteria, the areas were identified as a vernal pool. These types of areas are

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

typically referred to as "cryptic vernal pools" and, as their name suggests, may be easily overlooked. Such determinations were made by field biologists during the 2014 surveys.

All wetland areas associated with the Project corridor were investigated to determine if breeding amphibians, both obligate and facultative, were present in an effort to identify vernal pools. To facilitate the surveys, biologists were provided with Project specific wetland mapping, dip nets and digital cameras.

The surveys were conducted after the first significant rainfall events in the spring, when evening low temperatures remained in the 40s (^{o} Fahrenheit). These weather conditions facilitate inward migration of amphibians to the pools for the purpose of breeding. Biologists conducted visual surveys and used dip nets to sweep the water column to assist in determining the presence or absence of amphibians and other vernal pool species. Choruses of breeding frogs were noted when audible.

Representative photographs of the wetlands and observed species were taken at the majority of the identified vernal pool habitats and are provided in the Vernal Pool Report (Appendix K). Evidence of amphibian breeding, including but not limited to wood frog chorusing, mole salamander spermatophores, egg masses and amphibian larvae, was recorded on Vernal Pool Data Forms that are included in the Vernal Pool Report included in Appendix K of this DEIR. Additional data recorded on the data forms included the approximate size and depth of the observed breeding pool(s), substrate type and general comments, if any.

Lastly, the biologists then sketched the extent of the documented vernal pool habitat onto field mapping and/or used a global positioning system (GPS) data collection device to locate the boundaries or center of the pool where possible. Field sketches and GPS data were digitized onto updated Project mapping. Vernal pools identified along the Project corridor are provided on the mapping in the Vernal Pool Report (Appendix K). Additional vernal pool mapping including Project workspace is provided in Appendix K, separate from the Vernal Pool Report and mapping.

4.1.2.2 Field Survey Results

Based on the 2014 breeding season field surveys, 12 wetlands located along the Project corridor in Massachusetts were determined to contain breeding obligate vernal pool species. Several larger wetlands were found to contain multiple potential vernal pool areas within the larger wetland area. As a result, a total of 18 potential vernal pools, including the one Certified Vernal Pool identified from MassGIS were identified along the Project corridor and ROWs (Table 4-3).

The location of each potential vernal pool within the delineated wetland areas is provided in the Vernal Pool Report and vernal pool workspace mapping (Appendix K). Potential vernal pools delineated within the boundary of a wetland represent the areas that could be successfully utilized by obligate vernal pool species. Distinct areas within the overall vernal pool where specific data was collected are known as the data collection areas. The size of the data collection areas, as well as the overall vernal pool dimensions, represent data collected during the spring season of 2014 and can be expected to vary from year-to-year based upon seasonal fluctuations in the water table caused by annual variations in the amount and timing of precipitation. These hydrologic variations affect the location within a specific vernal pool area where amphibians would deposit egg masses in a given year, and may dictate breeding success.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

TABLE 4-3
POTENTIAL VERNAL POOLS IDENTIFIED ALONG THE PROJECT ALIGNMENT IN MASSACHUSETTS

Municipality	Vernal Pool Number[1]	Associated Wetland[2]	Species Observed and/or Heard	Existing Cover Type
Agawam	VP WMA01A	WMA01A	>1,000 wood frog tadpoles	PFO
Sandisfield	VP WMA-3-1	WMA-3	4 spotted salamander egg masses	PFO
Sandisfield	VP WMA-3-2	WMA-3	4 spotted salamander egg masses	PFO/PEM
Sandisfield	VP WMA-5-1	WMA-5	3 spotted salamander egg masses	PFO
Sandisfield	VP WMA-6-1	WMA-6	2 wood frog egg masses, 3 spotted salamander egg masses	PEM
Sandisfield	VP WMA-7-1	WMA-7	6 wood frog egg masses, 1 spotted salamander egg mass	PEM
Sandisfield	VP WMA-7-2	WMA-7	450-500 wood frog egg masses, 4 spotted salamander egg masses	PEM
Sandisfield	VP WMA-7-3	WMA-7	3 wood frog egg masses, 6 spotted salamander egg masses	PFO/PEM
Sandisfield	VP WMA-7-4	WMA-7	12 wood frog egg masses, 3 spotted salamander egg masses	PEM
Sandisfield	VP WMA-7-5	WMA-7	30-35 wood frog egg masses, 3 spotted salamander egg masses, 1 adult spotted salamander	PEM
Sandisfield	VP WMA-7-6	WMA-7	7 wood frog egg masses, 6 spotted salamander egg masses	PSS/PEM
Sandisfield	MA-CVP-1	None	1 wood frog egg mass, 4 spotted salamander egg masses	PFO
Sandisfield	VP WMA-12-1	WMA-12	6 wood frog egg masses, 2 spotted salamander egg masses	PEM
Sandisfield	VP WMA-13-1	WMA-13	40-45 wood frog egg masses, 3 spotted salamander egg masses	PEM
Sandisfield	VP WMA-16-1	WMA-16	200-250 wood frog egg masses	PFO
Sandisfield	VP WMA-18-1	WMA-18	10 wood frog egg masses	PEM
Sandisfield	VP WMA-23	WMA-23	50-60 wood frog egg masses	PEM
Sandisfield	VP WMA-24	WMA-24	80-1000 wood frog egg masses	PEM

[1] Vernal pool habitat number generated by AECOM for identification purposes.
[2] Associated wetland number corresponds to the Project Wetland Identification number.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

4.1.3 Rare Species

Beginning with written requests dated September 9, 2013 and continuing through 2014, at the federal level, Tennessee consulted with the USFWS and the NMFS. At the state level, Massachusetts (Natural Heritage and Endangered Species Program) was consulted on state-listed endangered, threatened, or species of special concern, rare plant and animal species. Based upon the information subsequently received from these agencies, Tennessee has identified areas of the Project alignment where the potential exists for occurrence of federal and/or state-listed threatened and endangered species. Tennessee has worked cooperatively with the stakeholder agencies in developing approved field survey protocols to identify and document occurrences of rare plant and animal species in the Project area. Qualified biologists performed field surveys in the summer and fall of 2013, as well as the spring of 2014. Due to the need for multiple survey efforts during species-specific seasonal survey windows, Tennessee is continuing rare species survey efforts in 2014 and early 2015, if needed.

4.1.3.1 Federally-listed Species

Section 7 of the federal ESA (16 U.S.C. §§ 1531-1543) requires each federal agency to ensure that any action authorized, funded, or carried out by the agency does not jeopardize the continued existence of federally-listed threatened or endangered species, or result in the destruction or adverse modification of the designated critical habitat for any federally-listed threatened or endangered species. The New England USFWS field office issued a response to consultation requests stating that two federally-listed or proposed federally-listed threatened or endangered species under its jurisdiction is known to occur in the Massachusetts portion of the Project area (USFWS 2013, Chapman 2014); the Northern Long-Eared Bat (*Myotis septentrionalis*) and the New England Cottontail Rabbit (*Sylvilagus transitionalis*).

4.1.3.1.1 Northern Long-Eared Bat

The Northern long-eared bat (*Myotis septentrionalis*) is not currently a Federally-listed species. However, consultation with the USFWS New England Office indicated that it is listed on the 2010 Candidate Notice of Review to determine if they should be added to the Federal Lists of Endangered and Threatened Wildlife and Plants. The USFWS indicated that the Massachusetts Loop is within the known range of the Northern long-eared bat (Chapman 2014).

Northern Long-eared bats hibernate during winter in caves or in abandoned mines. During hibernation, they require cool, humid caves with stable temperatures, under 50° F but above freezing. These hibernation requirements are generally uncommon and results in very few areas within the range of these species having suitable conditions. After emerging from hibernation, Northern Long-eared bats migrate to their summer habitat in wooded areas where they usually roost under loose tree bark on dead or dying trees. These species may also use the crevices and cavities created by large well developed trees such as shagbark hickory or other species. During summer, males roost alone or in small groups, while females roost in larger groups of up to 100 bats or more. Northern Long-eared bats also forage in or along the edges of forested areas. “Edge” habitats typically created by linear infrastructure corridors, such as natural gas pipelines combined with other edge habitats created by stream corridors and associated cover type changes, results in habitat conditions that may be suitable for these species (USFWS 2013).

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

The USFWS in New England recommended restricting tree clearing from April 1 to September 30 to avoid the cutting of occupied summer roosting habitat and concluded that meeting this restriction would eliminate the need for surveys or mitigation (Chapman 2014). Tennessee has committed to winter tree clearing only to prevent impacts to bat species.

4.1.3.1.2 New England Cottontail Rabbit

The New England cottontail is not currently a Federally-listed species. However, consultation with the USFWS New England Office indicated that it is listed on the 2010 Candidate Notice of Review to determine if the species should be added to the Federal Lists of Endangered and Threatened Wildlife and Plants. The USFWS indicated that the Massachusetts Loop is in an area within Berkshire County, Massachusetts known to be occupied by the New England cottontail (Chapman 2014).

Tennessee is planning to conduct surveys for the New England cottontail along the Massachusetts Loop in winter 2014/2015. Prior to the survey, Tennessee plans to continue consulting with the USFWS to confirm the adequacy of the proposed survey protocols. Should the species be confirmed within the proposed Project area, Tennessee would further consult the USFWS regarding appropriate measures to avoid, minimize, and mitigate potential impacts to the species and/or its habitat.

4.1.3.2 Massachusetts State-Listed Species

In Massachusetts, rare species are protected under the Massachusetts Endangered Species Act (“MESA”) (321 CMR 10.00, amended 2010). MESA protects rare species and their habitats by prohibiting the "Take" of any plant or animal species listed as Endangered, Threatened, or Special Concern by the MA Division of Fisheries & Wildlife. A "Take" is defined as, "in reference to animals to harass, harm, pursue, hunt, shoot, hound, kill, trap, capture, collect, process, disrupt the nesting, breeding, feeding or migratory activity or attempt to engage in any such conduct, or to assist such conduct. The Massachusetts Division of Fisheries and Wildlife administers the MESA through NHESP, which identifies the state’s most significant natural areas through a comprehensive inventory of rare plant and animal species located within regulated Priority Habitat.

Tennessee submitted an initial written rare species information data request on September 10, 2013 and October 15, 2013, asking that the NHESP review the Project and identify whether facilities along the proposed loop segments will cross or be within 0.25-mile of any officially designated wilderness areas or officially designated wildlife preserves; as well as identify occurrences of rare wildlife species, significant wildlife habitat, rare plant species, and ecological communities on or in the immediate vicinity of the proposed Project facilities. Correspondence received from MA NHESP, dated October 9, 2013 and November 14, 2013, indicated that no state-protected species or Priority Habitat are present within or in close proximity to the proposed Project alignment (French 2013a; French 2013b).

Subsequently, Tennessee identified a potential pipeyard in Tyringham, Massachusetts and the need to withdraw water from Lower Spectacle Pond in Sandisfield, Massachusetts for the purpose of hydrostatic testing of the pipeline once constructed. These two new areas fell outside of the initial study area. As a result, Tennessee submitted another data request to the MA NHESP requesting additional consultation for these areas. In response to that request, MA NHESP identified state-listed endangered species and species of special concern associated with these areas (French 2014). Table 4-4 provides the list of state-listed

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

species, wildlife habitats, and ecological communities identified by the state agencies as occurring in or near one or more of the proposed Project Facility locations in Massachusetts.

Based on pre-filing consultations with the MA NHESP, Tennessee does not anticipate surveying for any of the species identified in Table 4-4. Proposed mitigation measures should be adequate to avoid impacts to the state-listed species. Based upon the species identified by MA NHESP and the proposed carefully timed and implemented mitigation measures, at this time it is anticipated that a "Take" can be avoided under MESA.

TABLE 4-4
STATE-LISTED SPECIES POTENTIALLY ASSOCIATED WITH PROJECT ACTIVITIES

Common Name	Scientific Name	State Status
Tyringham Pipeyard		
Sedge Wren	*Cistothorus platensis*	Endangered
American Bittern	*Botaurus lentiginosus*	Endangered
Wood Turtle[1]	*Glyptemys insculpta*	Species of Special Concern
Lower Spectacle Pond		
Umber shadowdragon	*Neurocordulia obsoleta*	Species of Special Concern

[1] Only a portion of the proposed pipeyard is mapped as habitat for this species.

On September 11, 2014, Tennessee submitted a MESA Checklist with the MA NHESP outlining the proposed construction methods and pipe storage layout at the Tyringham Pipeyard and detailed the hydrostatic testwater withdrawal methods at Spectacle Pond to avoid impacts to the shadowdragon (Appendix G). Project activities occurring within these areas are subject to the jurisdiction of MESA. Due to the relatively minor impacts associated with the proposed activities and the proposed timing of mitigation measures, Tennessee believes it can avoid a "Take" under MESA.

4.1.3.2.1 Sedge Wren

The sedge wren is small and secretive. It prefers to breed in short grass and sedge marshes, with the nest often constructed in rushes, sedges or grasses within one to two feet of muddy ground or shallow water. This species has been documented as breeding in highly transitory habitats and tends to utilize differing patches of habitat on a nearly annual basis. Sedge wrens eat a variety of invertebrates. Therefore, if present in the area, it is possible that this species could potentially utilize the area proposed for the pipeyard for foraging. Existing conditions in the active, upland, hayfield are unlikely to provide suitable nest sites for this species.

4.1.3.2.2 American Bittern

The American bittern breeds and stalks its prey in freshwater marshes with tall vegetation, where it is very difficult to locate. This species would not typically utilize an upland hay field for nesting or foraging. Hop

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Brook is located to the north, west and south of the proposed pipeyard. This low gradient, perennial stream is associated with extensive wet meadow, marsh and scrub/shrub wetland habitats. These latter areas would serve as the primary habitat for any American bitterns that may occur in the area. Therefore, Tennessee does not anticipate negatively impacting this species or its habitat.

4.1.3.2.3 Wood Turtle

The wood turtle prefers low gradient streams with sandy bottoms and associated riparian habitats. This species spends a considerable amount of time on land in mixed deciduous forests, floodplains, hay fields, and wetlands of various types, where it forages for food and nests. Nesting typically takes place in areas with sandy/gravelly soils with some aspect of southern exposure. Based upon the existing conditions observed at the proposed pipeyard and the presence of Hop Brook and associated riparian areas nearby, it is possible that wood turtles could, at times, utilize the area for foraging. However, no nesting activity would be expected to occur there because the soils are not suitable and the hay field is heavily vegetated.

4.1.3.2.4 Umber Shadowdragon

This species does well in man-made habitats such as sections of impounded rivers and reservoirs. The species has a flight period from mid-May through mid-August.

4.1.4 Historic and Archaeological Resources

The Project requires approvals and permits from federal, state, and local entities. The primary Project approval at the federal level is the Certificate from the Commission. Consequently, the Project is being reviewed under Section 106 of the National Historic Preservation Act ("NHPA") of 1966, as amended. Prior to authorizing an undertaking (e.g., the issuance of an approval or certificate by a federal agency), Section 106 of the NHPA requires federal agencies to take into account the effect of that undertaking on historic properties listed or eligible for listing in the National Register of Historic Places ("National Register") and afford the Advisory Council on Historic Preservation an opportunity to comment on the undertaking. The Section 106 process is coordinated at the state level with the State Historic Preservation Office ("SHPO"), represented in Massachusetts by Massachusetts Historical Commission ("Massachusetts SHPO"). The Commission, as the lead federal agency, must consult with the state SHPOs regarding the effects of the Project on historic properties.

The primary goals of cultural resource investigations conducted as part of the Section 106 review are to:

- locate, document, and evaluate buildings, structures, objects, landscapes, and archaeological sites that are listed, or eligible for listing, in the National Register;
- assess potential effects of the Project on those resources; and
- provide recommendations for subsequent treatment, if necessary, to assist in complying with Section 106.

In addition to Section 106, the cultural resources investigation was conducted in accordance with the Commission's Office of Energy Project's *Guidelines for Reporting on Cultural Resources Investigations* (2002); the Secretary of the Interior's *Standards and Guidelines for Archeology and Historic Preservation* (48 Fed. Reg. 44716-42, Sept. 29, 1983); Section 380.3 of the FERC's regulations, 18 CFR § 380.3 (2014);

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

and the Massachusetts SHPO's *Public Planning and Environmental Review: Archaeology and Historic Preservation* (1985).

Tennessee commissioned Public Archaeology Laboratory, Inc. ("PAL") to complete the archaeological surveys for the Project. Results of the surveys in Massachusetts are discussed further below.

PAL notified the Massachusetts SHPO of the Project by submitting a Project information package for review and comment on September 4, 2013. On October 21, 2013, PAL submitted a proposal and State Archaeologist's permit application to perform an archaeological overview/identification survey for the proposed pipeline facilities in Massachusetts. The Massachusetts State Archaeologist issued permit #3422 to PAL on November 11, 2013, for archaeological survey of the proposed Massachusetts Loop in Sandisfield, Massachusetts.

On November 22, 2013, PAL submitted a proposal addendum to the Massachusetts SHPO to include the 500-foot ("ft") segment of the Connecticut Loop that extends from Tennessee's existing Agawam Compressor Station in the town of Agawam, Massachusetts to the Connecticut border (and continuing into Connecticut). The proposed addendum also included information regarding a proposed 10-acre pipeyard on the border of Massachusetts and Connecticut (of which approximately 3 acres would be located in Massachusetts), adjacent to the proposed Connecticut Loop.

On December 3, 2013, the Massachusetts SHPO amended State Archaeologist's permit #3422 to include the portions of the Connecticut Loop and pipeyard that are located in Massachusetts. On July 21, 2014, PAL submitted the archaeological and historic architectural properties overview/identification survey technical reports and the draft Unanticipated Discovery Plan to the Massachusetts SHPO for review. Comments from the Massachusetts SHPO are pending.

4.1.4.1 Area of Potential Effect

The Area of Potential Effect ("APE") is the "geographic area or areas within which an undertaking may directly or indirectly cause changes in the character of or use of historic properties, if any such properties exist" (36 CFR 800.16(d)). The APE is defined based upon the *potential* for effect, which may differ for aboveground resources (historic structures and landscapes) and subsurface resources (archaeological sites). The APE may include all areas where ground disturbances are proposed, where land use may change, or any locations from which the undertaking may be visible. Pursuant to 36 CFR § 800.4(a)(1), the Federal agency is responsible for determining the APE in consultation with the appropriate SHPO.

4.1.4.2 Area of Potential Effect for Archaeological Resources

For archaeological resources, PAL considered the APE as any areas of ground disturbance for the Project facilities including proposed pipeline trench, associated temporary workspaces, pipeyards, and access roads. The archaeological surveys encompass all areas where ground disturbances are currently proposed or where land use (i.e., traffic patterns, drainages, etc.) may change. The APE for the Massachusetts Loop is situated within a 400-foot ("ft") study area/study corridor centered on the proposed centerline. For ancillary facilities such as pipeyards and access roads, the APE limits vary based upon the acreage required at each.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

4.1.4.3 Area of Potential Effect for Historic Architectural Properties

The historic architectural properties overview and identification survey was conducted within a study area established to account for all potential direct or indirect effects of the Project. The study area comprised a linear corridor extending 150 ft from either side of the pipeline centerline (300 ft total width) and areas surrounding work spaces and access roads. Based on the nature of the potential impacts of the Project and the results of fieldwork conducted to identify historic properties, the study area as defined above comprises the recommended APE for historic architectural resources.

4.1.4.3.1 Massachusetts State Historic Preservation Office Correspondence

PAL submitted Project information to the Massachusetts SHPO on September 4, 2013. On October 21, 2013, PAL submitted a proposal/permit application to perform an archaeological overview survey for the proposed pipeline facilities in Massachusetts. The Massachusetts State Archaeologist issued a permit to PAL on November 11, 2013 to perform an intensive (locational) archaeological overview survey (overview) for the proposed Massachusetts Loop in Sandisfield, Massachusetts.

On November 22, 2013, PAL submitted an addendum proposal to the Massachusetts SHPO and State Archaeologist to include the segment of approximately 500-feet of the Connecticut Loop that extends from Tennessee's existing Agawam Compressor Station in the town of Agawam, Massachusetts to the Connecticut border (and continuing into Connecticut); and A 10-acre pipeyard in both Massachusetts and Connecticut (of which, approximately 3-acres are in Massachusetts), adjacent to the proposed Connecticut Loop. On December 3, 2013, the Massachusetts State Archaeologist amended Permit #3422 to include the portion of the Connecticut Loop that is located in Massachusetts.

4.1.4.3.2 Agency / Native American Consultation

Agency Consultation

PAL notified the Massachusetts Department of Conservation and Recreation and the Sandisfield Historical Commission by submitting a Project information package on September 4, 2013.

The Sandisfield Historic Commission responded on September 18, 2013, requesting further information regarding the Project. On September 23, 2013, PAL communicated via telephone with the Sandisfield Historic Commission and discussed the aboveground and archaeological surveys. PAL also provided the contact information for a Tennessee representative who would be able to answer further Project questions. On November 7, 2013, PAL notified the Sandisfield Historic Commission that the archaeological identification survey had begun on the Massachusetts Loop.

On October 21, 2013, PAL provided a copy of the technical proposal to perform an archaeological overview and identification survey for the proposed pipeline facilities in Massachusetts to the Staff Archaeologist at the DCR.

Native American Consultation

PAL, on behalf of Tennessee and the Commission, notified nine federally recognized and four non-federally recognized Native American groups of the Project, in order to identify any concerns about properties of

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

traditional religious or cultural significance that may be affected by this undertaking. Of the nine federally recognized Native American groups, two (Delaware Tribe of Indians and Mashantucket Pequot Tribal Nation) responded indicating that they should continue to be consulted during Project planning activities. Responses from seven federally recognized groups (Delaware Nation of Oklahoma, Mashpee Wampanoag Indian Tribe, Mohegan Indian Tribe, Narragansett Indian Tribe, St. Regis Mohawk Tribe, Stockbridge-Munsee, and the Wampanoag Tribe are pending.

4.1.4.4 Archaeological Survey Results

PAL excavated 270 test pits within the high and moderate sensitivity areas of the Massachusetts Loop study area, including the Slater and Hickory Street Pipeyards during the archaeological overview and identification survey. This testing resulted in the recovery of 37 pieces of post-contact cultural material in 15 of the 270 test pits. The majority of the cultural materials were collected from the two previously recorded historic sites (SAN-HA-2 and SAN-HA-3) within the Project study area between 0–30 centimeters below ground surface (cmbs). Fourteen post-contact artifacts were recovered from non-site areas and were not associated with any structural, landscape, or household features suggesting that they are best characterized as field scatter. No pre-contact cultural materials or features were recovered.

The survey resulted in the identification of one pre- and post-contact archaeological site and one post-contact archaeological site. The G. Dunham Foundation (SAN-2) and the Allen Foundation (SAN-3) sites, originally identified and mapped by the University of Massachusetts Archaeological Services ("UMAS") (Donta et al. 2001), were relocated by PAL.

PAL visually inspected 100 percent of the Massachusetts Loop for extant stone walls that intersect the study areas. A total of 38 stone walls were identified and are shown on Project mapping located in Appendix B and Appendix J. The walls were photographed and plotted on Project alignment sheets (Appendix B and Appendix J) to depict their length, orientation, and intersection with other stone walls or features. The stone walls are constructed of dry-laid fieldstones from 2 to 7 courses in height, depending on each wall's level of preservation and original construction. Some walls are largely intact, while others are partially demolished from natural weathering or from alterations such as bisecting during previous pipeline construction. PAL interprets the stone walls as most likely representing historical property boundaries. PAL also recommends that, where feasible, Tennessee avoid impacts to stone walls during construction. In the event that the Project workspace cannot be reduced to avoid impacting stone walls, PAL recommends Tennessee construction personnel implement procedures to restore stone walls following construction activities.

4.1.4.4.1 Summary

PAL concurs with previous recommendations by UMAS and the Massachusetts Historical Commission ("MHC") that the G. Dunham Foundation and Allen Foundation post-contact archaeological sites are potentially eligible for listing in the National Register. If these sites cannot be avoided archaeological evaluation is recommended for these two sites to determine significance and eligibility for listing in the National Register.

The results of the archaeological and historic architectural properties overview and identification surveys, as well as recommendations for proposed Project facilities are summarized in technical reports that were submitted to the Commission, MHC, Native American groups, and other cultural resource stakeholders for

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

review. Comments from all cultural resource stakeholders regarding proposed Project facilities in Massachusetts are pending.

Tennessee adjusted the Project alignment to entirely avoid the two existing foundations in the Project area discussed above and no impact to these foundations from the construction or operation of the Project will occur.

4.2 OTHER RESOURCES

4.2.1 Topography, Geology and Soils

The proposed Project route is located within the New England Upland Section of the New England Province. The topography of the province is that of a maturely-dissected plateau with narrow valleys, and the entire area is greatly modified by glaciation. It is the most widespread of the geomorphic sections in the New England Province, extending from Canada through New England. Numerous hills and mountains rise above the general level of the upland; except in the presence of mountains, the horizon of the regional landscape is fairly level. Glaciation has resulted in the erosion and rounding off of the bedrock topography and numerous rock basin lakes. Glacial drift is thin, patchy, and stony, and ice-contact features such as kames, kame terraces, and eskers are abundant. The surface of the New England Uplands slopes southeast from maximum inland altitudes around 2,200 feet, excluding the other mountainous sections of the province, to about 400 to 500 feet along its seaward edge at the narrow coastal Seaboard section, which goes down to sea level (Fenneman 1938).

Massachusetts was formed from a Precambrian basement distinguished by local fault basins of Eocambrian to Jurassic strata, and an offshore apron of Cretaceous and Tertiary deposits. All of these strata are generally masked by a thin mantle of glacial deposits (Woodhouse and Barosh 1991). The four major terrains of metamorphic and granite rock comprising the basement record a plate collision between Grenville-age North America and northwestern proto-Africa (Barosh and Miller 2006).

According to the United States Department of Agriculture, Natural Resources Conservation Service ("USDA-NRCS") Soil Survey for Berkshire County, topographic features in the Project area are partly the result of geologic erosion by the Housatonic River system and its geologic ancestors as well as changes caused by the retreat of Pleistocene ice sheets that covered the area until approximately 10,000 years ago. This created a valley to the west of the Project area, which is underlain by relatively soft, slightly soluble limestone and dolomite and the eastern highlands underlain by harder metamorphic rocks more resistant to erosion. The retreating ice sheet left stratified layers of sand, silt, gravel and clay deposited in a glacial lake that covered much of the southern part of Berkshire County (USDA 1983).

The surficial geology that characterized the Project area consists predominantly of thin (10-50 feet thick) till and, in the northern reaches of the project, till overlain by sand and gravel. A defunct gravel pit southwest of Lower Spectacle Pond, mapped as till, suggests that a higher resolution surficial geologic map would reveal additional details, however high resolution resources are presently unavailable for this area (Mabee 2014a).

According to the Massachusetts State Geologist, the entire Project alignment occurs within an area that is mapped on the 1:250,000-scale bedrock geologic map of Massachusetts as Proterozoic basement. These

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

rocks consist of schist, granofels and gneiss, specifically Washington gneiss, tyringham gneiss and granitoid gneiss (Mabee 2014b).

Table 4-5 summarizes the geologic conditions within the proposed Project area and lists areas of severe erosion potential and shallow depth to bedrock.

TABLE 4-5
GEOLOGIC CONDITIONS WITHIN THE CONNECTICUT EXPANSION PROJECT AREA

Project Component	Geology		Bedrock	Geologic Hazards
	Physiographic Province	Geological Formation/ Stratigraphic Unit	Mileposts of Shallow Bedrock[a]	Mileposts of Severe Erosion Potential[b]
Pipeline	New England Province New England Upland Section	Gently to strongly sloping topography, underlain by bedrock covered by glacial till	0.02 – 0.25, 1.80 – 2.19	0.00 – 0.08, 1.21 – 1.27, 1.60 – 1.78, 1.78 – 2.34

a Areas of shallow bedrock are those with bedrock within five feet from the surface. See Table 4-6 for soil series information, including depth to bedrock, for the soils crossed by the Project. Although not anticipated, if blasting is need it will be carried out according local, state and federal blasting regulations.

b Areas of soil that contain severe erosion potential. See Table 4-6 in Subsection 4.2.1.1 for soil series information, including erosion potential and erosion hazard, for the soils crossed by the Project.

4.2.1.1 Soil

The U.S. Department of Agriculture (USDA), Natural Resource Conservation Service ("NRCS") maps soil types and produces county-wide soils maps. These county maps provide information concerning soil characteristics, including but not limited to depth to bedrock, slope, drainage, development, agricultural suitability, and areas of hydric soils (which may signal the potential presence of jurisdictional wetlands), and erosion potential.

The Massachusetts Loop is located entirely in Berkshire County in western Massachusetts. The portion of the Connecticut Loop located in Massachusetts is located entirely within Hampden County. The soil series data are detailed below by State. This information was obtained from the USDA-NRCS's Soil Data Mart Web Soil Survey information for the Berkshire County and Hampden County Soil Survey Area available on-line (USDA-NRCS 2010a). Soil series for the Massachusetts Loop are also listed by milepost in Tables 4-6 and 4-7.

TABLE 4-6
SOIL ASSOCIATIONS AND SERIES CROSSED BY THE CONNECTICUT EXPANSION PROJECT

Project Loop	Soil Association	Milepost	Map Unit	Erosion Potential	Capability Class[1]	Drainage Characteristics
CT	Pollux	0.00 – 0.04	250B	Moderate	2e	Well Drained
CT	Scantic Variant	0.04 – 0.10	736A	Slight	4w	Poorly Drained
MA	Peru – Marlow	0.00 – 0.00	905C	Moderate	7s	Moderately Well Drained
MA	Lyman – Turnbridge	0.00 – 0.08	904E	Severe	7s	Somewhat Excessively Drained
MA	Turnbridge – Lyman	0.08 – 0.24	909C	Moderate	7s	Well Drained
MA	Peru – Marlow	0.24 – 0.84	905C	Moderate	7s	Moderately Well Drained
MA	Pillsbury	0.84 – 1.02	75B	Moderate	7s	Poorly Drained
MA	Peru – Marlow	1.02 – 1.21	905C	Moderate	7s	Moderately Well Drained
MA	Berkshire – Marlow	1.21 – 1.27	901E	Severe	7s	Well Drained
MA	Peru – Marlow	1.27 – 1.60	905C	Moderate	7s	Moderately Well Drained
MA	Berkshire – Marlow	1.60 – 1.78	901E	Severe	7s	Well Dratined
MA	Lyman - Turnbridge	1.78 – 2.18	904E	Severe	7s	Somewhat Excessively Drained
MA	Berkshire – Marlow	2.18 – 2.34	901E	Severe	7s	Well Drained
MA	Peru – Marlow	2.34 – 2.80	905C	Moderate	7s	Moderately Well Drained
MA	Pillsbury	2.80 – 2.88	75B	Moderate	7s	Poorly Drained
MA	Peru – Marlow	2.88 – 3.24	905C	Moderate	7s	Moderately Well Drained
MA	Pillsbury	3.24 – 3.30	75B	Moderate	7s	Poorly Drained
MA	Peru – Marlow	3.30 – 3.79	905C	Moderate	7s	Moderately Well Drained

TABLE 4-6
SOIL ASSOCIATIONS AND SERIES CROSSED BY THE CONNECTICUT EXPANSION PROJECT

Project Loop	Soil Association	Milepost	Map Unit	Erosion Potential	Capability Class[1]	Drainage Characteristics

Source: http://www.mass.gov/mgis/soi.htm. USDA (1993).

[1] = Capability class refers to the suitability of soils for most kinds of field crops. The soils are grouped according to their limitations for field crops, the risk of damage if they are used for crops, and the way they respond to management. Soil Capability Subclasses are designated by adding e, w, or s to the Capability Class designation. The letter "e" shows that the main hazard is the risk of erosion unless close-growing plant cover is maintained; the letter "s" denotes that the soil is limited mainly because it is shallow, droughty, or stony' "w" indicates that water in or on the soil interferes with plant growth or cultivation.
Capability Class I: Soils have slight limitations that restrict their use.
Capability Class II: Soils have moderate limitations that reduce the choice of plants or that require moderate conservation practices.
Capability Class III: Soils have severe limitations that reduce the choice of plants or that require special conservation practices, or both.
Capability Class IV: Soils have very severe limitations that reduce the choice of plants or that require very careful management, or both.
Capability Class V: Soils are not likely to erode but have other limitations, impractical to remove, that limit their use.
Capability Class VI: Sols have severe limitations that make them generally unsuitable for cultivation.
Capability Class VII: Soils have very severe limitations that make them unsuitable for cultivation.
Capability Class VIII: Soils and miscellaneous areas have limitations that nearly preclude their use for commercial crop production.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

TABLE 4-7
CHARACTERISTICS OF SOIL SERIES ASSOCIATED WITH THE CONNECTICUT EXPANSION PROJECT

Map Unit[1]	Slope (%)	Depth to Seasonal Mean High Water Table (feet)	Poor Revegetation Potential	Depth to Bedrock (inches)
250B	3-8	N/A	-	>75
736A	0-3	9	-	>75
327C	8-15	35	Yes	>75
905C	3-15	24	Yes	>75
904E	15-45	N/A	Yes	10-40
909C	3-15	N/A	Yes	10-40
75B	0-8	9	-	>75
901E	15-45	33	-	>75
500B	3-8	27	-	>75
510B	3-8	N/A	-	>75
76A	0-3	9	-	>75
258B	3-8	21	-	>75

[1] Map units 500B, 510B, and 76A are located only at the Tyringham pipeyard while map unit 258B is located at the pipeyard in Agawam.

4.2.1.1.1 Meckesville Loam, 8 to 15 percent slopes (327C)

The Meckesville component makes up 80 percent of the map unit. Slopes are 8 to 15 percent. The parent material consists of friable fine-loamy eolian deposits over dense silty lodgment till derived from sandstone and shale. Depth to a root restrictive layer, densic material, is 18 to 30 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 35 inches during January, February, March, April, November, and December. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 3e. This soil does not meet hydric criteria.

4.2.1.1.2 Amenia Silt Loam, 3 to 8 percent slopes (500B)

The Amenia component makes up 85 percent of the map unit. Slopes are 3 to 8 percent. This component is on depressions on uplands. The parent material consists of friable coarse-loamy eolian deposits over dense coarse-loamy lodgment till derived from limestone. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 27 inches during January,

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

February, March, April, May, November, and December. Organic matter content in the surface horizon is about 4 percent. Nonirrigated land capability classification is 2e. This soil does not meet hydric critera.

4.2.1.1.3 Kendaia Silt Loam, 0 to 3 percent slopes (76A)

The Kendaia component makes up 90 percent of the map unit. Slopes are 0 to 3 percent. This component is on depressions on till plains. The parent material consists of friable fine-loamy eolian deposits over dense fine-loamy lodgment till derived from phyllite. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is poorly drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 9 inches during January, February, March, April, May, November, and December. Organic matter content in the surface horizon is about 6 percent. Nonirrigated land capability classification is 3w. This soil meets hydric criteria.

4.2.1.1.4 Pittsfield Loam, 3 to 8 percent slopes (510B)

The Pittsfield component makes up 85 percent of the map unit. Slopes are 3 to 8 percent. This component is on drumlinoid ridges on uplands. The parent material consists of friable coarse-loamy eolian depositsover friable, calcareous coarse-loamy basal till derived from limestone. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. Nonirrigated land capability classification is 2e. This soil does not meet hydric criteria.

4.2.1.1.5 Amostown Fine Sandy Loam, 0 to 6 percent slopes (258B)

The Amostown component makes up 80 percent of the map unit. Slopes are 3 to 8 percent. The parent material consists of friable sandy glaciofluvial deposits over hard silty glaciolacustrine deposits. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is high. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 21 inches during December. Organic matter content in the surface horizon is about 4 percent. Nonirrigated land capability classification is 2w. This soil does not meet hydric criteria.

4.2.1.1.6 Pollux Fine Sandy Loam, 3 to 8 percent slopes (250B)

The Pollux component makes up 85 percent of the map unit. Slopes are 3 to 8 percent. The parent material consists of friable coarse-loamy glaciofluvial deposits over hard silty glaciolacustrine deposits derived from granite and gneiss. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is high. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. Nonirrigated land capability classification is 2e. This soil does not meet hydric criteria.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

4.2.1.1.7 Scantic Variant Silt Loam, 0 to 3 percent slopes (736A)

The Scantic Variant component makes up 80 percent of the map unit. Slopes are 0 to 3 percent. This component is on depressions. The parent material consists of soft silty and clayey glaciolacustrine deposits. Depth to a root restrictive layer, strongly contrasting textural stratification, is 20 to 40 inches. The natural drainage class is poorly drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 9 inches during January, February, March, April, May, June, October, November, and December. Organic matter content in the surface horizon is about 5 percent. Nonirrigated land capability classification is 4w. This soil meets hydric criteria.

4.2.1.1.8 Pillsbury Loam, 0 to 8 percent slopes, extremely stony (75B)

The Pillsbury component makes up 60 percent of the map unit. Slopes are 1 to 8 percent. This component is on depressions. The parent material consists of friable coarse-loamy eolian deposits over dense coarse-loamy lodgment till derived from granite and gneiss. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is poorly drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 9 inches during January, February, March, April, May, November, and December. Organic matter content in the surface horizon is about 6 percent. Nonirrigated land capability classification is 7s. This soil meets hydric criteria.

4.2.1.1.9 Berkshire-Marlow Association, 15 to 45 percent slopes, steep, extremely stony (901E)

The Berkshire component makes up 55 percent of the map unit. Slopes are 15 to 45 percent. This component is on hillslopes on uplands. The parent material consists of friable coarse-loamy eolian deposits over friable coarse-loamy basal till derived from granite and gneiss. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 4 percent. Nonirrigated land capability classification is 7s.

The Marlow component makes up 30 percent of the map unit. Slopes are 15 to 45 percent. This component is on hills. The parent material consists of friable coarse-loamy eolian deposits over dense coarse-loamy lodgment till derived from granite and gneiss. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 33 inches during March and April. Organic matter content in the surface horizon is about 4 percent. Nonirrigated land capability classification is 7s.

4.2.1.1.10 Lyman-Tunbridge Association, steep, very stony (904E)

The Lyman component makes up 45 percent of the map unit. Slopes are 15 to 45 percent. The parent material consists of shallow, friable loamy basal till derived from mica schist over mica schist. Depth to a root restrictive layer, is 10 to 20 inches. The natural drainage class is somewhat excessively drained. Water

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

movement in the most restrictive layer is high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.

The Tunbridge component makes up 40 percent of the map unit. Slopes are 15 to 45 percent. The parent material consists of moderately deep, friable coarse-loamy basal till derived from mica schist over mica schist. Depth to a root restrictive layer, bedrock (lithic), is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is very low. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 5 percent. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.

4.2.1.1.11 Peru-Marlow Association, rolling, extremely stony (905C)

The Peru component makes up 60 percent of the map unit. Slopes are 3 to 15 percent. This component is on uplands. The parent material consists of friable coarse-loamy eolian deposits over dense coarse-loamy lodgment till derived from granite and gneiss. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is moderately well drained. Water movement in the most restrictive layer is moderately low. Available water to a depth of 60 inches is moderate. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 24 inches during January, February, March, April, May, November, and December. Organic matter content in the surface horizon is about 4 percent. Nonirrigated land capability classification is 7s. This soil does not meet hydric criteria.

The Marlow component makes up 20 percent of the map unit. Slopes are 3 to 15 percent. This component is on uplands. The parent material consists of friable coarse-loamy eolian deposits over dense coarse-loamy lodgment till derived from granite and gneiss. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is moderately high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 33 inches during March and April. Organic matter content in the surface horizon is about 4 percent. Nonirrigated land capability is 7s. This soil does not meet hydric criteria.

4.2.1.1.12 Tunbridge-Lyman Association, rolling, extremely stony (909C)

The Tunbridge component makes up 50 percent of the map unit. Slopes are 3 to 15 percent. This component is on hills on uplands, mountains on uplands. The parent material consists of moderately deep, friable coarse-loamy basal till derived from mica schist over mica schist. Depth to a root restrictive layer, is 20 to 40 inches. The natural drainage class is well drained. Water movement in the most restrictive layer is low. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 5 percent. Nonirrigated land capability is 7s. This soil does not meet hydric criteria.

The Lyman component makes up 35 percent of the map unit. Slopes are 3 to 15 percent. This component is on hills on uplands, mountains on uplands. The parent material consists of shallow, friable loamy basal till

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

derived from mica schist over mica schist. Depth to a root restrictive layer, bedrock (lithic), is 10 to 20 inches. The natural drainage class is somewhat excessively drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is very low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. There is no zone of water saturation within a depth of 72 inches. Organic matter content in the surface horizon is about 2 percent. Nonirrigated land capability is 7s. This soil does not meet hydric criteria.

4.2.1.2 Mineral Resources

Sand and gravel are the primary mineral resources produced in Massachusetts, and the most important sources of sand and gravel are generally associated with glacial moraines (USGS 2014). Sand and gravel is found along the valley associated with Clam River, parallel to the northernmost 0.93 miles of the Project area. An abandoned gravel pit southwest of Lower Spectacle Pond indicates a second potential site of sand and gravel (Mabee 2014a). Because no resources are located near the Project area, construction of the proposed Massachusetts facilities will not directly or indirectly affect any mineral resources or mining operations.

4.2.2 Groundwater Resources

This subsection provides information on groundwater and surface water resources in the vicinity of the Project including fisheries, wetlands and waterbodies, as well as construction-related water use. On behalf of Tennessee, AECOM determined the nature and location of wetlands, surface waters, springs, wells, groundwater hazards and point and non-point pollution sources by consulting appropriate agencies and performing thorough field verification and delineation surveys during fall 2013 and spring 2014. The Wetland Delineation Reports included in Appendix K provide additional information relative to the wetlands and waterbodies identified within and immediately adjacent to the Project facilities.

The U.S. Environmental Protection Agency ("USEPA") has designated seven sole-source aquifers in Massachusetts (USEPA 2007). Review of the MassGIS Aquifer and Sole Source Aquifer datalayers and consultation with the Berkshire Regional Planning Commission did not identify any EPA designated Sole Source Aquifers or aquifer protection areas under the Project alignment (MassGIS 2009, Karns 2014). Review of these data layers showed a lack of surficial and bedrock aquifer data in the Project area. Consultation with the Massachusetts Department of Environmental Protection ("MADEP") confirmed that aquifer mapping for this area of western Massachusetts has not been performed, as it does not fall within a potentially productive river valley (Skiba 2014).

Available USGS publications discussed the general characteristics of aquifers expected in the Project area. Although less productive than surficial stratified drift aquifers, bedrock aquifers are more widely used for residential water supplies in areas where public water supplies are not available, as is the case in the vicinity of the Massachusetts Loop. Massachusetts has three principal types of bedrock aquifers: crystalline, sedimentary, and carbonate. The Carbonate-bedrock aquifer is located in Berkshire County and is composed of limestone, dolomite, and marble interbedded with schist and quartzite (USGS 1992).

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

4.2.2.1 Water Quality

Consultation with MADEP indicated that Massachusetts does not have specific groundwater standards (Skiba 2014). Areas not served by public drinking water service typically do not have their drinking water tested by the state. Massachusetts has evaluated a drinking water well in the Town of Sandisfield as part of its Source Water Assessment Program ("SWAP") (SWAP 2001). To protect drinking water resources, this program delineates protection areas for all public ground and surface water sources; inventories land uses in these areas that may present potential threats to water quality, and determines the susceptibility of water supplies to contamination from these sources. The well assessed in Sandisfield serves the New Boston Nursing Home located north of the confluence of Clam River and the West Branch of the Farmington River. It is believed to utilize the bedrock aquifer and supplies an average daily consumption at the facility of 6,500 gallons per day.

Water from the carbonate-bedrock aquifer tends to be slightly alkaline (median pH of 7.8), and very hard (median of 210 mg/L as calcium carbonate), with moderately high concentrations of dissolved solids (median of 220 mg/L). But, unlike the sedimentary-bedrock aquifer, it commonly contains little sodium (median of 3.7 mg/L), sulfate (median of 17 mg/L), and fluoride (median of less than 0.1 mg/L) (USGS 1992).

Tennessee does not anticipate any Project-related impacts to groundwater water quality. Adherence to the Commission's Plan and Procedures and Tennessee's Construction BMP's will minimize any potential impacts to groundwater quality.

4.2.2.1.1 Public and Private Water Supply Wells

Information on public water supply wells was requested from MADEP as well as county and local planning and health boards in January 2014, with follow-up phone calls in the summer 2014, though no response has been received to date. Towns in the Project area do not provide municipal drinking water supply and residents obtain water from private drinking water wells.

Tennessee conducted landowner surveys and discussions to acquire survey permission and identify locations of private drinking water wells. No private wells were identified within 150 feet of any Project workspace; one well is located approximately 168 feet from the nearest workspace near MP 2.85. Additional surveys, landowner discussions and consultation with local and state officials are ongoing and any additional information regarding drinking water wells will be provided to MEPA, as needed.

4.2.2.2 Public Watershed Areas

Review of the MassGIS water supply datalayer did not indicate any public watershed areas within 0.25 miles of the Project alignment or within 3 miles downstream of any waterbody crossing. In addition, no potable water supply intakes or public or municipal water supply areas were identified within 0.25 miles of the Project alignment (Jacobs 2014). Based on this information, the Project will not affect any public watershed or potable surface water supply areas. Tennessee will utilize the erosion control and spill prevention measures as described within the Commission's Plan and Procedures as well as the Construction BMP's to ensure that construction activities do not adversely affect surface waters that contribute to groundwater sources.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

4.2.2.3 Sensitive Surface Waters and Fisheries

MADEP considers surface waters sensitive (designated as Class A) if they provide a source of water supply for drinking or food processing purposes and are suitable for bathing and primary contact recreational purposes (MADEP 2002). No waterbodies in the Project alignment locations are designated by MADEP as Class A waters (MADEP 2002), and there are no waterbodies that are part of either the Federal Wild and Scenic Rivers System or the Federal Wild and Scenic Rivers Partnership (NPS 2005). In addition, no Ponds or lakes in proximity to the Project are listed as Great Ponds, subject to Chapter 91 jurisdiction.

The Massachusetts Division of Fisheries and Wildlife ("MADFW") maintains a list of waters that are considered Coldwater Fishery Resources, which denotes a waterbody that contains coldwater fish that reproduce in that waterbody or a tributary thereto and use such waters to meet one or more of their life history requirements. Identification of Coldwater Fishery Resources is based on fish samples collected annually by staff biologists. Data on fishery type and presence of sensitive fisheries for each stream crossed by the Massachusetts Loop were requested by Tennessee through direct consultation with MADFW (2014). All waterbodies crossed by the Massachusetts Loop are considered to support coldwater fisheries, based on their watershed designation.

4.2.3 Vegetation and Wildlife

4.2.3.1 Existing Vegetation Resources

Vegetative cover is an important environmental component for defining wildlife habitat and wildlife species distribution. Major terrestrial vegetative cover types in the Project area were mapped during environmental field surveys in 2013 and through the review of aerial photography of properties. The major terrestrial cover types in the Project area include upland forest, open lands (existing ROW, open fields, non-agriculture), agricultural lands, developed land (including residential, commercial/industrial, existing roadways), and wetlands (forested, scrub-shrub, and emergent).

Within each major cover type, there are variations in vegetative community types (e.g., deciduous hardwood vs. conifer) and other conditions, such as topography and land use disturbance, that together provide a variety of wildlife habitat conditions. Species likely to occur in each vegetation type were determined during field surveys, consultations with local wildlife experts and regulatory agencies, and by literature review.

The routing of the pipeline looping segments has been designed to utilize the existing Tennessee pipeline ROW to the maximum extent practicable, thereby minimizing alteration of undisturbed areas and additional fragmentation of contiguous areas. The general cover types include forested upland (mixed woods and hardwood), forested wetlands, old field/scrub/brushland (e.g., along existing ROW), emergent wetlands and agricultural land.

The Project is located in the Adirondack-New England Mixed Forest-Coniferous Forest-Alpine Meadow Province of the Eastern United States that comprises an area of approximately 43,600 square miles (Bailey et al 1994). This province is composed of subdued glaciated mountains and maturely dissected plateaus of mountainous topography. The mountains and plateaus are underlain by granite and metamorphic rocks and thinly mantled by glacial till. Many glacially broadened valleys have glacial outwash deposits and contain

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

numerous swamps and lakes. The mountainous region is in the transition zone between the boreal spruce-fir forest to the north and the deciduous forest to the south. Growth form and species are very similar to those found to the north, but red spruce tends to replace white spruce. Vertical vegetational zonation is present. Valleys contain a hardwood forest where the principal trees are sugar maple, yellow birch, and beech, with an admixture of hemlock. Low mountain slopes support a mixed forest of spruce, fir, maple, beech, and birch.

The Classification of the Natural Communities of Massachusetts (Swain and Kearsley 2011) describes the vegetation of terrestrial communities as not significantly influenced by standing or moving water. Terrestrial communities identified in the Project area, as defined by Swain and Kearsley (2011), are described below.

4.2.3.1.1 Upland Forest

The majority of the upland forest in the Project area consists primarily of coniferous species including Eastern white pine (*Pinus strobus*) and Eastern hemlock (*Tsuga canadensis*), typically comprising up to 60 percent of the canopy species. In addition, hardwood species present include, but are not limited to, red oak (*Quercus rubra*), white oak (*Quercus alba*), sugar maple (*Acer saccharum*), American beech (*Fagus grandifolia*), and yellow birch (Betula alleghaniensis). Upland forests provide food resources, cover and nesting habitat for a variety of mammals, birds, amphibians, reptiles, and invertebrates. The tree and shrub layers provide food and cover for birds and larger mammals such as white-tailed deer (*Oedicoileus virginianus*) and black bear (*Ursus americanas*). Detritus on the forest floor provides food and cover for invertebrates, amphibians, and reptiles. Smaller mammals such as the gray squirrel (*Sciurus carolinensis*), Eastern chipmunk (*Tamias striatus*), and raccoons (*Procyon lotor*) utilize fallen logs for cover and nest cavities.

The predominance of nut and seed producers is an important habitat component in upland forests in the Project area. Mammals rely directly on these seeds and nuts as a food source, while amphibians and invertebrates rely on the soil chemistry of the forest. Predatory species such as raptors, and red fox (*Vulpes vulpes*), also are attracted to upland forests and their edges by the abundance and diversity of prey species.

Northern Hardwoods – Hemlock – White Pine Forest

This community type is common within upland areas adjacent to the existing Project ROW and is characterized as a closed canopy forest dominated by a mix of evergreen and deciduous trees, with sparse shrub and herbaceous layers (Swain and Kearsley 2011). Common tree species of this plant community include sugar maple (*Acer saccharum*), Northern red maple *(Acer rubrum),* Eastern white pine (*Pinus strobus*), black cherry *(Prunus serotina),* sweet birch *(Betula lenta*), red oak (*Quercus rubra*), and hemlock (*Tsuga canadensis*). The shrub layer is usually open, but includes scattered clumps of witch-hazel *(Hamamelis virginiana),* red elderberry (*Sambucus pubens*), tartarian honeysuckle (*Lonicera tartarica*), multiflora rose (*Rosa multiflora*) and rhododendron (*Rhododendron canadense*) along the pipeline loop alignment. A sparse herbaceous layer includes hayscented fern (*Dennstaedtia punctilobula*), false Solomon's seal (*Smilacina racemosa*), starflower (*Trientalis borealis*), partridgeberry (*Mitchella repens*), poison ivy (*Toxicodendron radicans*), Canada mayflower (*Maianthemum canadense*), and wild sarsaparilla (*Aralia nudicaulis*).

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

4.2.3.1.2 Open Lands

Open land includes all non-forested vegetated areas that are not in agricultural production or landscaped. This vegetation class includes grasslands, successional scrub-shrub areas, fields, and maintained utility ROWs. Grasslands, old fields, and brushy areas can be utilized as foraging and nesting habitat by mammals and songbirds. Shrublands provide sources of food and nesting sites for various birds, as well as cover for invertebrates, reptiles, and amphibians. Shrublands and grassland habitats are attractive to many wildlife species, because they provide protection, nesting, and food sources. Species such as the Eastern cottontail (*Sylvilagus floridanus*), gray squirrel, red fox, Virginia opossum (*Didelphis virginiana*), and raccoon utilize these types of habitats.

Edges, where natural habitats lay adjacent to developed or maintained areas, also create other habitat types which are utilized by an array of wildlife. Open lands can be regularly maintained, cleared, or abandoned for the promotion of successional growth habitats. The areas of existing ROWs provide corridors that will be utilized by several species to move between habitats. These species may include white-tailed deer, coyote (*Canis latrans*), Eastern cottontail, and forest edge bird species, such as the American robin (*Turdus migratorius*), brown thrasher (*Toxostoma rufum*), field sparrow (*Spizella pusilla*) and the northern cardinal (*Cardinalis cardinalis*) are present where open areas border forest edges.

Cultural Grasslands

Cultural grassland is a human created and maintained open community dominated by grasses, normally maintained by mowing, and primarily of conservation interest for the grassland bird community. A grassland community generally occurs on sand or other droughty, low nutrient soils. Surroundings in many areas include Pitch pine/Scrub oak communities. Many small airports with surrounding grasslands were built on sand plains. Pastures and hayfields occur in all areas, and surroundings reflect the regional variations. Airports, cemeteries, pastures, and hayfields provide different habitats, and support different species of plants and animals. Grasslands at many smaller airports are dominated by graminoids, usually little blue stem grass (*Schizachyrium scoparium*), Pennsylvania sedge (*Carex pensylvanica*), and poverty grass (*Danthonia spicata*), and many non-native species. Some cultural grasslands do have some mix of herbaceous species, such as goldenrods (*Solidago* and *Euthamia* spp.) and milk weeds including butterfly weed (*Asclepias* spp. and *A. tuberosa*).

Agricultural Lands

Agricultural lands include areas actively in use for raising crops and hay, pasture for grazing livestock, or specialty crops, such as tree farms. Although crops generally provide poor to moderate cover habitat, they often provide forage and nesting for a number of species such as bobolinks (*Dolichonyx oryzivorus*), European starlings (*Sturnus vulgaris*), Eastern meadowlark (*Sturnella magna*), and mourning doves (*Zenaida macroura*). Pastures also provide grazing habitat for species such as the white-tail deer.

4.2.3.1.3 Developed Lands

Developed land includes residential areas, industrial and commercial lands, and surface mines. These lands are typically devoid of undisturbed vegetation, and are more commonly defined by mowed lawns, other landscaped areas, and impervious surfaces.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

4.2.3.1.4 Palustrine Emergent Wetlands

Emergent wetlands are characterized by erect, rooted, herbaceous hydrophytes not including mosses and lichens. These wetlands maintain the same appearance year after year, are typically dominated by perennial plants, and the vegetation of these wetlands is present for the majority of the growing season. Persistent emergent wetlands are characterized by species that typically remain standing until the beginning of the next growing season. Dominant vegetation within the Persistent PEM wetlands along the alignment of the proposed loop included wool grass (*Scirpus cyperinus*), bluejoint (*Calamagrostis canadensis*), skunk cabbage (*Syplocarpus foetidus*), tussock sedge, beaked sedge (*Carex rostrata*) and witchgrass species (*Dichanthelium spp.*).

Emergent wetlands are primarily found within the existing ROW in Massachusetts. Emergent wetlands are non-tidal wetlands characterized by erect, rooted, herbaceous hydrophytes. Emergent wetlands are generally dominated by perennial plants and maintain the same appearance through the years. Plant species commonly found in Palustrine emergent wetlands along the Project alignment included soft rush (*Juncus effusus*), common reed (*Pragmites australis*), broad-leaved cattail (*Typha latifolia*), purple loosestrife (*Lythrum salicaria*), woolgrass, lurid sedge (*Carex lurida*), sensitive fern (*Onoclea sensibilis*), spotted touch-me-not (*Impatiens capensis*), skunk cabbage, reed canary grass (*Phalaris arundinacea*) and blue flag (*Iris versicolor*).

4.2.3.1.5 Palustrine Scrub-Shrub Wetlands

Scrub-shrub wetlands are generally dominated by woody vegetation less than six meters (approximately 18 feet) tall. Scrub-shrub wetland types may represent a successional stage leading to a forested wetland and include shrubs, young trees, and trees or shrubs that are small and/or stunted due to environmental conditions. Shrub swamps are widespread, highly variable communities with shrub-dominated wetlands that occur on mineral or mucky mineral soils that are either seasonally or temporarily flooded. They are typically found in flat areas in which the water table is at or above the soil surface for most of the year. Shrub swamps are generally found on the transition zone of emergent and forested wetland areas that have been previously disturbed by vegetation control practices or past land use patterns. Shrub swamps are primarily found within and along the edge of the existing ROW in the Massachusetts portion of the project area. Dominant vegetation within shrub swamps include red maple, speckled alder, highbush blueberry (*Vaccinium corymbosum*), silky dogwood (*Cornus amomum*), cinnamon fern (*Osmunda cinnamomea*), New York fern (*Thelypteris noveboracensis*), royal fern (*Osmunda regalis*), arrow-wood (*Viburnum dentatum*), northern spicebush, sensitive fern, and skunk cabbage.

4.2.3.1.6 Palustrine Forested Wetland

Forested wetlands are characterized by woody vegetation that is six meters (approximately 18 feet) tall or taller with diameters of 4 inches or more, and normally include a moderate to dense canopy or overstory layer of trees, an understory of young trees or shrubs, and an herbaceous layer. Eastern hemlock swamps dominate the Massachusetts Loop. Species within these wetlands included red maple, white oak (*Quercus alba*), American elm (*Ulmus americana*), Eastern white pine and American hornbeam (*Carpinius caroliniana*) in the canopy and subcanopy layers, with silky dogwood and northern arrowwood in the understory. Dominant plants in the herbaceous layer included sensitive fern, cinnamon fern, Canada mayflower, spotted touch-me-not and poison ivy.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

4.2.3.1.7 Vegetative Communities of Special Concern

Tennessee has requested and obtained information regarding unique communities from the NHESP and USFWS. The NHESP indicated that there are no areas of Priority or Estimated Habitat in the vicinity of the Project area (French 2013a; French 2013b). One certified vernal pool is located in the Project area (Mass GIS reference), and was surveyed during the 2014 Vernal Pool surveys described in Section 4.1.2 of this DEIR. The USFWS did not identify any federal communities of special concern within the Project area (Chapman 2014).

4.2.3.2 Existing Wildlife Resources

The general cover types include forested land, wetland, agricultural land, residential land and scrub/shrub/brushland along the existing maintained ROW. The extent of each land cover type and the areas of transition between cover types were established during field reconnaissance in 2013 and 2014 and are further described below. While the majority of the proposed pipeline traverses similar land classifications, species composition, topography and land use provide a variety of habitat conditions within each.

4.2.3.2.1 Mammals

A variety of mammal species have geographic ranges that include the western portion of Massachusetts (DeGraaf and Rudis 1983). These species include small and large species such as white-tailed deer (*Odocoileus virginianus*), Eastern coyote (*Canis latrans*) and bobcat (*Felis rufus*). The proposed Project will occur within several different habitat types including forests, wetlands, agricultural land, open space. The impacts to habitat are expected to be temporary in nature and will not significantly affect mammal populations or habitats located within the Project limits.

4.2.3.2.2 Birds

The proposed Project will occur within several different habitat types including forests, wetlands, agricultural land, and open space. These habitats provide breeding, wintering and escape cover for birds as well as potential food sources in the form of berries and seeds. Any impacts associated with the proposed Project are expected to be temporary in nature and will not significantly affect resident or migratory populations located within the Project limits.

4.2.3.2.3 Reptiles and Amphibians

The proposed Project will occur within several different habitat types including forests, wetlands agricultural and open space areas. These areas offer habitats that provide breeding, wintering, and escape cover as well as potential food sources for reptiles and amphibians. Any impacts are expected to be temporary in nature and will not significantly affect resident or migratory populations located within the Project limits.

4.2.4 Scenic Qualities, Open Space and Recreational Resources

Parks, recreational areas, and federal and state lands located in the vicinity of the Project were identified and potential impacts were examined. Trail and park maps were obtained from online resources and digitized to

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

determine what recreational features (i.e., trails, campgrounds, boat access) are located in the vicinity of the Project. Initial tree felling on these lands will likely occur in the winter of 2015 through early winter of 2016. General pipeline construction is anticipated to occur during April through October 2016. Tennessee will work with the affected stakeholders during the permitting and easement acquisition processes to avoid impacting park operations and to mitigate construction impacts.

4.2.4.1 Federal Land

Consultation with the National Park Service ("NPS") and review of online resources indicated that no National Parks, National Natural Landmarks, National Scenic and Historic Trails, National Recreation Trails, National Park Service Wilderness Areas, Urban Parks and Recreation Recovery Areas, or National Wild and Scenic Rivers are located within 0.25 mile of the proposed pipeline facilities (NPS 2014, National Wild and Scenic Rivers System 2014, Morrison 2014).

4.2.4.2 State Land

4.2.4.2.1 Otis State Forest

The Massachusetts Loop crosses the Otis State Forest (MP 0-0.33 and 0.61-2.27) in Sandisfield, Massachusetts (Table 4-8). Otis State Forest was established in 1923 and continues to be owned and operated by the Commonwealth of Massachusetts Department of Conservation and Recreation ("DCR") for the purpose of conservation and recreation. The forest comprises over 3,800 acres with ranges in elevation up to 1,600 feet. There are numerous multi-use trails throughout the forest used for hiking, snowmobiling and snowshoeing; the historic Knox Trail, the old Boston to Albany Road, traverses a small block of the forest south of Route 23 in East Otis. Hunting is allowed within the forest in accordance with applicable state fish and game laws. Several streams and ponds throughout the park offer fishing opportunities, including Upper and Lower Spectacle Pond (BerkshireWeb 2014). The Old Growth Trail originates near proposed Access Road MA-3 and travels south, crossing the ROW at approximate MP 1.80. Tennessee has been and continues to be in consultation with the DCR to formulate mitigation procedures for crossing public lands.

The Otis State Forest Property being impacted consists of approximately 472.2 acres of Otis State Forest. Of this total, Tennessee proposes to use approximately 30.4 acres of the Property during construction, consisting of existing cleared ROW, new permanent ROW, and temporary workspace. Of the 30.4 acres used during construction, approximately 6.0 acres will be comprised of new permanent ROW adjacent to the existing ROW to accommodate the installation of the new 36-inch natural gas pipeline loop, approximately 7.0 acres will be workspace on the existing cleared ROW and the remaining 17.8 acres will be comprised of temporary workspace that will be allowed to re-vegetate following construction. The proposed new 15-foot to 35-foot wide permanent ROW (approximately 6 acres) will be maintained by Tennessee following construction.

TABLE 4-8
STATE LANDS LOCATED IN THE VICINITY([a]) OF THE CONNECTICUT EXPANSION PROJECT

Milepost	Name of Area	Land Ownership Management	Crossing Length (feet)	Existing Land Uses Crossed[b]	Area Affected (acres)	
					Const.[c]	Oper.
Massachusetts Loop						
0-0.33 0.61-2.27	Otis State Forest	Massachusetts Department of Recreation and Conservation	10,470	OL, PEM, PFO, RD, UF, WB, CI	30.37	5.98
N/A	Sandisfield State Forest[d]	Massachusetts Department of Recreation and Conservation	N/A	N/A	0.00	0.00
Connecticut Loop						
None Identified						

[a] In Table 4-8, "vicinity" means within 0.25 miles of the Project.

[b] AG = Agricultural; CI = Commercial/Industrial; OL = Open Land; PEM = Palustrine Emergent wetland; PFO = Palustrine Forested wetland; PSS = Palustrine scrub-shrub wetland; RD = Roadways; RE = Residential; ROW = Right-of-Way; RR = Railroad; SP = Other (Including Sand/Gravel); UF = Upland Forest; WB = Waterbody.

[c] Land impacted during construction will also be used during operation.

[d] Located within 0.25 mile. The Project will not cross the federal or state lands.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

4.2.4.2.2 Sandisfield State Forest

The Massachusetts Loop is located within 0.25 miles of the Sandisfield State Forest at approximate MP 3.81 in Sandisfield, Massachusetts (Table 4-8). The Sandisfield State Forest is a complex of lands purchased in 1965 and 1966 by DCR and consists of approximately 11,650 acres. York Lake is a popular destination with a 300-foot beach for swimming, fishing, a picnic area and boat launch. The forest also contains West and Abby Lakes, which are popular fishing destinations for bass and trout. Hunting is allowed within the forest in accordance with applicable state fish and game laws. Trails available for hiking and cross-country skiing, 10 campsites and a variety of scenic environmental areas offer recreational opportunities (Berkshire Web 2014). Because the Project will not cross state forest lands, Tennessee does not anticipate impacts to Sandisfield State Forest.

4.2.4.3 Municipal Land

The Massachusetts Loop does not cross or pass within 0.25 mile of municipal-owned land.

4.2.4.4 Private Land for Public Use

At approximate MP 0.0 to 0.11, the Connecticut Loop passes within 0.35 mile of Crestview Country Club, 281 Shoemaker Lane, Agawam, Massachusetts. No construction impacts to the golf course are expected. The closest fairway is located approximately 1,900 feet west of the Project.

4.2.4.4.1 Appurtenant Facilities

Existing Station 261, the MLV, and pig launcher/receiver facilities for the Massachusetts and Connecticut Loops will not be in the vicinity of any state or federal lands (NPS 2014, National Wild and Scenic Rivers System 2014, Morrison 2014).

4.2.4.4.2 Natural, Recreational, or Scenic Areas

Tennessee has had written and/or verbal contact with all landowners and will continue to work closely with them to avoid or mitigate for any potential conflicts with special land uses. Please refer to Section 4.1.4 of this DEIR for information regarding the presence of land of local historical or cultural significance.

4.2.4.5 Conservation Resources Enhancement and Protection and Agricultural Easements

A response has not been received from the Massachusetts Department of Agricultural Resources as of the date of this DEIR. The Massachusetts Loop does not cross any prime farmland soils or soils of statewide importance and only 4.99% of land crossed by the pipeline ROW is in land designated as agricultural use.

4.2.4.6 Scenic Resources

The Project route encompass mostly rural, open space, designated state forest, transportation ROWs (e.g., roadway corridor) and agricultural lands. Noteworthy areas crossed by, or adjacent to, the Preferred Route

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

that provide recreational uses, exhibit scenic qualities, and/or offer open space include Otis State Forest, Cold Spring Road, and Lower Spectacle Pond in Sandisfield, Massachusetts.

4.2.4.6.1 Otis State Forest

The proposed pipeline route for the Massachusetts Loop is co-located adjacent to an existing, cleared utility ROW that runs through a heavily wooded landscape in Otis State Forest in Sandisfield, Massachusetts. Changes to the existing landscape have been minimized to the maximum extent practicable and will be confined to widening of the existing cleared ROW, as necessary for safe construction and operation of the pipeline. Any physical and visual obstructions to the viewshed will be temporary in nature and limited to the period of construction. No existing views will be permanently obstructed by the proposed Project. Siting of the proposed Project next to existing ROW minimizes the amount of forest and other habitats that will be impacted during construction and operation of the Project facilities, and therefore minimizes the visual impacts to these areas.

4.2.4.6.2 Cold Spring Road

Cold Spring Road in Sandisfield, Massachusetts, which parallels and also crosses the existing pipeline, is known as a scenic road (Karns 2014a). The proposed pipeline is co-located adjacent to the existing Tennessee pipeline ROW. Any changes to the existing landscape will be minor and confined to widening of the existing cleared ROW, as necessary for safe construction and operation of the pipeline. Any physical and visual obstructions to the viewshed will be temporary in nature and limited to the period of construction. No existing views will be permanently obstructed by the proposed Project. Siting of the proposed Project next to existing ROW minimizes the amount of forest and other habitats that will be impacted during construction and operation of the Project facilities, and therefore minimizes the visual impacts to these areas.

4.2.4.6.3 Lower Spectacle Pond

Lower Spectacle Pond is in Sandisfield, Massachusetts and was noted by the Berkshire Regional Planning Commission as a scenic waterbody (Karns 2014a). Tennessee plans to improve an existing road near Lower Spectacle Pond as a temporary access road. In addition, Tennessee plans to utilize water from Lower Spectacle Pond for hydrostatic testing of the Massachusetts Loop. Any changes to the existing landscape in this area will be minor and confined to enhancement of the existing road, as necessary to provide safe travel for construction vehicles. Any physical and visual obstructions to the viewshed will be temporary in nature and limited to the period of construction. No existing views will be permanently obstructed by the proposed Project.

4.2.4.6.4 Appurtenant Facilities

Visual screening is not proposed at any of the appurtenant facilities. Existing vegetation and the absence of existing residences within 50 feet of existing Station 261, and the proposed MLV and pig launcher/receiver facilities effectively avoid impacts from these facilities on visual resources.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

4.2.4.7 Applications for Right-of-Way and Other Land Use

Land under the jurisdiction of the MA DCR, Otis State Forest, is crossed along the Massachusetts Loop in Sandisfield, Massachusetts (MP 0-0.33, 0.61-2.27). Tennessee has consulted with the MA DCR regarding the crossing of this state land, and Tennessee anticipates that legislation will be filed with the Massachusetts legislature pursuant to Article 97 requirements in January 2015 to allow the crossing.

4.2.4.8 Article 97 Land

The existing alignment crosses the Otis State Forest in two locations in the Town of Sandisfield (MPs 0 – 0.33 and MPs 0.61 – 2.27). The construction and operation of the Project will result in impacts to approximately 30.4 acres of Article 97 land. Tennessee is currently negotiating with DCR and the Town of Sandisfield relative to the Project impacts and potential mitigation.

The Otis State Forest Property consists of approximately 472.2 acres of Otis State Forest. Of this total, Tennessee proposes to use approximately 30.4 acres of the Property during construction, consisting of existing cleared ROW, new permanent ROW, and temporary workspace. Of the 30.4 acres used for construction, approximately 6.0 acres will be comprised of new permanent ROW adjacent to the existing ROW to accommodate the installation of the new 36-inch natural gas pipeline loop, approximately 7.0 acres will be workspace on the existing cleared ROW, and the remaining 17.8 acres will be comprised of temporary workspace that will be allowed to re-vegetate following construction. The proposed new 15-foot to 35-foot wide permanent ROW (approximately 6 acres), will be maintained by Tennessee following construction.

4.2.4.9 Agency and Landowner Consultation

Tennessee is in the process of acquiring all necessary easements and regulatory permits and approvals to install the pipeline facilities associated with the Project across affected private lands. Tennessee will acquire the necessary regulatory permits and approvals, as detailed in Table 1-3, prior to commencement of construction. Appendix C provides a table with a list of agencies contacted for information, consultation or technical assistance during preparation of this and other Project reports. Copies of all correspondences received to date are also provided in Appendix C.

Beginning in 2013, Tennessee began to contact all appropriate agencies, towns and private landowners regarding the proposed Project. Tennessee has met with the USACE, DCR, MADEP, MEPA, the Town of Sandisfield, and the Town of Agawam and has obtained survey permission for 100 percent of the proposed route. Discussions and meetings are ongoing with a variety of agencies and municipalities and Tennessee will continue to communicate with all stakeholders regarding the Project.

4.2.5 Air and Noise

The Project will not require air permitting per Federal Clean Air Act and Massachusetts regulations 310 CMR 7. A significant percentage of the greenhouse gas (GHG) emissions resulting from the Project will be temporary and associated with the pipeline construction and commissioning processes. A GHG analysis for the Project is provided in Appendix K.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Tennessee anticipates that noise generated from construction of the Project will be minor and consistent with noise generated from residential / commercial development. Once construction is complete, noise and traffic will be limited to occasional maintenance or repair activities. Tennessee does not anticipate issues pertaining to noise during construction or operation of the Project facilities. However, to address noise-related and other complaints, Tennessee will establish a complaint resolution process with the affected municipalities prior to the commencement of construction.

4.2.6 Environmental Screening – Potential Contaminated Sites

4.2.6.1 Database Search

Tennessee commissioned field and database research to identify, to the extent feasible, properties within 0.25 mile of the proposed route in Massachusetts having the potential to impact the proposed workspace with OHM (EDR 2014). Tennessee obtained a federal and state database search report from EDR for the area within 0.25 mile of the corridor boundaries. The database search performed by EDR identified one site with the potential for soil and/or groundwater contamination associated with a leaking underground storage tank at a residence. However, the site is located greater than 0.25 miles from the nearest Project workspace.

Tennessee has contacted affected landowners regarding the presence of private septic systems along the proposed alignment and will continue to consult landowners on the location of wells and septic systems. Tennessee will implement standards set forth in the Commission's Plan and Procedures (Appendix E) to minimize or avoid any potential disturbances to contaminated materials encountered during construction and will dispose of or mitigate for any hazardous materials uncovered, in accordance with federal, state, and local requirements.

The MADEP provided a letter in response to consultation request with direction to GIS data layers depicting state-mapped confirmed release sites of hazardous waste or oil (Skiba 2014). MADEP Site Number RTN 1-0014946, located southwest of Lower Spectacle Pond is listed on MADEP's searchable database as a closed site (MADEP 2014). A reportable release of petroleum and solvents was identified in soils on the site property and the MADEP was notified in November 2003. In August 2004 a Phase I and Tier Classification was completed classifying the site as a Tier II Disposal Site. Environmental Response Services, Inc. conducted response actions as part of a Release Abatement Measure (RAM) in 2006 which included soil excavation and disposal and attempted bedrock well installation. Response actions performed at the site have resulted in the elimination of all uncontrolled sources of contamination and the reduction of contaminant concentrations in soil. Residual contamination located within the site is below the Method 1 and Method 2 Risk Characterization Standards, which are considered to present no significant risk of harm to human health, the public welfare and safety, and the environment (ECS 2006). Based on these findings, Tennessee does not expect to encounter any contamination as a result of the historical release at this site. However, should unanticipated contamination be encountered during construction Tennessee will contact all applicable agencies and follow their required protocol.

Tennessee does not anticipate any potential issues relative to hazardous materials during construction and operation of the Project facilities. From information gathered as of the date of this DEIR, there appears to be no risk of encountering impacted soils or groundwater during pipeline construction. However, Tennessee is continuing to research information pertaining to the site from the EPA and state agencies to assess the probability of contaminant migration.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Should any hazardous materials be encountered during pipeline construction, Tennessee will dispose of and/or mitigate for any hazardous materials uncovered in accordance with applicable federal and state regulations. Additionally, Tennessee will implement the Commission's Plan and Procedures (Appendix E) during construction of the Project facilities to minimize potential disturbance of contaminated sediments. Should surface or subsurface contamination be encountered during construction, it will be addressed and handled in accordance with federal, state, and local requirements.

4.2.6.1.1 Groundwater Hazards

Tennessee commissioned field and database research to identify, to the extent feasible, properties within 0.25 mile of the proposed route in Massachusetts having the potential to impact the proposed workspace with Oil and/or Hazardous Materials ("OHM") (EDR 2014). Tennessee obtained a federal and state database search report from EDR for the area within 0.25 mile of the corridor boundaries. The database search performed by EDR identified one site with the potential for soil and/or groundwater contamination associated with a leaking underground storage tank at a residence. However, the site is located greater than 0.25 miles from the nearest Project workspace. Tennessee will contact affected landowners regarding the presence of private septic systems along the proposed alignment. Septic systems located adjacent to the construction workspace will be identified on residential construction plans to alert construction crews to the presence of the system and to avoid inadvertent damage to the system that could lead to groundwater contamination. Tennessee will implement standards set forth in the Commission's Plan and Procedures to minimize or avoid any potential disturbances to contaminated materials encountered during construction and will dispose of or mitigate for any hazardous materials uncovered, in accordance with federal, state, and local requirements.

4.2.6.1.2 Contaminated Sediments

Tennessee has contacted state environmental and water quality agencies in Massachusetts to determine potential waterbodies with known contaminated sediments crossed by the Project. A search of Federal and State databases yielded no reported sediment contamination in any of the waterbody crossings (EDR 2014). In addition, no evidence of abandoned drums, aboveground fuel pumps, unvegetated areas or dumpsites that would be considered a source of potential contamination was observed during field surveys conducted by AECOM in the fall 2013 or spring 2014.

Should any hazardous materials be encountered during pipeline construction, Tennessee will dispose of and/or mitigate for any hazardous materials uncovered in accordance with applicable federal and state regulations. Additionally, Tennessee will implement the Commission's Plan and Procedures (Appendix E) during construction of the Project facilities to minimize potential disturbance of contaminated sediments. Should surface or subsurface contamination be encountered during construction, it will be addressed and handled in accordance with federal, state, and local requirements.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

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5.0 ASSESSMENT OF IMPACTS

Tennessee has undertaken an extensive impact assessment as it relates to the Project and the existing resources along the proposed Project alignment. All Project facilities have been included in the impact assessment, along with consideration of all resource areas including, but not limited to: wetlands, rare species habitat, overall land use, public land and residential areas.

In addition to the pipeline looping segments and modifications at existing Station 261, Tennessee will construct appurtenant facilities as part of the Project, including one pig launcher, one pig receiver, and one MLV. One pig launcher will be constructed within the Agawam Compressor Station property and within the proposed workspace. The pig receiver and the MLV will be located at the terminus of the Massachusetts Loop at MP 3.81 in Sandisfield. As part of the Project, Tennessee is relocating the MLV from MP 0.0 to MP 3.81 in Sandisfield, Massachusetts. All appurtenant facilities will be constructed within the proposed workspace in the pipeline ROW and will not require additional impacts. Tennessee will utilize standard techniques to construct the aboveground facilities, and work will be conducted in accordance with the Commission's Plan and Procedures and Tennessee's Construction BMP's to minimize impacts.

The following sections of this DEIR discuss these impacts in more detail.

5.1 PRIMARY SCOPED RESOURCES

5.1.1 Wetland Protection Act Resources

Tennessee has carefully designed and sited the proposed Project to avoid and minimize impacts to resource areas, and where impacts are unavoidable, proposed mitigation. Tennessee assessed these unavoidable impacts to all WPA resources located along the proposed Project alignment resulting from the pipeline looping segments, appurtenant facilities, pipeyards, and access roads. The assessed resources include, but are not limited to BVWs, RFAs, LUWW, BLSF, and ILSF. Tables 5-1 through 5-4 summarize estimated impacts to resource areas and land use resulting from the Project and are discussed in more detail below.

As illustrated in Table 5-3, the Project will cross a total of 16 wetlands, representing approximately 5,666 linear feet. In addition to the 16 wetlands crossed by the pipeline looping segments, two wetlands are impacted by an access road, but will not be crossed by the pipeline looping segments. These wetland impacts from access roads total approximately 0.11 acre of permanent fill during construction and operation of the Project. One additional wetland is located in proximity to the Tyringham pipeyard. However, the pipeyard will be sited to avoid the wetland and all associated impacts. Approximately 10.23 acres of wetlands will be temporarily altered and impacted during construction of the pipeline looping segments and associated access roads. Approximately 2.24 acres of wetlands will be permanently converted from one wetland type to another; PFO to PSS or PEM and from PSS to PEM during operation of the pipeline looping segments. Upon completion of construction, topsoil, contour elevations and hydrologic patterns will be restored, and all disturbed areas will be reseeded or replanted to promote the re-establishment of native hydrophytic vegetation. All TWS and ATWS areas will be restored to pre-construction grades and contours, and reseeded and/or replanted during restoration activities.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

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TABLE 5-1
LANDUSE ACREAGE AFFECTED BY CONSTRUCTION AND OPERATION OF THE CONNECTICUT EXPANSION PROJECT

Facilities	County	Roadways[a] (RD)		Forest[b] (UF)		Open Land[c] (OL/ROW)		Agricultural (AG)		Com./Ind.[d] (CI)		Residential (RE)		Forested Wetlands[e] (PFO)		Non-forested Wetlands[f] (PSS/PEM)		Waterbodies[g] (WB/OW)		Other[h]		Total	
		Const.[i]	Oper.	Const.[i]	Oper.	Const.[i]	Oper.	Const.[i]	Oper.	Const.[i]	Oper.	Const.[i]	Oper.	Const.[i]	Oper.[j]	Const.[i]	Oper.[j]	Const.[i]	Oper.	Const.[i]	Oper.	Const.[i]	Oper.[j]
Massachusetts Loop																							
Pipeline[j]	Berkshire	0.18	0.07	28.27	8.89	4.60	0.39	2.29	0.81	0.36	0.00	0.00	0.00	5.62	2.09	3.04	0.03	0.09	0.02	0.00	0.00	44.45	12.30
ATWS		0.06	0.00	8.13	0.00	1.10	0.00	0.49	0.00	0.02	0.00	0.03	0.00	0.37	0.00	0.47	0.00	0.02	0.00	0.00	0.00	10.69	0.00
Access roads		0.03	0.00	0.84	0.00	0.68	0.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.11	0.00	0.00	0.00	0.00	1.66	0.43
Pipeyard		0.00	0.00	0.02	0.00	0.08	0.00	3.41	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.51	0.00
Massachusetts Loop Subtotal		0.27	0.07	37.26	8.89	6.46	0.71	6.19	0.81	0.38	0.00	0.03	0.00	5.99	2.09	3.62	0.14	0.11	0.02	0.00	0.00	60.31	12.73
Connecticut Loop																							
Pipeline[j]	Hampden	0.00	0.00	0.35	0.14	0.04	0.00	0.08	0.03	1.64	0.02	0.00	0.00	0.32	0.13	0.26	0.00	0.00	0.00	0.00	0.00	2.69	0.32
ATWS	Hampden	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Access roads	Hampden	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pipeyard	Hampden	0.00	0.00	0.01	0.00	0.00	0.00	3.18	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	3.19	0.00
Connecticut Loop Subtotal		0.00	0.00	0.36	0.14	0.04	0.00	3.26	0.03	1.64	0.02	0.00	0.00	0.32	0.13	0.26	0.00	0.00	0.00	0.00	0.00	5.88	0.32
PROJECT TOTAL		**0.27**	**0.07**	**37.62**	**9.03**	**6.50**	**0.71**	**9.45**	**0.84**	**2.02**	**0.02**	**0.03**	**0.00**	**6.31**	**2.22**	**3.88**	**0.14**	**0.11**	**0.02**	**0.00**	**0.00**	**66.19**	**13.05**

a: Includes federal, state, and local roadways, regardless of width.
b: Includes upland forest only.
c: Includes maintained utility easement (pipeline, electric transmission, etc.) crossings and other open lands.
d: Includes electric power or gas utility stations, manufacturing or industrial plants, landfills, mines, quarries, commercial or retail facilities, and roads.
e: Includes forested wetlands.
f: Includes palustrine scrub-shrub wetlands and palustrine emergent wetlands.
g: Includes all waterbodies.
h: Includes special land use cover types such as schools, parks, places of worship, cemeteries, and recreational areas.
i: Land affected during operation includes only those new areas to be permanently maintained outside of the existing maintained ROW associated with the existing 200 Line.
j: Operational wetland impacts include only the area in which vegetation will be maintained, not the extent of the permanent easement.
k: Acreage affected by installation of mainline valves is included in acreage affected by pipeline construction and operation.
Note: The totals shown in this table may not equal the sum of addends due to rounding.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

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20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

TABLE 5-2
SUMMARY OF TEMPORARY AND PERMANENT WETLAND IMPACTS BY MUNICIPALITY FOR MASSACHUSETTS

Municipality	Pipeline Impacts (acres)		Pipeyard / Contractor Yard Impacts (acres)		Wetland Tree Removal (acres)[2]		Access Roads in Wetlands (acres)		Non-wetland Tree Removal (acres)[3]	
	Temporary	Permanent[1]	Temporary	Permanent	Temporary	Permanent	Temporary	Permanent	Temporary	Permanent
Massachusetts										
Agawam	0.59	0.13	0.00	0.00	0.32	0.13	0.00	0.00	0.16	0.14
Sandisfield	9.64	2.11	0.00	0.00	5.99	2.08	0.11	0.11	27.52	8.89
Tyringham	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Massachusetts Total[4]	**10.23**	**2.24**	**0.00**	**0.00**	**6.31**	**2.21**	**0.11**	**0.11**	**27.68**	**9.03**

*Note: Impact areas are of federal wetlands and do not include impacts to the state-regulated upland review areas, buffer areas or floodplains.

[1] These impacts include numbers of acres converted from forested wetland to scrub-shrub or emergent wetland and from scrub-shrub to emergent during operation of the pipeline.

[2] These impacts represent the number of acres of wetland forest impacted during construction and operation. These wetland forest impacts are a total of all Project facilities (pipeline, access roads, pipeyards) constructed and operated as part of the Project.

[3] These impacts represent numbers of acres of secondary upland impacts due to vegetation removal.

[4] Minor apparent discrepancies between totals and sums of individual impacts are a result of rounding.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

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20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

TABLE 5-3
WETLANDS ASSOCIATED WITH THE CONNECTICUT EXPANSION PROJECT – MASSACHUSETTS

Wetland ID[a]	Milepost	Latitude Longitude	Town / County	Quadrangle	Wetland Class[b]	Crossing Length (ft)[c]	Wetland Impact (acres)[d]					State Wetland Classification[e]	Crossing Method[f]	Comments
							Construction			Operation				
							PEM	PFO	PSS	PFO	PSS			
Wetlands Associated With Pipeline Facilities														
WMA-01	0.07	42.03244/ -72.63412	Agawam/Hampden	West Springfield	PFO/PEM	337.53	0.16	0.32	0.11	0.13	-	BVW	II	Low lying forested wetland.
WMA-3	0.01	42.17803/ -73.1449	Sandisfield/ Berkshire	Monterey	PEM/PFO	11.58	0.15	0.03	-	0.01	-	BVW	II	Forested and emergent wetland associated with an intermittent stream
WMA-5	0.33	42.17475/ -73.14061	Sandisfield/ Berkshire	Monterey	PEM/PFO	19.09	0.01	0.04	-	0.01	-	BVW	II	Forested and emergent wetland associated with an intermittent stream channel
WMA-6	0.46	42.1734/ -73.13877	Sandisfield/ Berkshire	Monterey	PEM/PFO	94.40	0.02	0.16	-	0.06	-	BVW	II	Forested and emergent wetland slopes west
WMA-7	0.89	42.16882/ -73.13324	Sandisfield/ Berkshire	Monterey	PEM/PFO	1118.82	0.16	1.59	-	0.75	-	BVW	II	Large emergent and forested swamp
WMA-10	1.27	42.16438/ -73.12857	Sandisfield/ Berkshire	Monterey	PEM/PFO	21.82	0.00	0.06	-	0.02	-	BVW	II	Emergent marsh vegetation within ROW with forested wetlands off ROW
WMA-12	1.51	42.16244/ -73.12504	Sandisfield/ Berkshire	Monterey	PEM/PFO	461.44	0.39	0.34	-	0.04	-	BVW	II	Emergent marsh vegetation within ROW with forested wetlands off ROW
WMA-13	1.63	42.16098/ -73.12362	Sandisfield/ Berkshire	Otis	PEM	502.31	0.39	-	-	-	-	N/A (isolated)	II	Emergent marsh
WMA-14	1.94	42.15728/ -73.12034	Sandisfield/ Berkshire	Otis	PEM/PFO	388.57	0.36	0.39	-	0.09	-	BVW	II	Emergent marsh vegetation within ROW with forested wetlands off ROW
WMA-15	2.01	42.15679/ -73.11913	Sandisfield/ Berkshire	Otis	PEM/PFO	241.83	0.22	0.21	-	0.09	-	BVW	II	Emergent marsh vegetation within ROW with forested wetlands off ROW
WMA-16	2.76	42.15148/ -73.10709	Sandisfield/ Berkshire	Otis	PEM/PFO	888.50	0.47	0.97	0.15	0.40	0.03	BVW	II	Large emergent and forested swamp associated with a ponded area and a perennial stream
WMA-18	2.54	42.15384/ -73.11001	Sandisfield/ Berkshire	Otis	PEM/PFO	305.01	0.20	0.34	-	0.10	-	BVW	II	Large forested and emergent swamp
WMA-19	2.45	42.15472/ -73.11135	Sandisfield/ Berkshire	Otis	PEM/PFO	275.80	0.22	0.19	-	-	-	BVW	II	Forested and emergent wetland with disturbed soils in ROW.
WMA-20	2.89	42.15008/ -73.10563	Sandisfield/ Berkshire	Otis	PEM/PFO	130.25	0.23	0.19	-	0.04	-	BVW	II	Large emergent and forested wetland associated with a perennial stream
WMA-21	3.30	42.14573/ -73.10016	Sandisfield/ Berkshire	Otis	PEM/PFO	557.89	0.18	0.72	-	0.31	-	BVW	II	Large emergent marsh associated with a perennial stream

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

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20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

TABLE 5-3
WETLANDS ASSOCIATED WITH THE CONNECTICUT EXPANSION PROJECT – MASSACHUSETTS

Wetland ID[a]	Milepost	Latitude Longitude	Town / County	Quadrangle	Wetland Class[b]	Crossing Length (ft)[c]	Wetland Impact (acres)[d]					State Wetland Classification[e]	Crossing Method[f]	Comments
							Construction			Operation				
							PEM	PFO	PSS	PFO	PSS			
WMA-23	3.79	42.14078/ -73.09342	Sandisfield/ Berkshire	Otis	PEM/PFO	311.38	0.33	0.76	0.06	0.16	-	BVW	II	
WMA-24	3.81	42.13976/ -73.09195	Sandisfield/ Berkshire	Otis	PEM	0.00	0.00	-	-	-	-	BVW	N/A	
Pipeline Facilities Total						**5665.67**	**3.49**	**6.31**	**0.32**	**2.21**	**0.03**			
Wetlands Associated With Proposed Pipeyards														
No wetlands will be impacted from the use of Pipeyards														
Wetlands Associated With Access Roads														
WMA-16	2.73	42.15152/ -73.10795	Sandisfield/ Berkshire	Otis	PEM/PFO	-	-	-	-	-	-	BVW	N/A	
WMA-23	3.81	42.13994/ -73.09325	Sandisfield/ Berkshire	Otis	PEM/PFO	-	0.07	-	-	-	0.07	BVW	N/A	
WMA-24	3.81	42.13991/ -73.09319	Sandisfield/ Berkshire	Otis	PEM	-	0.04	-	-	-	-	BVW	N/A	Operational impacts to PEM (0.04 acres)
Access Roads Total						**0**	**0.11**	**0**	**0**	**0**	**0.11***			
MA LOOP TOTAL						**5665.67**	**3.60**	**6.31**	**0.32**	**2.21**	**0.14**			

N/A: Not applicable

*: This also includes 0.04 acres of permanent operation impacts to PEM from the permanent access road impacted WMA-24.

a: Field Wetland Identification Number.

b: Wetland classifications according to Cowardin et al 1979: PEM = Palustrine Emergent Wetland; PSS = Palustrine Scrub-Shrub Wetland; PFO = Palustrine Forested Wetland.

c: 0.0 = wetland is not crossed by pipeline but is in workspace.

d: Construction Acreage = all workspace during construction activities (TWS and ATWS plus permanent easement); Operation Acreage = 10-foot wide corridor permanently maintained in herbaceous vegetated cover through PSS wetlands, and 30-foot wide corridor permanently maintained through PFO wetlands where trees taller than 15 feet that could damage the pipeline coating will be selectively cut and removed. The permanently maintained corridors represent a change in cover type from PFO to PSS and PEM or PSS to PEM; there is no operation impact on PEM wetlands, since there is no change in the pre- and post-construction vegetation cover type. Construction impacts were calculated using a proposed construction footprint surface area and existing landuse based on field surveys. Surface area of operational maintenance corridor as described above were used to calculate acres of operation impact to each pre-construction wetland vegetation cover type for each wetland included in the table. The ROW width at all wetland crossings is 75 feet, except for those wetlands where additional workspace is required to safely construct the pipeline.

e: Massachusetts Wetlands Classification BVW = Bordering Vegetated Wetland

f: Methods for wetland crossings are described in Section 6.1.1.2; I = Standard Crossing; II = Conventional Crossing; III = Push/Pull Crossing; IV = Horizontal Directional Drill; N/A = Wetland not crossed by pipeline

Note: The totals shown in this table may not equal the sum of addends due to rounding.

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20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

TABLE 5-4
WATERBODIES ASSOCIATED WITH THE CONNECTICUT EXPANSION PROJECT – MASSACHUSETTS LOOP

Waterbody ID	Waterbody Name[a]	Approximate MP[b]	Latitude Longitude	Town / County	Type[c]	Riverfront Area (acres)[d]	Riverfront Area Impacts (acres construction / acres operation)[e]	Crossing Length[f] (feet)	LUWW Impacts (square feet)[g]	Water Quality Designation / Fishery Classification[h]	Timing Restriction[i]	Crossing Method[jk]	Comment
Waterbodies Associated with Pipeline Facilities													
SMA-3	Unnamed tributary to Clam River	0.01	42.17795 -73.14486	Sandisfield / Berkshire	I	-	-	3	45	B / Cold Water Fishery	June 1 – September 30	I	
SMA-5	Unnamed tributary to Clam River	0.33	42.17476 -73.14060	Sandisfield / Berkshire	I	-	-	0	-	B / Cold Water Fishery	N/A	N/A	
SMA-7	Unnamed tributary to Clam River	0.69	42.17060 -73.13659	Sandisfield / Berkshire	I	-	-	0	-	B / Cold Water Fishery	N/A	N/A	Off line parallel within wetland WMA-07 no impact
SMA-8	Unnamed tributary to Clam River	1.27	42.16440 -73.12862	Sandisfield / Berkshire	I	-	-	0	-	B / Cold Water Fishery	N/A	N/A	Off line within wetland WMA-08 adjacent to existing permanent easement no impact
SMA-10	Unnamed tributary to Clam River	1.27	42.16429 -73.12854	Sandisfield / Berkshire	I	-	-	6	90	B / Cold Water Fishery	June 1 – September 30	I	
SMA-30	Lower Spectacle Pond	1.68	42.16237 -73.12515	Sandisfield / Berkshire	POW	-	-	0	-	B / Warm Water	N/A	N/A	Off line hydrostatic test water withdrawal no crossing impact
SMA-14	Spectacle Pond Brook	1.90	42.15740 -73.12128	Sandisfield / Berkshire	P	12.21	(1.56 / 0.14)	21	315	B / Warm Water Fishery	June 1 – November 30	II	
SMA-16	Unnamed tributary to Clam River	2.83	42.15072 -73.10606	Sandisfield / Berkshire	P	2.37	(0.37 / 0.04)	0	-	B / Cold Water Fishery	N/A	N/A	
SMA-20	Unnamed tributary to Clam River	2.92	42.14969 -73.10583	Sandisfield / Berkshire	P	7.33	(2.01 / 0.42)	11	165	B / Cold Water Fishery	June 1 – September 30	II	
SMA-21	Unnamed tributary to Clam River	3.30	42.14540 -73.10010	Sandisfield / Berkshire	P	5.35	(1.03 / 0.41)	0	-	B / Cold Water Fishery	N/A	N/A	
Pipeline Facilities Crossing Length Total								**41**	**615**				

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

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20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

TABLE 5-4
WATERBODIES ASSOCIATED WITH THE CONNECTICUT EXPANSION PROJECT – MASSACHUSETTS LOOP

Waterbody ID	Waterbody Name[a]	Approximate MP[b]	Latitude Longitude	Town / County	Type[c]	Riverfront Area (acres)[d]	Riverfront Area Impacts (acres construction / acres operation)[e]	Crossing Length[f] (feet)	LUWW Impacts (square feet)[g]	Water Quality Designation / Fishery Classification[h]	Timing Restriction[i]	Crossing Method[jk]	Comment
Waterbodies Associated With Access Roads													
SMA-23	Unnamed tributary to Clam River	3.81	42.14552 -73.10008	Sandisfield / Berkshire	I		-	0	-	B / Cold Water Fishery	N/A	N/A	Off line runs parallel with access road #5 no impacts
Access Road Crossing Length Total								**0**					
Massachusetts Total Crossing Length								**41**					

N/A = Not Applicable
a: Unnamed tributary: waterbody is not mapped as a tributary on available GIS datalayers
b: MP = milepost; MP provided for access roads indicate the point at which the access road meets the proposed pipeline.
c: P = perennial; I = intermittent
d: Riverfront area is calculated using a 200' buffer from the edge of all perennial streams. Riverfront area overlaps with other resource areas including BVW but represents the amount of acreage in the full 200' buffer.
e: Amount of riverfront area impacted by Project construction and Project operation. Riverfront area impacts also include impacts to other resource areas due to overlap of boundaries. An additional 0.24 acres of Riverfront Area is temporarily impacted by the Tyringham pipeyard.
f: 0 = waterbody is not crossed but is in workspace. For minor waterbodies less than 3 feet in width delineated in the survey area and shown as a single line feature on the Project alignment sheets, an assumed 3 foot width has been used for this analysis.
g: LUWW – Land Under Water and Watercourses. In addition to these impacts, the Project will impact approximately 120 linear feet of Bank.
h: All surface waters in the Farmington River Basin are designated Class B, unless otherwise specified. Water quality classifications were identified through a desktop review of available GIS data layers and published literature.
i: Tennessee is continuing to consult with MADFW regarding timing restrictions for fisheries resources, but has not received a response related to timing restrictions as of the date of this DEIR. The timing restrictions provided in this table are based on the allowable construction windows in the FERC Plan and Procedures.
j: I = Conventional, Wet Crossing Method; II = Dry Crossing Method including Flume and Dam and Pump. Intermittent streams containing discernable flow at the time of construction will be crossed using a dry crossing method.
k: Tennessee will implement a dry-crossing construction technique on all waterbody crossings with discernable flow at the time of construction unless an alternative crossing method is approved by MADEP and the USACE.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

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20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

The proposed pipeline alignment in Massachusetts crosses four surface waters as detailed in Table 5-4. In addition, six surface waters are located within the proposed construction workspace or workspace related to the access roads but will not be impacted by construction or operation of the pipeline facilities. The table identifies each waterbody crossing location by pipeline loop, approximate milepost, waterbody identification number, whether the waterbody has perennial or intermittent flow, bank to bank crossing length, state water and fishery classifications (where applicable) and proposed crossing method. The information presented in the table was collected through field surveys during fall 2013 and spring 2014, and examination of the USGS 7.5-minute topographic quadrangle, NWI mapping and MADEP state wetland maps of the Project area.

Construction activities associated with pig launchers, pig receivers, and main line valves will not occur within the immediate vicinity of sensitive surface waters or wetlands. Therefore, impacts on sensitive surface waters or wetlands are not expected to result from construction, modification and operation of these facilities.

No impacts to wetlands are anticipated at the Tyringham pipeyard or Hickory Street pipeyard locations. These pipeyards will be located outside of the boundaries of the nearby wetlands. In addition, fueling within the pipeyards will not occur within 100 feet of any wetland area.

5.1.1.1 Bordering Vegetated Wetlands

Existing wetlands along the proposed Project alignment have been and are currently affected by the existing 200 Line ROW and the vegetation management practices associated with the existing ROW; high quality wetland habitats occur along the current ROW compatible with the management practices. The proposed looping of the 200 Line will require additional new permanent ROW along with TWS to facilitate safe construction of the Project. Construction and operation of the Project will result in both temporary and permanent impacts to wetlands (Table 5-3) as a result of required workspace for construction and installation of the pipeline and improvements to access roads. These impact estimates are conservative and represent a worst case scenario; actual impacts to wetlands are likely to be less than these estimated values.

Temporary impacts to BVWs as a result of construction will total approximately 10.23 acres, while operational impacts will total approximately 2.35 acres. Of these operational impacts, only approximately 0.11 acres are a result of permanent fills associated with an access road. All other operational impacts are a result of vegetation cover type conversion from PFO to PSS or PEM and from PSS to PEM. All impacts to wetlands will be mitigated in full compliance with state and federal requirements, and accordingly functional impacts to wetlands will be avoided or minimized, and unavoidable impacts will be mitigated.

5.1.1.1.1 Construction Workspace

To safely construct the new proposed pipeline looping segments, INGAA and DOT safety requirements will be met and maintained during construction of the Project. Except for areas where additional workspace is required to safely construct the pipeline due to environmental or other factors, the width of construction workspace has been reduced to 75 foot in wetlands to minimize impacts in accordance with Commission construction width requirements through wetlands. Vegetation within the construction workspace will be cut to facilitate pipeline construction. Temporary wetland impacts may include soil disturbance, temporary alteration of hydrology and loss of vegetation during construction. Upon completion of construction, topsoil, contour elevations and hydrologic patterns will be restored, and all disturbed areas will be reseeded or replanted to promote the re-establishment of native hydrophytic vegetation. All TWS and ATWS areas

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

will be restored to pre-construction grades and contours, and reseeded and/or replanted during restoration activities and allowed to revert back to their pre-construction land use and vegetation cover type.

Following construction, vegetation within the permanent ROW will be maintained in an herbaceous state, except in wetlands and adjacent to perennial streams, where maintenance clearing of woody vegetation will be limited. Here, during operation, a 10-foot wide corridor centered over the pipeline will be permanently maintained in an herbaceous state. In addition, trees that are located within 15 feet of the pipeline that may compromise the integrity of the pipe coating will be selectively cut and removed from the permanent ROW. The remaining temporary and permanent ROW will revert to its pre-construction land use/land cover once construction is complete.

5.1.1.1.2 Access Roads

Although public roads and the construction ROW will be used for primary access to the pipeline looping segments during construction, non-public access roads have been identified for potential use during construction of the Project as well. All access roads designated for temporary use during construction and permanent use during operation are listed in Table 2-5. Five access roads are proposed for use in Massachusetts to construct and operate the pipeline; four are existing access roads and one is an existing town road. Three of the proposed access roads are proposed to be permanent. Minor improvements are proposed for some access roads including adding gravel for stability. One permanent access road requiring widening will have minor impacts to BVW, totaling approximately 0.11 acre (Table 5-3); this is the only wetland filling proposed for the Project. While some of the proposed access roads will require minor improvements to allow for passage of construction vehicles, the Project will not require any modification of existing land use associated with the identified access roads during construction.

5.1.1.2 Lands Under Waterbodies and Waterways (LUWW) and Bank

The Project has been designed to avoid surface waterbodies to the maximum extent practicable. Where temporary impacts to surface waterbodies cannot be avoided during construction, Tennessee will restore these areas to pre-construction conditions upon completion of pipeline installation. Tennessee proposes to cross four watercourses to construct the Project in Massachusetts. Total Project impacts to LUWW are approximately 615 square feet and impacts to Bank total approximately 120 linear feet.

Construction and operation of the proposed Project may include temporary impacts to waterbodies crossed by the Project alignment. Tennessee does not anticipate any permanent adverse impacts to sensitive waterbodies as none will be crossed by the Project. Eleven waterbodies were identified and delineated in the field as being within the Project workspace. However, only four waterbodies will be crossed by the actual pipeline alignment; two minor crossings and two intermediate crossings as defined by the Commission. Minor waterbodies are defined in the Commission Procedures as “all waterbodies less than or equal to ten feet wide at the water’s edge at the time of crossing” and intermediate waterbodies are defined as, “all waterbodies greater than ten feet wide but less than or equal to 100 feet wide at the water’s edge at the time of crossing”.

Whenever construction occurs within a stream, there is potential for impacts to fish habitat. Downstream habitat alteration and increased suspended solids concentrations and sedimentation may eliminate or degrade fish spawning and nursery areas, resulting in a temporary reduction in reproductive potential. These impacts are typically temporary in nature as the sediments are flushed during subsequent storm events, and aquatic communities re-colonize the affected area. A detailed erosion control plan will be

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

designed and implemented, which will confine sediment within the immediate construction area and minimize impacts to downstream areas. The Commission's Plan and Procedures, will be implemented during installation of the pipeline loops, as well as appropriate construction BMPs to avoid, minimize, and mitigate for potential impacts during wetlands and waterbody crossings. For this Project, Tennessee plans to install either a dam and pump system or flume pipes in all waterbodies with perceptible flow at the time of construction to pass water across the disturbed areas and maintain downstream flow to further minimize impacts to the stream and fishery resources as opposed to using this method of crossing only for designated fisheries. Further, stream crossings will be treated as independent activity, and will be constructed separately from the rest of the pipeline construction. A separate construction crew will begin and complete each stream crossing before moving on so that construction is completed as quickly as possible, allowing for restoration of the stream immediately following pipeline installation. Once installation activities for each pipeline loop is complete, all disturbed areas will be restored to pre-construction conditions and stabilized as necessary to mitigate erosion of exposed soils and sedimentation to on- and off-site resource areas.

Post-construction or operational impacts to fisheries will be minimal. Restoration and maintenance of the vegetation within the ROW will minimize the erosion potential relative to the stream. Removal of mature streamside trees and vegetation at the pipeline crossing may temporarily reduce shading of the stream, eliminate escape cover and potentially result in a locally elevated water temperature. Elevated water temperature may lead to a reduction in levels of dissolved oxygen and influence fish survival and fitness. However, following construction of the Project and restoration/stabilization of the ROW, Tennessee will limit vegetation maintenance of the permanent ROW to the Commission-mandated 10-foot-wide corridor centered over the proposed new pipeline within wetlands and across waterbodies. In addition, trees that are located within 15 feet of the pipeline that may compromise the integrity of the pipe coating will be selectively cut and removed from the permanent ROW. This will allow for the re-establishment of woody and herbaceous species along the stream banks that will provide needed shading and crucial cover habitat to sufficiently maintain coldwater fisheries habitat characteristics. During ROW vegetation maintenance activities, Tennessee will comply with the Commission's Procedures and will leave vegetation in place within 25-feet adjacent to a waterbody, as measured from the waterbodies' high water mark, to allow for a riparian strip adjacent to waterbodies. Vegetation removal within this 25-foot riparian strip will be limited to a 10-foot corridor centered over the proposed pipeline centerline as necessary for temporary equipment crossings and emergency access.

No impact on fisheries is anticipated relative to the timing of construction. In accordance with the Commission's Procedures, Tennessee has consulted with the Massachusetts Division of Fisheries and Wildlife relative to timing restrictions associated with sensitive fisheries (Table 5-4). These timing restrictions are set forth in the waterbody table. Tennessee plans to construct the crossings in compliance with the restrictions provided by the state fisheries agency, unless state permit conditions relative to wetland and waterbody permits require more stringent timeframes for crossings. Tennessee will adhere to the Commission's Plan and Procedures to mitigate sedimentation and erosion within and adjacent to all waterbodies crossed by the pipeline.

5.1.1.3 Riverfront Area

Table 5-4 includes the acreage of RFA associated with each perennial stream along with the associated impacts during construction and operation. Impact acreage to RFA also includes impacts to BVW and other resource areas located within the RFA. Approximately 5.22 acres of RFA will be temporarily impacted by the construction of the Project. Of this, approximately 1.02 acres of RFA will be permanently impacted through operation of the pipeline. These permanent impacts represent a change in cover type as the RFA

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

will be maintained in an herbaceous or scrub-shrub community. These impacts to RFA represent a conservative estimate because the impacts to BVW and other resource areas located within the RFA have already been accounted for in the calculations for those resource areas.

5.1.1.4 Bordering Land Subject to Flooding

Bordering Land Subject to Flooding is represented by the 100-year floodplain. The 100-year floodplain is the area of flooding that would result during a storm that has a one percent chance of occurring during any year. BLSF is present in association with Lower Spectacle Pond (1.6 acres), Spectacle Pond Brook (1.23 acres), and Hop Brook (4.14 acres). Impacts to BLSF are related to one existing access road that will be used as is, and will not require improvements, two areas of ATWS at the beginning of this access road to accommodate staging and withdrawal of water for hydrostatic testing, and the Tyringham pipeyard. Although ATWS is identified at these locations no grading or tree clearing will occur at these locations. Tennessee is required to identify these areas for the Commission's purposes to identify where access is needed off the ROW. Tennessee will not clear or grade these ATWS areas and will use these for access purposes only. Temporary impacts to BLSF will be limited to 0.19 acres associated with Spectacle Pond Brook and 0.058 acre associated with Hop Brook in Tyringham. No loss of flood storage will result from the temporary use of these areas as access during construction or during operation of the pipeline. This access road will be used by rubber tire vehicles only with no tandem trailers. Impacts to BLSF, in addition to those already existing due to the presence of the access road, are not anticipated.

5.1.1.5 Vernal Pools

Only one certified vernal pool is located in the Project area (MAGIS 2014) but is not located within any of the Project workspace and will not be impacted during construction or operation of the pipeline facilities. Based on surveys conducted during spring 2014, the Project will have a direct impact to three potential vernal pools (Table 5-5). Impacts from workspace will occur at each of the three potential vernal pool locations during construction and operational impacts will occur at one of the potential vernal pools. Operational impacts at this potential vernal pool are limited to 25 square feet. However, this area of the vernal pool is currently PEM so no change in cover type will occur at this location. In addition to direct impacts to potential vernal pools, work is proposed to occur within portions of wetlands with vernal pool habitat. Ten wetlands with potential vernal pool habitat have proposed impacts as a result of the Project. Table 5-5 identifies the amount and type of impacts to the potential vernal pools and wetlands containing vernal pool habitat. It is noted that existing potential vernal pools are situated within the currently actively managed portion of the ROW, indicating that habitat conditions along the ROW are compatible with the preservation of vernal pool functions. To minimize impacts, Tennessee re-evaluated the need for workspace in certain areas to avoid impacting vernal pools. Tennessee has adjusted the workspace in Wetland WMA-7 to avoid impacting a vernal pool (VPMA-7-2) at this location: in WMA-16 to avoid impacts to VPMA-16 associated with this access road; and in WMA-23 to avoid impacts to VPWMA-23. The remaining impacts to potential vernal pools are necessary to allow for safe construction the pipeline.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

TABLE 5-5
IMPACTS TO POTENTIAL VERNAL POOLS ASSOCIATED WITH THE CONNECTICUT EXPANSION PROJECT*

Town/State	Wetland ID	Type of Impact to Surrounding Wetland (Square Feet)	Type of Impact to Potential Vernal Pool (square feet)
Sandisfield/MA	WMA-12	Workspace (31,481) Operation Impact (1,719)	No Direct Impact to Potential Vernal Pools
Sandisfield/MA	WMA-13	Workspace (16,790)	Workspace (1,370)
Sandisfield/MA	WMA-16	Workspace (69,316) Operation Impact (17,451)	No Direct Impact to Potential Vernal Pools
Sandisfield/MA	WMA-18	Workspace (23,527) Operation Impact (4,223)	Workspace (614)
Sandisfield/MA	WMA-23	Workspace (50,083) Operation Impact (7,062) Perrmanent Access Road (2,984)	No Direct Impact to Potential Vernal Pools
Sandisfield/MA	WMA-24	Workspace (38) Perrmanent Access Road (1,651)	No Direct Impact to Potential Vernal Pools
Sandisfield/MA	WMA-3	Workspace (7,533) Operation Impact (326)	Workspace (1761) Operation Impact (25)
Sandisfield/MA	WMA-5	Workspace (2,396) Operation Impact (582)	No Direct Impact to Potential Vernal Pools
Sandisfield/MA	WMA-6	Workspace (7,917) Operation Impact (2,761)	No Direct Impact to Potential Vernal Pools

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

TABLE 5-5
IMPACTS TO POTENTIAL VERNAL POOLS ASSOCIATED WITH THE CONNECTICUT EXPANSION PROJECT*

Town/State	Wetland ID	Type of Impact to Surrounding Wetland (Square Feet)	Type of Impact to Potential Vernal Pool (square feet)
Sandisfield/MA	WMA-7	Workspace (76,077) Operation Impact (33,047)	No Direct Impact to Potential Vernal Pools

*Impacts to the associated wetland for each potential vernal pool are also provided.

5.1.1.6 Rare Species

Potential impacts on rare species habitat could occur during the construction of the Project. The primary impacts to rare species would be related to disturbance of potential habitat through vegetation clearing and placement of temporary matting associated with the Tyringham Pipeyard or the withdrawal of water from Lower Spectacle Pond for hydrostatic pressure testing of the pipeline once it has been constructed. The long-term operation and maintenance of the Project is not anticipated to have any impacts to rare species or their habitat.

Consultations with NHESP to date have included submittal of pre-application materials, a pre-application meeting, and submittal of the Project Review Checklist Filing. During the pre-application meeting, NHESP indicated that it believes a "Take" could be avoided for all four of the listed species identified as being present in the Project area, through conditions and proposed construction procedures. NHESP also indicated that there would be no need to conduct additional surveys for any of the four species based on the proposed construction procedures and avoidance measures.

5.1.1.6.1 Spectacle Pond

In compliance with USDOT specifications, Tennessee will conduct hydrostatic testing on all segments of the pipeline prior to placement in service. Tennessee anticipates using water from Lower Spectacle Pond for hydrostatic pressure testing. Tennessee will access the Pond from an existing boat ramp off Cold Spring Road and install a pump at the end of the ramp in a secondary containment structure to avoid the potential for a spill (Appendix G). A suction pipe will be attached to the pump with a dissipation device/strainer (screen) attached to the end, to avoid the entrainment of fish and other wildlife. The screen will be attached to a buoy and also anchored to the bottom to ensure the intake is elevated off the bottom to avoid the withdrawal of mud and sediment. The intake location is proposed to be maintained in approximately six to eight feet of water with the intake structure located approximately three to four feet from the surface and three to four feet from the bottom, in the middle of the water column. The intake will consist of an eight-inch suction pipe with a 13-inch diameter suction strainer with an eight-inch inlet. The process of installing the elevated/suspended intake structure will be done from a small boat and/or on foot. Therefore, the process is anticipated to avoid disturbing insect larvae, including any odonate larvae which may be present, by avoiding impacts to the bottom substrate.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Preliminary evaluation of mapping and consultation with NHESP indicated that Lower Spectacle Pond contained Priority Habitat for the Umber shadowdragon (*Neurocordulia obsolete*), a dragon fly species listed as a species of special concern pursuant to MESA. Tennessee submitted a letter to the MA NHESP in July and participated in a pre-filing consultation meeting with NHESP staff in July 2014. MA NHESP indicated they have no concerns with the proposed method of withdrawing the hydrostatic testing water from Lower Spectacle Pond, as described above.

Lower Spectacle Pond has a surface area of approximately 70 acres. The proposed withdrawal for the hydrostatic testwater is approximately 1,025,00 gallons or 3 acre-feet. To complete the withdrawal in the proposed 8 hour timeframe, the withdrawal rate would be approximately 2,000 gallons per minute. The overall impact to Lower Spectacle Pond from the proposed withdrawal would be a reduction in depth of approximately 0.04 feet over the entire pond and is not anticipated to have an impact on wildlife or human users.

Upon completion of the hydrostatic tests, the test water will be discharged to an upland area through a dewatering structure consisting of an energy dissipation device and water filtration structure. The energy dissipation device will be located within the structure slowing the water discharge to allow water filtration through the structure walls. The discharge rate of the test water will be regulated using valves and energy dissipation devices to reduce the potential for erosion. This clean testwater (no chemical additives are used during testing) will only be discharged into areas where adequate vegetation is present, adjacent to the construction ROW. The pipeline sections will be coated internally with a chemical compound, Valspar flow liner, intended to reduce friction during pipeline operations. The flow liner is applied by the manufacturer at the plant to the pipe sections and allowed to dry before shipping. Once dry, the chemical is inert and will not result in any type of leaching or off-gasing of chemicals into the hydrostatic testwater or surrounding environments following discharge from the pipe. All discharge activities will be monitored through the duration of the activity to ensure proper function of the structures utilized to prevent erosion and subsequent sedimentation potentially occurring as a result of dewatering activities. Hydrostatic testwater discharge is anticipated to occur over an 8 hour period, similar to the fill rate. Tennessee anticipates that testwater will infiltrate into the ground and move as sheetflow across well vegetated areas before reaching surface waters downstream. Tennessee does not anticipate that this limited quantity of water would impact downstream areas and will monitor and slow the discharge rate, if necessary, to prevent any downstream impacts from the discharge.

5.1.1.6.2 Tyringham Pipeyard

Tennessee plans to use 3.50 acres of active hay field as a pipeyard to store equipment and materials in support of construction. The entire pipeyard is within uplands and no wetland areas will be impacted by the use of the pipeyard. Additionally, no woody vegetation will need to be cleared to accommodate the pipeyard.

In late winter or early spring 2015 (prior to April 2015), Tennessee anticipates placing construction mats and/or geotextile fabric over the entire 3.50 acre proposed pipe yard and associated access road, while simultaneously installing a perimeter of properly dug in silt fencing and double staked straw bales. A final decision on the exact matting has not been made at this time. Mat placement would take place prior to sedge wrens returning to the area for the pending breeding season and prior to wood turtles emerging from Hop Brook after over-wintering. A drawing depicting the anticipated layout of the pipeyard is included in this submittal as Appendix G.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

The construction mats and silt fencing would remain in place for approximately one year and Tennessee anticipates that the mats and fencing would be removed during the late winter or early spring of 2016. The hay field would then likely be put back into regular production for the 2016 growing season. Using this approach, both the sedge wren and the wood turtle would be excluded from using the area for one season.

Given that the proposed pipeyard area is on the edge of the PH mapping, is limited in scope and there is an abundance of hay fields in the immediate area, the local populations of sedge wren and wood turtle would likely not be negatively affected by being temporary exclusion from the area for one season. There is an abundance of more suitable habitat for both species associated with Hop Brook in Tyringham Valley. In our opinion, given the proposed mitigation measures, Tennessee would avoid a "Take" of these species under MESA.

5.1.1.6.3 Summary

Due to the relatively minor impacts associated with the proposed activities and the proposed timing of mitigation measures, Tennessee believes it can avoid a "Take" under MESA. In addition, the June 30, 2014 letter from the MA NHESP to the MA Executive Office of Environmental Affairs indicated the proposed actions at the two subject sites could be conditioned to avoid a prohibited "Take" of state-listed species. This opinion was reiterated at the July 15 pre-filing consultation meeting between the MA NHESP and AECOM.

5.1.1.7 Historic and Archaeological Resources

Tennessee commissioned PAL to conduct archaeological surveys for the Project in Massachusetts. Surveys conducted by PAL resulted in the identification of one pre- and post-contact archaeological site and one post-contact archaeological site. The G. Dunham Foundation (SAN-2) and the Allen Foundation (SAN-3) sites, originally identified and mapped by the University of Massachusetts Archaeological Services, were relocated by PAL.

PAL visually inspected 100 percent of the Massachusetts Loop for extant stone walls that intersect the study areas. A total of 38 stone walls were identified, photographed and plotted on Project alignment sheets (Appendix B) to depict their length, orientation, and intersection with other stone walls or features. Some walls are largely intact, while others are partially demolished from natural weathering or from alterations such as bisecting during previous pipeline construction. PAL interprets the stone walls as most likely representing historical property boundaries.

Tennessee adjusted the Project alignment to entirely avoid the two existing foundations in the Project area discussed above and no impact to these foundations from the construction or operation of the Project will occur. In addition, Tennessee has attempted to avoid stone wall features wherever possible along the Project alignment. Impacts to historic and archaeological resources are not expected to occur from construction and operation of the Project. If archeological resources are discovered during Project construction, Tennessee will follow their Unanticipated Discovery Plan for the Project (Attachment F).

5.1.2 Conservation Land (DCR Property)

Impacts to DCR property will occur where the Project crosses the Otis State Forest. The Project will cross Otis State Forest at approximate MPs 0.0 – 0.33 and 0.61 – 2.27, totaling 10,470 linear feet. Construction impacts to DCR property will total 30.4 acres and operational (permanent) impacts will total approximately

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

6 acres. Construction impacts to TWS on DCR property will be the same as the construction impacts for the rest of the Project. Temporary impacts will occur as a result vegetation clearing, site grading and trenching and stockpiling of trench spoils along the Project alignment, as described in Section 2.3.1 of this DEIR. The section that follows describes areas within DCR property with shallow depth to bedrock and the associated impacts related to blasting, if required.

5.2 OTHER RESOURCES

5.2.1 Topography and Geology

The principal impact to geologic resources as a result of the construction of any proposed pipeline is associated with potential blasting activities in areas where bedrock outcrops either at the ground surface or within the proposed pipeline trench. Shallow depth to bedrock based on the NRCS Web Soil survey and a survey by a trained geologist was assessed for the Massachusetts Loop. A reconnaissance-level geologic survey by a trained geologist to identify areas potentially requiring blasting was performed and results of the survey are provided in Table 5-6 and are shown in the shallow depth to bedrock mapping in Appendix J. However, a complete list of blasting locations can only be accurately determined in the field during the construction process. In the event that bedrock is encountered, the technique used for bedrock removal would depend on factors such as strength and hardness of the rock. Tennessee would attempt to use mechanical methods such as ripping or conventional excavation to remove the bedrock where possible. If blasting is necessary, Tennessee will obtain state and municipal approvals associated with proposed blasting prior to the blasting activities.

The proposed Project is not expected to be affected by seismic activity due to the low probability and low incidence/susceptibility of significant magnitude earthquakes within the Project area. Tennessee anticipates that the proposed pipeline looping and associated aboveground facilities will not be affected by fault movements. Tennessee will comply with all applicable USDOT Office of Pipeline Safety regulations regarding pipe wall thickness and strength, 49 Code of Federal Regulations ("CFR") Part 192.

Routine inspection of the pipeline will be conducted to identify any potential problems that may develop. The potential for slope failure due to earthflow along the proposed ROW would be minimized through specialized construction techniques and the use of erosion control procedures outlined in the Commission's Plan and Procedures.

5.2.1.1 Blasting

As noted above, the principal impact to geologic resources as a result of the construction of any proposed pipeline is associated with potential blasting activities in areas where bedrock either outcrops at the ground surface or within the proposed pipeline trench. United States Department of Agriculture, Natural Resources Conservation Service (USDA-NRCS) defines areas of shallow depth to bedrock as being within 5 feet of the ground surface (USDA 2014). The USDA-NRCS Web Soil Survey for Hampden County Massachusetts did not identify any areas of shallow depth to bedrock. The USDA-NRCS Web Soil Survey for Berkshire County, Massachusetts and a reconnaissance-level geologic survey by a trained geologist identified possible areas of shallow depth to bedrock along the Massachusetts Loop (Table 5-6). Shallow depth to bedrock figures along the Project alignment have been provided in Appendix J. However, a complete list of blasting locations can only be accurately determined in the field during the construction process. If blasting is necessary, Tennessee will obtain state and municipal approvals associated with proposed blasting prior to the commencement of construction.

TABLE 5-6
POTENTIAL BEDROCK BLASTING LOCATIONS ALONG PROPOSED PIPELINE ROUTE

Approximate Milepost		Town	Potential for Bedrock Blasting (A, B, or C)[1]	Approximate Segment Length (feet)	Rock Type	Comments
Start	End					
0.00	0.75	Sandisfield	A	3,978	Gneiss	Areas with shallow outcrops visible, ridge underlain by shallow bedrock
0.75	0.84	Sandisfield	B	490	Gneiss	
0.84	0.90	Sandisfield	A	340	Gneiss	Wetland possibly underlain by shallow rock
0.90	1.01	Sandisfield	B	540	Gneiss	Partially in wetlands
1.01	1.15	Sandisfield	A	760	Gneiss	Possible outcrops present
1.15	1.18	Sandisfield	B	150	Gneiss	Depression in topography
1.18	1.38	Sandisfield	A	1,064	Gneiss	Extensive rock exposures near Access Road #2
1.38	1.43	Sandisfield	B	250	Gneiss	Extensive outcrops to northeast of Cold Spring Road
1.43	1.52	Sandisfield	A	450	Gneiss	Near Cold Spring Road and outcrops to northeast
1.52	1.71	Sandisfield	C	1,006	Gneiss	Deeper glacial till soils
1.71	2.01	Sandisfield	B	1,585	Gneiss	Crosses SMA-14
2.01	2.24	Sandisfield	A	1,200	Gneiss	Over very steep ridge with extensive rock exposures
2.24	3.59	Sandisfield	C	7,125	Gneiss	Thicker glacial tills
3.59	3.63	Sandisfield	A	234	Gneiss	Bedrock outcrops visible adjacent to roadway and in fields

TABLE 5-6
POTENTIAL BEDROCK BLASTING LOCATIONS ALONG PROPOSED PIPELINE ROUTE

Approximate Milepost		Town	Potential for Bedrock Blasting (A, B, or C)[1]	Approximate Segment Length (feet)	Rock Type	Comments
Start	End					
3.63	3.80	Sandisfield	B	892	Gneiss	Sporadic bedrock outcrops visible through field

[1] Initial estimate of bedrock blasting locations for a specific segment were ranked using the following criteria:
A: High Probability that bedrock will be encountered within the pipeline excavation along the majority of the segment
B: Moderate Probability that bedrock will be encountered within the pipeline excavation along portions of the segment
C: Low Probability that bedrock will be encountered within the pipeline excavation in the segment

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Any blasting operations in Massachusetts will be conducted in accordance with the State Board of Fire Prevention Regulations 527 CMR 13.00: Explosives. In addition, blasting operations also will adhere to the following regulations:

- Code of Federal Regulations Bureau of Alcohol, Tobacco, Firearms and Explosive ("ATF") Title 27;
- Directive 495 standards of the National Fire Protection Association ("NFPA"); and
- Occupation Safety and Health Administration ("OSHA") standards, 29 CFR 1926.900 -1926.914 (Blasting and the Use of Explosives) and OSHA 1910.109 (Explosives and Blasting Agents).

Tennessee is developing a Blasting Plan for the Project that establishes procedures and safety measures that its contractor will adhere to while implementing blasting activities along the pipeline ROW during the Project. The contractor will be required to submit a detailed Blasting Specification Plan to Tennessee. The contractor's plan, when approved by Tennessee, will be incorporated into the contractor's scope of work.

In addition to detailed specification requirements of the site-specific blasting plans, safety and impact minimization precautions include:

- installing blasting mats in congested areas, in shallow waterbodies or near structures that could be damaged by fly-rock;
- posting warning signals, flags and barricades;
- following procedures for safe storage, handling, loading, firing, and disposal of explosive materials;
- manning adjacent pipelines at valves for emergency response; and
- controlling excessive vibration by limiting the size of charges and using charge delays that stagger each charge in a series of explosions.

These blasting standards meet or exceed all applicable federal, state, and local requirements covering the use of explosives. To protect groundwater and surface water from potential contaminants, use of perchlorate-containing explosives will not be allowed.

5.2.1.1.1 Minimization of Impacts to Structures

If blasting near structures, an independent contractor will inspect structures prior to blasting within approximately 200 feet of the construction work area, locations requested by the pipeline contractor, and at the request of an affected landowner. Post-blast inspections will be performed as warranted. Blasting will be performed by registered blasters and monitored by blasting inspectors. During blasting, the contractor will monitor ground vibrations at the nearest structure (or well) within 200 feet of the construction work area.

5.2.1.1.2 Minimization of Impacts to Water Quality

The two primary concerns related to water quality would be (1) potential impacts of perchlorates, which are contained in very small quantities in some explosives and detonators; and (2) potential residual chemicals from the incomplete detonation of Ammonium Nitrate Fuel Oil ("ANFO"), which is commonly used in mine and construction blasting, and if not oxygen balanced, can leave some nitrate residues.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

To avoid and prevent these water quality impacts, Tennessee will preclude the use of explosives or detonators containing perchlorates or ANFO. Special trenching-type explosives, which are designed specifically for narrow, controlled trench blasting and do not contain perchlorates or ANFO, will be required to be used on the Project.

5.2.1.1.3 Minimization of Impacts to Water Wells

Impacts on drinking water supply wells from trench construction blasting will be minimized by controlled blasting to protect the integrity of nearby wells. The proposed trench will be excavated to approximately six to seven feet deep and the design blast holes would typically be a maximum of seven to nine feet deep (including a subdrill), although the entire drill hole is not typically loaded with explosives.

Energy produced from blasting is dispersed towards the direction of least confinement, which for trench blasting is typically in an upward and lateral direction towards the trench surface. Therefore, rock fracturing is not expected to extend appreciably below the bottom of the blast holes. In addition, there should not be any fracturing of the bedrock beyond approximately 5 to 10 feet laterally from the trench. Because of this localized effect, Tennessee does not anticipate direct damage to water wells greater than 20 feet from the blast locations. Tennessee will minimize vibration-related damage by setting a conservative Peak Particle velocity limit of 2.0 inches per second (in/sec) at any water wells in the vicinity of construction. Tennessee will monitor the quantity or quality of wells within 250 feet of trench blasting and will conduct pre- and post-blast surveys of flow rate and water quality performed.

Tennessee will evaluate any damage complaints associated with construction activities, including blasting. In the unlikely event that blasting activities temporarily impair well water, Tennessee will provide alternative sources of water or otherwise compensate the owner. If well damage is substantiated, Tennessee will either compensate the owner for damages or arrange for a new well to be drilled. In the unlikely event that structural damage occurs at a nearby structure as a result of construction activities, the owner will be compensated for damages, or appropriate repairs will be made.

5.2.1.1.4 Minimization of Impacts to Wetlands

Trench Blasting Within or Down Slope from Wetland

One potential impact of trench construction within or downslope of a wetland could be carrying away or redirecting surface water or groundwater from the wetlands by flow into and through the pipeline trench itself. Since the pipeline will utilize relatively pervious backfill and bedding material below and beside it, there is potential for water from the wetlands to flow into the trench after construction is completed through fractures in the bedrock and be conveyed away from the wetland.

This potential impact will be prevented in three ways. First, perimeter control blasting methods (described below) will be utilized to minimize fracturing of the bedrock outside the limits of excavation in proximity to the wetlands. Second, when within a wetland, the upper portion of the trench backfill will be restored with low permeability wetland soils as specified. The wetlands soils will be carefully stockpiled during construction, or suitable materials will be brought in for wetland restoration. Third, there will be impervious dams or trench plugs constructed within the blasted pipeline trench at either end of the wetlands to keep water in the trench from flowing away from the resource area, as necessary.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Perimeter Control Blasting Procedures

As noted above, energy from blasting is in an upward and lateral direction, and fracturing is not expected below the bottom of the blast holes. Laterally, there should not be any fracturing of the bedrock beyond approximately 5 to 10 feet from the trench. Even with this limited fracture zone, special precautions will be taken when within a wetland or within 20 feet downslope of a wetland, to minimize fracturing of the bedrock outside the limits of excavation.

When blasting occurs within or 20 feet downslope from a wetland, special perimeter control procedures will be utilized in the trench to minimize fracturing of the rock outside the limits of excavation. Perimeter control blasting techniques (such as presplitting or trim blasting) utilizes closely-spaced drill holes drilled along the lateral trench limits, lightly loaded with explosives, to shear the rock between holes such that rock fracturing or fracture propagation and damage is prevented outside and beyond the intended limits of excavation.

Trench Blasting Up Slope from Wetland

One potential impact of trench construction upslope of a wetland could be reduction of surface water recharge to the wetlands by carrying away surface water or groundwater that enters into and through the trench, water which would otherwise contribute to the recharge to the wetlands. In effect, the trench construction may result in diversion of water away from the resource area.

This potential impact will be prevented in two ways. First, when within 100 feet up-slope of a wetland, the upper portion of the trench backfill will be restored with relatively impervious, excavated soils. Second, if needed, impervious dams or trench plugs will be constructed within the trench segment located up-slope from the wetlands to keep water in the trench from flowing away from the area, and to allow for the natural groundwater flow to continue toward the wetlands.

5.2.1.1.5 Excess Rock Removal

Excess rock is defined as all rock that cannot be returned to the existing rock profile in the trench or graded cuts, or is not needed to restore the ROW surface to a condition comparable to that found adjacent to the ROW. Excess rock will be hauled off the ROW to an approved quarry, landfill or recycling facility unless approved for some other use on the construction work areas by the landowner or land managing agency. Potential "other" uses includes placement of large rocks at access points to restrict access by unauthorized vehicles or all-terrain vehicles ("ATVs").

5.2.1.2 Grading

When existing topography and/or terrain does not permit crews and equipment to operate safely and does not provide access or an efficient work area, grading will be required.

The construction corridor will be graded to remove obstructions such as large rocks and other land features that prevent the safe operation of equipment. In accordance with the Commission's Plan, topsoil will be stripped from the full work area, or from the trench and subsoil storage area in active or rotated crop and pasture lands, residential areas, hayfields or other areas at the landowner or land manager's request.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Within wetlands, any grading activities will be limited to the areas directly over the trenchline, except where topography requires additional grading for safety purposes. In accordance with the Commission's Procedures, topsoil will be segregated in wetlands except where soils are saturated or frozen or in areas of standing water. These segregation techniques do not apply to wetlands within actively cultivated or rotated croplands.

Topographic impacts will be limited to temporary alteration of terrain during construction of the proposed Project. Based upon site-specific conditions, slopes may be re-contoured to ensure safe working conditions. Upon completion of pipe installation, disturbed areas and drainage patterns will be restored to pre-construction contours and elevations to prevent landslides or erosion in the future. Revegetation of the ROW in accordance with Commission's Plan and Procedures will ensure that the disturbed areas are stabilized to prevent erosion. Construction and restoration activities will be monitored throughout the process to ensure compliance. Operation and maintenance activities will include routine revegetation monitoring as a standard operational procedure.

5.2.2 Soils

Impacts will result from soil disturbance due to clearing, grading, excavating trenches, and heavy machinery traveling along the ROW during pipeline construction, and from potential reduction of soil quality from the intermixing of topsoil and subsoil, and the potential for soil settling or slumping. The soil resource impacts will occur only during the construction period and/or post-construction monitoring period. Depending on soil conditions, these impacts can also include loss of excavated soil from water and wind erosion, soil compaction from construction equipment, and mixing of wetland topsoil and subsoil.

An examination of the soil survey information showed that shallow depth to bedrock occurs in some locations along the Project alignment. In these locations, the probability of introduction of rock into the topsoil layer is higher than other portions of the Project where depth to bedrock is greater than six feet. Introduction of rock into topsoil results in reduction of soil quality, potential difficulty in tilling, and damage to farm equipment. Care will be taken to ensure rock is not introduced into topsoil.

A significant portion of the pipeline alignment contains soils with a seasonal high water table within 24 inches of the ground surface with some areas as close as 9 inches. Dewatering of the trench, bore pits and/or additional precautions may be necessary where the groundwater is encountered during pipeline installation in these particular areas. When necessary, Tennessee will utilize filtration bags placed in upland areas to dewater the excavation and will follow Commission's Plan and Procedures.

Two soils along the Project in Massachusetts have poor revegetation potential (Turnbridge – Lyman and Lyman - Turnbridge). The location of these soils is limited to three distinct locations along the alignment; they are located from MPs 0.00 – 0.08, 0.08 – 0.24 and 1.78 – 2.18. A poor revegetation potential typically requires a greater degree of management for successful revegetation. Tennessee will consult with the NRCS to determine recommended seed mixtures to help ensure the successful revegetation of the Project area and Tennessee will continue to work with NRCS through the permitting, construction and restoration phases of the Project to ensure successful revegetation of the ROW.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

5.2.3 Minimization of Impacts

5.2.3.1 Trenching

Following grading activities, the pipeline trench will be excavated to a sufficient depth so that the pipe will typically have a minimum of 36 inches of cover unless specified otherwise. Topsoil is required to be segregated in wetlands as part of the ditching procedure, unless the soil is saturated, there is standing water present, or in freezing conditions. Unless approved otherwise by the landowner or land management agency, topsoil is segregated prior to ditching in all residential areas (or by option, may be imported), in actively cultivated or rotated croplands and pastures, hayfields and other areas at the landowners or land managing agency's request. In areas that require topsoil segregation, topsoil and subsoil will be segregated during ditching and stockpiled separately. Topsoil will be removed to its actual depth or to a maximum depth of 12 inches, as determined by the EI, and topsoil shall not be used for padding, backfill or trench breakers, under any circumstances.

5.2.3.1.1 Lowering-in/Backfilling

After the pipe has been assembled, welded, and x-rayed, the pipe will be lowered into the trench and backfilled. After the subsoil has been rough graded, topsoil will be replaced in an even layer. Backfill material imported from off the ROW must be approved by the EI. Where rock was part of the surface features prior to construction of the pipeline loops, rock may be windrowed along the edge of and across the ROW to prevent unauthorized off-road vehicle traffic or will be trucked off-site for disposal at an appropriate receiving facility. In all cases, excess rock will be handled in accordance with applicable landowner agreements.

5.2.3.1.2 Cleanup/Restoration

All construction debris shall be removed following backfilling of the pipeline. Once backfilling is complete, Tennessee will restore the original contours and flow regimes to the extent practical, with the exceptions of unnatural features and unstable grades. In consultation with NRCS seeding specifications (or comparable), the ROW will be seeded with an erosion control seed mixture to stabilize the area until indigenous species can become re-established. If weather conditions limit the effectiveness of reseeding efforts, at the discretion of the Environmental Inspector and as allowed by all applicable permits, the ROW may be mulched to minimize erosion until conditions are suitable for reseeding. No fertilizer or lime shall be used in wetlands.

To minimize the amount of dust generated by construction activities, the extent of exposed/disturbed areas along the ROW at any one time will be minimized. Crushed stone pads will be added to points of ingress/egress along the ROW, as necessary, to minimize the potential for equipment to track dirt onto roads. In addition, to minimize dust, water may be used to wet down disturbed soils along the ROW, as needed. There will be no adverse effects on air quality associated with the operation of the Project facilities.

5.2.3.1.3 Active Croplands

Portions of the Project cross agricultural lands as detailed below in Table 5-7. To preserve soil productivity in agricultural lands, topsoil will be segregated and stored separately from subsoil during construction. During the backfilling and restoration phases, topsoil will be replaced, and any stones greater than four inches in diameter uncovered during construction will be removed. Any drain tiles damaged during

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

construction will be repaired or replaced, and a crop-monitoring program will be implemented to ensure that crop productivity is restored to pre-construction conditions in areas currently in active crop production.

TABLE 5-7
AGRICULTURAL LAND CROSSED BY THE CONNECTICUT EXPANSION PROJECT

Pipeline Loop	MP	Width (Feet)	Length (Feet)	Total Area (Acreage)
MA Loop	3.54 – 3.60	125	295	0.85
MA Loop	3.61 – 3.65	125	217	0.62
MA Loop	3.65 – 3.75	125	511	1.47
CT Loop	0.1 – 0.11	100	27	0.06
Tyringham Pipeyard	N/A	-	-	3.50
Hickory Street Pipeyard	N/A	-	-	3.26

5.2.4 Plant and Animal Species Habitat

Long-term impacts to successional habitats are limited to forest and scrub-shrub areas during operation of the proposed Project. The routing of the alignment along a previously disturbed and maintained pipeline corridor was the preferred alternative as it reduces the clearing of forested areas during construction and minimizes the potential for habitat fragmentation. In areas where workspace within forested areas is unavoidable, it will be cleared, and standard erosion control/cover species will be planted after construction is completed. In these areas, the Project will have temporary effects on wildlife habitat as the forested areas regrow. However, during the regrowth period, these areas will still provide suitable habitat for a variety of plants and animal species that rely on old field type communities and young growth forests. Additional shrub habitat will be created and maintained through forested habitats during operation of the pipeline. This represents a positive effect for species that require shrub habitats, as theses habitats are declining in New England due to ecological succession and development. Temporary workspace that was identified as forest during the field surveys will be allowed to revert to forest. Areas that are already vegetated with grasses or early successional species will be restored after construction has been completed.

The primary impact related to vegetation clearing along the Project alignment will be the modification of existing vegetative cover types, but these habitats will not be lost due to construction of the Project. The greatest impacts will occur in any areas of mature forest along the Project alignment, as the reduction in canopy cover and ROW maintenance during operation of the pipeline would create shrub lands and scrub-shrub wetlands. In addition, the existing forest edge will be moved back approximately 15 feet due to selective tree clearing during operation of the pipeline and the currently existing forested edge habitat will be maintained in a shrub community.

Tennessee shall protect and minimize potential adverse impacts to vegetation through the use of the following procedures:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

5.2.4.1 Tree Felling

Tennessee proposes to conduct tree felling during the winter 2015/2016 to minimize impacts to breeding and nesting birds and in compliance with the Migratory Bird Treaty Act ("MBTA"). Tennessee has minimized the acreage of tree felling that will be required for the Project by co-locating the Project within their existing 200 and 300 Line easements to the extent practicable, feasible, and legally permissible. Prior to commencement of any tree felling activities, the ROW boundaries (e.g., workspace limits) will be clearly delineated to ensure that no tree felling occurs beyond these boundaries. All wetland boundaries will also be clearly marked prior to tree felling so that all Project personnel and inspectors will know where these sensitive environmental resources are located and where specialized mitigation measures and techniques must be implemented. Any trees that are to be saved shall be sufficiently marked (i.e., flagging and construction fencing) before clearing begins. It should be noted that Tennessee has conducted field visits with DCR staff. DCR will be marking "trophy" trees and DCR has committed to make all practicable efforts to avoid DCR marked/designated trees.

The ROW will be cleared by tree felling by a contractor specializing in large-scale land clearing operations utilizing specialized clearing equipment such as mowers, feller bunchers, tree shears hydroaxes, and skidders. Use of these specialized machines will ensure an expedited tree felling operation that will limit the amount of time required for active tree felling operations. All vegetation will be cut as close to the ground surface as feasible. Non-woody vegetation may be mowed to ground level. Within uplands, mature tree stumps will either be removed or ground down to a suitable level to prevent a potential safety issue for equipment access. Trees shall be felled into the ROW. Trees that have inadvertently fallen into waterbodies or beyond the ROW shall be removed immediately.

When pruning is necessary to clear the ROW, pruning cuts shall be made as follows:

(1) cuts shall be smooth;

(2) branch collars shall not be cut (i.e., cuts should be made immediately in front of the branch collar);

(3) large, heavy branches shall be precut on the underside to prevent splitting or peeling of bark; and

(4) climbing spurs shall not be used for tree climbing.

All existing fences needing to be temporarily removed for access shall be maintained by the use of a temporary fence section (gap). Prior to being cut, the fence will be properly braced and similar material used to construct the gap. At no time will an unattended gap be left open. The gap will be replaced after cleanup with a permanent fence of the same or similar material and condition.

Should individual landowners wish to utilize the felled trees from the ROW, the timber will be left in tree length and will be neatly stacked at the edge of the ROW in areas identified by the EI prior to the commencement of clearing activities and directly accessible to the landowner in accordance with individual landowner agreements. Timber shall only be stacked along the ROW at the specific request of a landowner, under the condition that it is out of public view and will be accessible to the landowner without disturbing the restored ROW and in a location where waterbody and wetland crossings will not be necessary to access the logs. Timber shall not be stacked in drainage ways or left within wetlands. Tennessee does not plan to use timber stacks as wildlife habitat. Timber not designated for other uses will be disposed of by the contractor, as designated by the EI or contract agreement.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Tennessee has agreed to deliver forest products harvested from DCR land to a predetermined designated location, for DCR use, sale and management.

Trees and brush shall be disposed of in one or more of the following ways, depending on local restrictions, applicable permit stipulations, and/or as designated by the EI:

5.2.4.1.1 Chipping and Disposal

All woody vegetation cleared as part of the Project installation and construction will be chipped and hauled off-site. Some amount of chips may be left on the ROW, with EI approval, if it does not inhibit revegetation. Chips will not be left in agricultural lands, wetlands or within 50 feet of wetlands. Chips will not be stockpiled in such a manner that they may be transported into a wetland or agricultural land.

Chips will be hauled off-site and will not be stored at the Project location. Disposal shall be at an approved composting site that is traditionally used for disposal of such materials. Off-site disposal will be subject to compliance with all applicable survey information, landowner permissions, and mitigation requirements. No material will be stacked outside of the construction workspace boundaries. The timber will be delivered to the landowner (previously disturbed areas) via public ROWs or placed at the edge of the construction ROW for retrieval. In all cases where trees and vegetation are removed from the ROW in areas of public view, Tennessee and/or the construction contractor shall remove and dispose of all cut timber and brush without undue delay.

Tree stumps shall be disposed of by one of the following methods, pending approval of the landowner and the EI, and in accordance with permit and regulatory requirements:

(1) stumps may be removed from the site and disposed of in an approved landfill or other site which traditionally accepts such materials;

(2) stumps may be chipped and hauled away from the site; and

(3) stumps may be ground in wetlands and grindings will be removed from the wetlands to the maximum extent practicable.

Within wetlands, no rubber tire equipment will be permitted unless it will not damage the root systems and its use is approved by the on-site EI. Excessive traffic from rubber-tired clearing equipment, such as skidders, on saturated soils can result in soil compaction and damage to existing root systems. To mitigate potential damage to root systems from clearing operations, the EI would determine whether or not rubber-tired equipment would damage root systems by surveying the wetland ahead of clearing equipment for degree of saturation. Where wetlands are saturated and root damage is likely, clearing will be done manually or will be completed with equipment operating on timber mats. If the wetland must be crossed by rubber-tired equipment to access the remainder of the ROW, a travel lane of timber mats will be installed to facilitate access along the ROW. Bulldozers will not be used for clearing in wetlands. Trees and brush will be cut at ground level by hydroaxes, tree shears, grinders or chain saws. Within wetlands stumps will be left in place, except on the trenchline or unless the removal is necessary to ensure worker safety. Stumps may be ground to a suitable height for safety reasons.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

5.2.4.2 Wildlife

Long-term impacts to wildlife habitat due to construction and operation of the proposed Project will be limited to clearing of upland and wetland forests required for temporary workspace and new permanent easement. To the extent practicable, feasible, and legally permissible, Tennessee has routed the pipeline loops to follow existing utility line ROWs (and thus follow existing forest edges), thereby minimizing the acreage of forest lands crossed and the relatively greater impacts that would be associated with clearing an entirely new ROW through a contiguously forested area. Areas cleared for temporary workspace and for pipeline construction will quickly regenerate and provide additional open land habitat (i.e., scrub/shrub and old-field). These areas will not be maintained post-construction, and will revert back to forested habitat over time, much like land that has been previously cut during timber harvesting operations.

Areas of early successional habitat that are impacted by construction will naturally revegetate within one to two growing seasons to their pre-construction condition and cover type.

The wildlife populations that utilize the Project areas will not be permanently adversely affected by the proposed Project. While temporary impacts on food, cover, and water sources may occur, none of the species located within the Project area are specialized in such a way that construction of the Project will inhibit the overall fitness or reproductive output of the populations as a whole. Most species are not dependent on the ROW or transitional areas to provide all of their habitat requirements. Many of the mammal, bird, reptile, and amphibian species are adaptive to changing habitat conditions and possess the capability to expand or shift their home ranges to find alternative sources of food, water, and shelter until the disturbed habitats become re-established (DeGraaf et al. 1992).

Tennessee and its construction contractors will strive to minimize impacts to wildlife by expediting construction to the greatest extent possible. Conversion of forest and scrub-shrub habitats, particularly in wetlands, will be minimized by adhering to the Commission's Plan and Procedures. Restoration and revegetation will occur after construction has been completed, and the restored areas will be closely monitored until final site stabilization and revegetation has been achieved.

Tennessee does not anticipate adverse impacts to bird populations as a result of Project construction and operation. Tennessee has consulted with the USFWS and NHESP to identify potential habitats of migratory birds, as well as federal and state-listed threatened and endangered species. Tennessee will continue to work with the USFWS and applicable state agencies to determine the potential impacts to migratory and rare bird species and develop appropriate avoidance, minimization, and mitigation measures as necessary. Tennessee proposes to clear the ROW during the winter of 2015/2016 to minimize impacts to breeding birds.

It is anticipated that vegetation clearing will cause a temporary impact as a result of habitat loss and general disturbance from construction activities. Wildlife will vacate a selected breeding/wintering location and expend energy finding an alternate location. However, disruption of habitat will be temporary in nature, and the individuals will be able to utilize the area in subsequent seasons, post-construction.

Habitat loss has been minimized by co-locating the pipeline looping segments adjacent to the existing pipeline to the extent practicable, feasible, and legally permissible. Disturbance will be minimized by adhering to the Commission's Plan and Procedures for this Project and expediting construction to the extent practicable. Additional timing restrictions on vegetation clearing may be implemented by state agencies based upon the final findings of impact assessments for rare, threatened or endangered species. These

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

timing restrictions would likely be limited to specific areas identified as suitable habitat for rare species within the Project workspace.

Tree removal along the ROW will increase the scrub-shrub and emergent vegetation habitat (Johnstone et al. 2002). Based on some published literature, the creation of additional shrub land habitat along the maintained ROW would represent a long-term positive effect on disturbance and scrub-shrub dependent species, since shrub land habitat is otherwise declining in New England (Nickerson and Thibodeau 1984). This decline is a result of various factors (e.g., development, ecological succession, absence of fire). Additionally, most of the historic shrubland in the Northeast is irreversibly gone due to permanent human development; therefore, management for these species and for biodiversity cannot occur at these locations. Scrub-shrub birds and other disturbance dependent species are now more dependent than ever on human activities to maintain the habitat required for their survival (King et al. 2009). In this regard, pipeline ROW is considered a major source of shrub-land habitat (Saucier 2003).

Since all tree felling activities will occur along the existing edge of a maintained ROW, it will not result in an overall net increase in edge habitat on the ROW. It is anticipated that impacts to habitat from fragmentation will be minimal because the Project does not require the creation of new ROW corridors. Increasing the width of existing ROWs may have a positive effect for early successional and shrubland species and will not create an overall increase in edge habitat.

A study of amphibians in Pennsylvania found a higher amphibian diversity in the cleared ROW than in the adjacent forest habitat (Yahner et al. 2001). A recent study in Maine assessed the wood frog and spotted salamander egg mass abundance in vernal pools on and off a managed ROW and found that the ROW conditions did not prohibit the presence of breeding vernal pool species and that ROW creation and maintenance should not be considered incompatible with vernal pool habitat preservation (Duncan et al. 2008).

5.2.5 Land Use, Recreation, and Visual Resources

The primary impacts to existing land uses will be associated with clearing and widening the existing ROW through forested areas and may include displacement, inconveniences and encumbrances. As detailed in Table 2-3, a combined total of approximately 66 acres will be utilized for TWS, ATWS, pipeyards, or access during construction of the Project. Upon completion of construction, a total of 13.4 acres will be maintained as new permanent ROW, and 9.03 acres of lands that were forested upland prior to construction will be permanently maintained in an herbaceous/scrub-shrub state. To ensure operational safety and to allow for routine maintenance of the facilities, trees that are located within 15 feet of the pipeline that may compromise the integrity of the pipe coating will be selectively cut and removed from the permanent ROW. Land used as temporary workspace and ATWS will revert to pre-construction condition. The following provides a brief discussion of the impacts and mitigation measures associated with the various land use types crossed by the Project.

5.2.5.1 Roadways

The Project will cross a total of 0.03 miles of existing roadways that will result in a temporary impact of 0.27 acres during construction. The Project crosses a total of three roads in Massachusetts including; Cold Springs Road (2 crossings), Hammertown Road, and Beech Plain Road.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Road crossings will be required at four locations, as detailed in Table 5-8 below. Prior to construction, Tennessee will locate all existing underground utilities and make provisions for traffic management in work areas. Road crossings will be completed using standard open cut or conventional boring methods. Conventional boring entails drilling a hole beneath travel arteries through which the pipe will pass.

TABLE 5-8
ROAD CROSSINGS FOR THE CONNECTICUT EXPANSION PROJECT

No.	MP	Name	Length[1] (feet)	Type
1	2.4	Cold Springs Road	47	Conventional Bore
2	2.84	Cold Springs Road	32	Conventional Bore
3	3.13	Hammertown Road	22	Open Cut
4	3.64	Beech Plain Road	28	Open Cut
		TOTAL	**129**	

[1] Includes road surface only

Potential temporary impacts associated with roadway crossing include disruption of traffic flows, disturbance of existing underground utilities such as water and sewer lines, and disruption of emergency vehicle access. There will be no permanent effects on existing use of the roadways crossed by the Project. Hammertown Road and Beech Plain Road will be crossed via an open-cut method and Cold Springs Road will be crossed via a conventional bore. Tennessee will reduce potential impacts associated with road crossings by utilizing conventional boring techniques where feasible to install the pipeline under major arterial roadways along the Project route. Tennessee will also incorporate measures to ensure that construction activities will not prevent the passage of fire and emergency vehicles. Traffic lanes and residential access will be maintained except for the temporary periods essential for laying pipeline. When necessary, a police detail will be present to ensure traffic flow and the safety of pedestrians and vehicles. A transportation route map showing the roadways that will be used during construction is provided in the Traffic and Transportation Management Plan in Appendix F. This transportation plan also provides information on the number of trips and types of equipment that will be used to bring the pipe from the Tyringham pipeyard to the Project site.

5.2.5.2 Forested Land

A total of 1.94 miles of the Project crosses forested land, and a total of 37.62 acres of forest will be impacted during construction. Of this area, approximately 9.03 acres will remain as permanent easement. The primary impact minimization measure to reduce the impact of the Project on forestland consists of siting the proposed pipeline as much within the existing cleared ROW as practicable to limit the extent of forest clearing required for construction and operation of the facilities. Additionally, Tennessee has located ATWS areas outside of forested land where possible to further reduce adverse impacts.

5.2.5.3 Agricultural Land

A total of 0.22 miles of the Project crosses agricultural land, and approximately 9.45 acres of agricultural land will be temporarily altered during the construction of the Project. Of this area, approximately 0.71 acres will be associated with the permanent ROW. Tennessee will reduce adverse impact to agricultural

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

land by following the Commission's Construction Procedures and by implementing BMPs. Table 5-7 details the types and size of agricultural land crossed by the Project.

5.2.5.4 Residential Land

The Project alignment is predominantly characterized by non-developed areas (i.e., forested, wetlands, open space). No residences are located within 50 feet of the construction work area. Temporary construction impacts on residential land account for 0.03 acres, or 1,307 square feet. Impacts to residential areas could include inconvenience caused by noise and dust generated by construction equipment, personnel, and trenching of roads or driveways; and ground disturbance.

5.2.5.5 Commercial / Industrial Land

A total of 0.004 miles of the Project crosses commercial/industrial land characterized by Tennessee's existing valve site. Approximately 2.02 acres of commercial/industrial land will be temporarily impacted during construction. Of this, approximately 0.02 acres will be associated with the permanent ROW.

5.2.5.6 Open Land (Grass and Shrub Cover)

Approximately 0.69 miles of the pipeline alignment traverses open land primarily consisting of co-location within the existing pipeline ROW. Areas of upland scrub-shrub and herbaceous vegetation are present within this land use category. Approximately 6.50 acres of this land will be impacted during construction, and this total is dominated by the TWS area co-located within the existing ROW. Upon completion of construction, 0.71 acres of this total will be used for permanent ROW with the majority of this acreage already being maintained in an herbaceous / shrub condition through regular maintenance of the pipeline ROW. The use of a portion of the existing pipeline easement allows for Tennessee to minimize impacts to forest land along the pipeline route. Tennessee will follow the Commission's Plan and applicable land owner requirements to restore temporary impacts within construction workspace.

5.2.5.7 Other

This category includes special use areas (e.g., land associated with schools, parks, places of worship, cemeteries, sports facilities, race tracks, campgrounds, golf courses, ball fields, utilities, municipal and state-owned land, etc.). The Project will cross approximately two miles of Otis State Forest, impacting approximately 30 acres of land. Impacts specific to Otis State Forest are discussed in Section 5.1.2.

5.2.5.8 Solid Waste Management

Only minimal amounts of solid waste will be generated as a result of the construction or operation of the Project. Excess or unused pipe will be returned to Tennessee facilities in Agawam, Massachusetts or Albany, New York and stockpiled for maintenance purposes or recycled at a pre-approved facility in compliance with 310 CMR 19.000, and specifically 310 CMR 19.017 pertaining to the waste ban. No demolition activities will be required as part of the Project.

Waste associated with painting at valve sites will be generated during Project construction. Any paint related waste will be disposed of at pre-approved, certified facilities with appropriate tracking in compliance with the Massachusetts regulations 310 CMR 19.000 and 310 CMR 19.017.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

The primary type of waste generated during construction and operation is typical contractor refuse associated with normal, everyday activities (i.e., paper, lunch bags, water bottles, coffee cups). All contractors will be required to maintain clean work areas and will provide trash bags and/or receptacles to ensure generated trash from workers is not left at the site. All of this trash will be collected at marshalling yards in suitable containers and hauled off by registered haulers to landfill and/or recycling facilities. Appendix F contains Tennessee's Waste Management Plan for the project.

5.2.6 Air Quality and Noise

5.2.6.1 Air Quality

The Project would result in short-term (lasting only for the duration of the construction period), highly localized effects on air quality during construction, primarily from fugitive dust from land disturbance (construction activities) and vehicular emissions associated with the operation of the construction equipment.

During the construction period, GHG emissions will be emitted from diesel fired non-road construction equipment and diesel and gasoline fired on-road construction and commuter vehicles. Emissions can also occur when gas is vented as the new pipeline is tied into the existing pipeline (called a tie-in). GHG associated with construction are carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O) from construction and commuter vehicle internal combustion engines. CH_4 and CO_2 may be released from pipeline operations involved with the tie-in. This is a one-time event where emissions associated with construction will not continue beyond the construction period.

During the commissioning process of the Project, CH_4 and CO_2 may be released from pipeline operations involved with commissioning. These GHG emissions will result from purging the air out of the new pipeline and filling it with natural gas. This is a necessary and important step to make sure that the oxygen level inside of the pipeline meets safety thresholds. A safety valve will be opened to allow the air to vent from the pipeline and small amounts of natural gas will vent to ensure that the air is removed prior to placing the pipeline into service. In addition, shortly after placing the pipeline segments into service, Tennessee will run a pipeline inspection gauge through the pipeline to clean impurities and check pipe wall integrity. These in-line inspection gauges are round cylindrical objects which are used to clean and inspect the inside of the pipeline without having to remove individual sections of pipe. Emissions from in-line inspections are a result of venting the launcher and receiver barrels (traps) prior to opening hatches. Launcher and receiver barrels are short sections of pipe which protrude out of the ground to allow loading and unloading of the in-line inspection gauges. The loading or removal of the inspection/maintenance will cause a small amount of natural gas to escape when the launcher or receiver barrel is vented prior to opening. These purging and inspection operations during commissioning are one-time events where emissions will not continue beyond the construction period.

During normal operation, very small amounts of CH_4 and CO_2 emissions may occur from fugitive leaks in the pipeline. The location of fugitive leaks is primarily limited to valves at either end of the new pipeline. The underground pipeline itself is not expected to be a source of fugitive leaks. Even though the underground pipeline is not expected to be a source of fugitive leaks during normal operation, fugitive emissions were still estimated using standard emission factors from the Interstate Natural Gas Association

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

of America[7] (INGAA) and the length of pipeline to conservatively account for some level of fugitive leaks. The emissions quantified are the emissions being emitted each year. A GHG analysis conducted for the Project is provided in Appendix K.

Other non-routine operations may occur for long term maintenance procedures or unplanned blowdowns of pipeline sections. Long term maintenance consists of pipeline inspections and consists of small releases of gas when venting the launcher or receiver barrels prior to opening the hatches. As noted above a one-time in-line inspection event will also occur during commissioning. Blowdowns occur when a section of pipe which is in service must be vented for safety purposes. Blowdowns may be required if there is a need to perform unplanned maintenance repair on a section of pipeline. Blowdowns are performed to reduce the pressure within the pipeline and release gas to safely perform any required repairs. There are no planned blowdowns expected to occur along the pipeline. CH_4 and CO_2 emissions from in-line inspections and blowdowns are sporadic in nature and are expected to occur infrequently. Ongoing in-line inspection/maintenances of the new pipeline sections may occur once every 5-7 years or more and blowdowns are expected to be an even rarer event as they only occur as a result of an unplanned response to a discrete incident.

Table 5-9 lists the calculated GHG emissions from the various construction and operation phases of the Project. These emissions account for the mitigation efforts detailed in Section 6.2.4. Table 5-10 lists the calculated carbon loss due to removal of trees during the construction process.

TABLE 5-9
GHG EMISSIONS – TONS

Project Phase	Duration	CO_2	CH_4	N_2O	CO_2e
Construction	Once	1,070.00	0.01	0.05	1,085.93
Commissioning	Once	0.02	3.01	-	75.26
Normal Operations	Annual	0.003	0.03	-	0.77
Non-Routine Operations	Once per 5-7 Years/Sporadic	0.004	0.63	-	15.64
	Infrequent/Only if Needed	0.41	60.89	-	1,522.72

TABLE 5-10
CARBON LOSS – TONS

Town	Activity	Acres Impacted	Duration	Carbon Loss
Agawam	Tree Removal	0.68	Once	99
	Loss From Sequestration	0.27	Annual	0.06
Sandisfield	Tree Removal	43.25	Once	5,912
	Loss From Sequestration	10.98	Annual	3.55

[7]INGAA GHG Emission Estimates – Table 4-4 http://www.ingaa.org/Topics/ClimateChange/6490.aspx.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

There are no anticipated significant long-term effects on air quality associated with the operation of the existing pipelines or the new pipeline looping segments, or the modified compressor station facilities. The Project does not require any air plan approvals from MassDEP.

5.2.6.2 Noise

Noise generated from construction of the Project facilities will be limited to daytime hours, and will be minor and consistent with noise generated from residential/commercial construction. Once construction is complete, noise and traffic will be limited to occasional maintenance or repair activities. Tennessee does not anticipate issues pertaining to noise during construction or operation of the Project facilities. However, to address noise-related and other complaints, Tennessee will establish a complaint resolution process with the affected municipalities prior to the commencement of construction.

5.2.7 Scenic Qualities, Open Space and Recreational Resources

Massachusetts has 13 Regional Land Use Planning Agencies, which implement conservation and development strategies and goals in their respective regions. The Towns of Sandisfield and Tyringham are part of the Berkshire Regional Planning Commission. The Berkshire Region Comprehensive Economic Development Strategy sets forth six goals to help the region meet their objectives including:

- To implement unified regional economic development initiatives
- To advance the region's economic progress through the use of current and pertinent data
- To increase the economic competitiveness of the region in the global economy
- To stabilize and strengthen the regions workforce
- To advance high-quality infrastructure and community improvements to support development, redevelopment and revitalization of the built environment
- To facilitate the region's assessment, remediation and redevelopment of buildings and sites

The Town of Agawam is included in the Pioneer Valley Plan for Progress. A list of strategies in the 2004 Plan and added to in 2009 include:

- Attract, retain, and grow existing businesses and priority clusters
- Promote small business and generate flexible risk capital
- Advocate efficient regulatory processes at all levels of government
- Integrate workforce development and business priorities
- Improve and enrich pre-K to 12 education
- Support higher education and retain graduates
- Recruit and train a new generation of regional leaders
- Market our region
- Revitalize the Connecticut River
- Enhance high-tech and conventional infrastructure
- Develop an array of housing options
- Endorse a regional approach to public safety
- Champion statewide fiscal equity
- Develop a Green regional economy

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

The Sustainable Berkshires Plan includes a series of reports and plans as part of the overall Sustainable Berkshires Plan. The Climate and Energy Plan ("BCEP") focused heavily on implementing sustainable green energy (i.e., wind, solar, hydro) opportunities to meet future demands for energy in the region. Those alternatives were examined for this Project and are discussed in Section 3.0 of this DEIR. The BCEP focused on reduction of emissions, particularly CO2 and GHG. The Plan provided user data indicating that natural gas is in the highest demand of all energy uses by fuel type including electricity, oil, and propane. In addition, the Plan attributed the reduction in CO2 emissions between 2008 and 2011 to the conversion of many New England power plants from coal and oil to natural gas. The Project will deliver natural gas to help meet increasing demand from private citizens and industry.

These Plans state that one of the greatest needs regionally is energy infrastructure improvements. For the regions to meet the above listed goals, it is important that adequate volumes of natural gas are available to the communities. The proposed Project will serve to meet current and future natural gas demands in the region.

Tennessee has minimized impacts to open space by siting the Project within existing utility ROW, resulting in reduced temporary and permanent impacts compared to entirely new ROW. The Project is consistent with open space, recreational use factors and scenic areas included in the municipal plans and provides a safe, reliable source of natural gas that is vital to meeting the increasing demand in the region.

5.2.8 Traffic

The construction and operation of the Project is not expected to have a significant impact on the normal use of the roadways within the Project area. The public road network in the Project area will afford access for construction vehicles and equipment to many of the work sites, and the five identified access roads (Table 2-5) associated with the Project will allow access of construction vehicles and equipment to the remainder of the sites.

Construction of the pipeline looping segments will require crossing paved and unpaved roads with varying levels of traffic. Construction of pipelines across major paved highways, railroads, paved roads, and unpaved roads where traffic cannot be interrupted will be accomplished by utilizing conventional boring. The pipeline looping segments will be buried to the depth required by applicable road crossing permits and approvals and will be designed to withstand anticipated external loadings.

The Project will temporarily increase traffic on the road network due to construction employees commuting to and from work and trucks transporting equipment. However, these impacts would be short-term. Construction employees will likely be located within a 20-mile radius of the Project route and commute to and from the designated contractor staging yard locations. Vehicles used to deliver equipment and materials will be traveling to the pipeyards and pipeline construction locations. At road crossings, if necessary, provisions will be made for alternating one-way traffic, detours, or other measures to permit traffic flow during construction. Once construction is complete, occasional utility truck traffic will continue to perform normal maintenance and survey tasks. A Transportation Plan for the Project is provided in Appendix F.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

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6.0 MITIGATION MEASURES

Tennessee has worked closely with the design engineers, environmental scientists, and constructability experts to maximize avoidance and minimize impacts to environmentally sensitive areas. Most areas impacted by construction will be restored to conditions equivalent to their pre-construction state. Efforts to avoid and/or minimize impacts, through reducing either the size or the duration of impacts will continue through the construction phase of the Project. Section 6.0 presents Tennessee's proposed mitigation for those areas where impacts are unavoidable. In Massachusetts, the Project will traverse the municipality of Sandisfield and with a small segment of the Project in Agawam and one pipeyard located in Tyringham.

Because the Project is predominantly sited within and directly adjacent to existing ROWs, thereby eliminating the need for a new or greenfield ROW, environmental impacts of the Project were minimized. Additionally, effects to wetlands and waterbodies have been avoided or minimized by locating structures, access roads and staging areas outside of resource areas to the extent practicable. The Project will not traverse any watercourses that are designated as navigable or otherwise subject to jurisdiction under Section 10 of the Rivers and Harbors Act of 1899, or that are designated as a National Wild and Scenic River under the National Wild and Scenic Rivers Act (16 U.S.C. 1271-1287). Unavoidable effects from construction activities will occur to jurisdictional Waters of the United States (i.e., those regulated under Sections 401 and 404 of the Federal Clean Water Act ("CWA") – 33 U.S.C. § 1341 and 33 U.S.C. § 1344. Mitigation for these impacts is discussed in the following sections. In addition to the CWA, the Project is subject to state wetlands-related statutes and regulations.

6.1 PRIMARY SCOPED RESOURCES

6.1.1 Wetland Protection Act Resource Areas

6.1.1.1 Minimization and Mitigation Strategy

In accordance with the Council on Environmental Quality ("CEQ") and Clean Water Act Section 404 (b)(1) guidance, as well as the Wetlands Protection Act and Section 401 of the State Clean Water Act, Tennessee has designed this Project to

(1) avoid impacts to aquatic resources to the extent practicable;

(2) minimize unavoidable impacts; and,

(3) mitigate for any unavoidable and remaining impacts to aquatic resources.

Avoidance and minimization measures have been incorporated into the Project since the inception of the feasibility stage, and have been described in Section 2.0 of this DEIR.

In order to offset unavoidable wetland impacts associated with the Project, appropriate compensatory mitigation (in collaborative consultation with local, state, and federal resource agencies) will be provided as a component of the final Project design to offset any environmental impacts. The following discussion outlines Tennessee's draft plans, which will be further developed in the FEIR and through consultation with the DCR as the primary landowner, MADEP, and USACE. The final Compensatory Wetland Mitigation Plan will be developed to follow the MADEP requirements/guidelines and the USACE New

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

England District Compensatory Mitigation Guidance and Checklist Instructions. A draft Compensatory Mitigation Plan ("CMP") is provided in Appendix D. Proposed mitigation for each Resource Area is given in the sections that follow this discussion.

In developing and preparing the wetland mitigation strategy for Project components located in Massachusetts, Tennessee considered the 2010 New England District Compensatory Mitigation Guidance, document as well as the Section 404 ILFP for the state. These programs/guidelines incorporate both the 2008 federal Compensatory Mitigation for Losses of Aquatic Resources; Final Rule (4/10/08; 33 CFR Parts 325 and 332 ("Mitigation Rule")) and the USACE Regulatory Guidance Letter 08-03: Minimum Monitoring Requirements for Compensatory Mitigation Projects Involving the Restoration, Establishment, and/or Enhancement of Aquatic Resources. The mitigation strategy also addresses MADEP requirements and guidelines, such as the MADEP Inland Wetland Replication Guidelines (2002) and the Regulatory requirements of 310 CMR 10.00.

The foundation of the wetland mitigation plan is the restoration of impacted wetlands in-situ. Following construction, vegetation within the permanent ROW will be maintained in an herbaceous state, except in wetlands and adjacent to perennial streams, where maintenance clearing of woody vegetation will be limited. In these areas, a 10-foot wide corridor centered over the pipeline will be permanently maintained in an herbaceous state, and trees that are located within 15 feet of the pipeline that may compromise the integrity of the pipe coating will be selectively cut and removed from the permanent ROW, while the remaining temporary and permanent ROW will revert to its pre-construction land use/land cover once construction is complete.

Additional mitigation measures that are incorporated into the mitigation plan strategy include land preservation, wetland restoration, wetland creation, and use of the ILFP; final selection of these options of the strategy will be developed through the permitting process with state and federal agencies. Other mitigation measures include the implementation of BMPs, such as erosion and sediment control and stormwater management, and invasive species control. An invasive species control plan for the Project has been developed and supplied in Appendix D.

Tennessee will continue to work with local, state and federal permitting agencies and stakeholders throughout the Project design and permitting to develop a mitigation plan that meets or exceeds the requirements of the respective regulatory programs.

6.1.1.2 Bordering Vegetated Wetlands

To minimize impacts to wetlands, Tennessee will implement the wetland construction procedures described in the FERC Plan and Procedures. Specific permit drawings for each specific wetland and watercourse crossing are located in Appendix E. The Commission limits workspace within wetlands to 75 feet in width unless topographic conditions or other safety concerns require additional workspace. These site specific areas will be identified and approved by local Conservation Commissions, MADEP, the USACE, and the Commission prior to construction. During operation of the Project, 10 feet of the permanent ROW, centered over the pipeline, will be maintained within wetlands as emergent wetland in accordance with Commission requirements. In forested wetlands, Tennessee will minimize tree clearing to the maximum extent practicable while maintaining safe construction conditions. Tree clearing within wetlands during operation of the pipeline will be limited to selectively clearing trees within 15 feet of the pipeline that could compromise the integrity of the pipeline coating.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Access within the ROW across wetlands will only be permitted where soils are non-saturated and able to support construction equipment at the time of crossing, during frozen soil conditions (for winter tree clearing) or with the use of timber mats to avoid rutting of the wetland soil.

Impacts to wetlands will be minimized by generally limiting the construction workspace to 75 feet and by segregating up to the top 12 inches of soil from the area disturbed by trenching activities, except in super saturated areas or when soils are frozen. The topsoil will be restored to its original location immediately after backfilling is complete to preserve the existing seedbank and promote revegetation of the disturbed area. Seed mixes spread on the restored topsoil for temporary stabilization will include annual rye grass (*Lolium multiflorum*) at a rate of 40 pounds per acre (unless standing water is present) or appropriate mixes recommended by the landowner, state agency or county conservation districts. The use of fertilizers will not be permitted. Mulch will only be used within wetlands, as required by state agencies. Utilizing recommended seed mixes containing native plants will control the import of invasive and/or exotic plant species to the site. Erosion controls including silt fence and/or staked hay bales will also be put in place to protect wetlands from sediment disturbed in adjacent uplands during construction. Post-construction, the disturbed area will be monitored to ensure long-term stabilization of the site.

Tennessee will protect and minimize potential adverse impacts to wetlands by limiting workspace, expediting construction in and around wetlands, by restoring wetlands to their original configurations and contours, by segregating topsoil during excavation, by permanently stabilizing upland areas near wetlands as soon as possible after backfilling, by inspecting the ROW periodically during and after construction, and by repairing any erosion control or restoration features until permanent revegetation is successful. Tennessee will comply with the applicable permit conditions issued by federal, state, and local permitting agencies with respect to construction and operation of the Project facilities within wetlands.

In addition to minimization of impacts to wetlands through implementation of the Commission's Plan and Procedures, Tennessee has developed a Project-specific draft CMP as part of the federal and state wetlands permitting processes. The mitigation plan details measures to avoid, minimize, and mitigate for temporary and permanent wetland impacts associated with the Project. Mitigation for temporary and permanent wetland impacts consist of replanting TWS, potential on- and off-site wetland restoration and conservation, and the ILFP.

Temporary impacts to wetlands and watercourses may result from the placement of temporary mat structures to accommodate work vehicles for pipeline construction and to cross wetland areas. Temporary mats will consist of untreated timber construction mats, which will be removed upon completion of construction activities. Tennessee has made every effort to limit temporary impacts to wetlands by reducing the size of the workspace in these areas. All temporary impacts to wetland and watercourses will be mitigated in situ by restoring the affected areas to pre-existing conditions following construction.

Permanent impacts to wetlands will result from necessary upgrades to one permanent access road. To the extent possible, access roads have been carefully sited outside wetlands and other sensitive areas. Improvements to one existing access road will result in a permanent impact of 0.11 acre from permanent fill; a site-specific wetland replication plan will be developed for this impact consistent with the requirements of 310 CMR 10.55. This wetland impact will occur where a current access road ("Alberts Road") extends northeast off Beech Plain Road, and the widening/upgrade to this access road will result in 0.11 acre of fill to Wetlands WMA-23 and WMA-24. Tennessee anticipates that replication for wetland impacts will occur in the same wetland where the impacts occur by creating emergent wetland from upland habitat adjacent to the impacted wetland, west of the access road.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

The Project has been designed to avoid and minimize adverse impacts to water resources to the extent practicable. For example, contractor pipeyards and appurtenant facilities (including pig launchers/receivers and mainline valves) are located in upland areas wherever practical and outside of aquatic resource areas. Pipeyard facilities will be constructed outside the boundaries of any nearby wetlands and BMPs consisting of silt fencing and other appropriate sedimentation controls will be installed to prevent the disturbance of wetland habitat and the transport of sediments from active Project locations to wetlands.

Temporary impacts to wetlands and watercourses are associated with the construction of the new ROW, access routes, TWSs and ATWSs. Temporary wetland impacts within these areas may include soil disturbance, temporary alteration of hydrology and loss of vegetation during construction. Upon completion of construction, topsoil, contour elevations and hydrologic patterns will be restored, and disturbed areas will be reseeded or replanted to promote the re-establishment of native hydrophytic vegetation. All TWS and ATWS areas will be restored to pre-construction grades and contours, and reseeded and/or replanted during restoration activities. Tennessee will protect and minimize potential adverse impacts on wetlands using construction procedures specified within the Commission's Plan and Procedures and Tennessee's Construction BMP's. Tennessee will utilize one of the following three methods for crossing wetlands during construction. The alignment sheets and Table 5-3 indicate the proposed crossing technique for each wetland. The three methods are:

- Standard Pipeline Construction
- Conventional Wetland Construction
- Push-Pull Technique

6.1.1.2.1 Standard Pipeline Construction (Method I)

The Standard Pipeline Construction method will be utilized in wetlands where soils are non-saturated and able to support construction equipment at the time of crossing. This method requires segregation of topsoil from subsoil along the trenchline. Where present, a maximum of 12 inches of topsoil will be segregated from the area disturbed by trenching, except where standing water is present or if soils are super-saturated or frozen. Topsoil segregation is followed by trench excavation, pipe laying, backfilling, and grade restoration. Immediately after backfilling is complete, the segregated topsoil is restored to its original location. Erosion control measures including site-specific contouring, silt fence, hay-bale barriers, permanent slope breakers, mulching, and reseeding or sodding with soil-holding vegetation will be implemented. Contouring will be accomplished using acceptable excess soils from construction. Where this method is to be implemented for construction, the EI will measure the pre- and post-construction soil density using a penetrometer to determine if the soil has been inadvertently compacted during construction or access. If the soils have been found to be compacted, de-compaction of the soil will be conducted using a harrow, paraplow, paratill or other equipment. Deep subsoil shattering shall be performed with a subsoiler tool having angled legs.

6.1.1.2.2 Conventional Wetland Construction (Method II)

The Conventional Wetland Construction method will be used for crossing wetlands with saturated soils or soils unable to support construction equipment without significant soil disturbance.

Prior to crossing and movement of construction equipment through these wetlands, the ROW will be stabilized using timber mats to allow for a stable, safe working condition. Unless soils are inundated or super-saturated, up to the top 12 inches of wetland topsoil over the trenchline will be segregated. Trench spoil will be temporarily stockpiled in a ridge along the pipeline trench. Gaps in the spoil pile will be left at

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

appropriate intervals to provide for natural circulation or drainage of water. While the trench is dug, the pipeline will be assembled in a staging area located in an upland area. After the pipeline is lowered into the trench, wide track bulldozers or backhoes supported on timber mats will be used for backfill, final cleanup, and grading. This method will minimize the amount of equipment and travel in wetland areas.

6.1.1.2.3 Push-Pull Technique

Construction in saturated/inundated wetland areas may involve the "push-pull technique". The push-pull technique is used in large wetland areas where sufficient water is present for floating the pipeline in the trench and grade elevation over the length of the push/pull area will not require damming to maintain adequate water levels for floatation of the pipe. Push and pull techniques involve pushing the prefabricated pipe from the edge of the wetland or pulling the pipe with a winch from the opposite bank of the wetland into the trench. During implementation of this technique, initial clearing within the wetland will be minimized. The width of the ROW cleared will be limited to only that necessary to install the pipeline. Grading in inundated wetlands will be held to a minimum and generally will not be necessary due to the typically level topography and the absence of rock outcrops in such areas. Timber mats may be placed over existing vegetation where grading is not required. Trees and brush will be cut at ground level by hand, with low ground pressure equipment, or with equipment supported by timber mats. Tennessee will not use dirt, rock, pulled tree stumps or brush rip-rap to stabilize the travel lane and sediment barriers will be installed prior to grading, as needed, to protect adjacent wetland areas.

The trench will be excavated using amphibious excavators (pontoon mounted backhoes) or tracked backhoes (supported by fabricated timber mats or floats). The excavated material will be stored adjacent to the trench (if possible). If storage of excavated material next to the trench is not possible, the material will be temporarily stored in one of the following locations:

(1) in upland areas of the ROW as near to the trench as possible,

(2) in construction vehicles or

(3) transported to an approved off-site staging location until needed for backfilling.

The pipe will be stored and joined at staging areas (push and pull sites) located outside the wetland. Floats may be attached temporarily to give the pipe positive buoyancy. After floating the pipe into place, these floats will be cut and the negatively buoyant pipe will settle to the bottom of the ditch. This operation will be repeated, with pipe sections fabricated, pushed into place, and welded together, until the wetland crossing is complete. The excavated material will then be placed over the pipe to backfill the trench.

6.1.1.2.4 Minimization and Mitigation of Impacts

To minimize impacts to wetlands, Tennessee will implement the wetland construction procedures described in the Commission's Plan and Procedures and any additional conditions required by local, state, and federal permitting authorities. The Commission limits workspace within wetlands to 75 feet in width unless topographic conditions or other safety concerns require additional workspace. These site specific areas will be identified and approved by the Commission prior to construction. During operation of the Project, 10 feet of the permanent ROW, centered over the pipeline, will be maintained within wetlands as emergent wetland in accordance with Commission requirements. In forested wetlands, Tennessee will minimize tree clearing to the maximum extent practicable while maintaining safe construction conditions. Tree clearing

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

within wetlands during operation of the pipeline will be limited to selectively clearing trees within 15 feet of the pipeline that could damage the integrity of the pipeline coating.

Prior to construction, the boundaries of the wetlands along the ROW will be re-flagged by a wetland scientist. Tennessee will implement several measures during construction that which will minimize impacts to the environment. These measures include the use of existing access roads where possible, installation of erosion and sedimentation controls, supervision and inspection of construction activities within resource areas by an environmental monitor and minimization of disturbed areas. When working in or traversing such wetlands, Tennessee will:

- Install temporary erosion controls around work sites in or near wetlands to minimize the potential for erosion and sedimentation.
- Avoid or minimize access through wetlands to the extent practical. Where access roads must be improved or developed, the roads would be designed, where practical, so as not to interfere with surface water flow or the functions of the wetland;
- Limit grading for access roads in wetlands to the amount necessary to provide a safe workspace;
- Restore wetlands, after pipeline facility construction, to pre-construction configurations and contours to the extent practicable;
- Comply with the conditions of federal and state permit conditions related to wetlands;
- Avoid piling cut woody wetland vegetation so as to block surface water flows within or otherwise to adversely affect the integrity of the wetland;
- Cut forested wetland vegetation without removing stumps unless it is determined that intact stumps pose a safety concern for the installation of the pipeline, movement of equipment, or the safety of personnel;
- Refuel construction equipment (apart from equipment that cannot be practically moved) 100 feet or more from a wetland. If refueling must occur within a wetland, temporary containment will be provided; and
- Store petroleum products in areas farther than 100 feet from wetland boundaries.

Tennessee will implement the Commission's Plan and Procedures to protect sensitive habitats during construction, including wetlands and watercourses. In addition to the below minimization and mitigation measures, Tennessee has prepared a mitigation plan for the Project.

6.1.1.3 Lands Under Waterbodies and Waterways (LUWW) and Bank

Through careful planning and design, Tennessee has minimized impacts to wetlands and waterways along the Project alignment, however some work in these areas is unavoidable. Only 615 square feet of LUWW will be directly impacted by the pipeline crossings, and only 120 linear feet of Bank will be directly impacted; these impacts are all temporary and will be restored in place. All waterbodies crossed by the pipeline or within the construction workspace will be protected by adherence to the Commission's Plan and Procedures, as well as any additional specific permit conditions required by federal, state and local agencies. Specific permit drawings for each crossing are located in Appendix E. The measures to protect and minimize potential adverse impacts to streams, include:

- expediting construction and limiting the amount of equipment and activities in waterbodies;
- coordinating construction activities to avoid high flow and spawning periods;
- installing erosion controls to prevent sediment and siltation from entering streams;

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

- constructing waterbody crossings perpendicular to the axis of the waterbody channel as engineering and routing conditions allow;
- maintaining ambient downstream flow rates;
- removing construction material and structures from the waterbody after construction;
- restoring stream channels and bottoms to their original configurations and contours;
- permanently stabilizing stream banks and adjacent upland areas after construction;
- inspecting ROWs regularly during and after construction and repairing any erosion controls and/or performing restoration, as needed, in a timely manner; and
- reducing the amount of clearing and maintaining existing vegetation in place on stream banks to the extent practicable.

The proposed construction procedures will ensure that potential impacts at all stream crossings are minimized. To limit the time required for construction of a stream crossing, the ROW will be prepared on either side of the stream prior to the actual crossing. Stream crossings will be perpendicular to the flow to the extent practical. Temporary erosion control measures will be implemented as necessary to prevent downstream impacts. After the completion of construction, streambeds will be restored to their pre-construction elevations and grades. Spoil, debris, piling, cofferdams, construction materials, and any other obstructions resulting from or used during construction of the pipeline will be removed to prevent interference with normal stream flow. Any excavated material not used as backfill will be removed and disposed of in accordance with local, state and federal conditions. Following grading, all stream banks will be restored to pre-construction conditions and in accordance with permit requirements.

Post-construction or operational impacts to fisheries will be minimal. Restoration and maintenance of the vegetation within the ROW will minimize the erosion potential relative to the stream. Removal of mature streamside trees and vegetation at the pipeline crossing may temporarily reduce shading of the stream, eliminate escape cover and potentially result in a locally elevated water temperature. A 10-foot vegetated buffer will remain along all streams crossed by the Project except for where the excavation of the trench occurs. During ROW vegetation maintenance activities, Tennessee will comply with the Commission's Procedures and will leave vegetation in place within 25-feet adjacent to a waterbody, as measured from the waterbodies' high water mark, to allow for a riparian strip adjacent to waterbodies. Vegetation removal within this 25-foot riparian strip will be limited to a 10 foot corridor centered over the proposed pipeline centerline as necessary for temporary equipment crossings and emergency access.

No impact on fisheries is anticipated relative to the timing of construction. Tennessee has consulted with the applicable state fisheries agency relative to timing restrictions associated with sensitive fisheries. These timing restrictions are set forth in the waterbody table (i.e., June 1 through September 30). Tennessee plans to construct the crossings in compliance with the restrictions provided by the state fisheries agency, unless state permit conditions relative to wetland and waterbody permits require more stringent timeframes for crossings. Tennessee will adhere to the Commission's Plan and Procedures to mitigate sedimentation and erosion within and adjacent to all waterbodies crossed by the pipeline.

6.1.1.3.1 Waterbody Construction and Minimization/Mitigation Procedures

All waterbodies crossed by the pipeline looping segments or within the construction workspace will be protected by adherence to the Commission's Plan and Procedures, as well as any additional specific permit conditions required by federal, state and local agencies. Tennessee anticipates that all of the waterways in the Project area will be crossed by one of the three methods as described below.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Conventional Trenching

Minor waterbodies with no discernible flow at the time of construction may be crossed using the conventional wet trenching method (i.e., bed and bank disturbance with no stream flow bypass equipment installed). For conventional trench crossings, the pipeline will be placed deep enough to meet the minimum cover requirement of three feet, provided rock is not encountered. Consistent with the Commission's Procedures, Tennessee plans to complete construction activities within 24 hours at minor conventional trench stream crossings and within 48 hours at intermediate conventional trench crossings. The following additional stipulations will apply to wet stream crossings:

- use of equipment operating in the waterbody will be limited to that needed to construct the crossing;
- material excavated from the trench will be stockpiled in the construction ROW at least 10 feet from the water's edge or in ATWS (located at least 50 feet from the water's edge);
- material excavated from the trench generally will be used as backfill, unless federal or state permits specify otherwise;
- any excess material will be removed from the body of water; and
- the stream bottom will be returned to its original contour.

Flumed Crossing

A flumed (dry) stream crossing redirects the water flow through one or more pipes to allow for the trenching and pipe installation to occur in dry conditions. The number, length, and diameter of the pipes are dependent on estimated stream flow for the stream being crossed. This method allows for drier trenching, pipe installation, and restoration, while maintaining continuous downstream flow and passage for aquatic organisms. Soil types must have characteristics that allow stable stream bank conditions, and stream flow must be low enough for this method to be used successfully and safely. The flume pipe(s) must be long enough to account for the potential for the ditch width to increase during excavation (due to sloughing) and over-sized somewhat to accommodate the possibility of high flow conditions. An effective seal must be created around the flume(s) at both the inlet and outlet ends, so water will not penetrate and potentially compromise the channelized dam. Tennessee will implement the following measures where the dry flume crossing method is utilized:

- the flume pipe will be installed, after blasting if necessary, but before any trenching;
- an effective seal will be created around the flume pipe with sand bags or an equivalent seal mechanism;
- the flume pipe(s) will be aligned parallel with natural water flow to prevent scouring of the bank, preventing erosion and sedimentation;
- the flume pipe will not be removed during trenching, pipe-laying, backfilling activities, or initial streambed restoration efforts, except in rare conditions where a severe flow event causes conditions that make it unsafe for the pipe to remain; and
- flume pipes and dams that are not associated with an equipment bridge will be removed as soon as final cleanup of the stream bed and bank is complete.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Dam and Pump Method

The dam and pump method may be used for stream crossings where pumps and hoses can adequately transfer stream flow volumes from upstream of the work area to downstream of the work area, and there are no concerns with preventing the passage of aquatic organisms. Tennessee will implement the following measures where the dam and pump method is utilized:

- sufficient pump size, horsepower and hose capacity, including on-site backup pumps, will be used to maintain downstream flows;
- coffer dams will be constructed with "clean" materials to prevent pollutants from entering the waterbody (e.g., sandbags or clean gravel with plastic liner);
- water intakes will be suspended in the water column above the stream bed and will be screened to reduce entrainment of aquatic organisms or particles that may clog the pump;
- pumps will be located within secondary containment structures to catch and prevent petroleum liquids from entering the waterbody during refueling or if a pump failure occurs;
- large volume and strong velocity discharges will use water dispersion structures placed at the downstream discharge location to prevent streambed scour; and
- the coffer dam, pumps, and hoses will be monitored and maintained when necessary to ensure proper operation for the duration of the waterbody crossing.

If necessary, the pipe used for stream crossings and in floodplains will be weighted to prevent flotation. The pipe will be welded together in the staging areas and then carried or floated along the ROW into place. If the streambed is composed of unconsolidated material, the pipe will be pulled into place. In rock-bottomed streams, the pipe will be floated or lifted across and then lowered into place. After the pipe is lowered into the trench, previously excavated material will be returned to the trench line for backfill. Stream flow will be maintained at all waterbody crossings, and no alteration of the stream capacity will result from pipeline construction. At small streams encountered along the ROW, a backhoe, or similar equipment will be used for trench excavation. As a rule, the completion of all construction activities at minor stream crossings should not exceed one to two days per crossing.

The proposed construction procedures will ensure that potential impacts at all stream crossings are minimized. To limit the time required for construction of a stream crossing, the ROW will be prepared on either side of the stream prior to the actual crossing. Stream crossings will be perpendicular to the flow to the extent practical. Temporary erosion control measures will be implemented as necessary to prevent downstream impacts. After the completion of construction, streambeds will be restored to their pre-construction elevations and grades. Spoil, debris, piling, cofferdams, construction materials, and any other obstructions resulting from or used during construction of the pipeline will be removed to prevent interference with normal stream flow. Any excavated material not used as backfill will be removed and disposed of in accordance with local, state and federal conditions. Following grading, all stream banks will be restored to pre-construction conditions and in accordance with permit requirements.

6.1.1.4 Riverfront Areas

All of the perennial watercourses (and their associated Riverfront Area) located along the Project alignment are currently subject to vegetation management along the existing pipeline ROW. The Project will not create a new corridor across these watercourses and Riverfront Area but will increase the width of the maintained ROW in those areas after construction. Along the perennial streams, the Project will have

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

limited and short-term overall effects on Riverfront Area. Approximately 5.22 acres of Riverfront Area will be temporarily affected by construction activities. Approximately 1.02 acres of Riverfront Area will be permanently affected by the construction of new pipeline and ROW.

To minimize impact to Riverfront Area, all construction procedures described in Sections 6.1.1 through 6.1.3 will be implemented to reduce Project impacts to these areas. Stream crossings will be located perpendicular to the channel to the extent possible to reduce the crossing length. Design and implementation of all crossing structures (i.e., temporary mat bridges) will comply with standards and specifications as outlined in the BMPs for the Project, and the site specific permit drawings (see Appendix E). The Project has been sited to minimize the number of stream crossings and the impact to Riverfront Area.

6.1.1.5 Bordering Land Subject to Flooding

No Federal Emergency Management Agency ("FEMA") designated flood zones or flood plains are crossed by the proposed pipeline alignments in Massachusetts. Tennessee reviewed National Flood Insurance Program, Flood Insurance Rate Maps (FIRM) issued by FEMA to identify proposed crossings of areas subject to flooding and high volume flows. One access road and associated ATWS along with ATWS for hydrostatic testwater withdrawal and a portion of the Tyringham pipeyard are located within the flood zones of Spectacle Pond Brook, Lower Spectacle Pond, and Hop Brook. Tennessee is not proposing any improvements to this existing road and has limited the proposed use to rubber tired vehicles and no tandem trailers. No grading or tree felling will occur in any of the ATWS areas located within BLSF. These areas are identified for use by Tennessee as required by FERC for access only to Lower Spectacle Pond. Given the temporary nature of the work, no loss of floodplain storage will occur as a result in the encroachment on the existing floodplain.

6.1.2 Vernal Pools

Impacts to potential vernal pool habitat were carefully considered during the design of the Project. There is only one certified vernal pool located in proximity to the proposed Project activities and it will not be impacted by the Project. The Project workspace was shifted to avoid potential vernal pools as much as possible, while still maintaining safe construction workspace layouts. Based on the current Project design, three potential vernal pools will be impacted from construction and operation of the Project. No permanent fills will occur within potential vernal pool habitat; all three potential vernal pools will be temporarily impacted by the construction workspace and one will also be impacted during operation of the Project (although potential vernal pool functions will not be impaired by this operational component).

Tennessee will work with the MADEP to develop and implement approved measures to avoid or minimize potential adverse effects to potential vernal pools and amphibian breeding habitats as a result of the construction and operation of the Project such as time of year restrictions. Construction is anticipated to begin in June 2016 through these areas, which is after the amphibian breeding season, so no direct impacts to species utilizing these areas is expected. In addition, Tennessee's consultants have reviewed the document entitled," Best Development Practices, Conserving Pool-Breeding Amphibians in Residential and Commercial Developments in the Northeastern United States" (Calhoun and Klemens 2002) and will implement the management practices, as applicable to pipeline construction.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

As a result of past experience, agency consultations, and literature reviews, Tennessee has identified the following types of measures that may be applicable to minimize adverse Project effects on amphibians and will be implemented during construction:

- Where feasible in areas proximate to vernal pools and other confirmed amphibian breeding habitats, adhere to the seasonal windows for tree clearing to avoid negative effects on amphibians during migration periods. Tennessee intends to perform the work associated with potential vernal pools between June and September 2016. This will allow the amphibian larvae present in the pool to fully hatch and emerge before work begins; no vernal pool species would be expected to still be present.
- Install appropriate erosion and sedimentation controls around distinct work sites and access roads to minimize the potential for sediment deposition into amphibian breeding areas, and remove such controls promptly after final site stabilization.
- Minimize the removal of low-growing vegetation surrounding amphibian breeding pools.

Routine maintenance practices conducted by Tennessee along the 200 Line do not appear to have not had a detrimental effect on the vernal pool species or vernal pool habitat along the existing ROW. It appears that vernal pool functions are not impaired by the operational maintenance of the ROW. Tennessee will conduct similar maintenance practices on the expanded new permanent ROW and therefore do not anticipate any long term impacts to vernal pools.

The specific measures that would be implemented to protect amphibians would be defined in consultation with the involved regulatory agencies (e.g., MADEP) but a number of restoration procedures are available to restore any affected vernal pools. Those restoration procedures are described below.

6.1.2.1 Clearing, Grubbing, and Site Access Phase

1. Evaluate cut woody debris for preservation and subsequent re-use as habitat features; set aside selected material separately from woody debris to be removed from the site.
2. Implement any necessary construction-phase monitoring for state-listed species (if any) and/or sensitive vernal pool species (e.g., monitoring for wood turtles and Jefferson salamanders).
3. Ensure preservation of any specific habitat features that have been designated to be avoided and preserved.

6.1.2.2 Backfilling and Grading Phase

1. Layer soils in lifts to re-establish existing zonation to the extent practicable. Use low ground pressure machinery, as necessary, to minimize compaction in the distribution of soils.
2. Use grade stakes and pre-construction topographic mapping and data to re-establish the pre-construction topography to the extent practicable. In this regard, make efforts to establish the original configuration of depressional areas and swales in proximity to the vernal pool that contribute to surface water conveyance to the pool, soil moisture, and overall habitat conditions.
3. Promote microtopographic variability, consistent with current conditions in the pool, by embedding some organic debris within the replacement soils.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

4. Place at least a two-inch layer of mulch composed of leaf litter from trees characteristic of the nearby floodplain forest to the extent practicable.

6.1.2.3 Placement of Woody Debris and Other Habitat Features

1. Distribute dead woody debris over and into the ground surface as appropriate depending on pre-construction coverage by such debris.
2. Consider placement of other habitat features, such as boulders or slash piles, outside of the pool to provide suitable cover, as appropriate, for vernal pool animals, based upon final pre-construction inventory and specifications.
3. Install any specific habitat features designed to replace features used by state-listed species.

6.1.2.4 Seeding and Planting

1. Apply a wetland seed mix (or other acceptable mix) to the disturbed portions of the vernal pool.
2. Plant trees, shrubs, and herbaceous species as detailed on final planting plans approved for the site. These plans would include, to the extent feasible, replanting any state-listed plant species that would be impacted and/or any affected plant species that are relied upon by state-listed animal species.
3. Manage the new plantings according to final detailed specifications.
4. Implement an invasive species control plan immediately after planting.

Following the construction phase of restoration, a monitoring program would be established, typically for a period of five years after restoration. The details of this program would be determined during final design, but would likely include semi-annual or annual inspections of the replanted vegetation during the growing season, as well as annual inspections of the vernal pools in the spring during the monitoring period. The program would also include an invasive species monitoring and control plan (see Appendix D).

6.1.3 Rare Species

Correspondence with the MADEP and USFWS indicated that portions of the Project ROWs are located within habitat for a variety of state and federal rare species. Tennessee continues to consult with the applicable state and federal agencies responsible for rare and protected species and has performed surveys for some species identified during consultations (see Section 4.1.3).

6.1.3.1 State-Listed Rare Species

Tennessee has consulted with NHESP to determine the potential for rare species in the Project area and also develop construction and mitigation practices to avoid a “Take” of these rare species. Based upon the species identified by MA NHESP and the proposed carefully timed and implemented mitigation measures, at this time it is anticipated that a “Take” can be avoided under MESA. Discussions and consultations with NHESP are ongoing.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

6.1.3.1.1 Tyringham Pipeyard

Tennessee plans to use 3.50 acres of active hay field as a pipeyard to store equipment and materials in support of construction. The pipeyard is mapped habitat for the sedge wren, the wood turtle and the American bittern. Tennessee has developed a construction plan for the Tyringham pipeyard to avoid impacts to these rare species. The following measures will be implemented at the Tyringham pipeyard location:

- No grading or topsoil segregation will occur at the pipeyard
- The pipeyard will be sited entirely outside of the existing wetlands
- No woody vegetation will be removed to accommodate the pipeyard
- Tennessee will place construction mats over all or a portion of the pipeyard in late winter/early spring while simultaneously installing a perimeter of properly dug in silt fencing
- All activity and matting will take place prior to the state-listed sedge wren returning to the area for the pending breeding season and prior to wood turtles emerging from Hop Brook after over-wintering

6.1.3.1.2 Lower Spectacle Pond

According to the MA NHESP, Lower Spectacle Pond provides habitat for the umber shadowdragon. This species prefers sparsely vegetated lakes and sections of rivers of various size. The species does well in man-made habitats such as impounded rivers and reservoirs and has a flight period from mid-May through mid-August.

In compliance with USDOT specifications, Tennessee will conduct hydrostatic testing on all segments of the pipeline prior to placing it in service. Tennessee anticipates using water from Lower Spectacle Pond for hydrostatic pressure testing and plans on accessing the pond from an existing boat ramp off of Cold Spring Road. Tennessee is proposing to install a pump at the end of the ramp in a secondary containment structure to avoid the potential for a fuel and/or oil spill as shown on the plan provided in Appendix G. A spill kit containing materials designed to contain a release would be kept on site for the duration of the withdrawal process. A suction hose or pipe would be attached to the pump with a dissipation device (screen) attached to the end, to avoid the entrainment of fish and other wildlife. The intake and screen will be suspended in the water column and elevated off the bottom by attaching floats, to avoid the withdrawal of mud and sediment from the bottom. The process of installing the elevated/suspended intake hose and screen will be done from a small boat and/or on foot. Therefore, the process is anticipated to avoid disturbing insect larvae, including any odonate larvae which may be present, by avoiding impacts to the bottom substrate. Timing of the withdrawal (fall) would avoid the flight period of the umber shadowdragon, further reducing any chance of negative impacts to this listed species.

Upon completion of the hydrostatic tests, the test water will be discharged to an upland area through a dewatering structure consisting of an energy dissipation device and water filtration structure. Tennessee's preference for dewatering the pipe is to locate the discharge at the manifold site within the construction area. This would minimize the amount of equipment required at the work site. Pumps and other dewatering equipment would need to be transported down the access road to the manifold site in order to pump the water back up gradient to Spectacle Pond, if the discharge were located adjacent to Spectacle Pond. This creates unnecessary additional impacts to DCR property that could otherwise be avoided if the dewatering occurred on the ROW. The hydrostatic testwater would remain within the watershed of Spectacle Pond Brook but would enter the system further downstream as opposed to directly back into Spectacle Pond.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Tennessee does not anticipate downstream impacts to Spectacle Pond Brook or downstream resources. Spectacle Pond Brook is approximately 20 feet wide and several feet deep, receiving the outflow from Lower Spectacle Pond on a daily basis. The amount of additional water discharged from the hydrostatic test operation, which would travel over land back to Spectacle Pond Brook further downstream is insignificant compared to normal flows within Spectacle Pond Brook.

The discharge rate of the test water will also be regulated using valves and energy dissipation devices to reduce the potential for erosion. This clean test water (no chemical additives are used during testing) will only be discharged into areas where adequate vegetation is present, adjacent to the construction ROW. All discharge activities will be monitored through the duration of the activity to ensure proper function of the structures utilized and to prevent erosion and sedimentation from occurring as a result of dewatering activities. Hydrostatic test water discharge is anticipated to occur over an 8 hour period, similar to the fill rate. Tennessee anticipates that test water will infiltrate into the ground and move as sheet flow across well vegetated areas before reaching surface waters downstream. Tennessee does not anticipate that this limited quantity of water would impact downstream areas and will monitor and slow the discharge rate, if necessary, to prevent any downstream impacts from the discharge. Environmental impacts from withdrawal and discharge of test water will be minimized by utilizing the measures outlined in FERC's Plan & Procedures and Tennessee's Construction BMP's as well as by complying with all applicable permit requirements.

6.1.4 Historic and Archaeological Resources

Avoidance and preservation of any historical or archaeological resources will be the preferred strategy during Project construction and operation. Tennessee adjusted the Project alignment to entirely avoid the two existing foundations in the Project area discussed in Section 4.1.4.4.1 and no impacts to these foundations from the construction or operation of the Project will occur. All cultural areas identified during surveys will be marked in the field; no impacts are anticipated to any of the cultural or sensitive areas identified during the surveys. In the case of an archaeological discovery during construction, Tennessee has developed an Unanticipated Discovery Plan (Appendix F) that will be followed.

6.2 OTHER RESOURCES

6.2.1 Topography, Geology and Soils

In accordance with the Massachusetts Stormwater Handbook, Tennessee will develop a SWPPP for the Project. The SWPPP will not be finalized and filed until the final detailed engineering issues are in the final phases of completion, anticipated in spring 2015. In accordance with the General Permit administered under Section 402 of the Clean Water Act, a Notice of Intent ("NOI") will be provided to EPA Region 1 prior to construction.

To minimize potential soil impacts, Tennessee will construct the pipeline in accordance with the Commission's Plan and Procedures and Tennessee's Construction BMPs and any additional permit conditions required by local, state or federal agencies. These documents identify erosion control measures designed to reduce potential short-term and long-term impacts on soil and water resources including installing slope breakers, temporary sediment barriers and permanent trench breakers; topsoil segregation in wetlands and residential lands; and the stabilization of exposed surfaces through revegetation and mulching. The specific erosion control measure to be utilized in each area will be a function of factors considered, including:

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

- Type of soil and erodibility of the soil
- Soil moisture regimes
- Type and amount of vegetation removed and the amount and type of remaining vegetation
- Slope/Steepness
- Presence and location of sensitive resources
- Time of year
- Schedule for future work in those areas

Additionally, Tennessee prescribes the use of erosion control devices and construction practices that will minimize erosion during and after construction. During construction, erosion control structures, temporary seeding and revegetation, and erosion control fabrics will be used. After construction is complete, Tennessee will minimize further erosion by re-grading and reseeding the disturbed areas. Following restoration and clean up, Tennessee will monitor the disturbed areas to maintain erosion control structures and repair any developing erosion.

In addition, the following are brief descriptions of some of the methods Tennessee will utilize during construction to minimize impact upon soils:

- minimize the quantity and duration of soil exposure;
- protect critical areas by reducing the velocity of and redirecting runoff;
- install and maintain erosion and sediment control measures;
- reestablish vegetation as soon as possible following final grading; and,
- inspect the ROW and maintain erosion and sediment controls as necessary until final stabilization is achieved.

The Environmental Inspector ("EI") is responsible for ensuring that contractors implement and maintain erosion and sediment control measures during construction. Erosion control and sedimentation measures will be implemented through construction of slope breakers or water bars and terraces diagonally across the ROW on slopes to reduce runoff. Water diverted by the water bars will be channeled to well-vegetated areas. Erosion control barriers consisting of silt fences, hay/straw bales, silt tubes, and/or sandbags may be temporarily used in place of water bars.

As a general practice, erosion control barriers will be installed immediately after soil disturbances in the following areas:

- at water bar outlets if vegetation is incapable of filtering effectively;
- between graded ROW and waterbody after clearing (along banks);
- downslope of stockpiled soils near waterbodies and wetlands;
- at the base of slopes adjacent to road crossings, and at downslope boundaries of construction areas where runoff is not controlled with a water bar; and,
- in the ROW at boundaries between wetlands and adjacent disturbed uplands.

In wetlands, the ROW will be seeded with the seed mix prescribed in Tennessee's Construction BMP's (Appendix E) or an equivalent New England WetMix at 40 lbs/acre (unless standing water is present) to stabilize the area until indigenous wetland species are re-established. Amendments such as fertilizer and lime will not be permitted in wetlands, unless otherwise stated. If there are adverse weather conditions, the ROW will be mulched in accordance with local NRCS or other local soil conservation authority

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

recommendations until reseeding can resume. The ROW will generally be seeded within six working days of final grading, weather and soil conditions permitting. Slopes steeper than 3:1 will be seeded immediately after final grading, weather and soil conditions permitting. Stabilizing of the soil will be necessary until vegetation is established. Temporary measures include mulching, matting, or netting. If construction is completed 30 days or more before the seeding season for perennial vegetation, areas adjacent to waterbodies will be mulched with three tons/acre of straw, at a minimum of 100 feet on either side.

6.2.1.1 Blasting/Rock Removal

Tennessee has developed a Blasting Plan for the Project that establishes procedures and safety measures that its contractor will adhere to while implementing blasting activities along the pipeline ROW during the Project. The contractor will be required to submit a detailed Blasting Specification Plan to Tennessee. The contractor's plan, when approved by Tennessee, will be incorporated into the contractor's scope of work.

In addition to detailed specification requirements of the site-specific blasting plans, safety and impact minimization precautions include:

- installing blasting mats in congested areas, in shallow waterbodies or near structures that could be damaged by fly-rock;
- posting warning signals, flags and barricades;
- following procedures for safe storage, handling, loading, firing, and disposal of explosive materials;
- manning adjacent pipelines at valves for emergency response; and
- controlling excessive vibration by limiting the size of charges and using charge delays that stagger each charge in a series of explosions.

These blasting standards meet or exceed all applicable federal, state, and local requirements covering the use of explosives. To protect groundwater and surface water from potential contaminants, use of perchlorate-containing explosives will not be allowed.

6.2.1.1.1 Minimization of Impacts to Structures

If blasting near structures, an independent contractor will inspect structures prior to blasting within approximately 200 feet of the construction work area, locations requested by the pipeline contractor, and at the request of an affected landowner. Post-blast inspections will be performed as warranted. Blasting will be performed by registered blasters and monitored by blasting inspectors. During blasting, the contractor will monitor ground vibrations at the nearest structure (or well) within 200 feet of the construction work area.

6.2.1.1.2 Minimization of Impacts to Water Quality

The two primary concerns related to water quality would be (1) potential impacts of perchlorates, which are contained in very small quantities in some explosives and detonators; and (2) potential residual chemicals from the incomplete detonation of Ammonium Nitrate Fuel Oil (“ANFO”), which is commonly used in mine and construction blasting, and if not oxygen balanced, can leave some nitrate residues.

To avoid and prevent these water quality impacts, Tennessee will preclude the use of explosives or detonators containing perchlorates or ANFO. Special trenching-type explosives, which are designed

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

specifically for narrow, controlled trench blasting and do not contain perchlorates or ANFO, will be required to be used on the Project.

6.2.1.1.3 Minimization of Impacts to Water Wells

Impacts on drinking water supply wells from trench construction blasting will be minimized by controlled blasting to protect the integrity of nearby wells. The proposed trench will be excavated to approximately six to seven feet deep and the design blast holes would typically be a maximum of seven to nine feet deep (including a subdrill), although the entire drill hole is not typically loaded with explosives.

Energy produced from blasting is dispersed towards the direction of least confinement, which for trench blasting is typically in an upward and lateral direction towards the trench surface. Therefore, rock fracturing is not expected to extend appreciably below the bottom of the blast holes. In addition, there should not be any fracturing of the bedrock beyond approximately 5 to 10 feet laterally from the trench. Because of this localized effect, Tennessee does not anticipate direct damage to water wells greater than 20 feet from the blast locations. Tennessee will minimize vibration-related damage by setting a conservative Peak Particle velocity limit of 2.0 inches per second (in/sec) at any water wells in the vicinity of construction. Tennessee will monitor the quantity or quality of wells within 250 feet of trench blasting and will conduct pre- and post-blast surveys of flow rate and water quality performed.

Tennessee will evaluate any damage complaints associated with construction activities, including blasting. In the unlikely event that blasting activities temporarily impair well water, Tennessee will provide alternative sources of water or otherwise compensate the owner. If well damage is substantiated, Tennessee will either compensate the owner for damages or arrange for a new well to be drilled. In the unlikely event that structural damage occurs at a nearby structure as a result of construction activities, the owner will be compensated for damages, or appropriate repairs will be made.

6.2.1.1.4 Minimization of Impacts to Wetlands

Trench Blasting Within or Down Slope from Wetland

One potential impact of trench construction within or downslope of a wetland could be carrying away or redirecting surface water or groundwater from the wetlands by flow into and through the pipeline trench itself. Since the pipeline will utilize relatively pervious backfill and bedding material below and beside it, there is potential for water from the wetlands to flow into the trench after construction is completed through fractures in the bedrock and be conveyed away from the wetland.

This potential impact will be prevented in three ways. First, perimeter control blasting methods (described below) will be utilized to minimize fracturing of the bedrock outside the limits of excavation in proximity to the wetlands. Second, when within a wetland, the upper portion of the trench backfill will be restored with low permeability wetland soils as specified. The wetlands soils will be carefully stockpiled during construction, or suitable materials will be brought in for wetland restoration. Third, there will be impervious dams or trench plugs constructed within the blasted pipeline trench at either end of the wetlands to keep water in the trench from flowing away from the resource area, as necessary.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Perimeter Control Blasting Procedures

As noted above, energy from blasting is in an upward and lateral direction, and fracturing is not expected below the bottom of the blast holes. Laterally, there should not be any fracturing of the bedrock beyond approximately 5 to 10 feet from the trench. Even with this limited fracture zone, special precautions will be taken when within a wetland or within 20 feet downslope of a wetland, to minimize fracturing of the bedrock outside the limits of excavation.

When blasting occurs within or 20 feet downslope from a wetland, special perimeter control procedures will be utilized in the trench to minimize fracturing of the rock outside the limits of excavation. Perimeter control blasting techniques (such as presplitting or trim blasting) utilizes closely-spaced drill holes drilled along the lateral trench limits, lightly loaded with explosives, to shear the rock between holes such that rock fracturing or fracture propagation and damage is prevented outside and beyond the intended limits of excavation.

Trench Blasting Up Slope from Wetland

One potential impact of trench construction upslope of a wetland could be reduction of surface water recharge to the wetlands by carrying away surface water or groundwater that enters into and through the trench, water which would otherwise contribute to the recharge to the wetlands. In effect, the trench construction may result in diversion of water away from the resource area.

This potential impact will be prevented in two ways. First, when within 100 feet up-slope of a wetland, the upper portion of the trench backfill will be restored with relatively impervious, excavated soils. Second, if needed, impervious dams or trench plugs will be constructed within the trench segment located up-slope from the wetlands to keep water in the trench from flowing away from the area, and to allow for the natural groundwater flow to continue toward the wetlands.

6.2.2 Groundwater Impact and Mitigation Measures

Tennessee proposes to implement construction practices designed to reduce and / or mitigate potential impacts on groundwater during construction as detailed within the Commission's Plans and Procedures and Tennessee's Construction BMPs. Tennessee and its contactors will adhere to these practices related to groundwater protection including specifications for trench breakers and dewatering as well as restrictions on refueling and storage of hazardous substances. In the unlikely event that construction of the proposed Project temporarily impacts private or public well quality or yield, Tennessee will provide alternative water sources or other compensation to the well owner. Should permanent well damage be sustained, Tennessee will either compensate the well owner or make arrangements for a new well to be drilled.

All equipment used in construction of the pipeline will be refueled and lubricated within the limits of the ROW at a minimum distance of 100 feet from all wetlands, waterbodies and identified wells. Auxiliary fuel tanks will be used to reduce the frequency of refueling operations, and refueling will not take place within 400 feet of identified municipal or community water supplies including groundwater and surface water as per state requirements. The impact minimization measures will prevent the discharge of hydraulic fluids or fuels from leaving the ROW and / or leaching into the groundwater.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

6.2.3 Vegetation and Wildlife

Tennessee will perform routine vegetative maintenance as part of the operation of the pipeline once construction is completed. Tennessee will only apply herbicides for the control of vegetation around buildings, and herbicide applications will not occur along the pipeline ROW unless it is in response to invasive species and control of those invasive species. In these special circumstances, Tennessee will use a licensed applicator and will obtain any and all necessary permits to apply herbicides to invasive species along the ROW. Tennessee will minimize the spread of invasive species by cleaning equipment before transporting to another location if the equipment came in contact with invasive species seed stock or rhizomes. An Invasive Species Control Plan has been prepared for the Project and is included in Appendix D. Tennessee shall protect and minimize potential adverse impacts to vegetation through the use of the following procedures:

6.2.3.1 Tree Felling

Tennessee proposes to conduct tree felling during the winter 2015/2016 to minimize impacts to breeding and nesting birds and in compliance with the Migratory Bird Treaty Act ("MBTA"). Tennessee has minimized the acreage of tree felling that will be required for the Project by co-locating the Project within its existing 200 and 300 Line easements to the extent practicable, feasible, and legally permissible. Prior to commencement of any tree felling activities, the ROW boundaries (e.g., workspace limits) will be clearly delineated to ensure that no tree felling occurs beyond these boundaries. All wetland boundaries will also be clearly marked prior to tree felling so that all Project personnel and inspectors will know where these sensitive environmental resources are located and where specialized mitigation measures and techniques must be implemented. Any trees that are to be saved shall be sufficiently marked (i.e., flagging and construction fencing) before clearing begins.

The ROW will be cleared by tree felling by a contractor specializing in large-scale land clearing operations utilizing specialized clearing equipment such as mowers, feller bunchers, tree shears hydroaxes, and skidders.

Use of these specialized machines will ensure an expedited tree felling operation that will limit the amount of time required for active clearing operations. All vegetation will be cut as close to the ground surface as feasible. Non-woody vegetation may be mowed to ground level. Within uplands, mature tree stumps will either be removed or ground down to a suitable level to prevent a potential safety issue for equipment access. Trees shall be felled into the ROW. Trees that have inadvertently fallen into waterbodies or beyond the ROW shall be removed immediately.

When pruning is necessary to clear the ROW, pruning cuts shall be made as follows:

(1) cuts shall be smooth;

(2) branch collars shall not be cut (i.e., cuts should be made immediately in front of the branch collar);

(3) large, heavy branches shall be precut on the underside to prevent splitting or peeling of bark; and

(4) climbing spurs shall not be used for tree climbing.

All existing fences needing to be temporarily removed for access shall be maintained by the use of a temporary fence section (gap). Prior to being cut, the fence will be properly braced and similar material

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

used to construct the gap. At no time will an unattended gap be left open. The gap will be replaced after cleanup with a permanent fence of the same or similar material and condition.

Should individual landowners wish to utilize the trees felled from the ROW, the timber will be left in tree length and will be neatly stacked at the edge of the ROW in areas identified by the EI prior to the commencement of tree felling activities and directly accessible to the landowner in accordance with individual landowner agreements. Timber shall only be stacked along the ROW at the specific request of a landowner, under the condition that it is out of public view and will be accessible to the landowner without disturbing the restored ROW and in a location where waterbody and wetland crossings will not be necessary to access the logs. Timber shall not be stacked in drainage ways or left within wetlands. Tennessee does not plan to use timber stacks as wildlife habitat. Timber not designated for other uses will be disposed of by the contractor, as designated by the EI or contract agreement.

It should be noted that Tennessee is working cooperatively with DCR and has agreed to deliver forest products taken from DCR property to a predetermined location, designated by DCR.

Trees and brush shall be disposed of in one or more of the following ways, depending on local restrictions, applicable permit stipulations, and/or as designated by the EI.

6.2.3.2 Chipping and Disposal

All woody vegetation cleared as part of the Project installation and construction will be chipped and hauled off-site. Some amount of chips may be left on the ROW, with EI approval, if it does not inhibit revegetation. Chips will not be left in agricultural lands, wetlands or within 50 feet of wetlands. Chips will not be stockpiled in such a manner that they may be transported into a wetland or agricultural land.

Chips will be hauled off-site and will not be stored at the Project location. Disposal shall be at an approved composting site that is traditionally used for disposal of such materials. Off-site disposal will be subject to compliance with all applicable survey information, landowner permissions, and mitigation requirements. No material will be stacked outside of the construction workspace boundaries. The timber will be delivered to the landowner (previously disturbed areas) via public ROWs or placed at the edge of the construction ROW for retrieval. In all cases where trees and vegetation are removed from the ROW in areas of public view, Tennessee and/or the construction contractor shall remove and dispose of all cut timber and brush without undue delay.

Tree stumps shall be disposed of by one of the following methods, pending approval of the landowner and the EI, and in accordance with permit and regulatory requirements:

(1) stumps may be removed from the site and disposed of in an approved landfill or other site which traditionally accepts such materials;

(2) stumps may be chipped and hauled away from the site; and

(3) stumps may be ground in wetlands and grindings will be removed from the wetlands to the maximum extent practicable.

Within wetlands, no rubber tire equipment will be permitted unless it will not damage the root systems and its use is approved by the on-site EI. Excessive traffic from rubber-tired clearing equipment, such as skidders, on saturated soils can result in soil compaction and damage to existing root systems. To mitigate

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

potential damage to root systems from clearing operations, the EI would determine whether or not rubber-tired equipment would damage root systems by surveying the wetland ahead of clearing equipment for degree of saturation. Where wetlands are saturated and root damage is likely, clearing will be done manually or will be completed with equipment operating on timber mats. If the wetland must be crossed by rubber-tired equipment to access the remainder of the ROW, a travel lane of timber mats will be installed to facilitate access along the ROW. Bulldozers will not be used for clearing in wetlands. Trees and brush will be cut at ground level by hydroaxes, tree shears, grinders or chain saws. Within wetlands stumps will be left in place, except on the trenchline or unless the removal is necessary to ensure worker safety. Stumps may be ground to a suitable height for safety reasons.

6.2.3.3 Grading

When existing topography and/or terrain does not permit crews and equipment to operate safely and does not provide access or an efficient work area, grading shall be required.

The construction corridor will be graded to remove obstructions such as large rocks and other land features that prevent the safe operation of equipment. In accordance with the Commission's Plan, topsoil will be stripped from the full work area, or from the trench and subsoil storage area in active or rotated crop and pasture lands, residential areas, hayfields or other areas at the landowner or land manager's request.

Within wetlands, any grading activities will be limited to the areas directly over the trenchline, except where topography requires additional grading for safety purposes. In accordance with the Commission's Procedures, topsoil will be segregated in wetlands except where soils are saturated or frozen or in areas of standing water. These segregation techniques do not apply to wetlands within actively cultivated or rotated croplands.

6.2.3.4 Trenching

Following grading activities, the pipeline trench will be excavated to a sufficient depth so that the pipe will typically have a minimum of 36 inches of cover unless specified otherwise. Topsoil is required to be segregated in wetlands as part of the ditching procedure, unless the soil is saturated, there is standing water present, or in freezing conditions. Unless approved otherwise by the landowner or land management agency, topsoil is segregated prior to ditching in all residential areas (or by option, may be imported), in actively cultivated or rotated croplands and pastures, hayfields and other areas at the landowners or land managing agency's request. In areas that require topsoil segregation, topsoil and subsoil will be segregated during ditching and stockpiled separately. Topsoil will be removed to its actual depth or to a maximum depth of 12 inches, as determined by the EI, and topsoil shall not be used for padding, backfill or trench breakers, under any circumstances.

6.2.3.4.1 Lowering-in/Backfilling

After the pipe has been assembled, welded, and x-rayed, the pipe will be lowered into the trench and backfilled. After the subsoil has been rough graded, topsoil will be replaced in an even layer. Backfill material imported from off the ROW must be approved by the EI. Where rock was part of the surface features prior to construction of the pipeline loops, rock may be windrowed along the edge of and across the ROW to prevent unauthorized off-road vehicle traffic or will be trucked off-site for disposal at an appropriate receiving facility. In all cases, excess rock will be handled in accordance with applicable landowner agreements.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

6.2.3.5 Cleanup/Restoration

All construction debris shall be removed following backfilling of the pipeline. Once backfilling is complete, Tennessee will restore the original contours and flow regimes to the extent practical, with the exceptions of unnatural features and unstable grades. In consultation with NRCS seeding specifications (or comparable), the ROW will be seeded with an erosion control seed mixture to stabilize the area until indigenous species can become re-established. If weather conditions limit the effectiveness of reseeding efforts, at the discretion of the Environmental Inspector and as allowed by all applicable permits, the ROW may be mulched to minimize erosion until conditions are suitable for reseeding. No fertilizer or lime shall be used in wetlands.

6.2.4 Air Quality

Tennessee will apply mitigation measures during each of the Project phases to reduce the amount of GHG emissions and the amount of trees removed.

For the construction phase, Tennessee is planning on using a hot-tap methodology for connecting the pipelines which eliminates natural gas venting from this process. On- and-off road vehicles and engines used during the construction phase will minimize emissions by utilizing vehicles adhering to the more stringent Tier 3 and 4 emissions standards when available and practical. All construction vehicles will operate with ultra-low sulfur diesel fuel, and limit the amount of engine idling time.

For the commissioning phase, Tennessee is planning on pressure testing the pipeline using hydrostatic testing which eliminates the need to use, and then vent, natural gas to pressure test the pipes. Emissions from purging and in-line inspections of the pipeline are minimal enough to make any control attempt impractical.

For the normal operation of the pipeline, protected steel pipes will be installed, regular inspections will check for potential leaks, and all practical efforts will be made to fix leaks expeditiously to limit the amount of natural gas vented into the atmosphere. Locations of potential leaks are expected to be primarily limited to valves at either end of the new pipeline segments.

For non-routine operations, in-line inspection emissions will only occur approximately once every 5-7 years. Since just a very small amount of natural gas is lost during the in-line inspections from the launcher and receiver barrels, it is not economically feasible to recover. Blowdown emissions will only occur due to unplanned discrete incidents and thus may never need to occur. If blowdowns are needed, it is likely that no controls can be implemented due to timing constraints. Emissions calculated assume the worst case scenario where the entire length of the Project pipeline will be required to be vented.

Trees will only be removed for construction access or pipeline safety. The proposed pipeline route was chosen in part to minimize the amount of upland forest impacted by utilizing existing ROW as much as possible. Following construction, vegetation within a 10-foot corridor centered over the pipeline within the ROW will be maintained in an herbaceous state (grasses and small shrubs). In addition, trees that are located within 15 feet of the pipeline that may compromise the integrity of the pipe coating will be selectively cut and removed from the permanent ROW.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

6.2.5 Noise

Elevated noise levels generated during construction of the Project will be temporary. To help mitigate for noise during construction the following procedures may be applied:

- Construction equipment will be properly muffled and maintained to minimize excessive noise and will not be allowed to idle unnecessarily
- In areas where blasting is required, Tennessee will attempt to schedule or muffle these activities to minimize blasts and disturbances

6.2.6 Scenic Qualities, Open Space and Recreational Resources

Scenic areas of note along the Project alignment include Otis State Forest, Lower Spectacle Pond and Cold Springs Road. Through pre-construction planning and consultations Tennessee has consulted with representatives of these potentially affected resources to develop acceptable mitigation and construction practices. Tennessee will develop and submit the anticipated construction schedule to these representatives that will outline construction activities, any required or potentially required detours or closures and any other proposed or required mitigation measures that may impact the recreational elements at these locations.

6.2.7 DCR State Property

Tennessee has met with the DCR on multiple occasions to discuss the Project alignment and impacts to DCR properties and to develop appropriate and acceptable mitigation under Article 97. Construction activities and methods along with minimization and mitigation techniques employed at this location will be the same as the rest of the Project as described previously in the document for uplands, wetlands, and streams. In addition, Tennessee has developed a conceptual mitigation plan for impacts to DCR property to satisfy the requirements of Article 97. The following mitigation has been proposed:

- Compensation for the new permanent easement (6 acres), as determined by DCAM;
- Compensation for the construction permit for 17 acres of temporary workspace;
- Forest products to be delivered to a DCR designated location for DCR use, sale and management;
- Additional compensation for 6 acres of permanent impacts to Article 97 land, to address No Net Loss of Article 97 Land Policy, and;
- Other mitigation associated with permitting conditions e.g., gated access roads, ATV control, invasive species control and monitoring, wetlands replication and monitoring.

6.2.8 Traffic, Transit and Pedestrian and Bicycle Transportation

Major modifications to transportation infrastructure or traffic patterns are not expected to be needed for the Project. During construction of the proposed pipeline road crossings, modifications to traffic patterns may be necessary to facilitate safe construction. During the crossings, modifications to the traffic pattern limited to one lane of traffic may be necessary, and Massachusetts standards for maintenance and protection of traffic will be followed. If traffic cannot be maintained through the work area, a detour will be developed. In the interest of public safety, the contractor will coordinate any road closures with federal, state, and local emergency responders (law enforcement, fire, and medical). Track pads will be installed at the entrance and exit points between public roads and the utility ROW or access roads. Appropriate signage will be posted at all access points along the ROW and if necessary, police detail will be utilized.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

The use of track pads at the entrance and exit points will minimize the amount of soils and other materials that may be tracked onto the public roadways by construction vehicles moving back and forth between the public roads and the ROW. Whenever necessary, the public roadways will be swept to remove any soils or debris that makes its way to the public roadways. If it is determined that certain locations require a local police detail to direct traffic at the entrance and exit locations along the Project, Tennessee will employ those details.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

7.0 DEMONSTRATION OF STATUTORY AND REGULATORY COMPLIANCE

7.1 MASSACHUSETTS WETLANDS PROTECTION ACT

The Wetlands Protection Act requires approval by municipal Conservation Commissions and from the MADEP. The Conservation Commissions are empowered under state law to issue Orders of Conditions, approving or denying jurisdictional activities. The MADEP has the authority to intervene on projects and to act on appeals of Orders of Conditions.

Permit applications (Notices of Intent) will be filed in Agawam, Sandisfield, and Tyringham. These permit applications will detail the Project, short term and long-term Project impacts, and the proposed mitigation for impacts. Attention will be given to how the Project and the proposed mitigation activities conform to the performance standards for each of the affected Resource Areas.

The following paragraphs present a summary of the Project's compliance with the performance standards of the Wetlands Protection Act and its regulations at 310 CMR 10.00.

7.1.1 Limited Project Provision

As outlined at 310 CMR 10.53(3)(d), natural gas lines are "limited projects" that may be approved by the issuing authority even if the activity cannot comply with the wetlands performance standards, provided that the project proponent demonstrates that they have conducted an alternatives analysis to avoid, minimize and mitigate any impacts.. However, it is within the issuing authority's discretion to consider the magnitude of the alteration and the significance of the Project site to the interests identified in M.G.L. c. 131, § 40, the availability of reasonable alternatives to the proposed activities, the extent to which the adverse impacts are minimized, and the extent to which mitigation measures, including replication or restoration, are provided to contribute to the protection of the interests identified in M.G.L. c. 131, § 40. However, no such project may be permitted which will have any adverse effect on specified habitat sites of rare vertebrate or invertebrate species, as identified by procedures established under 310 CMR 10.59.

The general provisions for natural gas lines and other linear projects are set forth at 310 CMR 10.53(3)(d).

As demonstrated in Section 3.0 of this DEIR, an alternatives analysis has been prepared, demonstrating that the Project has avoided, minimized and mitigated impacts and represents the best solution to meet the increased demand for natural gas with the fewest amount of adverse impacts. The route for the Project is co-located within an existing, natural gas ROW that is operated and maintained by Tennessee.

Best available measures shall be used to minimize adverse effects during construction;

Section 2.0 and Appendix D of this DEIR provides the BMPs that will be applied during construction of the Project. Minimization measures to avoid wetlands and sensitive resource areas were taken during design and planning to adjust the Project layout to avoid these areas. Tennessee will implement the Commission's Plan and Procedures, Tennessee's BMPs and other permit conditions during construction and restoration.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

The surface vegetation and contours of the area shall be substantially restored.

The vast majority of impacts to wetlands will be temporary and will be restored in-situ. Permanent impacts are almost entirely in the form of vegetation conversion during operation of the pipeline. One small area of permanent wetland fill (0.11 acres) will occur as a result of this Project. Mitigation and restoration measures are provided in Section 6.0 of this DEIR.

The Limited Project activities include the construction and installation of the Massachusetts Loop, 3.81 miles of new 36-inch outside diameter OD pipeline, co-located within or adjacent to Tennessee's existing 200 Line ROW in Sandisfield, Massachusetts, and the portion of the Connecticut Loop in Massachusetts, 0.11 miles of 24-inch OD pipeline co-located within or adjacent to Tennessee's 300 Line ROW in Agawam, Massachusetts. The primary purpose of the Project is to meet the current demand for increased natural gas in the region.

7.1.2 Bordering Vegetated Wetlands

As presented in Section 5 of this DEIR, the Project will result in both temporary and permanent alteration of Bordering Vegetated Wetlands (BVWs). The Project qualifies as a Limited Project under the provisions at 310 CMR 10.53(3)(d), which authorizes an issuing authority to grant permission for a project to proceed even if performance standards for specific resource areas cannot be met, provided that impacts are avoided, minimized and mitigated through an alternatives analysis. .

The nature of a linear facility such as this natural gas pipeline, coupled with the varied dispersal of wetlands in glaciated terrain, results in some unavoidable intersection of the pipeline with wetland resources. All practicable measures have been taken to avoid impacts to BVWs and extensive mitigation is proposed for unavoidable impacts. With these considerations in mind, no significant impairment of BVW function within the Project area is anticipated.

The Project proposes the filling of only 0.11 acres (4,792 square feet) of BVW for improvements to an access road. No other loss of wetland will occur from the Project, although temporary impacts and permanent vegetative cover changes will occur that far exceed the 5,000 square foot threshold. With the proposed in-situ restoration, all of these areas will fully retain wetland characteristics and provide full wetland functional attributes. As a Limited Project pursuant to 310 CMR 10.53(3)d, the 5,000 square feet BVW "loss" restriction may be exceeded, provided the associated conditions of the Limited Project are complied with (as addressed in Section 7.1.1) without requiring a variance from the Regulations.

Temporarily impacted wetlands will be restored in-situ after construction is complete. One area of permanent fill to BVW (0.11 acre) is associated with an access road and will be replaced in accordance with this standard. The final location for the wetland replacement is still under consideration but is anticipated to be located adjacent to the existing wetland boundaries for the impacted wetlands. A site-specific wetland replication plan will be developed for this impact consistent with the requirements of 310 CMR 10.55. This wetland impact will occur where a current access road ("Alberts Road") extends northeast off Beech Plain Road, and the widening/upgrade to this access road will result in 0.11 acre of fill to Wetland WMA-23. The preliminary plan entails providing a wetland replication area along the north side of this wetland just west of the access road.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

It is anticipated that the 0.11 acre of filled BVW will be mitigated by the replication of wetland in accordance with these criteria. For other wetlands that will be temporarily impacted and restored in-situ, the ground water and surface elevations of the restored wetland areas, along with the other physical/hydrologic

Tennessee will develop a comprehensive wetland replacement plan that includes the establishment of a native wetland community. The plan will also outline the requirements for annual monitoring for the presence of invasive species and methods to control and prevent the establishment of invasive species in the replacement area. Immediately following planting, any exposed soil within the replacement area will be stabilized to prevent soil erosion.

All wetland mitigation will be provided in a manner consistent with the performance standards for all other resource areas. Again, this is accomplished by the proposed in-situ restoration approach for impacted wetlands.

NHESP has determined that some components of the Project are located within mapped habitat for wood turtle, sedge wren, umber shadowdragon and American bittern. Tennessee is in continuing consultation with NHESP, and NHESP has indicated that the proposed construction methods and avoidance techniques appear adequate to avoid a "Take" to any of the four identified species.

7.1.3 Land Under Waterbodies and Waterways

The Project is designed and will be constructed to meet the performance standards for 310 CR 10.56(3). The Project will not result in permanent impacts to watercourses. One existing culvert, associated with stream SMA-14, will be removed resulting in restored land under waterbodies based on Massachusetts Stream Crossing Standards. All proposed stream crossings with discernible flow at the time of the crossing will be completed using a dry crossing method as discussed previously in this DEIR. No permanent impacts will occur as a result of these crossings and all LUWW and bank will be restored to pre-crossing conditions.

Only clean fills, if required, for the Project and best management practices will be installed and maintained to prevent sedimentation to any water courses during construction. As such, groundwater and surface water quality will be maintained. Erosion control measures will be installed to prevent sedimentation of any adjacent wetlands and watercourses.

The Project will not result in any permanent impacts to streams or LUWW and will restore all such resources to pre-existing conditions. The existing culvert in SMA-14 will be removed, daylighting the stream and providing additional habitat for any fish present in the stream.

The Project will result in a direct impact to only 615 square feet of LUWW, which is well below the threshold of impacts to this resource area deemed to impair the capacity to provide important wildlife habitat functions. Despite this, the Project proposes to fully restore the LUWW conditions to those equivalent to the pre-construction conditions. Accordingly, it is not anticipated that there will be any significant impairment to the LUWW capacity to provide important wildlife habitat functions.

Lower Spectacle Pond, the proposed water source for hydrostatic testing, is within estimated and priority habitat for the umber shadowdragon. Tennessee is in continuing consultation with NHESP, and has implemented a design for testwater withdrawal that minimizes the potential for any adverse effect on this rare species. Accordingly, it is anticipated that this activity will not result in a "Take". Therefore, this standard will be met.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

7.1.4 Inland Bank

The Project is designed and constructed to meet the performance standards for 10.54(3). The Project will result in the removal of culverts currently spanning Lower Spectacle Pond Brook. Removal of the culverts will restore bank resources along this stretch of the Brook. In addition, all of the proposed stream crossings will be temporary in nature and any impacts to the associated bank will be restored to pre-existing conditions once the crossing is complete. In areas where the existing bank is experiencing erosion, the restoration methods will stabilize the bank to a degree comparable to current conditions.

All stream crossings will be temporary and restoration will return these areas to pre-existing conditions once construction is complete. At the stream crossing locations, erosion control measures will be installed to prevent sedimentation of the adjacent wetland and watercourse.

The Project will result in a direct impact to only 120 linear feet of Bank, which is over the threshold of impacts to this resource area deemed to impair the capacity to provide important wildlife habitat functions. Despite this, the Project proposes to substantially restore the Bank conditions to that equivalent to the pre-construction conditions. Accordingly, it is not anticipated that there will be any significant impairment to the Bank capacity to provide important wildlife habitat functions.

NHESP has determined that some components of the Project are located within mapped habitat for wood turtle, sedge wren, umber shadowdragon and American bittern. Tennessee is in continuing consultation with NHESP. NHESP has indicated that the proposed construction methods and avoidance techniques are adequate to avoid a "Take" to any of the four identified species. Therefore, this performance measure will be met.

7.1.5 Riverfront Area

Proposed work within RFA will either be in compliance with performance standards for all other resource areas, as described throughout this Section of the DEIR, or is allowed pursuant to the Limited Project provisions of 310 CMR 10.53.

NHESP has determined that some components of the Project are located within mapped habitat for wood turtle, sedge wren, umber shadowdragon and American bittern. Tennessee is in continuing consultation with NHESP and believes the proposed construction methods and avoidance techniques are adequate to avoid a "Take" to any of the four identified species.

7.1.6 Bordering Land Subject to Flooding

No permanent impacts to BLSF will occur as a result of the Project and no loss of flood storage volume will occur. Therefore, the performance standards will be met.

All work in vegetated wetlands has been assessed as work in BVWs, which have comparable or more stringent performance standards than ILSF resource areas. Accordingly, should any of the wetland areas actually consist of ILSF, there will be no impairment of the ILSF functions, and restoration of the wetland conditions as proposed herein will meet the above performance standards.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

7.1.7 Compliance with the Massachusetts Stormwater Policy

This section summarizes the Project design in relation to the ten Stormwater Management Standards under the MassDEP Stormwater Management Policy and local bylaws. No new impervious areas are proposed, so no new untreated stormwater discharges will occur.

Standard 1: The Project will not result in any new stormwater point source discharge of untreated stormwater into, or causing erosion to, wetlands and waters.

Standard 2: Post-development discharge rates will not exceed pre-development rates.

Standard 3: This Project will not result in an increase in impervious area and no groundwater recharge alteration will occur.

Standard 4: The Project will not result in an increase in impervious area and therefore does not require TSS removal facilities.

Standard 5: This Project does not contain land uses with higher potential pollutants as described in MassDEP's Stormwater Management Policy.

Standard 6: This Project will not result in any new point source discharges and will not, therefore, discharge to or affect a critical area.

Standard 7: This Project will not result in new impervious areas or point source discharges and therefore, Standards 1, 2, 3, 4, 5, 6, 7, 9, and 10 are mainly not applicable.

Compliance with Standard 8 is discussed below.

Standard 8: Appropriate erosion and sedimentation controls for construction and land disturbance activities will be incorporated into the Project design.

Standard 9: Not applicable. No management systems as part of the Project.

Standard 10: No illicit discharges to a stormwater management system will occur.

7.2 MASSACHUSETTS PUBLIC WATERFRONT ACT

The Project is not subject to licensing under the Massachusetts Public Waterfront Act regulations (a.k.a. "Chapter 91" - 310 CMR 9.00, Waterways Regulations), as it does not involve the construction of new pipelines that cross an Area Subject to Jurisdiction per 310 CMR 9.04(1)(b), nor construction within "any non-tidal river or stream on which public funds have been expended for stream clearance, channel improvement, or any form of flood control or prevention work…," (310 CMR 9.04(1)(e)).

7.3 WATER QUALITY CERTIFICATION

Section 401 of the federal Clean Water Act and 314 CMR 9.00 require that construction and operation is in compliance with the Massachusetts Water Quality Standards at 314 CMR 4.00. Much of the same information reviewed under the Wetlands Protection Act is independently reviewed during this process. The alternatives analysis that will be included in the Section 401 application will include the alternatives analyses in Section 3.0 "Project Alternatives" in this DEIR.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Section 3.0 of this DEIR provides a comprehensive analysis of alternatives considered to achieve the overall goal of the Project as well as specific alternatives considered to avoid impacts to wetlands, surface waters, and DCR property. All practicable measures have been taken to avoid and minimize impacts to these resource areas.

The Project will result in the "loss" (i.e., filling) of only 0.11 acres of wetland, although more than one acre of wetland/water area will be impacted and restored as part of the Project. As described in the alternatives section (Section 3.0) of this DEIR, it is not practicable to obtain new pipeline ROW to achieve the overall Project purpose, and such a requirement would clearly result in substantially greater impacts to wetlands and other resources. All practicable measures have been taken to avoid and minimize impacts to these resource areas.

All practicable measures have been taken to avoid or minimize adverse impacts to wetland resource areas.

No certified vernal pools with be impacted by the construction or operation of the Project. The Project will result in temporary impacts to three potential vernal pools along the Project alignment during construction. During operation of the pipeline, one potential vernal pool with be impacted minimally (25 square feet) but the pre and post construction vegetative cover type will not change; this area of the potential vernal pool is already PEM.

7.4 MASSACHUSETTS ENDANGERED SPECIES ACT

As detailed in Sections 4.1.3, 5.1.1.6, and 6.1.3, Tennessee is consulting closely with the NHESP to avoid impacts to listed species and their habitat. Tennessee will present any additional correspondence or plans in the FEIR.

7.5 ARCHAEOLOGICAL AND HISTORIC PRESERVATION

Tennessee will be seeking approval and comments from various federal, state, and local entities. The primary Project approval at the federal level is a Certificate from the Commission. Consequently, the Project is being reviewed under Section 106 of the National Historic Preservation Act ("NHPA") of 1966, as amended. Prior to authorizing an undertaking (e.g., the issuance of an approval or certificate by a federal agency), Section 106 of the NHPA requires federal agencies to take into account the effect of that undertaking on historic properties listed or eligible for listing in the National Register of Historic Places ("National Register") and afford the Advisory Council on Historic Preservation an opportunity to comment on the undertaking. The Section 106 process is coordinated at the state level with the State Historic Preservation Office ("SHPO"), represented in Massachusetts by Massachusetts Historical Commission ("Massachusetts SHPO"). The Commission, as the lead federal agency, must consult with the Massachusetts SHPO regarding the effects of the Project on historic properties.

The primary goals of cultural resource investigations conducted as part of the Section 106 review are to:

- locate, document, and evaluate buildings, structures, objects, landscapes, and archaeological sites that are listed, or eligible for listing, in the National Register;
- assess potential effects of the Project on those resources; and
- provide recommendations for subsequent treatment, if necessary, to assist in complying with Section 106.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

In addition to Section 106, the cultural resources investigation was conducted in accordance with the Commission's Office of Energy Project's *Guidelines for Reporting on Cultural Resources Investigations* (2002); the Secretary of the Interior's *Standards and Guidelines for Archeology and Historic Preservation* (48 Fed. Reg. 44716-42, Sept. 29, 1983); Section 380.3 of the FERC's regulations, 18 CFR § 380.3 (2014); the guidelines set forth in Massachusetts SHPO's *Public Planning and Environmental Review: Archaeology and Historic Preservation* (1985).

Tennessee commissioned PAL to complete the archaeological surveys for the Project. Results of the surveys in Connecticut and Massachusetts are discussed further below.

7.5.1.1 Summary of Results

The archaeological survey resulted in the identification of three archaeological deposits in Massachusetts. The three archaeological sites in Massachusetts have already been recommended by the SHPO as potentially eligible for listing in the National Register: the G. Dunham Foundation Site (SAN-2), the Dunham Site (19-BK-173), and the Allen Foundation Site (SAN-3).

Historic architectural properties overview and identification survey technical memoranda have been submitted to the Connecticut and Massachusetts SHPOs and other consulting parties. No historic architectural properties that are listed in the National Register are located within the APE for the Project. A total of 14 properties that are potentially eligible for listing were identified during the historic architectural properties overview and identification surveys within the established study area. The effects assessments performed as part of the surveys indicates that the Project will have no adverse effect on the 14 identified properties that are potentially eligible for listing in the National Register.

7.6 GREENHOUSE GAS EMISSIONS POLICY

Upon review of the submitted Expanded Environmental Notification Form, the Executive Office of Energy and Environmental Affairs (EOEEA) requested that a GHG Emissions Policy and Protocol (Policy, last revised May 5, 2010) be provided. The Policy was established in accordance with the Massachusetts Environment Policy Act (MEPA). The purpose of the Policy is to inform the MEPA office of the quantity of GHG associated with proposed projects, by assessing the project baseline, considering where alternatives are available, and evaluating the feasibility and impact of performing the alternatives. The Policy applies to new projects which file an Environmental Notification Form which initiates MEPA review after the May 5, 2010 effective date of the revised Policy.

A GHG Analysis was performed and documented in accordance with the Policy. GHG emissions were calculated for the Project baseline assuming standard practices. Alternative methodologies that could reduce GHG emissions were also evaluated for their applicability and plausibility. Those alternative methods that could be practically applied were chosen and new GHG emissions (if applicable) were determined assuming these mitigation options. The detailed GHG Analysis is in Appendix K.

7.7 FEDERAL PROGRAMS

In addition to the Commission, two federal agencies have permit authority over the Project; the USACE pursuant to Section 404 of the Clean Water Act, and the U. S. Environmental Protection Agency (EPA) through the National Pollutant Discharge Elimination System (NPDES) regulations (stormwater and

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

hydrostatic testwater discharges). Further information of federal programs is detailed in the following subsections.

7.7.1 Federal Energy Regulatory Commission

The Project will require issuance of a Certificate from the Commission. Tennessee has requested that the Commission issue a certificate finding that the Project is in the public convenience and necessity pursuant to Section 7(c) of the NGA. A certificate order would authorize Tennessee to construct, install, operate, and maintain the Project facilities as proposed in the certificate application. Tennessee submitted the certificate application to the Commission on July 31, 2014, in Docket No. CP14-529-000, including a complete Environmental Report prepared pursuant to NEPA and Commission regulations and all other required documentation for the Project.

7.7.2 US Army Corps of Engineers

The Project will require an Individual Permit from the USACE for activities within federal wetlands as defined by Section 404 of the Clean Water Act. Section 404 of the Clean Waters Act established a permit program to regulate the discharge of dredged or fill material into waters of the United States, as well as discharges of dredged or fill material into wetlands adjacent to national waters. Tennessee submitted an application for an Individual Permit to the USACE on July 31, 2014. One component of the permit application package is the development of a preliminary mitigation (compensation) strategy for impacts to federal wetlands and watercourses. A draft CMP is included in Appendix D of this DEIR. The alternatives analysis that was included in the Section 404 application is similar to the alternatives analysis that is supplied in Section 3.0 of this DEIR. Tennessee is continuing to work with the USACE to develop a final mitigation program to mitigate for all of the Project impacts.

7.7.3 EPA

The NPDES program in Massachusetts requires that any construction project that will disturb one or more acres of land and will discharge storm water (or dewatering discharges) from the site into municipal separate storm water system or into waters of the U.S. must first seek coverage under and comply with EPA's Stormwater General Permit. In addition, the NPDES program also requires hydrostatic testing of pipelines must seek coverage under and comply with EPA's Remediation General Permit.

The NPDES General Permit requirements involve:

(1) the filing of a Notice of Intent (NOI) that identifies the general operator of the site and provides information on the site itself,

(2) the development and implementation of a SWPPP with appropriate BMPs to minimize discharge of pollutants from the site, and

(3) the submittal of a Notice of Termination (NOT) when the site has achieved final stabilization or stormwater is no longer being discharged.

Inspections and erosion control methods will be detailed in the SWPPP prior to the start of construction. Tennessee will provide the EPA with the required NOI, SWPPP and the NOT, as appropriate once a contractor(s) has been selected for the Project.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

The NPDES Remediation General Permit for hydrostatic testwater discharge requirements involve a discharge sampling and monitoring program that includes at least six (6) representative grab samples collected during hydrostatic testing which involves:

- the collection of one (1) sample of the fill (source) water during the first 10%;
- one (1) sample collected during the last 10% of the fill segment time;
- two (2) samples collected during the in-process phase; and
- one (1) sample collected during the last 10% of discharge.

The samples collected during the in-process phase will be analyzed and evaluated prior to discharge and prior to the combination with wastewaters of any type. If the in-process sample analysis demonstrates that the water quality is not consistent with the effluent limits established in the permit, the operator will not discharge the effluent prior to treatment.

7.8 LOCAL PROGRAMS

The Massachusetts Wetlands Protection Act, requires Tennessee to file Notices of Intent with the local Conservation Commissions. These NOIs are anticipated to be filed with the local Conservation Commissions in the winter of 2014/2015.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

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20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

8.0 RESPONSE TO COMMENTS

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

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20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

dcr
Massachusetts

July 3, 2014

Secretary Maeve Vallely Bartlett
Executive Office of Energy and Environmental Affairs
Attn: Alex Strysky, MEPA Office
100 Cambridge Street, Suite 900
Boston, Massachusetts 02114

Re: EOEEA #15205 Connecticut Expansion Project

Dear Secretary Bartlett:

The Department of Conservation and Recreation ("DCR" or "Department") is pleased to submit the following comments in response to the Expanded Environmental Notification Form ("EENF") submitted by Tennessee Gas Pipeline Company ("the Proponent") for the Connecticut Expansion Project (the "Project").

As described in the EENF, the Project proposes to construct 3.8 miles of new 36-inch outside diameter pipeline between Town Hill Road and South Beech Plain Road in Sandisfield, and 0.11 miles of 24-inch pipeline in Agawam. The Proponent currently operate a pipeline adjacent to the Project corridor that is contained within an easement of variable widths. Associated infrastructure to support the pipeline includes construction of two pig launchers, one pig receiver, a relocated mainline valve, and five access roads. The Project exceeds triggers for filing of a mandatory Environmental Impact Report ("EIR") due to acreage of land alteration and wetland impacts; however, the Proponent is requesting a waiver from the EIR requirement.

A 2.3-mile portion of the proposed Route between Town Hill and Cold Spring Roads, and three proposed access roads are located on a newly acquired parcel known as Spectacle Pond Farm, which is part of DCR's Otis State Forest. The Proponent is seeking acquisition of a new permanent 35-foot wide easement within the State Forest, totaling six acres in area. The new easement request triggers a disposition of Article 97 lands. A new pig launcher is proposed on DCR property near Town Hill Road, and an existing mainline valve is proposed to be relocated from DCR property. As part of pipeline testing after construction, approximately 1,025,100 gallons of water is proposed to be pumped out of Lower Spectacle Pond, a Great Pond surrounded by DCR property. This water will be held in the pipeline for eight hours and then discharged within an existing permanent easement on DCR property. A DCR Construction and Access Permit will be required. In total, approximately 30.2 acres of DCR lands are proposed to be altered, including the six acres of permanent easement, 7.2 acres within the existing easement, and 17 acres of impacts deemed to be temporary.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

DCR submits the following comments related to our requests for additional information on Project impacts to Article 97 lands. DCR requests that an EIR be required for the Project so alternatives to avoid or minimize project impacts are investigated and described, and if project impacts are unavoidable, a commensurate mitigation package is developed.

Spectacle Pond Farm

In 2007, the Commonwealth purchased 904 acres of land around Lower Spectacle Pond known as Spectacle Pond Farm. More than 15 years ago, DCR identified Spectacle Pond Farm as one of the most significant land protection opportunities remaining in the state. Working in partnership with Mass Audubon, DCR acquired this spectacular property, which includes a variety of important habitats, rare plant and animal species, historic mill sites, old growth forest, frontage along the Clam River, and Lower Spectacle Pond. The property links DCR's Otis State Forest to the Clam River Flood Control Area, and was the central missing puzzle piece to connecting more than 8,500 acres of protected open space. Portions of the Property include BioMap Core Habitat for numerous species of turtles and dragonflies, adding significance to the habitat values. The property is crucial for maintaining ecological functions and values and provides a wide variety of plant and wildlife habitats that are important for supporting local biodiversity and protecting nearby rare species habitats and priority resources. Spectacle Pond Farm contains extensive mature forest that is characterized by important natural features, intact natural communities, and habitats that include many large bedrock outcrops, large cavity trees, forested wetlands, streams, seeps and springs. In addition to its high conservation value, the property provides opportunities for a variety of recreational activities including hiking, canoeing, kayaking, snowmobiling, cross-country skiing, fishing, and hunting.

Article 97

The Proponent's request for a permanent easement would entail a disposition of state land protected by Article 97 of the Amendments to the Massachusetts Constitution. Such a disposition requires approval by a 2/3 vote of the legislature, and compliance with the Division of Capital Asset Management's ("DCAM") disposition process, as well as the requirements set forth in the Executive Office of Energy and Environmental Affairs ("EOEEA") Article 97 Land Disposition Policy. The Article 97 Policy has a stated goal of ensuring No Net Loss of public conservation lands under the ownership and control of the Commonwealth. The policy states as a general principle that EOEEA and its agencies shall not sell, transfer or otherwise dispose of any right or interest in Article 97 lands. Transfer of ownership or interests in DCR-managed land may only occur under exceptional circumstances.

G-1 DCR requests that the scope for the EIR include a specific section to address how the proposal meets all Article 97 disposition criteria, including no net loss and avoiding or minimizing impacts to Article 97 lands. As part of the Article 97 analysis, DCR requests that the Proponent more thoroughly describe alternatives to this Project, including a no-build alternative as well as an alternative that avoids DCR property.

G-2 In addition, DCR requests that the Proponent provide a clear explanation as to why new easement area is needed between stations 17+35 and 71+46 when space appears to be available with the existing easement. Based on the information provided to date, DCR notes that it appears that this alignment change will result in more clearing of mature forestland, and requires additional new easements of state lands where an alternative may exist.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

G-3 As the Proponent continues its field work, the Department requests that the Proponent stake the requested new easement areas, as well as temporary work areas in the field so DCR can adequately assess Project impacts. DCR notes that clear-cutting; blasting, grading, trenching, and compaction of DCR lands will change the habitat types, functions and values, and affect biodiversity on this conservation land.

Stream and Riverfront Area Impacts

Two perennial streams have been identified to be crossed on DCR property with a few options presented for crossing methods. All streams within the Project area are tributaries to the Clam River and are very important to coldwater fisheries and wildlife. Any temporary or permanent impacts to Land Under Water and to the Banks and riparian buffers should be avoided to the maximum extent possible. In the DEIR, DCR recommends that the Proponent specify the proposed methodology for each stream crossing. DCR

G-4 requests that in the DEIR the Proponent evaluate potentially using directional drilling for crossing of perennial streams, in particular the stream shown at SMA 14 and 15 on the Project plans.

Coldwater fisheries are highly sensitive to disturbance that may cause siltation, water temperature increases, changes in hydrology, and loss of forested riparian habitats. Corroding metal flume pipes, intended for temporary crossings during a previous project by the Proponent, have been left in one of these streams currently impacting stream functions and habitat quality. DCR recommends these pipes be

G-5 removed by hand as quickly as possible and temporary bridges be installed when the stream must be crossed for maintenance activities. DCR requests an update on this request in the Proponent's EIR.

DCR notes that Riverfront Areas along perennial streams are critically important to protect the water quality, aquatic and terrestrial habitat potential, and continued integrity of the stream banks. Riverfront Area impacts for this Project have not been described in the narrative in the EENF, but they pose a serious concern, as they total 2.85 acres of clearing according to Table B-4. In its DEIR, DCR requests that the Proponent provide a map that shows Riverfront Areas proposed to be altered on DCR property. DCR

G-6 notes that these impacts are important to quantify as tree clearing of forest within riparian areas causes degradation of the Riverfront Area corridor and of the aquatic characteristics of the stream that it protects.

Construction Impacts

Our initial assessment of the areas to be impacted on DCR property raises serious concerns about the feasibility of constructing portions of this Project without causing extensive environmental damage that will extend and expand these impacts onto adjacent and downgradient sensitive resources.

The majority of the DCR-owned areas to be altered are characterized by extensive bedrock outcrops and large boulders that will need to be moved and/or blasted in order to install this new pipeline. Many of these rock features and outcrops are partially vegetated, and provide important habitats for plants and

G-7 wildlife. In its DEIR, DCR requests that the Proponent identify particular areas on DCR property where the use of blasting is likely to be necessary, and articulate likely impacts to natural and cultural resources that will result from blasting.

DCR notes that clear-cutting, soil disturbance, and trenching of the extremely steep slopes within the Project area pose serious risks for erosion and sedimentation of nearby wetlands and streams. Existing access roads will require widening and tree clearing to accommodate the large construction equipment.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Stormwater runoff from these roads poses a risk to the water quality in adjacent wetlands and streams that are important for coldwater fisheries and wildlife. In its DEIR, DCR requests that the Proponent clearly
G-8 identify any and all alternatives to minimize potential erosion and sedimentation impacts on DCR property.

Based on the information provided in the EENF, DCR notes it is unclear how the pig launcher proposed for DCR property will be installed, and how the existing mainline valve currently located on DCR will be removed. DCR requests that the Proponent provide construction details on these proposed activities, including a map showing their locations and the existing easement, plans for restoration and treatment of these areas, and information on impacts to land and resources.

Wetland Impacts

DCR notes that wetlands, streams and springs in the Project areas are important for the protection of groundwater quality, storm damage prevention, flood control, pollution prevention, wildlife habitat, and coldwater fisheries. Although the EENF filing states that the wetlands will be restored after construction, wetlands and springs will be forever changed by impacts to the soils, subtle hydrologic alterations, plant composition, habitat structure, and function. DCR notes that wetlands within the existing easement have not been adequately protected from continuing disturbance from vehicles and the establishment and increase of invasive plants. Vehicles driving through the wetlands not only compact the soils and cause direct mortality to wildlife and plants, but they affect the hydrology of the wetland. In the wetlands
G-9 section within the DEIR, DCR requests the Proponent include details regarding proposed wetland monitoring and structural maintenance post-construction.

The EENF notes that a certified vernal pool is close to the Project site but states the Project will have no impacts to this vernal pool. DCR requests the Proponent include the location of this certified vernal pool on a plan that clearly depicts the limits of nearby work areas. It appears that potential vernal pools have yet to be adequately assessed for potential impacts from this Project. Amphibians that breed in nearby vernal pools need acres of mature upland forest habitat to survive. Proposed impact areas are characterized by intact and mature forested habitat that will be further fragmented with many acres of
G-10 forest to be cleared for this Project. DCR requests that the Proponent assess and describe all Potential Vernal Pools in its EIR, adding the extent of associated wildlife breeding and terrestrial habitats.

G-11 DCR requests that the Proponent flag existing wetland resources found on the Spectacle Pond Farm site so the Department can adequately assess potential impacts in the field. Acres of forested wetlands and groundwater seeps within the Project site will be impacted during construction, degrading soil structure and texture and affecting water quality, habitat structure, function, and use by wildlife. DCR requests
G-12 that the Proponent expand the alternatives analysis to avoid and minimize impacts to forested wetlands, seeps and springs and that specific BMP's and restoration methodology be identified and described that will minimize long term impacts to these sensitive natural resources.

Invasive Plant Species

DCR notes invasive plants are currently an issue in this portion of the pipeline easement, including extensive stands of *Phragmites*. The construction equipment and the soil disturbance associated with this Project will likely encourage the spread of these invasives to new areas of impact, further degrading

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

disturbed areas. DCR requests that the Proponent include an invasive species monitoring and control plan
G-13 in its EIR that describes control methods, detection, and monitoring procedures that will be used to control and prevent the spread of invasive plant species both during construction and post-construction on the existing and proposed ROW.

Temporary Workspaces

DCR requests additional information on the difference between areas identified as "Temporary
G-14 Workspace" and "Additional Temporary Workspace." The Proponent should clarify the difference between these two types of areas on DCR property; map the two types of areas as planned on DCR property, distinguishing between previously disturbed land and currently undisturbed land, and quantifying areas in square feet; and describe what the areas will be used for and the process and timing for restoration. DCR also requests that the Proponent, in its EIR, provide specific re-vegetation and stabilization plans for these areas on DCR property post-construction.

DCR notes that the EENF categorizes new access roads as temporary workspace. In its EIR, DCR
G-15 requests that the Proponent clarify the proposed use and maintenance of the roads, and clarify whether or not these roads will be used for permanent access for pipeline maintenance.

Hydrostatic Testing

The Proponent proposes to withdraw approximately 1,025,100 gallons of water from Spectacle Pond.
G-16 The water will be discharged within the existing easement on DCR property. DCR requests detailed information on the dewatering facility and the process that will be used to ensure that no siltation or erosion will occur that would negatively impact downgradient historic and natural resources including the Clam River, the historic mills located downstream, and the old growth forest located downgradient of the pipeline right of way.

Off Highway Vehicle Use

DCR notes that Off Highway Vehicle ("OHV") use is a management issue along utility corridors on Department property. In its EIR, DCR requests that the Proponent be required to provide a proposal, displayed on a map, to prevent OHV use along the pipeline corridor and its access roads.

Cultural Resources

An archaeological survey was conducted for the Connecticut Expansion Project at Otis State Forest between Cold Spring Road and Town Hill Road. The goal of the archaeological survey was to locate and identify any archaeological deposits potentially eligible for listing on the National Register of Historic Places within the project's Area of Potential Effect ("APE"). During an intensive survey for the Tennessee Gas Eastern Express Gas Pipeline in 1999, a dry-laid stone house foundation associated with G. Dunham ca. 1770-1900, was located near the pipeline corridor. In addition, at this site, a projectile point, diagnostic of the late Archaic Period (ca. 6000- 3000 Before Present) was recovered and given a site number.

An intensive survey conducted by Public Archaeology Lab, Inc. in November 2013 found cultural resources associated with the G. Dunham Foundation Site (MHC#SAN-2). No pre-contact cultural material was identified in any of the subsurface testing in this area.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

G-17 DCR requests that in its EIR, the Proponent clearly map all stone walls on Department property. The existing plans do not distinguish between large boulders piled along the edge of the existing ROW and actual stone walls.

Thank you for the opportunity to comment on the EENF. If you have questions related to Article 97, please contact Jennifer Howard at 413-586-8706 ext. 18 or Jennifer.howard@state.ma.us. Please contact Nancy Putnam at 617-626-1394 or nancy.putnam@state.ma.us for environmental questions. Questions related to cultural resources can be directed to Ellen Berkland at 617-626-1377 or ellen.berkland@state.ma.us.

Sincerely,

John P. Murray
Commissioner

cc: Paul Adams, Andy Backman, Ellen Berkland, Jennifer Howard, Bob Mellace, Joe Orfant, Nancy Putman, Nat Tipton (DCR)
Mark Gardella, AECOM
Susan Lacey, Tennessee Gas Pipeline Co.

TABLE 8-1
RESPONSE TO COMMENTS FROM DEPARTMENT OF CONSERVATION AND RECREATION (7/3/2014)

Comment Number	Comments	Responses	DEIR Section
G-1	DCR requests that the scope for the EIR include specific section to address how the proposal meets all Article 97 disposition criteria, including no net loss and avoiding or minimizing impacts to Article 97 lands.	The DEIR includes an evaluation of the Article 97 Easement that is needed for the Project, including analysis for avoiding Article 97 lands, minimizing impacts and mitigating impacts. Please see Section 2.7.	Section 2.7
G-2	DCR requests proponent more thoroughly describe alternative to the project, provide clear explanation as to why new easement area is needed between stations 17+35 and 71+46 when space appears to be available with the existing easement.	The referenced stationing does not coincide with DCR property; however, new easement is required adjacent to the existing easement to maintain a 25-foot separation from the existing pipeline to safely construct the new pipeline. Therefore, Tennessee needs to acquire new easement to install the new pipeline. A detailed analysis of alternatives, including alternatives to avoid DCR property have been provided in the DEIR.	Section 3.0
G-3	DCR requests staking of new easement areas, temporary work areas in the field.	Tennessee provided GIS shape files of the construction workspace and wetlands for use by DCR to evaluate the impacts from the project on DCR property during site walkovers with Tennessee. Prior to commencement of any clearing activities, the ROW boundaries (e.g., workspace limits) will be clearly delineated to ensure that no clearing occurs beyond these boundaries.	Section 2.3.1.1
G-4	DCR requests that in the DEIR the Proponent evaluate potentially using directional drilling for crossing of perennial streams, in particular the streams shown as SMA 14 and 15 on the Project plans.	Tennessee has evaluated the potential use of HDD to cross SMA-14 and SMA-15. A detailed discussion of this alternative is provided in Section 3.3.1.3.	Section 3.3.1.3

TABLE 8-1
RESPONSE TO COMMENTS FROM DEPARTMENT OF CONSERVATION AND RECREATION (7/3/2014)

Comment Number	Comments	Responses	DEIR Section
G-5	DCR recommends replacement of metal pipes (intended for temporary crossings during previous project) be removed by hand as quickly as possible and temporary bridges be installed when the stream must be crossed. DCR requests an update on this in the EIR.	Culverts associated with stream SMA-14 will be removed resulting in restored land under waterbodies based on Massachusetts Stream Crossing Standards. Tennessee treats each stream crossing as an independent construction activity and will install equipment bridges across streams and complete the crossing including placement and removal of culverts and restoration of the stream banks either within 24 or 48 hours depending on the width of the stream in compliance with FERC Plan and Procedures.	
G-6	Mapping include Riverfront Area proposed to be altered on DCR property.	Resource area mapping, including Riverfront Area has been provided in the DEIR.	Appendix D and Section 5.1.1.3

TABLE 8-1
RESPONSE TO COMMENTS FROM DEPARTMENT OF CONSERVATION AND RECREATION (7/3/2014)

Comment Number	Comments	Responses	DEIR Section
G-7	Identify areas on DCR property where the use of blasting is likely to be necessary, and articulate likely impacts to natural and cultural resources that will result from blasting.	The USDA-NRCS Web Soil Survey for Berkshire County, Massachusetts identified possible areas of shallow depth to bedrock from MP 0.02-0.25 and MP 1.80-2.19 along the Massachusetts Loop. Shallow depth to bedrock figures along the Project alignment have been provided in Appendix J. On September 12, 2014 Tennessee walked the ROW with DCR and geologists and hydrogeologists from Haley & Aldrich and identified areas along the alignment where blasting may occur. However, a complete list of blasting locations can only be accurately determined in the field during the construction process. If blasting is necessary, Tennessee will obtain state and municipal approvals associated with proposed blasting prior to the commencement of construction. A Blasting Plan has been provided in Appendix F.	Appendix J, Appendix F, and Sections 2.3.2.6, 5.2.1.1, and 6.2.1.1.

TABLE 8-1
RESPONSE TO COMMENTS FROM DEPARTMENT OF CONSERVATION AND RECREATION (7/3/2014)

Comment Number	Comments	Responses	DEIR Section
G-8	Identify any and all alternatives to minimize potential erosion and sedimentation impacts on DCR property.	Erosion and sedimentation impacts will be avoided with a number of BMPs identified in Tennessee Best Management Practices and Erosion Control Drawings in Appendix E, and FERC's Upland Erosion Control, Revegetation and Maintenance Plan in Appendix E. In addition, Section 6.0 describes temporary soil erosion and sediment control measures that will be installed along the proposed construction ROW, ATWS areas, access roads, wetlands, and other work areas. Measures will be taken to minimize the free flow of water into the trench and through the trench into waterbodies. The construction corridor will be protected through the implementation of erosion control measures including site specific contouring, permanent slope breakers, mulching, and reseeding or sodding with soil-holding vegetation. Other areas to be protected include areas of rugged topography and steep slopes and specific restoration measure to minimize potential erosion and sedimentation control problems.	Section 6.0 and Appendix E.

TABLE 8-1
RESPONSE TO COMMENTS FROM DEPARTMENT OF CONSERVATION AND RECREATION (7/3/2014)

Comment Number	Comments	Responses	DEIR Section
G-9	DCR requests details regarding proposed wetland monitoring and structural maintenance post-construction.	Tennessee has developed a draft compensatory mitigation plan and has provided the plan in Appendix D of the DEIR. Tennessee anticipates that following the construction phase of restoration, a monitoring program would be established, typically for a period of three-five years after restoration. The details of this program would be determined during final design, but would likely include semi-annual or annual inspections of the replanted vegetation during the growing season, as well as annual inspections of the vernal pools in the spring during the monitoring period. The program would also include an invasive species monitoring and control plan (see Appendix D).	Section 6.0 and Appendix D
G-10	Assess and describe all potential vernal pools in the EIR.	Field surveys were conducting during the 2014 breeding season along the Project alignment and a Vernal Pool Report describing the findings is provided in Appendix K. Additional information on the vernal pool surveys, results of the surveys, proposed impacts and mitigation are provided in the DEIR.	Appendix K and Sections 4.1.2, 5.1.1.5, and 6.1.2
G-11	DCR requests flagging of existing wetland resources found on the Spectacle Pond Farm site so the Department can adequately assess potential impacts in the field.	Tennessee has met with DCR in the field and has provided the GIS shapefiles so the Department can adequately assess potential impacts in the field.	
G-12	Expand the alternatives analysis to avoid and minimize impacts to forested wetlands, seeps and springs and that specific BMP's and restoration methodology be identified and described that will minimize long term impacts to these sensitive natural resources.	Tennessee has developed a detailed analysis of alternatives and has provided this in the DEIR and also included detailed restoration methods following construction.	Section 3.0

TABLE 8-1
RESPONSE TO COMMENTS FROM DEPARTMENT OF CONSERVATION AND RECREATION (7/3/2014)

Comment Number	Comments	Responses	DEIR Section
G-13	Include an invasive species monitoring and control plan in the EIR that describes control methods, detection, and monitoring procedures that will be used to control and prevent the spread of invasive species during and post construction.	An invasive species plan has been provided in Appendix D.	Appendix D
G-14	Clarify the difference between Temporary Workspace and Additional Temporary Workspace, map the types on the plan, distinguishing between previously disturbed land and currently undisturbed land, quantifying areas in SF; describe what the areas will be used for and the process and timing for restoration.	A description of workspaces is provided in Section 1.2 and illustrated on Project mapping in Appendices B, E, and J. Additional permanent ROW will be required along with temporary workspace ("TWS") and additional temporary workspace ("ATWS") to facilitate construction of the pipeline. TWS is granted by FERC to safely construct the pipeline in addition to the new permanent easement, which comprises the construction workspace. ATWS is extra workspace in areas such as side slopes, crossovers, and road crossings where more workspace is needed in specific areas for spoil storage, equipment maneuvering and grading where FERC grants this "additional" space beyond the typical TWS and requires justification before approving and allowing Tennessee to use this extra workspace. Project mapping in the appendices and the site specific permit drawings provide details on the types of workspace and the proposed impacts. Upon completion of construction, topsoil, contour elevations and hydrologic patterns will be restored in all wetland areas, and disturbed areas will be reseeded or replanted to promote the re-establishment of native hydrophytic vegetation and substantial restoration of	Sections 1.0, 5.0 and Appendices B, E, and J

TABLE 8-1
RESPONSE TO COMMENTS FROM DEPARTMENT OF CONSERVATION AND RECREATION (7/3/2014)

Comment Number	Comments	Responses	DEIR Section
		applicable wetland functions. All TWS and ATWS areas will be restored to pre-construction grades and contours, and reseeded and/or replanted during restoration activities. Impacts to wetlands to have been quantified and are provided in Section 5.0 of the DEIR.	
G-15	Clarify use and maintenance of the access roads (permanent).	Tennessee plans to utilize temporary and permanent access roads to facilitate installation of the facilities. All access roads designated for permanent use during construction and operation are listed in Table 2-5 by milepost. Site-specific designs of the access roads proposed for temporary and/or permanent use for the Project, detailing locations for road dimensions, pull-offs, and stormwater management facilities have been provided in Appendix B.	Section 2.2.2.4 and Appendix B
G-16	Detailed information on the dewatering facility and the process that will be used to ensure no siltation or erosion will occur would negatively impact downgradient historic and natural resources including Clam River, the historic mills, and old growth forest.	Tennessee proposes to implement construction practices designed to reduce and / or mitigate potential impacts on groundwater or surface water during construction as detailed within the Commission's Plans and Procedures and Tennessee's Construction BMPs. Tennessee and its contactors will adhere to these practices related to surface water and groundwater protection including specifications for trench breakers and dewatering as well as restrictions on refueling and storage of hazardous substances. The dewatering structure will consist of a double staked wide and high rows of hay bales in an enclosed square shaped basin that will disperse the velocity of the	Sections 2.3.1.15, 5.1.1.6.1, 6.1.3.1.2, and Appendix E

TABLE 8-1
RESPONSE TO COMMENTS FROM DEPARTMENT OF CONSERVATION AND RECREATION (7/3/2014)

Comment Number	Comments	Responses	DEIR Section
		testwater coming out of the pipe and serve as a level spreader to allow the discharge water to overland through well vegetated areas and infiltrate into the ground before reaching Spectacle Pond Brook further downstream from the alignment. The NPDES program in Massachusetts requires that any construction project that will disturb one or more acres of land and will discharge storm water (or dewatering discharges) from the site into municipal separate storm water system or into waters of the U.S. must first seek coverage under and comply with EPA's Stormwater General Permit. Any dewatering will be in accordance with the FERC Plan and Procedures and in accordance with all regulatory requirements and permit conditions. In addition, the NPDES program also requires hydrostatic testing of pipelines must seek coverage under and comply with EPA's Remediation General Permit.	
G-17	Map and clearly showing stone walls on DCR land.	Stone walls have been shown on the alignment sheets in Appendix B and on shallow depth to bedrock and stonewall Project mapping in Appendix J.	Appendix B and Appendix J

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Mass Audubon
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July 1, 2014

Secretary Maeve Vallely Bartlett
Executive Office of Energy and Environmental Affairs
Attn: MEPA Office, EEA #15205
100 Cambridge Street, Suite 900
Boston, MA 02114

Via Email: Alexander.Strysky@state.ma.us

Re: **EOEEA # 15205, Connecticut Expansion Project, Agawam, Sandisfield and Tyringham**

Dear Secretary Bartlett:

On behalf of Mass Audubon, I submit the following comments on the Expanded Environmental Notification Form (EENF) for this project. The project is proposed by Tennessee Gas Pipeline Company (a Kinder Morgan subsidiary) and involves construction of 3.8 miles of new 36-inch diameter pipeline. The project exceeds thresholds under the Massachusetts Environmental Policy Act (MEPA) triggering mandatory preparation of a full Environmental Impact Report (EIR). It will alter 58.8 acres of land, including 9.8 acres of wetlands.

The project also will traverse 1.9 miles within the Otis State Forest, impacting 30 acres of state-owned parklands including 6 acres on which the company does not presently hold an easement and proposes to obtain construction permission and an easement through the Article 97 disposition process. Mass Audubon assisted the Department of Conservation and Recreation (DCR) in protecting substantial areas of land at Otis State Forest, including areas around Lower Spectacle Pond that include an old growth hemlock forest stand, intact large blocks of forest, cold water fishery habitat, and other important natural resources. Mass Audubon transferred its interests in land affected by this project to the state with the understanding that the land would be permanently protected under Article 97. The Executive Office of Energy and Environmental Affairs (EEA) Article 97 Land Disposition Policy states that EEA may only consider supporting Article 97 dispositions when several conditions are met including: "the disposition of a parcel is not contrary to the express wishes of the person(s) who donated or sold the parcel or interests therein to the commonwealth." Mass Audubon objects to and opposes the proposed Article 97 disposition.

The EENF requests permission to submit only a Single EIR for this project. Given the lack of documentation on project need and alternatives, substantial proposed impacts, and lack of site-specific details on proposed construction impacts, Mass Audubon requests that a full Draft and Final EIR be required. We request that the scope for the EIR address the following comments.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Alternatives Analysis

B-1 The EENF states that the project is needed to serve increasing customer demand and prevent gas shortages, but no quantitative information is presented regarding the local gas customer demand vs. available supplies. No filing has been submitted to the Federal Energy Regulatory Commission (FERC) yet. The alternatives analysis does not consider the option of increasing energy efficiency in the customer base to reduce demand. It also does not evaluate the possibility of locating the pipeline, if needed, within Cold Spring Road or other roadways in the region.

Although this project is much smaller than the Northeast Expansion project that the company is also proposing to traverse the state from Richmond to Dracut, it is part of a larger picture where energy infrastructure projects are being proposed within a vacuum of public, transparent planning for meeting the commonwealth's energy needs. Mass Audubon's President, Henry Tepper, submitted a letter to Governor Patrick on April 18, 2014, requesting that he instruct the "Departments of Public Utilities (DPU) and Energy Resources (DOER) to undertake open and transparent processes to publicly examine energy supply needs and pursue options that will meet those needs with the least damaging environmental impact while advancing Massachusetts clean energy policy." We have yet to receive the courtesy of a response to that letter. (attached)

Mass Audubon requests that the scope for the EIR require further analysis of project need and alternatives.

Greenhouse Gas Emissions and Global Warming Solutions Act

Under the Global Warming Solutions Act, the commonwealth has established goals for reducing Greenhouse Gas (GHG) emissions by 25% by 2020 and 80% by 2050. A MEPA policy has been established for review of GHG emissions associated with projects requiring an EIR. In addition to
B-2 review of direct emissions associated with the project (i.e. production, distribution, and burning of the natural gas proposed to be transmitted through the new pipeline), the GHG effects of the proposed alteration of 58.8 acres of mostly forested lands should also be evaluated under the MEPA GHG policy. On average, an acre of upland forest in Massachusetts stores approximately 85 tons of carbon, and the amount of stored carbon is increasing annually. The proposed construction will remove existing carbon stores and significantly reduce the affected land's capacity for ongoing carbon sequestration for decades, even in portions where the impacts are described as "temporary."

It should also be noted that the EENF tries to have it both ways in regards to whether impacts are temporary or permanent. On page 3, it argues that the total impact of the project is less than the 58.8 acre footprint because 12.5 acres were previously disturbed by prior pipeline construction and maintenance. Yet other sections of the EENF state that impacts to wetlands and other resources will be temporary because most of the disturbed area will be restored and vegetation allowed to regrow. This ignores the decades-long temporal impact associated with pipeline construction and the likelihood that plant communities will never fully return to pre-construction conditions.

B-3 The GHG analysis should include evaluation of alternatives to reduce demand and consumption of gas and therefore the need for the proposed increased supply, including ramping up energy efficiency measures at homes and businesses in the company's service area.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Article 97 Impacts

The area around Lower Spectacle Pond at Otis State Forest was a top land protection priority for the commonwealth for decades. In 2007, Mass Audubon assisted the state in achieving its longstanding goal of protecting 900 acres around the pond by selling our undivided half interest in the land to DCR, with the understanding that the land would be permanently protected. This land is part of a spectacular landscape with large areas of unbroken forest supporting a wide array of plants and animals, coldwater fisheries, and nature-based recreation. It includes a rare stand of old growth hemlocks as well as historic sites associated with an old mill village along the Clam River. The proposed pipeline route runs close to these resources. Although there is an existing pipeline easement, the proposed expansion would significantly widen this scar across the land and fragment an otherwise largely intact natural area. Mass Audubon objects to the proposed Article 97 transfer of 6 acres of land for the proposed expanded pipeline easement and requests that alternatives be considered, including alternative routes.

B-4

Wetlands

The proposed project would traverse several wetlands and streams. Although the EENF describes typical pipeline construction methods and provides assurances that water quality and wetland resources will be protected and restored, the fact remains that the work will significantly and permanently alter these resources. Measures to identify and control invasive species are proposed to only be undertaken for five years, while the permanent opening created by the pipeline easement will present an ongoing susceptibility to establishment of invasive species. In addition to routine mowing and vegetation control, access by maintenance vehicles along the easement will continually disturb soils and present potential means of introducing and spreading invasives through seeds and propagules adhering to vehicles.

The area contains cold-water fisheries. Large areas of forested land are increasingly important for protecting these aquatic resources, particularly with the increasing stresses associated with climate change. Widening the permanent openings in the forest canopy along the easement will exacerbate its impacts on these sensitive resources. The EENF also notes that there is at least one vernal pool in close proximity to the proposed work. Amphibians that breed in vernal pools rely on substantial areas of surrounding forest for habitat throughout much of the year. The EIR should evaluate impacts of the project on both wetland and upland wildlife habitat.

B-5

Alternatives that avoid and reduce impacts to wetlands and waterways should be evaluated in detail in the EIR. If the project is allowed to proceed along any route affecting wetlands, additional off-site mitigation should be required in addition to on-site restoration.

Off-Road Vehicles

Utility corridors are frequently used illegally by all terrain vehicles (ATVs). The EENF describes a commitment to provide gates and signage, and to work on an ongoing basis with landowners to deter unauthorized access including by ATVs. However, there is no commitment made to work with local or state law enforcement authorities or to assist in the funding of chronically underfunded ATV enforcement programs. DCR does not have the capacity to effectively deter unauthorized ATV use on its properties, and the proposed expansion of this utility easement increases the likelihood of ATV enforcement problems at Otis State Forest.

B-6

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

B-7 In conclusion, Mass Audubon urges that serious consideration be given to alternatives that avoid the need for this pipeline or, if it is truly needed, that will re-route it outside of Otis State Forest and away from sensitive wetlands and pristine blocks of forest.

Sincerely,

E. Heidi Ricci

E. Heidi Ricci
Senior Policy Analyst

cc: Mark Gardella, AECOM
Commissioner Jack Murray, DCR
NHESP
Lealdon Langley, DEP

Mass Audubon works to protect the nature of Massachusetts for people and wildlife. Together with more than 100,000 members, we care for 35,000 acres of conservation land, provide school, camp, and other educational programs for 225,000 children and adults annually, and advocate for sound environmental policies at local, state, and federal levels. Founded in 1896 by two inspirational women who were committed to the protection of birds, Mass Audubon is now one of the largest and most prominent conservation organizations in New England. Today we are respected for our sound science, successful advocacy, and innovative approaches to connecting people and nature. Each year, our statewide network of wildlife sanctuaries welcomes nearly half a million visitors of all ages, abilities, and backgrounds and serves as the base for our work. To support these important efforts, call 800-AUDUBON (800-283-8266) or visit www.massaudubon.org.

Protecting the Nature of Massachusetts

TABLE 8-2
RESPONSE TO COMMENTS FROM MASS AUDUBON (7/1/2014)

Comment Number	Comments	Response	DEIR Section
B-1	The EENF states that the project is needed to serve increasing customer demand and prevent gas shortages, **but no quantitative information is presented regarding the local gas customer demand vs. available supplies. The alternatives analysis does not consider the option of increasing energy efficiency in the customer base to reduce demand. It also does not evaluate the possibility of locating the pipeline, if needed, within Cold Spring Road or other roadways in the region.** Mass Audubon requests that the scope for the EIR require further analysis of project need and alternatives.	Based on publicly available information, including information from filings made with the Federal Energy Regulatory Commission, it is Tennessee's understanding that these pipeline systems are at or near capacity (i.e., firm transportation capacity fully subscribed). A detailed analysis of alternatives, including consideration of a route utilizing area roadways, is provided in Section 3.0 of the DEIR.	Sections 1.1, 1.1.1 and 3.0
B-2	Under the Global Warming Solutions Act, the commonwealth has established goals for reducing Greenhouse Gas (GHG) emissions by 25% by 2020 and 80% by 2050. A MEPA policy has been established for review of GHG emissions associated with projects requiring an EIR. In addition to review of direct emissions associated with the project (i.e. production, distribution, and burning of the natural gas proposed to be transmitted through the new pipeline), the GHG effects of the proposed alteration of 58.8 acres of mostly forested lands should also be evaluated under the MEPA GHG policy. On average, an acre of upland forest in Massachusetts stores approximately 85 tons of carbon, and the amount of stored carbon is increasing annually. The proposed construction will remove existing carbon stores and significantly reduce the affected land's capacity for ongoing carbon sequestration for decades, even in	A detailed greenhouse gas analysis has been completed for the Project and is included in Appendix K of the DEIR. Sections 4.2.5, 5.2.6 and 6.2.4 provide detailed discussions of Project impacts and mitigation techniques to be implemented during construction and operation. All construction vehicles will operate with ultra-low sulfur diesel fuel and idling time will be limited during construction and operation. The loss of carbon storage capacity due to tree removal has also been evaluated for the Project and traffic patterns to reduce the number of required trips have been assessed in the Traffic and Transportation Management Plan.	Sections 4.2.5, 5.2.6, 6.2.4, Appendix F, and Appendix K

TABLE 8-2
RESPONSE TO COMMENTS FROM MASS AUDUBON (7/1/2014)

Comment Number	Comments	Response	DEIR Section
	portions where the impacts are described as "temporary." It should also be noted that the EENF tries to have it both ways in regards to whether impacts are temporary or permanent. On page 3, it argues that the total impact of the project is less than the 58.8 acre footprint because 12.5 acres were previously disturbed by prior pipeline construction and maintenance. Yet other sections of the EENF state that impacts to wetlands and other resources will be temporary because most of the disturbed area will be restored and vegetation allowed to regrow. This ignores the decades-long temporal impact associated with pipeline construction and the likelihood that plant communities will never fully return to pre-construction conditions.		
B-3	The GHG analysis should include evaluation of alternatives to reduce demand and consumption of gas and therefore the need for the proposed increased supply, including ramping up energy efficiency measures at homes and businesses in the company's service area.	A detailed Greenhouse Gas analysis has been performed for the Project and is included in Appendix K of the DEIR.	Appendix K

TABLE 8-2
RESPONSE TO COMMENTS FROM MASS AUDUBON (7/1/2014)

Comment Number	Comments	Response	DEIR Section
B-4	The area around Lower Spectacle Pond at Otis State Forest was a top land protection priority for the commonwealth for decades. In 2007, Mass Audubon assisted the state in achieving its longstanding goal of protecting 900 acres around the pond by selling our undivided half interest in the land to DCR, with the understanding that the land would be permanently protected. This land is part of a spectacular landscape with large areas of unbroken forest supporting a wide array of plants and animals, coldwater fisheries, and nature-based recreation. It includes a rare stand of old growth hemlocks as well as historic sites associated with an old mill village along the Clam River. The proposed pipeline route runs close to these resources. Although there is an existing pipeline easement, the proposed expansion would significantly widen this scar across the land and fragment an otherwise largely intact natural area. Mass Audubon objects to the proposed Article 97 transfer of 6 acres of land for the proposed expanded pipeline easement and requests that alternatives be considered, including alternative routes.	See Section 2.7 for the discussion on EEA Article 97 Land Disposition Policy.	Section 2.7

TABLE 8-2
RESPONSE TO COMMENTS FROM MASS AUDUBON (7/1/2014)

Comment Number	Comments	Response	DEIR Section
B-5	The EIR should evaluate impacts of the project on both wetland and upland wildlife habitat. Alternatives that avoid and reduce impacts to wetlands and waterways should be evaluated in detail in the EIR. If the project is allowed to proceed along any route affecting wetlands, additional off-site mitigation should be required in addition to on-site restoration.	Tennessee has provided a detailed analysis of alternatives in the DEIR. Impacts to wetlands have been avoided and minimized to the extent practicable and all mitigation and restoration will follow state and federal statutory requirements and regulations. A draft mitigation plan has been included in Appendix D. Upland habitats are also evaluated in the DEIR. As further discussed in Section 7, Tennessee has evaluated potential impacts to wetlands and waterways. Tennessee continues to work with DCR regarding mitigation, the components of which are discussed in Section 6.	Sections 3.0, 6.0, and 7.0 and Appendix D
B-6	Utility corridors are frequently used illegally by all-terrain vehicles (ATVs). The EENF describes a commitment to provide gates and signage, and to work on an ongoing basis with landowners to deter unauthorized access including by ATVs. However, there is no commitment made to work with local or state law enforcement authorities or to assist in the funding of chronically underfunded ATV enforcement programs. DCR does not have the capacity to effectively deter unauthorized ATV use on its properties, and the proposed expansion of this utility easement increases the likelihood of ATV enforcement problems at Otis State Forest.	Tennessee will place gates, at landowners' requests, at access points to deter unauthorized use of the ROW by vehicles and ATVs. Tennessee has also considered placing large rocks in strategic locations to further deter unauthorized use of the ROW and will consult with DCR and other property owners regarding methods to effectively deter illegal access by ATVs.	Sections 1.6, 2.7.1, and 5.2.1.1.5

TABLE 8-2
RESPONSE TO COMMENTS FROM MASS AUDUBON (7/1/2014)

Comment Number	Comments	Response	DEIR Section
B-7	In conclusion, Mass Audubon urges that serious consideration be given to alternatives that avoid the need for this pipeline or, if it is truly needed, that will re-route it outside of Otis State Forest and away from sensitive wetlands and pristine blocks of forest.	Tennessee has provided a purpose and need evaluation that illustrates the need for the proposed Project. In addition, a detailed analysis of alternatives has been provided in the DEIR. Specific alternatives have been evaluated in an attempt to avoid impacts to Otis State Forest and to reduce any impacts resulting from the Article 97 Easement as discussed in Section 2.7.1 and provide mitigation as discussed in Section 6.2.7.	Sections 1.1.1, 2.7.1, 3.0, and 6.2.7

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20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

PIONEER VALLEY PLANNING COMMISSION 50 YEARS 1962-2012

Timothy W. Brennan, Executive Director

July 2, 2014

Mr. Richard K. Sullivan, Jr., Secretary
Executive Office of Energy and Environmental Affairs
100 Cambridge Street, Suite 900
Boston, Massachusetts 02114

Attention: MEPA Unit

Reference: Review Comments on the Expanded Environmental Notification Form (EENF) for the proposed Connecticut Expansion Project Encompassing the Towns of Agawam, Sandisfield and Tyringham, Massachusetts — EEA # 15205.

Dear Secretary Sullivan:

The Pioneer Valley Planning Commission (PVPC) has the following review comments on the Expanded Environmental Notification Form (EENF) submitted for the above-cited project. As described, the project will consist of proposed improvements to increase the delivery capability of natural gas to southern Massachusetts. Within the PVPC's planning district, the project proposes to install an additional 0.11 miles of 24-inch diameter pipeline in the Town of Agawam. The project requires the preparation of an Environmental Impact Report (EIR) under both the "Wetlands and Waterways" and "Land" thresholds. The project proponent has requested a single EIR be prepared which is a request we can support.

Only the Agawam portion of the project is located within the PVPC's planning district. While much smaller in scale compared to the rest of the project, it is expected to impact existing wetlands. Additional information is requested to quantify the extent of wetland impacts by area. This should ideally include a discussion on the specific project alternatives that were considered for the Agawam portion of the project. We'd also like to request that additional information be provided in the single EIR to address the following issues:

E-1

E-2 • The need for the removal of trees outside of the 10 foot ROW near waterways.

E-3 • An assessment of those areas where the 100 foot clearance buffer for the work site might not be needed.

E-4 • A copy or link to the project's invasive species prevention plan.

E-5 • An expanded explanation of how "standard construction procedures" will be utilized to limit vehicle idling during construction and to address the noise created by idling vehicles.

E-6 • Infrastructural approaches such as existing pipeline maintenance and repair of leaks that would enhance energy conservation.

E-7 To the extent possible, we would like to encourage the project proponent to avoid the off-site restoration of wetlands as this approach unfortunately has a high failure rate.

Thank you for the opportunity to offer our comments on this proposed project.

Sincerely,

Timothy W. Brennan
Executive Director

cc: M. Palcologopoulos, PVPC Commissioner – Agawam
D. Chase, PVPC Alternate – Agawam
M. Gardella, AECOM

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

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TABLE 8-3
RESPONSE TO COMMENTS FROM PIONEER VALLEY PLANNING COMMISSION (7/2/2014)

Comment Number	Comment	Response	DEIR Section
E-1	Additional information is requested to quantify the extent of wetland impacts by area by including a discussion on the specific project alternatives that were considered for the Agawam portion of the project.	An alternative analysis has been provided in Section 3.0 of the DEIR. Proposed impacts from the Agawam portion of the Connecticut Loop are provided in Section 5.1 of the DEIR.	Sections 3.0 and 5.1.
E-2	Request the following additional information: the need to remove trees outside the 10 foot ROW near waterways.	Tennessee reserves the right to selectively cut and remove trees that could damage the pipeline coating within 15 feet of the pipeline. In addition, Tennessee is planning to construct the pipeline in accordance with USDOT regulations and FERC and INGAA safety standards.	Sections 1.2 and 2.3
E-3	Provide an assessment of those areas where the 100' clearance buffer for the work site might not be needed.	The typical construction ROW width for the Project will be 125 feet for the 36-inch loop section in Massachusetts and 100 feet for the 24-inch loop section in Connecticut and Massachusetts, and will generally consist of 25 feet of existing, permanently maintained ROW associated with the Tennessee's 200 and 300 Line, 25 to 35 feet of new permanent ROW, and 50 to 75 feet of temporary construction workspace. TWS within the majority of wetlands will be limited to minimize adverse impacts.	Section 2.2.2.2
E-4	A copy or link to the project's invasive species prevention plan.	The invasive species management plan has been provided in Appendix D.	Appendix D
E-5	Expanded explanation of how "standard construction procedures" will be utilized to limit vehicle idling during construction and to address the noise created by idling vehicles.	To help mitigate noise during construction, construction equipment will be properly muffled and maintained to minimize excessive noise and will not be allowed to idle unnecessarily.	Section 6.2.5

TABLE 8-3
RESPONSE TO COMMENTS FROM PIONEER VALLEY PLANNING COMMISSION (7/2/2014)

Comment Number	Comment	Response	DEIR Section
E-6	Infrastructural approaches such as existing pipeline maintenance and repair of leaks that would enhance energy conservation.	Tennessee will operate and maintain the newly constructed pipeline loop segments in the same manner as it currently operates and maintains its major interstate pipeline facilities, in accordance with the requirements of the Commission, the DOT's PHMSA pursuant to 49 CFR Part 192, and industry-proven practices and techniques. The facilities will be operated and maintained in a manner such that pipeline integrity is protected to ensure that a safe, continuous supply of natural gas reaches its ultimate destination. Maintenance activities will include regularly scheduled gas-leak surveys and measures necessary to repair any potential leaks.	Section 2.4
E-7	Avoid off-site restoration of wetlands.	In-Situ restoration and plantings within areas of temporary impacts in the ROW will be restored in accordance with USACE and MADEP wetland guidelines and monitoring of restoration success. Tennessee plans on performing wetland replication for unavoidable permanent impacts to wetlands at the impact site and in accordance with the MADEP 2002 guidelines on wetland replication.	Sections 1.6 and 6.1.1

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Berkshire Regional Planning Commission
Clearinghouse Review Report

June 26, 2014

SUBJECT:	**Connecticut Expansion Project**
EOEEA#:	**15205**
LOCATION:	**Tyringham and Sandisfield**
ESTIMATED COST:	**Unknown**
REVIEW TYPE:	**EENF**
PROPONENT:	**Tennessee Gas Pipeline Company, L.L.C.**
COMMENTS DUE:	**July 3, 2014**

PROJECT DESCRIPTION:
The "Massachusetts Loop" is located in Sandisfield and consists of approximately 3.8 miles of new 36-inch outside diameter pipeline co-located within or adjacent to the existing Tennessee Gas Pipeline Company, L.L.C. ("Tennessee") 200 Line Mainline right-of-way ("ROW"). The loop segment commences near Tennessee's existing Mainline Valve ("MLV") 258 at MP 0.0 adjacent to Town Hill Road and extends southeast to approximately MP 3.8 southeast of South Beech Plain Road. Additional permanent ROW will be required along with temporary workspace ("TWS") and additional temporary workspace ("ATWS") to facilitate construction.

The "Connecticut Loop" commences in Agawam in the yard of Compressor Station 261 at MP 0.0 and extends southward approximately 8.1 miles to the terminus in Suffield Connecticut. The portion of the pipeline along this loop section in Massachusetts will consist of approximately 0.11 miles of 24-inch outside diameter pipeline co-located within or adjacent to Tennessee's existing ROW, terminating at the Massachusetts and Connecticut state line.

Appurtenant facilities associated with the Project will include two pig launchers, one pig receiver and one relocated mainline valve to be constructed by Tennessee. One pig launcher will be constructed at the Agawam Compressor Station property and a second pig launcher will be constructed within the workspace at MP 0.0 in Sandisfield off of Town Hill Road at the beginning of the Massachusetts looping segment. A pig receiver and MLV will be located at the terminus of the Project at MP 3.8 in Sandisfield. Tennessee plans to relocate the existing valve site located off of Town Hill Road to the terminus at MP 3.8 to minimize impacts to state lands and place the valve site on private property at the terminus of the loop. All appurtenant facilities will be constructed within the proposed workspace in the pipeline ROW and will not require additional impacts.

The construction workspace (including TWS, ATWS, permanent ROW, access roads and contractor/pipeyards) will total approximately 58.8 acres. Operation of the Project facilities will require approximately 11.85 acres that will be maintained as new permanent ROW. The majority of the existing land use in the Project area consists of upland forests, open land, agricultural land and wetlands. Typically, pipeline construction will require between 100 to 125 feet of workspace depending on the size of the pipeline to be installed.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

A 3 acre pipeyard will be located in Tyringham. Although maps are included within the EENF and the pipeyard is periodically referenced, there is no discussion within the EENF relative to the pipeyard.

Required Permits & MEPA Thresholds

The project requires an Order of Conditions from the Tyringham Conservation Commission and the Sandisfield Conservation Commission, MESA Review for Rare and Endangered Species, Massachusetts Department of Environmental Protection (MassDEP) Section 401 Water Quality Certification, Massachusetts Historical Commission Project Notification Form, US Army Corps of Engineers Section 404 Permit, US Environmental Protection Agency NPDES Permit, and Federal Energy Regulatory Commission Certificate of Public Convenience and Necessity. The project has reached the MEPA review threshold for an ENF and Mandatory EIR for 58.8 acres of land disturbance and the alteration of 8.87 acres of bordering vegetated wetlands. The proponent is requesting a Single EIR.

CONSIDERATIONS AND POTENTIAL ISSUES:

Land Impacts

Article 97 Land
The construction and operation of the Project will result in impacts to approximately 30 acres of Article 97 Land within Otis State Forest in Sandisfield. Approximately 6 acres will be comprised of new permanent ROW adjacent to the existing ROW to accommodate the installation of the new 36-inch pipe. Approximately 7.2 acres will be workspace on the existing cleared ROW and the remaining 17 acres will be comprised of temporary workspace that will be allowed to re-vegetate following construction.

Blasting
According to the EENF, the USDA-NRCS Web Soil Survey does not identify any shallow depth to bedrock along any portions of the Project loops in Massachusetts. Therefore, the EENF indicates that no blasting is anticipated to be required for the Project. The EENF states that a complete list of blasting locations can only be accurately determined in the field during the construction process. If blasting is necessary, Tennessee will obtain state and municipal approvals associated with proposed blasting prior to the commencement of construction. Tennessee will develop a Blasting Plan for the Project that establishes procedures and safety measures that its contractor will adhere to while implementing blasting activities along the pipeline ROW during the Project. An independent contractor will inspect structures and wells within approximately 200 ft of the construction work area. During blasting, the contractor will monitor ground vibrations at the nearest structure or well within 200 ft of the construction

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

work area. Post-blast inspections of structures will be performed as warranted and wells will be inspected for water quality and flow with the owner's permission.

During the MEPA Consultation Session, it was brought to the proponent's attention that there are significant bedrock outcrops and that based on local knowledge, including previous pipeline construction, blasting should be anticipated. Bedrock outcrops were observed on DCR land during the site visit. The DEIR should include a description of the *anticipated* blasting plan. Based on historical records from previous pipeline construction and bedrock outcrops that are visible in the field, specific areas where blasting is anticipated/likely should be identified.

Environmental Impacts

Rare Species Habitat

Tennessee anticipates using water from Lower Spectacle Pond to conduct hydrostatic testing on all segments of the pipeline prior to placement in service. Tennessee will install a pump at the end of the boat ramp off of Cold Spring Road. A dissipation device (screen) will be used to avoid the entrainment of fish and other wildlife. The screen will be elevated off of the bottom of the pond to avoid the withdrawal of mud and sediment. Lower Spectacle Pond is Priority Habitat for an insect species. The proposed withdrawal process will avoid potential impacts to the state listed species by avoiding impacts to the bottom sediments where this insect would exist in its aquatic larval form. The timing of the withdrawal may also avoid additional impacts to the listed species. Upon completion of the hydrostatic test, the test water will be discharged through a filtration device to an upland area adjacent to the existing ROW. The discharge rate of the test water will be regulated using valves and energy dissipation devices to reduce the potential for erosion. The clean test water will only be discharged into areas where adequate vegetation is present.

During the MEPA Consultation Session, it was learned that the pipeyard in Tyringham includes Priority Habitat for the wood turtle (*Glyptemys insculpta*), American bittern (*Botaurus lentiginosus*), and a third (unidentified) species. The proponent explained that they have initiated correspondence with the Natural Heritage and Endangered Species Program (NHESP). The proponent plans to utilize fencing to prevent the wood turtle from entering into the work area. In addition, a mat will be laid over the work area to prevent any American bittern from nesting on the site and prevent direct impacts to the species.

Wetlands

The Project will cross a total of 16 wetlands, representing approximately 5,392 linear feet. In addition to the 16 wetlands crossed by the pipeline, one wetland is impacted by an access road, but will not be crossed by the pipeline. One wetland is located in proximity to the Tyringham pipeyard. Approximately 9.85 acres of wetlands will be temporarily altered and impacted during construction. Approximately 2.19 acres of wetlands will be permanently maintained in a scrub-shrub or herbaceous vegetation community during operation of the pipeline.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Tennessee will implement wetland construction procedures to minimize impacts to wetlands. Workspace will be limited to 75ft in width unless topographic conditions or other safety concerns require additional workspace. Tennessee will minimize tree clearing to the maximum extent practicable while maintaining safe construction conditions. Tree clearing within wetlands during operation of the pipeline will be limited to selectively clearing trees within 15 feet of the pipeline that are greater than 15 feet in height. Upon completion of construction, topsoil, contour elevations and hydrologic patterns will be restored, and all disturbed areas will be reseeded or replanted to promote the re-establishment of native hydrophytic vegetation. All TWS and ATWS areas will be restored to pre-construction grades and contours, and reseeded and/or planted during restoration activities.

A 10-foot wide corridor centered over the pipeline will be permanently maintained in an herbaceous state in wetland areas and areas adjacent to perennial streams. The remaining temporary and permanent ROW will revert to its pre-construction land use/land cover once construction is complete. No permanent loss of wetlands will occur due to the construction or operation of the Project, and No Net Loss of Wetlands will be met.

Tennessee will develop a Project-specific wetland mitigation plan prior to construction. Mitigation for permanent wetland impacts will likely consist of off-site wetland restoration or conservation. Tennessee will develop a Project-specific Invasive Species Management Plan ("ISMP") to be implemented prior to construction and to continue for a minimum of five years post-construction.

Riverfront
Two surface waterbody crossings have been identified and three potential methods for crossing have been identified: conventional trenching, flumed crossing, and dam and pump.

Alternatives to sandbags, such as water diversion tubes, should be considered for temporary clean water diversion to reduce the potential for sand to leach out into the stream. *Massachusetts River and Stream Crossing Standards* should be met to the maximum extent practicable. During the MEPA Consultation Session, an existing stream crossing composed of corroding pipes laid across the stream was observed. This crossing does not meet the objectives of the stream crossing standards and does not allow for fish passage. Such crossing should not be included within the proposed project and a plan should be developed for the removal of such existing crossings.

Green House Gases
It is stated within the EENF that Tennessee is not required to quantify Greenhouse Gas emissions during construction of the Project.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Based on correspondence with the MEPA Office, the Project is subject to the Revised MEPA Greenhouse Gas Emissions Policy and Protocol (2010). Since the proponent is seeking a Single EIR pursuant to 301 CMR 11.06(8), the proponent should quantify emissions, analyze proposed mitigation, and submit this information in the Expanded Environmental Notification Form (EENF) in accordance with 301 CMR 11.05(7). This information must be submitted within a Draft Environmental Impact Report.

The proponent should quantify emissions, analyze proposed mitigation, and submit this information in accordance with the Revised MEPA Greenhouse Gas Emissions Policy and Protocol. Both carbon dioxide (CO_2) and methane (CH_4) emissions should be quantified for construction activities and ongoing maintenance and operation.

The proponent should consider the US EPA document titled Carbon Sequestration through Reforestation as an alternative mitigation measure for the long-term storage of carbon in trees and plants. CO_2 removed from the atmosphere is stored in growing plants in the form of biomass. Sequestering carbon helps to reduce or slow the buildup of CO_2 concentrations in the atmosphere. The proponent should investigate participation in Regional Greenhouse Gas Initiative (RGGI) CO_2 allowance auctions. RGGI is the first cap-and-trade program to distribute nearly all CO_2 allowances by auction. A RGGI CO_2 offset allowance represents a project-based greenhouse gas emission reduction outside of the capped electric power generation sector. Offset allowances have been designed to reduce or sequester emissions of carbon dioxide (CO_2), methane (CH_4), or sulfur hexafluoride (SF_6) within the nine-state region. Methane emissions may potentially be offset by equivalent CO_2.

Transportation Impacts

Road crossings will be required at five locations. Prior to construction, Tennessee will locate all existing underground utilities and make provisions for traffic management in work areas. Road crossings will be completed using standard open cut and conventional boring methods depending on the road.

In addition to road crossings, the Project calls for transporting heavy equipment, including pipe, from the Tyringham Pipeyard through Sandisfield. Such transport is expected to intensify damage to road surfaces and bases, bridges, and culverts. It is important to note that these roads were not designed with the intent to carry such loads. Main Road is the only road through Tyringham and is a feeder road to the Towns of Otis and Monterey as well as a connection to Town of Lee and City of Pittsfield. Based on the existing condition of the transportation infrastructure and the sheer amount of wear and tear projected from the construction, transportation infrastructure improvements may be needed prior to, during, or at the conclusion of construction. Tennessee shall ensure that roads utilized are in adequate condition and safe to travel during construction and in a good state of repair at the conclusion of construction. A Transportation Impacts Assessment Scope of Work has been developed for

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

the General Electric "Rest of River Cleanup" and is attached. The elements that shall be included within a Corrective Measures Study/Proposal document are described within the Transportation Impacts Assessment Scope of Work.

Alternatives Analysis

Tennessee undertook a needs and alternative routing analysis for the Project. Tennessee evaluated pipeline routing options based on regional topography, potential adverse environmental impacts, population density, existing land use, and construction safety and feasibility considerations. Tennessee also considered route alternatives in conjunction with Federal Energy Regulatory Commission guidelines.

No-Action Alternative
The "no-action" alternative would not fulfill the project purpose, to provide additional capacity to meet the existing demand for natural gas.

Energy Conservation/Energy Alternatives
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. Energy conservation, wind power, solar power, and geothermal power were evaluated independently and it was determined that each alternative would not be able to provide the energy to meet the projected need on its own. Goal, oil, nuclear, electric, fuel cells, Liquefied Natural Gas and propane/air storage were also independently evaluated and were not determined to be a preferable or viable alternatives.

System Alternatives
System alternatives would make use of other existing, modified or proposed natural gas pipeline systems or existing compression to meet the stated objectives of the proposed Project. The impacts were determined to be similar to or greater than that associated with the construction of the proposed Project. The Alternatives Analysis includes the analysis of one alternative Greenfield pipeline of 100 miles in length. Tennessee also evaluated an option of installing 42-inch OD pipeline looping which would reduce the pipeline mileage by 0.3 miles. This alternative was not selected for many reasons including the need for more above ground facilities.

Route Alternatives/Alternate Sites
Route variations evaluated consisted of evaluating which side of the ROW the new pipeline would be located and minimizing cross-overs. A discussion of alternative sites was limited to appurtenant facilities.

Berkshire Regional Planning Commission
Clearinghouse Review Report

COMMENTS AND RECOMMENDATIONS:

Primary Recommendation:
BRPC recommends that projects of this scope be required to submit both a Draft and Final EIR. **BRPC does not believe that the EENF meets the standards of a Draft EIR and recommends that the Secretary deny the request for a Single EIR.** This project exceeds thresholds for a Mandatory EIR for 58.8 acres of land disturbance and the alteration of 8.87 acres of bordering vegetated wetlands. The proponent submitted an Expanded ENF requesting a Single EIR. Projects of this scope should be reviewed very closely and particular attention paid to issues such as, but not limited to, the Alternatives Analysis and impacts resulting from Article 97 takings.

BRPC offers the following comments as the Secretary issues a scope for the Draft EIR.

Recommendations to MEPA for Scoping the Draft EIR:

1. The BRPC Sustainable Berkshires Plan should be sited, not the Comprehensive Economic Development Plan. The Sustainable Berkshires Plan is available at www.berkshireplanning.org.

2. The project should be described in its entirety. The entire route should be described starting from the point of entry in Massachusetts. The proponent should provide clarification as to how it was determined that the proposed Northeast Expansion Project is a separate project and does not pose an issue with regard to segmentation. The project description should include whether any excess capacity is included within the proposed Connecticut Expansion Project and whether an additional future expansion is anticipated to meet future demand. An analysis of the cumulative pipeline capacity, which includes other pipelines (i.e., Iroquois and Algonquin), should be included in order to better understand the cumulative impacts statewide and impacts to supply and demand.

3. The proponent should provide a more complete alternatives analysis in order to ascertain which alternative minimizes overall impacts to land, Article 97 and other conserved land, wetlands, and rare species. The EIR should fully explain any trade-offs inherent in the alternatives analysis, such as increased impacts on some resources to avoid impacts to other resources. A detailed alternatives analysis should include:
    a. Low demand scenario.
    b. Alternative routes within Connecticut in conjunction with the existing pipeline system.
    c. Co-locating new pipeline loops within existing and/or proposed ROW in Connecticut.
    d. Alternative routes within existing ROW in Massachusetts.
    e. Replacement of existing line with larger, more efficient line.
    f. Combination of conservation, efficiency, and renewable energy to reduce demand.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

4. Significant detail is lacking with regard to the proposed pipeyard in Tyringham, which includes wetlands and rare species habitat. A detailed site plan and description of the proposed mitigation must be provided. Correspondence from the Natural Heritage and Endangered Species Program should be included.

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6. A detailed site plan(s) should be required showing resource areas, buffer areas, rare species habitat, Article 97 lands, and wells with all access roads, appurtenant facilities, ROW (existing and new), construction limits, TWA and ATWA, wetland mitigation areas (if any), and stormwater and erosion controls clearly labeled. Site plan(s) should depict both the proposed work and the resource areas together and not on separate plans/maps in order to capture cumulative impacts and a greater understanding of the project.

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10. A description of the *anticipated* blasting plan including specific areas where blasting is anticipated/likely. Plans should be in place to inform local town officials, if it is determined that blasting will be necessary. Local town officials should be provided with copies and detailed Project-specific blasting plans as soon as they are developed and should be provided enough lead time to make comments and address issues and concerns. There should be a detailed public notification plan for any blasting.

11. A detailed description of the proposed water withdrawal and discharge of hydrostatic test water. The description should include the time of year when water withdrawal and discharge will be conducted, where the water will be discharged, the rate of discharge,

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

potential effects of water withdrawal to Lower Spectacle Pond, water quality of hydrostatic test water discharged, and alternative methodologies for hydrostatic testing (such as alternative locations for withdrawal and discharge).

12. A monitoring plan and contingency plan should be required to identify and mitigate any adverse impacts to rare species.

13. An erosion and sediment control plan which includes frequent monitoring during all phases of construction to insure that the erosion control devices function properly.

14. A detailed dewatering plan, including plans to address sediment and siltation, should be included for the dewatering of trenches which will be required.

15. A detailed plan outlining how the *Massachusetts River and Stream Crossing Standards* will be met to the maximum extent practicable.

16. A detailed plan to replicate impacted wetlands in accordance with the Wetlands Protection Act, which is consistent with the *Massachusetts Inland Wetland Replication Guidelines* (2002) and the *Massachusetts Wildlife Habitat Protection Guidance for Inland Wetlands* (2006). Alternatively, a detailed plan, including potential sites, for off-site wetland restoration or conservation.

17. A detailed plan to reestablish vegetated cover in the ROW, TWA and ATWA, including plant lists and a monitoring plan to determine the successful establishment of plants and a plan to address invasive species through monitoring and eradication (should invasive species become established).

18. The proponent should develop a detailed Project-specific Invasive Species Management Plan and take extreme care not to introduce/spread invasive species.
    a. The proponent should consider using an alternative method of silt-fencing and straw-baling to reduce the risk of the inadvertent introduction of invasive species since hay bales frequently contain seed stock from invasive plants. Alternatives include straw bales in place of hay bales or double silt fences, silt socks, or coconut fiber material which can be staked like a silt fence and obviates the need for hay bales. These products are available from a variety of manufacturers.
    b. Similarly, the proponent should carefully select all fill materials to protect against the introduction of invasive species.
    c. The proponent should require vehicle cleaning before and after all work, both construction and routine operation and maintenance.
    d. An independent monitor should be required in perpetuity.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Recommendations to Local Boards and Commissions for the Local Permitting Process:

1. The Towns should not close public hearings on pending permits for this project prior to the conclusion of the MEPA process.

2. The Towns should determine that they have the appropriate rules and regulations in place to hire outside consultants, at the proponent's expense, to review the project for wetlands, rare and endangered species, floodplain impacts, blasting, and road infrastructure projects.

3. The Conservation Commissions should include provisions for ongoing monitoring.

4. Given careful management of refueling and servicing of construction equipment should be conducted, particularly in wetland and riverfront areas. The use of biodegradable plant-based hydraulic fluids should be considered.

5. Tennessee should be required to provide periodic training of emergency responders in Sandisfield and all communities with whom the Sandisfield Volunteer Fire Department normally interacts for mutual aid situations. This should be an ongoing commitment for the life of the pipeline. Ambulance and police should also be included, as well as the towns' Emergency Managers.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Berkshire Regional Planning Commission
Clearinghouse Review Report

July 15, 2014

SUBJECT:	**Connecticut Expansion Project**
EOEEA#:	**15205**
LOCATION:	**Tyringham and Sandisfield**
ESTIMATED COST:	**Unknown**
REVIEW TYPE:	**EENF**
PROPONENT:	**Tennessee Gas Pipeline Company, L.L.C.**
COMMENTS DUE:	**July 3, 2014**

PROJECT DESCRIPTION:
The "Massachusetts Loop" is located in Sandisfield and consists of approximately 3.8 miles of new 36-inch outside diameter pipeline co-located within or adjacent to the existing Tennessee Gas Pipeline Company, L.L.C. ("Tennessee") 200 Line Mainline right-of-way ("ROW"). The loop segment commences near Tennessee's existing Mainline Valve ("MLV") 258 at MP 0.0 adjacent to Town Hill Road and extends southeast to approximately MP 3.8 southeast of South Beech Plain Road. Additional permanent ROW will be required along with temporary workspace ("TWS") and additional temporary workspace ("ATWS") to facilitate construction.

The "Connecticut Loop" commences in Agawam in the yard of Compressor Station 261 at MP 0.0 and extends southward approximately 8.1 miles to the terminus in Suffield Connecticut. The portion of the pipeline along this loop section in Massachusetts will consist of approximately 0.11 miles of 24-inch outside diameter pipeline co-located within or adjacent to Tennessee's existing ROW, terminating at the Massachusetts and Connecticut state line.

Appurtenant facilities associated with the Project will include two pig launchers, one pig receiver and one relocated mainline valve to be constructed by Tennessee. One pig launcher will be constructed at the Agawam Compressor Station property and a second pig launcher will be constructed within the workspace at MP 0.0 in Sandisfield off of Town Hill Road at the beginning of the Massachusetts looping segment. A pig receiver and MLV will be located at the terminus of the Project at MP 3.8 in Sandisfield. Tennessee plans to relocate the existing valve site located off of Town Hill Road to the terminus at MP 3.8 to minimize impacts to state lands and place the valve site on private property at the terminus of the loop. All appurtenant facilities will be constructed within the proposed workspace in the pipeline ROW and will not require additional impacts.

The construction workspace (including TWS, ATWS, permanent ROW, access roads and contractor/pipeyards) will total approximately 58.8 acres. Operation of the Project facilities will require approximately 11.85 acres that will be maintained as new permanent ROW. The majority of the existing land use in the Project area consists of upland forests, open land, agricultural land and wetlands. Typically, pipeline construction will require between 100 to 125 feet of workspace depending on the size of the pipeline to be installed.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

A 3 acre pipeyard will be located in Tyringham. Although maps are included within the EENF and the pipeyard is periodically referenced, there is no discussion within the EENF relative to the pipeyard.

Required Permits & MEPA Thresholds

The project requires an Order of Conditions from the Tyringham Conservation Commission and the Sandisfield Conservation Commission, MESA Review for Rare and Endangered Species, Massachusetts Department of Environmental Protection (MassDEP) Section 401 Water Quality Certification, Massachusetts Historical Commission Project Notification Form, US Army Corps of Engineers Section 404 Permit, US Environmental Protection Agency NPDES Permit, and Federal Energy Regulatory Commission Certificate of Public Convenience and Necessity. The project has reached the MEPA review threshold for an ENF and Mandatory EIR for 58.8 acres of land disturbance and the alteration of 8.87 acres of bordering vegetated wetlands. The proponent is requesting a Single EIR.

CONSIDERATIONS AND POTENTIAL ISSUES:

Land Impacts

Article 97 Land
The construction and operation of the Project will result in impacts to approximately 30 acres of Article 97 Land within Otis State Forest in Sandisfield. Approximately 6 acres will be comprised of new permanent ROW adjacent to the existing ROW to accommodate the installation of the new 36-inch pipe. Approximately 7.2 acres will be workspace on the existing cleared ROW and the remaining 17 acres will be comprised of temporary workspace that will be allowed to re-vegetate following construction.

Blasting
According to the EENF, the USDA-NRCS Web Soil Survey does not identify any shallow depth to bedrock along any portions of the Project loops in Massachusetts. Therefore, the EENF indicates that no blasting is anticipated to be required for the Project. The EENF states that a complete list of blasting locations can only be accurately determined in the field during the construction process. If blasting is necessary, Tennessee will obtain state and municipal approvals associated with proposed blasting prior to the commencement of construction. Tennessee will develop a Blasting Plan for the Project that establishes procedures and safety measures that its contractor will adhere to while implementing blasting activities along the pipeline ROW during the Project. An independent contractor will inspect structures and wells within approximately 200 ft of the construction work area. During blasting, the contractor will monitor ground vibrations at the nearest structure or well within 200 ft of the construction

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

work area. Post-blast inspections of structures will be performed as warranted and wells will be inspected for water quality and flow with the owner's permission.

During the MEPA Consultation Session, it was brought to the proponent's attention that there are significant bedrock outcrops and that based on local knowledge, including previous pipeline construction, blasting should be anticipated. Bedrock outcrops were observed on DCR land during the site visit. The DEIR should include a description of the *anticipated* blasting plan. Based on historical records from previous pipeline construction and bedrock outcrops that are visible in the field, specific areas where blasting is anticipated/likely should be identified.

Environmental Impacts

Rare Species Habitat

Tennessee anticipates using water from Lower Spectacle Pond to conduct hydrostatic testing on all segments of the pipeline prior to placement in service. Tennessee will install a pump at the end of the boat ramp off of Cold Spring Road. A dissipation device (screen) will be used to avoid the entrainment of fish and other wildlife. The screen will be elevated off of the bottom of the pond to avoid the withdrawal of mud and sediment. Lower Spectacle Pond is Priority Habitat for an insect species. The proposed withdrawal process will avoid potential impacts to the state listed species by avoiding impacts to the bottom sediments where this insect would exist in its aquatic larval form. The timing of the withdrawal may also avoid additional impacts to the listed species. Upon completion of the hydrostatic test, the test water will be discharged through a filtration device to an upland area adjacent to the existing ROW. The discharge rate of the test water will be regulated using valves and energy dissipation devices to reduce the potential for erosion. The clean test water will only be discharged into areas where adequate vegetation is present.

During the MEPA Consultation Session, it was learned that the pipeyard in Tyringham includes Priority Habitat for the wood turtle (*Glyptemys insculpta*), American bittern (*Botaurus lentiginosus*), and a third (unidentified) species. The proponent explained that they have initiated correspondence with the Natural Heritage and Endangered Species Program (NHESP). The proponent plans to utilize fencing to prevent the wood turtle from entering into the work area. In addition, a mat will be laid over the work area to prevent any American bittern from nesting on the site and prevent direct impacts to the species.

Wetlands

The Project will cross a total of 16 wetlands, representing approximately 5,392 linear feet. In addition to the 16 wetlands crossed by the pipeline, one wetland is impacted by an access road, but will not be crossed by the pipeline. One wetland is located in proximity to the Tyringham pipeyard. Approximately 9.85 acres of wetlands will be temporarily altered and impacted during construction. Approximately 2.19 acres of wetlands will be permanently maintained in a scrub-shrub or herbaceous vegetation community during operation of the pipeline.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Tennessee will implement wetland construction procedures to minimize impacts to wetlands. Workspace will be limited to 75ft in width unless topographic conditions or other safety concerns require additional workspace. Tennessee will minimize tree clearing to the maximum extent practicable while maintaining safe construction conditions. Tree clearing within wetlands during operation of the pipeline will be limited to selectively clearing trees within 15 feet of the pipeline that are greater than 15 feet in height. Upon completion of construction, topsoil, contour elevations and hydrologic patterns will be restored, and all disturbed areas will be reseeded or replanted to promote the re-establishment of native hydrophytic vegetation. All TWS and ATWS areas will be restored to pre-construction grades and contours, and reseeded and/or planted during restoration activities.

A 10-foot wide corridor centered over the pipeline will be permanently maintained in an herbaceous state in wetland areas and areas adjacent to perennial streams. The remaining temporary and permanent ROW will revert to its pre-construction land use/land cover once construction is complete. No permanent loss of wetlands will occur due to the construction or operation of the Project, and No Net Loss of Wetlands will be met.

Tennessee will develop a Project-specific wetland mitigation plan prior to construction. Mitigation for permanent wetland impacts will likely consist of off-site wetland restoration or conservation. Tennessee will develop a Project-specific Invasive Species Management Plan ("ISMP") to be implemented prior to construction and to continue for a minimum of five years post-construction.

Riverfront
Two surface waterbody crossings have been identified and three potential methods for crossing have been identified: conventional trenching, flumed crossing, and dam and pump.

Alternatives to sandbags, such as water diversion tubes, should be considered for temporary clean water diversion to reduce the potential for sand to leach out into the stream. *Massachusetts River and Stream Crossing Standards* should be met to the maximum extent practicable. During the MEPA Consultation Session, an existing stream crossing composed of corroding pipes laid across the stream was observed. This crossing does not meet the objectives of the stream crossing standards and does not allow for fish passage. Such crossing should not be included within the proposed project and a plan should be developed for the removal of such existing crossings.

Green House Gases
It is stated within the EENF that Tennessee is not required to quantify Greenhouse Gas emissions during construction of the Project.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Based on correspondence with the MEPA Office, the Project is subject to the Revised MEPA Greenhouse Gas Emissions Policy and Protocol (2010). Since the proponent is seeking a Single EIR pursuant to 301 CMR 11.06(8), the proponent should quantify emissions, analyze proposed mitigation, and submit this information in the Expanded Environmental Notification Form (EENF) in accordance with 301 CMR 11.05(7). This information must be submitted within a Draft Environmental Impact Report.

The proponent should quantify emissions, analyze proposed mitigation, and submit this information in accordance with the Revised MEPA Greenhouse Gas Emissions Policy and Protocol. Both carbon dioxide (CO_2) and methane (CH_4) emissions should be quantified for construction activities and ongoing maintenance and operation.

The proponent should consider the US EPA document titled Carbon Sequestration through Reforestation as an alternative mitigation measure for the long-term storage of carbon in trees and plants. CO_2 removed from the atmosphere is stored in growing plants in the form of biomass. Sequestering carbon helps to reduce or slow the buildup of CO_2 concentrations in the atmosphere. The proponent should investigate participation in Regional Greenhouse Gas Initiative (RGGI) CO_2 allowance auctions. RGGI is the first cap-and-trade program to distribute nearly all CO_2 allowances by auction. A RGGI CO_2 offset allowance represents a project-based greenhouse gas emission reduction outside of the capped electric power generation sector. Offset allowances have been designed to reduce or sequester emissions of carbon dioxide (CO_2), methane (CH_4), or sulfur hexafluoride (SF_6) within the nine-state region. Methane emissions may potentially be offset by equivalent CO_2.

Transportation Impacts

Road crossings will be required at five locations. Prior to construction, Tennessee will locate all existing underground utilities and make provisions for traffic management in work areas. Road crossings will be completed using standard open cut and conventional boring methods depending on the road.

In addition to road crossings, the Project calls for transporting heavy equipment, including pipe, from the Tyringham Pipeyard through Sandisfield. Such transport is expected to intensify damage to road surfaces and bases, bridges, and culverts. It is important to note that these roads were not designed with the intent to carry such loads. Main Road is the only road through Tyringham and is a feeder road to the Towns of Otis and Monterey as well as a connection to Town of Lee and City of Pittsfield. Based on the existing condition of the transportation infrastructure and the sheer amount of wear and tear projected from the construction, transportation infrastructure improvements may be needed prior to, during, or at the conclusion of construction. Tennessee shall ensure that roads utilized are in adequate condition and safe to travel during construction and in a good state of repair at the conclusion of construction. A Transportation Impacts Assessment Scope of Work has been developed for

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

the General Electric "Rest of River Cleanup" and is attached. The elements that shall be included within a Corrective Measures Study/Proposal document are described within the Transportation Impacts Assessment Scope of Work.

Alternatives Analysis

Tennessee undertook a needs and alternative routing analysis for the Project. Tennessee evaluated pipeline routing options based on regional topography, potential adverse environmental impacts, population density, existing land use, and construction safety and feasibility considerations. Tennessee also considered route alternatives in conjunction with Federal Energy Regulatory Commission guidelines.

No-Action Alternative
The "no-action" alternative would not fulfill the project purpose, to provide additional capacity to meet the existing demand for natural gas.

Energy Conservation/Energy Alternatives
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. Energy conservation, wind power, solar power, and geothermal power were evaluated independently and it was determined that each alternative would not be able to provide the energy to meet the projected need on its own. Goal, oil, nuclear, electric, fuel cells, Liquefied Natural Gas and propane/air storage were also independently evaluated and were not determined to be a preferable or viable alternatives.

System Alternatives
System alternatives would make use of other existing, modified or proposed natural gas pipeline systems or existing compression to meet the stated objectives of the proposed Project. The impacts were determined to be similar to or greater than that associated with the construction of the proposed Project. The Alternatives Analysis includes the analysis of one alternative Greenfield pipeline of 100 miles in length. Tennessee also evaluated an option of installing 42-inch OD pipeline looping which would reduce the pipeline mileage by 0.3 miles. This alternative was not selected for many reasons including the need for more above ground facilities.

Route Alternatives/Alternate Sites
Route variations evaluated consisted of evaluating which side of the ROW the new pipeline would be located and minimizing cross-overs. A discussion of alternative sites was limited to appurtenant facilities.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Berkshire Regional Planning Commission
Clearinghouse Review Report

COMMENTS AND RECOMMENDATIONS:

Primary Recommendation:
BRPC recommends that projects of this scope be required to submit both a Draft and Final EIR. **BRPC does not believe that the EENF meets the standards of a Draft EIR and recommends that the Secretary deny the request for a Single EIR.** This project exceeds thresholds for a Mandatory EIR for 58.8 acres of land disturbance and the alteration of 8.87 acres of bordering vegetated wetlands. The proponent submitted an Expanded ENF requesting a Single EIR. Projects of this scope should be reviewed very closely and particular attention paid to issues such as, but not limited to, the Alternatives Analysis and impacts resulting from Article 97 takings.

BRPC offers the following comments as the Secretary issues a scope for the Draft EIR.

Recommendations to MEPA for Scoping the Draft EIR:

1. The BRPC Sustainable Berkshires Plan should be sited, not the Comprehensive Economic Development Plan. The Sustainable Berkshires Plan is available at www.berkshireplanning.org.

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20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

4. Significant detail is lacking with regard to the proposed pipeyard in Tyringham, which includes wetlands and rare species habitat. Information should be provided with regard to how this location/site was selected. An analysis of alternative sites should be provided that includes sites closer to the construction activity and analyzes potential impacts. A detailed site plan and description of the proposed mitigation must be provided. Correspondence from the Natural Heritage and Endangered Species Program should be included.

5. Two archaeological sites are potentially impacted. Correspondence from the Massachusetts Historical Commission should be included.

6. A detailed site plan(s) should be required showing resource areas, buffer areas, rare species habitat, Article 97 lands, and wells with all access roads, appurtenant facilities, ROW (existing and new), construction limits, TWA and ATWA, wetland mitigation areas (if any), and stormwater and erosion controls clearly labeled. Site plan(s) should depict both the proposed work and the resource areas together and not on separate plans/maps in order to capture cumulative impacts and a greater understanding of the project.

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20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

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12. A monitoring plan and contingency plan should be required to identify and mitigate any adverse impacts to rare species.

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18. The proponent should develop a detailed Project-specific Invasive Species Management Plan and take extreme care not to introduce/spread invasive species.
    a. The proponent should consider using an alternative method of silt-fencing and straw-baling to reduce the risk of the inadvertent introduction of invasive species since hay bales frequently contain seed stock from invasive plants. Alternatives include straw bales in place of hay bales or double silt fences, silt socks, or coconut fiber material which can be staked like a silt fence and obviates the need for hay bales. These products are available from a variety of manufacturers.
    b. Similarly, the proponent should carefully select all fill materials to protect against the introduction of invasive species.
    c. The proponent should require vehicle, clothing, and boot cleaning before and after all work, both construction and routine operation and maintenance.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

d. An independent monitor should be required in perpetuity.

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1. The Towns should not close public hearings on pending permits for this project prior to the conclusion of the MEPA process.

2. The Towns should determine that they have the appropriate rules and regulations in place to hire outside consultants, at the proponent's expense, to review the project for wetlands, rare and endangered species, floodplain impacts, blasting, and road infrastructure projects. (M.G.L. Chapter 44 Section 53G)

3. The Conservation Commissions should include provisions for ongoing monitoring.

4. Careful management of refueling and servicing of construction equipment should be conducted, particularly in wetland and riverfront areas. The use of biodegradable plant-based hydraulic fluids should be considered.

5. Tennessee should be required to provide periodic training of emergency responders in Sandisfield and all communities with whom the Sandisfield Volunteer Fire Department normally interacts for mutual aid situations. In addition, Tennessee should be required to provide assistance to the affected communities to ensure that all of the equipment that may be needed in the case of an emergency response is available and in proper working order. This should be an ongoing commitment for the life of the pipeline. Ambulance and police should also be included, as well as the towns' Emergency Managers.

TABLE 8-4
RESPONSE TO COMMENTS FROM
BERKSHIRE REGIONAL PLANNING COMMISSION CLEARINGHOUSE REVIEW REPORT (6/26/2014, 7/15/2014)

Comment Number	Comment	Response	DEIR Section
D-1	The BRPC Sustainable Berkshires Plan should be sited, not the Comprehensive Economic Development Plan. The Sustainable Berkshires Plan is available at www.berkshireplanning.org	Tennessee reviewed the Sustainable Berkshires Plan and addressed how the Project fits in with the goals of the Plan and provided the discussion in the DEIR.	Section 5.2.7
D-2	The project should be described in its entirety. The entire route should be described starting from the point of entry in Massachusetts. The proponent should provide clarification as to how it was determined that the proposed Northeast Expansion Project is a separate project and does not pose an issue with regard to segmentation. The project description should include whether any excess capacity is included within the proposed Connecticut Expansion Project and whether an additional future expansion is anticipated to meet future demand. An analysis of the cumulative pipeline capacity, which includes other pipelines (i.e., Iroquois and Algonquin), should be included in order to better understand the cumulative impacts statewide and impacts to supply and demand.	Discussions on the need for the proposed Project and its distinction from the Northeast Energy Direct Project and information about capacity needs in the region have been provided in the DEIR.	Sections 1.1.1 and 2.5

TABLE 8-4
RESPONSE TO COMMENTS FROM
BERKSHIRE REGIONAL PLANNING COMMISSION CLEARINGHOUSE REVIEW REPORT (6/26/2014, 7/15/2014)

Comment Number	Comment	Response	DEIR Section
D-3	The proponent should provide a more complete alternatives analysis in order to ascertain which alternative minimizes overall impacts to land, Article 97 and other conserved land, wetlands, and rare species. The EIR should fully explain any trade-offs inherent in the alternatives analysis, such as increased impacts on some resources to avoid impacts to other resources. A detailed alternatives analysis should include: a. Low demand scenario. b. Alternative routes within Connecticut in conjunction with the existing pipeline system. c. Co-locating new pipeline loops within existing and/or proposed ROW in Connecticut. d. Alternative routes within existing ROW in Massachusetts. e. Replacement of existing line with larger, more efficient line. f. Combination of conservation, efficiency, and renewable energy to reduce demand.	Tennessee has provided a detailed discussion and analysis of alternatives in the DEIR.	Section 3.0
D-4	Significant detail is lacking with regard to the proposed pipeyard in Tyringham, which includes wetlands and rare species habitat. A detailed site plan and description of the proposed mitigation must be provided. Correspondence from the Natural Heritage and Endangered Species Program should be included.	Tennessee has provided additional discussions on the Tyringham Pipeyard in the DEIR, including wetlands, rare species, mitigation and the proposed layout.	Sections 2.2.2.3, 5.1.1.6.2, 6.1.3.1.1, and Appendix G

TABLE 8-4
RESPONSE TO COMMENTS FROM
BERKSHIRE REGIONAL PLANNING COMMISSION CLEARINGHOUSE REVIEW REPORT (6/26/2014, 7/15/2014)

Comment Number	Comment	Response	DEIR Section
D-5	Two archaeological sites are potentially impacted. Correspondence from the Massachusetts Historical Commission should be included.	All correspondence is included in Appendix C. Archaeolgoical sites will be avoided as described in a discussion of the archeological surveys that are provided in the DEIR.	Appendix C and Section 4.1.4
D-6	A detailed site plan(s) should be required showing resource areas, buffer areas, rare species habitat, Article 97 lands, and wells with all access roads, appurtenant facilities, ROW (existing and new), construction limits, TWA and ATWS, wetland mitigation areas (if any), and stormwater and erosion controls clearly labeled. Site plan(s) should depict both the proposed work and the resource areas together and not on separate plans/maps in order to capture cumulative impacts and a greater understanding of the project.	Detailed site plans and a variety of Project mapping products depicting resource areas and workspace have been provided in the DEIR.	Appendices A, B, E, G, I, and J
D-7	The proponent should quantify emissions, analyze proposed mitigation, and submit this information in accordance with the Revised MEPA Greenhouse Gas Emissions Policy and Protocol. Both carbon dioxide (CO2) and methane (CH4) emissions should be quantified. The volume of methane should be quantified from wellhead to burner tip and not limited to construction activity.	A detailed Greenhouse Gas evaluation was performed for the Project and is provided in the DEIR.	Sections 4.2.5, 5.2.6, 6.2.4, and Appendix K
D-8	Document and describe the anticipated impacts and proposed mitigation for Article 97 lands, which typically serve significant functions such as climate resiliency.	Tennessee has made efforts to avoid, minimize and mitigate any impacts to Article 97 lands and provided information on impacts and the proposed mitigation in the DEIR.	Sections 1.6, 2.7.1, 4.2.4.8, and 6.2.7

TABLE 8-4
RESPONSE TO COMMENTS FROM
BERKSHIRE REGIONAL PLANNING COMMISSION CLEARINGHOUSE REVIEW REPORT (6/26/2014, 7/15/2014)

Comment Number	Comment	Response	DEIR Section
D-9	A Transportation Impact Assessment and the Corrective Measures Study/Proposal should be developed. A final transportation route that includes road crossing and access roads and operation plans to manage the anticipated impacts on each municipality that will be affected by the transportation and construction of this project. Such plans should deal with traffic, road closures, emergency services and compensation to each municipality for any costs incurred and damage caused. A copy of the proposed methodology is attached.	Tennessee has developed a Traffic and Transportation Management Plan for the Project.	Appendix F
D-11	A description of the anticipated blasting plan including specific areas where blasting is anticipated/likely. Plans should be in place to inform local town officials, if it is determined that blasting will be necessary. Local town officials should be provided with copies and detailed Project-specific blasting plans as soon as they are developed and should be provided enough lead time to make comments and address issues and concerns. There should be a detailed public notification plan for any blasting.	Any blasting activity will be performed according to strict guidelines designed to ensure safety to the public and the environment, utilizing proper safeguards to protect personnel and property in the area. A Blasting Plan has been provided in Appendix F.	Sections 5.2.1.1 and 6.2.1.1, and Appendix F

TABLE 8-4
RESPONSE TO COMMENTS FROM
BERKSHIRE REGIONAL PLANNING COMMISSION CLEARINGHOUSE REVIEW REPORT (6/26/2014, 7/15/2014)

Comment Number	Comment	Response	DEIR Section
D-12	A detailed description of the proposed water withdrawal and discharge of hydrostatic test water. The description should include the time of year when water withdrawal and discharge will be conducted, where the water will be discharged, the rate of discharge, potential effects of water withdrawal to Lower Spectacle Pond, water quality of hydrostatic test water discharged, and alternative methodologies for hydrostatic testing (such as alternative locations for withdrawal and discharge).	Tennessee will obtain a NPDES General Permit for Remediation which covers hydrostatic testing of natural gas pipelines and comply with the Commission's Plan and Procedures for hydrostatic testing. All permit conditions of the NPDES GP will be met during the hydrostatic testing of the pipeline. Specific information regarding the proposed withdrawal and testing are provided in the DEIR.	Sections 5.1.1.6.1, 6.1.3.1.2, and 7.7.3
D-13	Potential effects of water withdrawal to Lower Spectacle Pond, water quality of hydrostatic test water discharged, and alternative methodologies for hydrostatic testing (such as alternative locations for withdrawal and discharge).	Tennessee will obtain a NPDES General Permit for Remediation which covers hydrostatic testing of natural gas pipelines and comply with the Commission's Plan and Procedures for hydrostatic testing. All permit conditions of the NPDES GP will be met during the hydrostatic testing of the pipeline. Specific information regarding the proposed withdrawal and testing are provided in the DEIR.	Sections 5.1.1.6.1, 6.1.3.1.2, and 7.7.3
D-14	An erosion and sediment control plan which includes frequent monitoring during all phases of construction to insure that the erosion control devices function properly.	Discussions on erosion control and mitigation are provided throughout the DEIR. The Project will utilize Best Management Practices and FERCs Plan (Upland Erosion Control, Revegetation, and Maintenance Plan), a copy of which is located in Appendix E to minimize any impacts. Specific Erosion Control Plans are also provided in Appendix E.	Throughout DEIR and Appendix E

TABLE 8-4
RESPONSE TO COMMENTS FROM
BERKSHIRE REGIONAL PLANNING COMMISSION CLEARINGHOUSE REVIEW REPORT (6/26/2014, 7/15/2014)

Comment Number	Comment	Response	DEIR Section
D-15	A detailed dewatering plan, including plans to address sediment and siltation, should be included for the dewatering of trenches which will be required.	Tennessee will perform dewatering in a manner that will avoid impacts to resource areas and in accordance with the Commission's Plan and Procedures and in accordance with the requirements of all applicable regulations and permits. The dewatering process will be monitored to ensure no erosion or scouring occurs.	Section 2.3.1.5 and Appendix E
D-16	A detailed plan outlining how the Massachusetts River and Stream Crossing Standards will be met to the maximum extent practicable.	The Project will not result in permanent impacts to watercourses. One existing culvert, associated with stream SMA-14, will be removed resulting in restored land under waterbodies based on Massachusetts Stream Crossing Standards. All proposed stream crossings with discernible flow at the time of the crossing will be completed using a dry crossing method as discussed previously in this DEIR. No permanent impacts will occur as a result of these crossings and all LUWW and bank will be restored to pre-crossing conditions.	
D-17	A detailed plan to replicate impacted wetlands in accordance with the Wetlands Protection Act, which is consistent with the Massachusetts Inland Wetland Replication Guidelines (2002) and the Massachusetts Wildlife Habitat Protection Guidance for Inland Wetlands (2006). Alternatively, a detailed plan, including potential sites, for off-site wetland restoration or conservation.	A detailed plan for wetland mitigation is being developed for the Project, and a draft of that plan is provided in Appendix D of this DEIR. All temporary impacts to wetlands will be restored in place. The one small (0.11 acre) permanent wetland fill (needed for access) will be replicated per state and federal requirements. The replication will occur in the vicinity of the proposed impacts from a permanent access road.	Section 6.1.1.2 and Appendix D

TABLE 8-4
RESPONSE TO COMMENTS FROM
BERKSHIRE REGIONAL PLANNING COMMISSION CLEARINGHOUSE REVIEW REPORT (6/26/2014, 7/15/2014)

Comment Number	Comment	Response	DEIR Section
D-18	A detailed plan to reestablish vegetated cover in the ROW, TWA and ATWA, including plant lists and a monitoring plan to determine the successful establishment of plants and a plan to address invasive species through monitoring and eradication (should invasive species become established).	A draft compensatory mitigation plan and an invasive species control and monitoring plan for the Project are located in Appendix D. All areas of temporary impact will be replanted and monitored after construction is complete.	Appendix D and Section 6.1.1.2

TABLE 8-4
RESPONSE TO COMMENTS FROM
BERKSHIRE REGIONAL PLANNING COMMISSION CLEARINGHOUSE REVIEW REPORT (6/26/2014, 7/15/2014)

Comment Number	Comment	Response	DEIR Section
D-19	The proponent should develop a detailed Project-specific Invasive Species Management Plan and take extreme care not to introduce/spread invasive species. a. The proponent should consider using an alternative method of silt-fencing and straw-baling to reduce the risk of the inadvertent introduction of invasive species since hay bales frequently contain seed stock from invasive plants. Alternatives include straw bales in place of hay bales or double silt fences, silt socks, or coconut fiber material which can be staked like a silt fence and obviates the need for hay bales. These products are available from a variety of manufacturers. b. Similarly, the proponent should carefully select all fill materials to protect against the introduction of invasive species. c. The proponent should require vehicle cleaning before and after all work, both construction and routine operation and maintenance. d. An independent monitor should be required in perpetuity.	An invasive species control and monitoring plan for the Project has been developed and is located in Appendix D.	Appendix D

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Sandisfield Taxpayers Opposing the Pipeline

June 26, 2014

Secretary Maeve Vallely Bartlett
Executive Office of Energy and Environmental Affairs (EEA)
Attn: MEPA Office
Alex Strysky, Connecticut Expansion Project – Sandisfield, Tyringham, Agawam, EEA # 15205
100 Cambridge Street, Suite 900
Boston MA 02114

Dear Ms. Secretary,

We, the residents and taxpayers of Sandisfield, Massachusetts, stand in opposition to the latest pipeline expansion proposed by Kinder Morgan and its subsidiary, Tennessee Gas. At our annual town meeting on May 17, 2014, Sandisfield voters *unanimously* passed a "Resolution to Ban Gas Pipeline Expansion in Sandisfield" (please see attached).

While there are so many reasons that this unnecessary and unjust project is seriously ill-chosen and ill-timed including perils of construction and ongoing danger of explosion, serious disruption of community life, and long-term ruinous economic consequences, the most egregious impact is to the environment and the climate. This reckless assault on precious land, water, air, as well as on hapless and helpless creatures in its path, must not be allowed. We must transition away from fossil fuels to sustainable, local, renewable resources while pursuing energy efficiency.

Unlike some areas in the state and elsewhere in New England that have been targeted for new pipelines, Sandisfield knows all too well about living with these monstrosities. Our beautiful town has been ravaged twice by this particular corporation with lines installed in 1952 and in 1981. The land is now irreversibly scarred. There is daily erosion and the corridor is replete with invasive species, particularly phragmites. Long after the fracked gas supplies have run out, this atrocity will remain as a permanent reminder of corporate greed and feckless acquiescence by state and federal government agencies that stood by instead of protecting the land and the people who live here. We beseech you, for the sake of posterity, not to make matters even worse by approving this pipeline through our beautiful community. That would be a colossal mistake.

In this day and age, and of all places, Massachusetts, proud of its commitment to and national leadership in the quest for alternative, clean energy, this project, which does not even benefit the Commonwealth, will make a mockery of such aims and negate everything that has been accomplished. It is absurd to expect the people to sacrifice, conserve and support important environmental causes while letting this go forward. We cannot have it both ways. The people know that action speaks so much louder than words. Instead of considering this inane expansion proposition, the debate ought to be focused on how to <u>remove</u> – permanently -- existing very old and questionable pipelines and to restore the environment as best as possible. *That* would be the right thing to do.

<u>In the meantime, the people of Sandisfield request, because of numerous and careless errors and omissions in the ENF that could result in serious and lasting environmental consequences, that the State not waive mandates and allow the proponent a single EIR. Instead we urge you to insist that the company submit a draft EIR as required by law and common sense</u>.

We call your attention to the following highly relevant facts and concerns:

First, this project will traverse almost two miles of permanently conserved state land in the Otis State Forest around Spectacle Pond, under management of the Department of Conservation and Recreation. The land is protected under **Constitutional Amendment Article 97**. In a breath taking display of audacity but insight to the mindset of the petitioner, the ENF document hardly recognizes this fact.

The DCR's Director of Ecology is on the record that the area includes irreplaceable natural resources that are likely to be affected by the construction. To wit:

H-1 • Numerous bedrock outcrops in the middle of the old-growth forest

H-2 • Large old-growth oak and ash

H-3 • The pipeline crosses at least two significant perennial streams

H-4 • Archeological assets such as stone walls and at least one 18th-century foundation are at risk.

There is a likelihood of biodiversity loss with significant clearing, a loss of forest at crossovers, and species composition loss from a change of habitat types. Perhaps the last stand of old growth hemlock in this state is dangerously close to the pipeline. Methane gas, a well-known problem emanating from all points in gas transmission, is highly damaging to trees. A rupture or explosion in the vicinity would affect -- possibly obliterate – such an irreplaceable resource.

H-5 **Secondly**, what *independent* experts will monitor environmental compliance and how will it be done? During recent repairs to "anomalies" (May, 2014), KM/TGP knowingly and willfully disturbed invasive species and did not even follow their own guidelines such as washing excavators. One abutter whose land had an anomaly was not even notified at all. He found out about the work only when the excavators showed up. Tennessee Gas later admitted, "…we neglected to forward a letter advising you of our planned maintenance activities on your property." Who knows what other omissions or shortcuts occurred? For our part, we'll take this experience as proof of the attitude and routine practices of the company.

H-6 **Third**, concerned residents staged walks (May, early June) over the majority of the corridor. They observed numerous vernal pools, some or all potentially with rare species, which S.T.O.P. will be submitting for certification. The ENF cites only one certified vernal pool. Kinder Morgan's environmental consultants visited in the fall of 2013 when active vernal pools were not apparent. That may be convenient for them, but vernal pool studies should be done in the springtime, not during dry seasons.

Fourth, we are very concerned about TGP's pattern of disregard and apparent ignorance of existing law governing maintenance and pipeline repairs as reflected in the ENF. Specifically:

H-7 • **Management of invasive species:** Phragmites and some bittersweet are currently not being adequately controlled. TGP asserted in the June 10 MEPA site visit to Sandisfield that for routine maintenance and repairs they do not need to follow any special management practices. However, according to the DCR ecologist, Best Management Practices *must* be followed even in routine maintenance and repairs.

H-8 • **Restoration of wetlands**: TGP is also not following Best Management Practices in normal operations, which in Massachusetts is required. Wetlands are not protected. Vehicles routinely cross, causing rutting and thereby affecting water accumulation and drainage patterns, ultimately exacerbating the invasives problem. Normal operation – not just new construction – should implement BMP. This is required of foresters and should be required of TGP.

H-9 • **Greenhouse gas emissions:** During recent repairs, equipment was seen idling. Additionally, there is no analysis of the impact of methane release related to this project included in the ENF.

H-10 • TGP recently repaired five so-called "anomalies" in the Sandisfield corridor without obtaining the **required 401 Water Quality permit** from the Army Corps of Engineers through the Massachusetts Department of Environmental Protection. Kinder Morgan failed to notify at least one abutter in advance

of the work (see above), nor was the reason for work explained to the community, which caused needless anxiety.

H-11 • Given the general pattern of behavior, there must be plan that includes independent monitoring throughout the construction. We also need a copy of the TGP's 5-year invasive species mitigation plan referenced in the ENF.

There are additional deficiencies in the ENF report including:

H-12 • According to NHESP, Lower Spectacle Pond is a priority habitat for rare species. Why is this not acknowledged?

H-13 • KM is planning to withdraw upwards of a million gallons of water from Spectacle Pond for testing the new pipeline's integrity. They intend to discharge the water along the right of way, possibly exacerbating erosion. If it has to be used, water should be returned to its source in pure condition, i.e., not potentially contaminated by chemicals or materials coating the inside of the pipeline. (The company is not forthcoming about the nature of such materials).

H-14 • Reference page A-17. No blasting is anticipated because of "no shallow bedrock." The 1981 pipeline required blasting (which caused a pipeline rupture and evacuation of much of the Beech Plain section and parts of two other towns). KM's opinion that blasting will probably not be necessary is wishful thinking. The DCR Ecologist identified numerous bedrock outcrops in or near the path of the pipeline. The majority of the land in question is bedrock much of it visible due to earlier construction and/or subsequent unchecked erosion.

H-15 • Access roads are narrow. Will they need widening? One is next to a perennial stream. Heavy equipment will have a significant impact.

H-16 • In the Alternatives section, page 4, a "greenfield pipeline" is rejected. Such reasoning means that Sandisfield is automatically a default candidate for further pipeline expansion. The Town was targeted for expansion in 1981 *because* there was a line in place in 1952. The Town is targeted now *because* there are two lines in place. By this circular logic Sandisfield and the local environment are condemned to unlimited future expansions. This policy is fundamentally unfair if not immoral.

H-17 • Blatant environmental disregard in stream crossings. The image at right depicts an example of a 1981/82 makeshift stream crossing still in use on Article 97 land in Sandisfield. It was observed during the June 10 MEPA site visit. Decrepit, rusting pipes are scattered in the stream, creating a barrier to fish and wildlife passage. In this case there are older pipes under the visible upper ones. During the tour, TGP expressed no concern about this unacceptable situation.



General carelessness and inconsistencies throughout the report, for example:

H-18 • The ENF has inconsistencies throughout. For example, the figures on page 12 regarding threshold permits review do not match the figures in table B6, page B27.

H-19 • The wrong Berkshire Regional Planning Commission plan is cited. The BRPC Sustainable Berkshires Plan should be cited, not the Comprehensive Economic Development Plan. In fact, the citation is not only from the wrong document but it also implies that the gas benefits Massachusetts. This project has no benefit for Massachusetts – all customers are in Connecticut as has been the case for over 60 years. Did the preparers read their own report?

H-20 • Stone walls. The mapping is not accurate. The ENF maps include boulders dislodged in earlier construction and calls them “stone walls”. True historic stone walls are not shown! These important heritage assets are now at unacceptable risk for destruction.

H-21 • See Page 3: It says, "There are virtually no residential land impacts and the pipeline itself does not cross any residential land use." This is incorrect, unless “virtually” is interpreted so broadly as to be meaningless. In fact, there are plenty of residential land "impacts." The pipeline route does not, of course, drive through anyone's living room, but it passes for example within 300 feet of the house at 182 Cold Spring Road. Likewise, the archeological consultants imply that there are no historic assets at risk. The above property, circa 1785, is indeed historic and in fact has been recommended for listing on the National Register of Historic Places. An application is under preparation.

We appreciate the additional time granted for review of the ENF. However, as lay persons we are not familiar with geological and engineering technical data, much less the nuances of the business. The ENF has been prepared by a major, highly motivated, private corporation with great experience, practically unlimited resources, and access to paid experts as they wish. This is a ‘David and Goliath’ situation and the good citizens of this vulnerable small town (pop. 900) are relying on you, our public servants, to question the veracity, the completeness and the relevance of this environmental filing. The stakes for Sandisfield, and indeed for the Berkshires and the Commonwealth, are very high. There is no need to rush. We implore you to ensure this application receives the highest scrutiny, which is our duty and our right.

Respectfully Submitted,



Roberta Myers, Citizen Liaison,
S.T.O.P. (Sandisfield Taxpayers Opposing the Pipeline)
P.O. Box 671
Sandisfield, MA 01255
413-679-1066
www.SandisfieldTaxpayers.org

Please refer to the attached signature pages for a small sampling of S.T.O.P.’s many supporters.

cc: Select Board, Town of Sandisfield
Representative Smitty Pignatelli
Senator Benjamin Downing
United States Representative Richard Neal
United States Senator Edward Markey
United States Senator Elizabeth Warren
Governor Deval Patrick

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RESOLUTION TO BAN GAS PIPELINE EXPANSION IN SANDISFIELD

Whereas a proposed High-Pressure Pipeline, also known as a "loop," carrying natural gas including gas obtained by hydraulic fracturing, may come through Sandisfield transporting said fuel to Connecticut or to overseas destinations; and

Whereas said pipeline may undermine current Massachusetts commitments to renewable energies and combating global climate change; and

Whereas said pipeline expansion would at least double the width of the existing 4-mile route and obliterate for all time major tracts of precious forest, conservation and farm lands and would threaten wetlands as well as streams, rivers and ground water, and

Whereas said pipeline expansion would be ruinous to the scenic beauty and tranquility of this Town and the Berkshire Mountains including the Otis State Forest in Sandisfield; and

Whereas a high-pressure 36-inch gas pipeline loop designed to store and concentrate vast amounts of gas a mere 24 inches below ground in order to boost the velocity of gas through adjacent existing very old pipelines which by its nature carries the potential for leak, rupture, as has in fact already happened in this town, or potential devastating explosion causing untold damage to property and lives and the local economy; and

Whereas such pipelines are notorious for leaks and escape of the highly environmentally damaging methane gas at every point in the process including extraction, transmission and storage; and

Whereas the cost of said pipeline expansion would require Massachusetts citizens to pay a utility bill tariff as well as environmental costs not required by law for Tennessee Gas Pipeline Company, ("TGP", a subsidiary of Kinder Morgan Energy Partners, L.P.), forcing ratepayers to bear financial risk for the benefit of a wealthy private corporation; and

Whereas, we the citizens of Sandisfield, Massachusetts choose not to participate in such encumbrances to the life, vibrancy, economic stability wherever hydraulic fracturing is occurring and the pressurized pipeline is running; now, therefore, be it

Resolved, that the people of Sandisfield, Massachusetts:

1. Hereby call on our Select Board to stand in opposition to TGP's pipeline expansion and not allow it within our Town borders;

2. Oppose said pipeline expansion, and any new pipeline carrying natural gas whether obtained by hydraulic fracturing or otherwise, within the borders of our Commonwealth or our Nation; and

3. Hereby instruct our state and federal legislators and executive branch officials to enact legislation and take such other actions as are necessary to disallow such projects that go against our commitments to life, the environment, our economic well-being and our bodily safety, and, instead, to promote more stringent energy efficiency and further exploration of renewable energy sources.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Signature page supporting S.T.O.P. (Sandisfield Taxpayers Opposing the Pipeline)
Comment Letter to MEPA dated June 26, 2014
RE: EEA No. 15205 Connecticut Expansion Project- Sandisfield, Agawam, and Tyringham

NAME (PRINTED)	SIGNATURE	ADDRESS (including zip code)
SIMON WINCHESTER		87 SILVERBROOK · 01255
[illegible]		42 Town Hall Rd
~~Susan Croft~~		
Susan Croft	Susan Croft	2 New Hartford Rd.
Karen Burrows	Karen Burrows	174 New Hartford Rd
Sandra Morrison	Sandra Morrison	4 Tolland Rd
Ralph E Morrison	Ralph E Morrison	4 Tolland Rd
JOHN BURROWS	John Burrows	174 New Hartford Rd
Zoe R. Marinelli	Zoe R. Marinelli	19 Dodd Rd.
ANITA M. CARR Anita M. Carr	Anita M Carr	51 Silver Brook Rd.
[illegible]	[illegible]	19 Dodd Rd
Rose Nelson	[illegible]	19 Dodd Rd
J & C Zeller.	[illegible]	42 New Hartford Road
Karen Zeller	Karen Zeller	42 New Hartford Rd
Barry Freedman	B Freedman	17 Hammertown Rd

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NAME (PRINTED)	SIGNATURE	ADDRESS (including zip code)
JOSEPHINE F. FREEDMAN	Josephine Freedman	17 Hammertown Rd,
MARGARET A. O'CLAIR	Margaret A. O'Clair	22 River Rd
Anina Carr	Anina Carr	2 Sears Rd P.O. Box 651
Maurice W. Carr	Maurice Carr	" " " " " "
Karlene T. Blass	Karlene T. Blass	25 S. Beach Plain Rd.
Warren J. Blass, Jr.	Warren J. Blass	25 S. Beach Plain Rd.
Elizabeth Kuzmech	Elizabeth Kuzmech	14 Roosterville Rd 01255
John Kuzmech		14 Roosterville Rd 01255
Leona Patterson	Leona C. Patterson	106 Sandy Brook Turnpike 01255
Terry Ignace	Terry Ignace	106 Sandy Brook Tpke 01255
Hadassah Herman	Hadassah Herman	239 Sandisfield Rd 01255

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NAME (PRINTED)	SIGNATURE	ADDRESS (including zip code)
Carl Barton	Carl Barton	965 Main Sandisfield 01255
Susan Van Sickle	Susan Van Sickle	30 Rood Hill Rd. Sandisfield 01255
David J LeBreau	DAVID J LeBreau	119 So Main
Flora Parish	Flora Parish	N Main 01255
David Hubbard	[illegible]	39 Dodd 01255
Kit Gill	Kit Gill	82 Hammertown Rd 01255
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Allan Luks	Allan Luks	118 Sandisfield Rd.
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Naomi O Seligman	Naomi Seligman	N.O. Seligman
Kenneth Mayer	KENNETH MAYER	38 Norton Rd East EAST OTIS. 01029
Leslie Garfield	Leslie Garfield	61 Fox Rd. Sandisfield
Bonnie Benson	Bonnie Benson	45 West Center Road, West Stockbridge
SARAH HUDSON	SARAH HUDSON	12 Beach Rd Tyringham

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NAME (PRINTED)	SIGNATURE	ADDRESS (including zip code)
William Price	William Price	13 River Road Sandisfield MA 01255
Jean Atwater-Williams	Jean Atwater	182 Cold Spring Rd Sandisfield MA 01255
Paul R Slowatycki	[illegible]	12 S Sandisfield Sandisfield MA 01255
Donald H. Peet	Donald H. Peet	77 So. Beech Plain Rd Sandisfield, MA-01255
Charlene N. Peet	CHARLENE N. PEET	77 S BEECH PLAIN RD SANDISFIELD MA 01255
Mary Anne Grammer	Mary Anne Grammer	86 S Beech Plain Rd. Sandisfield, MA 01255
Herbert Bustis	[illegible]	83 Reed Hill Rd
Adam Manacher	[illegible]	100 Silverbrook Rd., Sandisfield
JP BLACHERE	[illegible]	153 New Hartford Rd.
GEORGE NELSON	George Nelson	Springfield Lane MA
Aleksandra Uzpurvis	[illegible]	182 Coldspring Rd Sandisfield MA 01255
Rachel Nelson	Rachel E Nelson	Springfield La MA
JOHN GRAMMER	John Grammer	86 SOUTH BEECH PLAIN RD., SANDISFIELD

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NAME (PRINTED)	SIGNATURE	ADDRESS (including zip code)
Doris Hryckvich	Doris Hryckvich	5 Roosterville Road, Sandisfield, Ma. 01255
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NICHOLAS HRYCHKVICH	Nicholas Hryckvich	116 S BEECH PLAIN RD
Nina Hryckvich	Nina Hryckvich	114 South Beech Plain Rd Sandisfield Ma 01255
Theresa Hryckvich	Theresa Hryckvich	114 South Beech Plain Rd Sandisfield Ma 01255
Sidney Pinsky	Sidney Pinsky	7 Silverbrook Rd Sandisfield Ma 01255
Victor Hryckvich		114 S Beech Plain
Devi Hyland	Devi Hyland	30 Sandisfield Rd Sandisfield MA 01255
Craig Cooley	Craig Cooley	57 Sandisfield Rd Sandisfield MA 01255
Nicole Hryckvich	Nicole Hryckvich	114 S. Beech Plain Road Sandisfield MA
	Jimmy Mourkas	26 HAMBLIN RD WALTHAM MA 02453
Roger Poirier	Roger Poirier	144 Chapel St Newton ma 02458
Julie Mclermick	Julie Mclermick	106 South main St Sandisfield MH 01255
Zach Ferron	Zach Ferron	106 South Main St Sandisfield, MA 01255

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NAME (PRINTED)	SIGNATURE	ADDRESS (including zip code)
Barbara Colorio	Barbara Colorio	101 North main St Sandisfield MA 01255
Eric Hoffman	Eric Hoffman 7 Silverbrook Rd	7 Silverbrook Rd Sandisfield MA 01255
Daniel G. Pinsky	Daniel G. Pinsky 8 Silverbrook Rd. Sandisfield	8 Silverbrook Rd Sandisfield MA 01255
Margret Hoffman	Margret Hoffman	8 Silverbrook Rd Sandisfield MA 01255

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NAME (PRINTED)	SIGNATURE	ADDRESS (including zip code)
Constance Canty Donaldson	Constance Canty Donaldson	Sandisfield MA 2 Bosworth Rd 01255
Jo Garfield	61 Fox Road	Sandisfield, MA 01255
Barbara Steenstra	Barbara Steenstra	104 Wash St Sandisfield MA 01255
P. Nicholas Enton		104 West St. Sandisfield, MA 01255
Aaron Bartow		1016 Cross Rd to Canaan Valley Southfield, MA 01259
Setsuko Winchester	Setsuko Winchester	87 Silverbrook Rd
Teresa DellaGiustina	Teresa DellaGiustina	45 Clark Rd
Stephen Hayes	Stephen Hayes & Co	109 North Main ST

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Signature page supporting S.T.O.P. (Sandisfield Taxpayers Opposing the Pipeline)
Comment Letter to MEPA dated June 26, 2014
RE: EEA No. 15205 Connecticut Expansion Project- Sandisfield, Agawam, and Tyringham

NAME (PRINTED)	SIGNATURE	ADDRESS (including zip code)
Hilde Weisert S.T.O.P.	Hilde Weisert	98 Hammertown Rd, Sandisfield MA 01255
Barbara Penn (S.T.O.P.)	Barbara PENN	Box 117 SANDISFIELD MA 01255

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Signature page supporting S.T.O.P. (Sandisfield Taxpayers Opposing the Pipeline)
Comment Letter to MEPA dated June 26, 2014
RE: EEA No. 15205 Connecticut Expansion Project- Sandisfield, Agawam, and Tyringham

NAME (PRINTED)	SIGNATURE	ADDRESS (including zip code)
LAUREN PAUL	Lauren Paul	219 SANDISFIELD Rd. 01255
RONALD M BERNARD	Ronald M Bernard	182 Cold Spring Rd 01255

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Signature page supporting S.T.O.P. (Sandisfield Taxpayers Opposing the Pipeline)
Comment Letter to MEPA dated June 26, 2014
RE: EEA No. 15205 Connecticut Expansion Project- Sandisfield, Agawam, and Tyringham

NAME (PRINTED)	SIGNATURE	ADDRESS (including zip code)
Jean A. Killackey	Jean A. Killackey	41 South Pine St. Otis, MA 01253
Scott MacKenzie	Scott MacKenzie	351 Addit Cross Rd New Marlborough Ma. 01230

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Signature page supporting S.T.O.P. (Sandisfield Taxpayers Opposing the Pipeline)
Comment Letter to MEPA dated June 26, 2014
RE: EEA No. 15205 Connecticut Expansion Project- Sandisfield, Agawam, and Tyringham

NAME (PRINTED)	SIGNATURE	ADDRESS (including zip code)
Alice Boyd	Alice L Boyd	125 Sandisfield Rd Sandisfield, MA 01255
Sanford Parisky	Sanford Parisky	99 North Main St. Sandisfield, MA 01255
JERRY HERMAN	Jerry Herman	239 SANDISFIELD RD SANDISFIELD MA 01255
BEN LUXON	Ben Luxon	2 NEW HARTFORD RD SANDISFIELD MA 01255
Roberta Myers	Roberta Myers	250 Cold Spring Rd Sandisfield MA 01255
Thelma Esteves	Thelma Esteves	113 Beech Plain Rd Sandisfield MA 01255
Inez Wessman	Inez Wessman	647 James ST Pelham NY 10803
Isis-Esteves Tornow	Isis Esteves Tornow	32 Sawyer ST Nashua NH 03060
Pat Comunale	Pat Comunale	730 Pelham Rd New Rochelle NY 10805
Lovelle Ruggiero	Lovelle Ruggiero	71 So. Sandisfield Rd Sandisfield MA 01255
Judith Goldsmith	Judith Goldsmith	215 N. Beech Plain Rd Sandisfield MA 01255
TED GOLDSMITH	Ted Goldsmith	215 N. BEECH PLAIN RD SANDISFIELD, MA 01255
Dylan Winters	Dylan Winters	2651 Cold Springs Rd. Otis MA 01245

TABLE 8-5
RESPONSE TO COMMENTS FROM SANDISFIELD TAXPAYERS OPPOSING THE PIPELINE (6/26/2014)

Comment Number	Comment	Response	DEIR Section
H-1	Numerous bedrock outcrops in the middle of the old-growth forest.	See DEIR for discussion on bedrock and potential blasting areas and Appendix J for shallow depth to bedrock mapping.	Sections 5.2.1, 5.2.1.1, and Appendix J
H-2	Large old-growth oak and ash.	Comment only	
H-3	The pipeline crosses at least two significant perennial streams.	See DEIR for discussions on stream crossings, impacts and restoration.	Section 5 and Table 5-4.
H-4	Archeological assets such as stone walls and at least one 18th-century foundation are at risk.	The DEIR includes discussions on the archeological and historical places investigations.	Section 4.1.4
H-5	What independent experts will monitor environmental compliance and how will it be done?	Tennessee will employ environmental inspectors during construction of the Project.	Section 2.3.5
H-6	Concerned residents observed numerous vernal pools, some or all potentially with rare species, which S.T.O.P. will be submitting for certification. The ENF cites only one certified vernal pool.	Tennessee conducted Vernal Pool surveys during the amphibian breeding season in spring 2014. Results of those surveys are detailed in the DEIR and the vernal pool reports and mapping are included in Appendix K.	Sections 4.1.2, 5.1.1.5, 6.1.2, and Appendix K.
H-7	Management of invasive species: Phragmites and some bittersweet are currently not being adequately controlled. TGP asserted in the June 10 MEPA site visit to Sandisfield that for routine maintenance and repairs they do not need to follow any special management practices. However, according to the DCR ecologist, Best Management Practices must be followed even in routine maintenance and repairs.	Tennessee has developed an Invasive Species Management Plan, provided in Appendix D.	Appendix D

TABLE 8-5
RESPONSE TO COMMENTS FROM SANDISFIELD TAXPAYERS OPPOSING THE PIPELINE (6/26/2014)

Comment Number	Comment	Response	DEIR Section
H-8	Restoration of wetlands: TGP is also not following Best Management Practices in normal operations, which in Massachusetts is required. Wetlands are not protected. Vehicles routinely cross, causing rutting and thereby affecting water accumulation and drainage patterns, ultimately exacerbating the invasive problem. Normal operation – not just new construction – should implement BMP. This is required of foresters and should be required of TGP.	Appendix E contains Tennessee's BMPs which will be followed during construction and operation of the pipeline.	Appendix E
H-9	Greenhouse gas emissions: During recent repairs, equipment was seen idling. Analysis of the impact of methane release related to this project?	A greenhouse gas analysis has been prepared for the Project and is provided in Appendix K.	Appendix K
H-10	TGP recently repaired five so-called "anomalies" in the Sandisfield corridor without obtaining the required 401 Water Quality permit from the Army Corps of Engineers through the Massachusetts Department of Environmental Protection. Kinder Morgan failed to notify at least one abutter in advance of the work (see above), nor was the reason for work explained to the community, which caused needless anxiety.	Comment only	
H-11	Given the general pattern of behavior, there must be a plan that includes independent monitoring throughout the construction. We also need a copy of the TGP's 5-year invasive species mitigation plan referenced in the ENF.	An invasive species management plan has been provided in Appendix D.	Appendix D

TABLE 8-5
RESPONSE TO COMMENTS FROM SANDISFIELD TAXPAYERS OPPOSING THE PIPELINE (6/26/2014)

Comment Number	Comment	Response	DEIR Section
H-12	According to NHESP, Lower Spectacle Pond is a priority habitat for rare species. Why is this not acknowledged?	The presence and avoidance of rare species is discussed in the DEIR in Sections 4.1.3, 5.1.1.6, and 6.1.3 and filings with the NHESP are provided in Appendix G.	Sections 4.1.3, 5.1.1.6, 6.1.3, and Appendix G.
H-13	KM is planning to withdraw upwards of a million gallons of water from Spectacle Pond for testing the new pipeline's integrity. They intend to discharge the water along the right of way, possibly exacerbating erosion. If it has to be used, water should be returned to its source in pure condition, i.e., not potentially contaminated by chemicals or materials coating the inside of the pipeline. (The company is not forthcoming about the nature of such materials).	The pipeline sections will be coated internally with a chemical compound, Valspar flow liner, intended to reduce friction during pipeline operations. The flow liner is applied by the manufacturer at the plant to the pipe sections and allowed to dry before shipping. Once dry, the chemical is inert and will not result in any type of leaching or off-gasing of chemicals into the hydrostatic testwater or surrounding environments following discharge from the pipe.	Section 5.1.1.6.1
H-14	Reference page A-17. No blasting is anticipated because of "no shallow bedrock." The 1981 pipeline required blasting (which caused a pipeline rupture and evacuation of much of the Beech Plain section and parts of two other towns).	See DEIR for discussion on bedrock and potential blasting areas and Appendix J for shallow depth to bedrock mapping.	Sections 5.2.1, 5.2.1.1 and Appendix J
H-15	Access roads are narrow. Will they need widening? One is next to a perennial stream. Heavy equipment will have a significant impact.	Five access roads are proposed for use in the Project; three access roads will be permanent. Discussions on access road construction, use and impacts have been provided in the DEIR. Access road details have been provided in Appendix B.	Sections 2.2.2.4, 5.1.1.1.2, 6.1.1.2 and Appendix B.

TABLE 8-5
RESPONSE TO COMMENTS FROM SANDISFIELD TAXPAYERS OPPOSING THE PIPELINE (6/26/2014)

Comment Number	Comment	Response	DEIR Section
H-16	In the Alternatives section, page 4, a "greenfield pipeline" is rejected. Such reasoning means that Sandisfield is automatically a default candidate for further pipeline expansion. The Town was targeted for expansion in 1981 because there was a line in place in 1952. The Town is targeted now because there are two lines in place. By this circular logic Sandisfield and the local environment are condemned to unlimited future expansions. This policy is fundamentally unfair if not immoral.	A detailed alternatives analysis is provided in Section 3 of the DEIR.	Section 3
H-17	Blatant environmental disregard in stream crossings. The image at right depicts an example of a 1981/82 makeshift stream crossing still in use on Article 97 land in Sandisfield. It was observed during the June 10 MEPA site visit. Decrepit, rusting pipes are scattered in the stream, creating a barrier to fish and wildlife passage. In this case there are older pipes under the visible upper ones.	Tennessee has committed to removing the existing culvert/pipes at the Lower Spectacle Pond Brook crossing.	
H-18	The ENF has inconsistencies throughout. For example, the figures on page 12 regarding threshold permits review do not match the figures in table B6, page B27.	Comment only.	

TABLE 8-5
RESPONSE TO COMMENTS FROM SANDISFIELD TAXPAYERS OPPOSING THE PIPELINE (6/26/2014)

Comment Number	Comment	Response	DEIR Section
H-19	The wrong Berkshire Regional Planning Commission plan is cited. The BRPC Sustainable Berkshires Plan should be cited, not the Comprehensive Economic Development Plan. In fact, the citation is not only from the wrong document but it also implies that the gas benefits Massachusetts. This project has no benefit for Massachusetts – all customers are in Connecticut as has been the case for over 60 years. Did the preparers read their own report?	The Comprehensive Economic Development Plan has been reviewed and is discussed in the DEIR.	Section 5.2.7
H-20	Stone walls. The mapping is not accurate. The ENF maps include boulders dislodged in earlier construction and calls them “stone walls”. True historic stone walls are not shown! These important heritage assets are now at unacceptable risk for destruction.	Stone walls are depicted on the Project Alignment sheets in Appendix B and in the stonewall mapping in Appendix J.	Appendices B and J
H-21	See Page 3: It says, "There are virtually no residential land impacts and the pipeline itself does not cross any residential land use." This is incorrect, unless “virtually” is interpreted so broadly as to be meaningless. In fact, there are plenty of residential land "impacts." The pipeline route does not, of course, drive through anyone's living room, but it passes for example within 300 feet of the house at 182 Cold Spring Road. Likewise, the archeological consultants imply that there are no historic assets at risk. The above property, circa 1785, is indeed historic and in fact has been recommended for listing on the National Register of Historic Places. An application is under preparation.	Comment only.	

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20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM



July 3, 2014

Secretary Maeve Vallely Bartlett
Executive Office of Energy and Environmental Affairs (EEA)
Attn: MEPA Office
Alex Strysky, EEA No. 15205
100 Cambridge Street, Suite 900
Boston MA 02114

Re : Connecticut Expansion Project proposed by Tennessee Gas Pipeline through their Expanded Environmental Notification Form. (EEA # 152005)

Dear Secretary Bartlett,

Berkshire Environmental Action Team (BEAT) would like to offer the following comments regarding the proposed Connecticut Expansion Project proposed by Tennessee Gas Pipeline Company.

C-1 1. **Draft and Final EIR** - This pipeline will have a huge impact on our environment. Please require Tennessee Gas Pipeline (TGP) to undergo the full MEPA process, producing a draft EIR for public comment. TGP can then use those comments to fully develop a final EIR. In order to make an informed decision, it is critical to weigh all the environmental costs.

C-2 2. BEAT believes that **independent monitoring** of the proposed Connecticut Expansion Project should be required. TGP has recently (in May) investigated 5 "anomalies" in the Sandisfield part of their existing pipeline WITHOUT obtaining the required 401 Water Quality permit from the Army Corps of Engineers through Massachusetts Department of Environmental Protection (personal communication with David Foulis, WERO). If this was an emergency, was the town notified and were residents notified? How do we ensure this error never occurs again and that applicable laws are followed?

C-3 3. **"Purpose and Need" -** BEAT disputes the assertion that this project is needed to meet the current demand for gas in the region. Even during the coldest days last winter, there was enough gas in the region despite a compressor station being out of service in Delmont, Pennsylvania, to service all gas heating customers, but also to generate enough electricity to fill all the need, and extra capacity need, required by ISO-New England, and still sell electricity to New York state, and have 44 MW left over. (ISO-New England, January 2014 FERC Data Request *attached*).

BEAT ~ 29 Highland Ave., Pittsfield, MA 01201-2413 jane@thebeatnews.org 413-230-7321

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

We believe that continued gains in energy efficiency can easily reduce the need for gas in the region both for heating homes and for producing electricity. The Department of Energy Resources is looking to encourage the adoption of cold-weather, high-efficiency heat pumps as an alternative to using gas or oil heating. Heat pumps are cost-competitive with gas, reduce our gas use for heating, and reduce greenhouse gas emissions.

We request that before any new gas transmission pipeline is considered that there be an analysis of the costs and benefits of meeting the Low Demand Scenario of the New England States Committee on Electricity, Gas-Electricity Working Group Final Report dated March 28, 2014. (*attached*) According to this report (page 14), under the Low Demand Scenario there is no need for long-term infrastructure, but an analysis of the costs and benefits of the Low Demand Scenario has not been done. Before building any long-term infrastructure to bring in more fossil fuels, please require an analysis of the Low Demand Scenario which would be the **No Build Alternative**. (see also the *attached* ENE letter "Right-sizing infrastructure")

C-4

4. **Segmentation** - We are concerned that separating this project from the Northeast Energy Direct pipeline project (as well as the other pipeline projects proposing to bring more gas from the Marcellus Shale hydraoulic fracturing fields into New England) could be interpreted as segmenting the project. We need a study to determine if any more gas infrastructure is truly needed.

C-5

5. This proposed infrastructure will bring in a **diminishing, limited resource**. We do not believe the price of this fuel is likely to remain low. We should be investing instead in renewable energy long-term infrastructure to gather fuel that has no cost and no emissions.

C-6

6. **Greenhouse Gas Emission Study** - Please require a greenhouse gas emission study that includes emissions from well head to burner tip. This should include both CO2 emissions as well as methane emissions not only from burning the increased amount of fuel, but also from leakage from drilling, gathering, compressing, and transporting this fuel. The leakage at drilling and gathering facilities can be enough to make using this gas worse for climate change than using coal. (Howarth presentation – Petron et al. 2012 direct landscape scale measurement showed 4% leakage at drilling and gathering areas – *slide attached*)

C-7

7. **Permanently protected land** under our State Constitution, Article 97, should not be released from that permanent protection. The Senator and Representative for Sandisfield have stated publicly that they will not vote for, and indeed will argue against, releasing these lands from state protection.

C-8

8. **Monitoring Plans -** P A-15 - Active Croplands - TGP proposes to implement a crop monitoring program where they go through crop land. We request that they implement a RESTORATION monitoring plan for the entire project area, especially wetlands and waterways, where an independent monitor is hired to determine if pre-construction conditions are restored, ensure that native vegetation is re-established, and ensure that

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

invasive species are eliminated. This monitoring should be maintained for as long as the pipeline is in place.

9. **Waterbody Construction and Minimization/Mitigation Procedures -** No construction equipment should be allowed in any of the waterbodies. Time of year restriction should be observed. All crossings should maintain the natural water flows and the crossings should be restored to a natural condition as quickly as possible. C-9

10. **Stream crossings** - At the site visit we observed a stream crossing where TGP had placed pipes lengthwise in a stream. Evidently, when those pipes no longer functioned to serve TGP's purposes, they placed more pipes on top of the first pipes. These pipes are mostly rotted through. This is a barrier to fish and wildlife passage. TGP still includes this method, along with using sand bags, as a proper way to build a stream crossing. We request that the use of sand bags be severely limited – they always send sand into the stream. In addition, we ask that TGP be required to use temporary bridges to cross any streams. And they should be required to restore the stream crossing we visited to a natural condition, removing all pipes and parts there of. C-10

11. **Vernal Pools** – The proposents mention that one certifed vernal pool exists along the pipeline route. What steps have been taken to identify additional vernal pools along the construction route? BEAT would suggest requiring TGP to provide funding for Natural Heritage to hire experts next spring to look for and document vernal pools within the proposed work area. C-11

12. **Invasive species** - C-12
    A. TGP should be required for both the proposed project and any work on their right-of-way in Massachusetts – to come up with a project-specific plan to prevent the spread of invasive species, including washing their equipment between sites. An independent monitor should be required as long as the right-of-way exists.
    B. The proponent should not use hay bales for either the proposed work or work on their existing Right-of-way, as these frequently have seeds of invasive species.
    C. Brushing off the "mats" is not sufficient. ALL equipment used, especially in an area with invasive species, should be washed thoroughly when moving to a new area. This should be routine practice.
    D. It is obvious that TGP has failed to prevent the spread of invasive species to date. The right-of-way is heavily infested. TGP should devise a plan to prevent the further introduction and spread of invasive species and be required to monitor for invasive species spread in perpetuity.

Although on page 7 of the ENF, TGP states that all areas will be returned to pre-construction conditions after construction is complete – on the ground, it appears that TGP is incapable of making good on this statement.

13. **Off-Road Vehicles** - BEAT agrees with Mass Audubon's comments: "Utility corridors are frequently used illegally by all terrain vehicles (ATVs). The EENF describes a commitment C-13

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

to provide gates and signage, and to work on an ongoing basis with landowners to deter unauthorized access including by ATVs. However, there is no commitment made to work with local or state law enforcement authorities or to assist in the funding of chronically underfunded ATV enforcement programs. DCR does not have the capacity to effectively deter unauthorized ATV use on its properties, and the proposed expansion of this utility easement increases the likelihood of ATV enforcement problems at Otis State Forest."

14. **Pipeyard in Tyringham**. No wetlands were delineated at the time of the site visit. It was impossible to get an understanding of the potential impacts to the rare species habitat.
C-14 This section of the ENF needs expanding! The proponent should be required to have a biologist with expertise in turtles on site when preparing the site. The entire work area should be surrounded by silt fence - well entrenched, taut, and angled outward to prevent turtles from climbing over it, and inspected several times a day if the fence is up during nesting/hatching times.

C-15 15. All species used for replanting should be **native to the southern Berkshires.**

16. **Proposed Facilities**
    A. page A-2 – We would like to note that at pig launching and receiving stations,
C-16 methane along with whatever **chemical residuals from hydraulic fracturing** are released as a part of normal operating procedures. Unfortunately, our federal Clean Air Laws do not appear to protect us from this.

    B. page A-3 – We request that Tennessee Gas Pipeline Company be required to **disclose ALL potential "modifications"** that they will need on and along the right-of-way during the MEPA process. At a public meeting in Richmond, TGP said that they were showing two compressor stations – one in Wright, NY and one in Dracut, MA. We believe that it would be impossible for TGP to operate this pipeline over the hilltowns of Massachusetts at high pressures with only those two compressor stations. While that misleading statement does not apply to the pipeline under discussion in this ENF, it is a major reason that we feel strongly that the MEPA process must be used to ferret out all the potential "modifications" that TGP is likely to add as this process moves along.

    C. **Incineration zone** – page A-15 - The ENF states that no residences are located within 50 feet of the construction work. What is the incineration zone if a pipeline of this size ruptures?

17. **Blasting** -
    A. page A-16 – TGP claims "no blasting is anticipated". We find that hard to believe
C-17 seeing the amount of ledge and bedrock at the site and knowing that they last time they put a pipeline in this location, not only did they have to do blasting, but it was the blasting that ruptured the adjacent pipeline so much of the town had to be evacuated.
    B. page A-17 – We would like a third party to evaluate any damage complaints.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

18. **Air quality monitoring** - Appurtenant Facilities – page A-18 - Air quality monitoring should occur at the compressor station in Agawam and at the pigging facilities when they are active to determine the amount and composition of the gas released in these locations and the potential harm nearby residents could be exposed to. C-18

19. **Herbicides** - Operations and Maintenance – page A-18 – TGP claims they do not use herbicides, however they have a plan on file with the state of Massachusetts to allow them to use herbicides, and in the ENF they say they will not use herbicides within 100 feet of wetlands. We would like a statement in writing that no herbicides will be used. C-19

20. Future Plans and **Abandonment** – page A-19 – The state of Massachusetts is moving away from the use of fossil fuels. MEPA should require an abandonment plan. C-20

21. **Construction and Operation Impact** – page B-9 – This section lacks adequate detail on how TGP would deal with a high water table. C-21

22. **Hydrostatic Test Water –** page B-17 – There should be an independent monitor to ensure that this procedure is carried out in compliance with NHESP restrictions. The water should be returned to an upland area up gradient of Spectacle Pond (assuming the pipeline coating is not toxic) and allowed to infiltrate into the soil. C-22

23. **Coating inside the pipes** - At the site visit, we requested information on what is used to coat the insides of these pipes. As far as I know, we have not had an answer. The water that will be withdrawn from rare species habitat of Spectacle Pond will be used to test these pipes and then be released into the environment. We would like a full list of the chemicals that water will be exposed to. Will the water be tested as it comes out of the pipes? While we would like that water to be returned to an upland area upstream of Spectacle Pond to infiltrate and make its was back to the pond, we would only like that if the water would be completely safe for the very sensitive species in the pond. C-23

24. **<u>Alternatives</u>**
    A. page C-1 – **Energy Conservation** – TGP presents no evidence that energy efficiency programs, demand generation, and planned renewable generation could not meet the supposed need. C-24

    B. NESCOE's Gas-Electricity Working Group Final Report, March 28, 2014 (*attached*) - page 14 – states that the required analysis has not been done:

> "Reducing consumers' demand for electricity and natural gas to the extent assumed in the Low Demand Case eliminates the need for consumers to invest in infrastructure (beyond the pipeline currently in process toward commercialization). Successfully implementing natural gas and electricity energy efficiency programs, renewable thermal heating applications,

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

> and distributed electric generation that cause the demand for natural gas and the net electric load to decline in the long-term could eliminate any need for additional infrastructure. The associated cost of achieving a Low Demand Scenario is not known. Further analysis would be required to determine whether policies that would result in a Low Demand Scenario are cost-competitive with infrastructure investments."

25. TGP says this project will assist with "the Commission's goal of bringing new supplies of natural gas to market." Exactly what Commission are they referring to? The Berkshire Regional Planning Commission (BRPC) specifically states the need to move away from fossil fuels and produce more clean, renewable energy within the region.

C-25

26. **BRPC Sustainable Berkshires – comprehensive, long-range master plan.** The underlying theme of the new master plan is the concept of economic resiliency and environmental sustainability.

C-26

In the Climate and Energy section, on page CE-3 it states:

A. **Shifting energy from an imported product to a local one.** As noted in the *Massachusetts Clean Energy and Climate Plan for 2020*, the state is at the "end of the energy pipeline," importing almost all of its energy from other parts of North America or the world. We are dependent on producers and market forces. This means that funds spent on importing fuel leave the state and the region, impacting economic stability. The estimated exported economic value of purchasing energy from outside Massachusetts for 2008 was $22 billion state-wide.

B. **Job creation through clean energy economy investments**. Massachusetts is in a position to show the way to a clean energy economy and reap direct benefits in economic growth. Between 2007 and 2012 the number of photovoltaic systems installed in Massachusetts increased 20-fold, with jobs in solar manufacturing, installation and services nearly tripling from 1,200 to 3,000. Two-thirds of these jobs are in manufacturing. In total, the Clean Energy Center estimates that at least 11,000 people were employed in the clean energy sector in 2010, up 65% from 2007.

And on page CE-25

C. **Transitioning the region away from fossil fuels** could help the region stand out. As a standout leader, the region may attract green and clean tech businesses or green friendly businesses to locate here. The costs of inaction are therefore a concern to the future of the region.

And BEAT agrees with BRPC's additional recommendations:

C-27

<u>Recommendations to Local Boards and Commissions for the Local Permitting Process:</u>

1. The Towns should not close public hearings on pending permits for this project prior to

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

the conclusion of the MEPA process.

C-28 2. The Towns should determine that they have the appropriate rules and regulations in place to hire outside consultants, at the proponent's expense, to review the project for wetlands, rare and endangered species and floodplain impacts.

C-29 3. The Conservation Commissions should include provisions for ongoing monitoring.

C-30 4. Given careful management of refueling and servicing of construction equipment should be conducted, particularly in wetland and riverfront areas. The use of biodegradable plant-based hydraulic fluids should be considered.

C-31 5. Tennessee should be required to provide periodic training of emergency responders in Sandisfield and all communities with whom the Sandisfield Volunteer Fire Department normally uses for mutual aid situations. This should be an ongoing commitment for the life of the pipeline. Ambulance and police should also be included, as well as the towns' Emergency Managers.

Thank you for considering our comments.

Sincerely,



Jane Winn, Executive Director

BEAT ~ 29 Highland Ave., Pittsfield, MA 01201-2413 jane@thebeatnews.org 413-230-7321

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

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TABLE 8-6
RESPONSE TO COMMENTS FROM BERKSHIRE ENVIRONMENTAL ACTION TEAM (7/3/2014)

Comment Number	Comment	Response	DEIR Section
C-1	Require Tennessee Gas Pipeline (TGP) to undergo the full MEPA process, producing a draft EIR for public comment. TGP can then use those comments to fully develop a final EIR. In order to make an informed decision, it is critical to weigh all the environmental costs.	Tennessee initiated Massachusetts Environmental Policy Act ("MEPA") review by filing an Expanded Environmental Notification Form ("EENF") on May 15, 2014. After considering public comments, the Secretary of the Executive Office of Energy and Environmental Affairs (Secretary of "EEA") issued a Certificate dated July 11, 2014 requiring Tennessee to proceed with the filing of a DEIR and a Final EIR ("FEIR"). A copy of the EENF Certificate is provided at the beginning of the DEIR which was submitted to MEPA on September 30, 2014.	
C-2	BEAT believes that **independent monitoring** of the proposed Connecticut Expansion Project should be required. TGP has recently (in May) investigated 5 "anomalies" in the Sandisfield part of their existing pipeline WITHOUT obtaining the required 401 Water Quality permit from the Army Corps of Engineers through Massachusetts Department of Environmental Protection (personal communication with David Foulis, WERO). If this was an emergency, was the town notified and were residents notified? How do we ensure this error never occurs again and that applicable laws are followed?	Tennessee will have Environmental Monitors during construction in compliance with FERC's Plan and Procedures and will be present to oversee construction in compliance with permit conditions. FERC typically assigns an independent 3rd party monitor to report directly to FERC regarding environmental compliance during construction. Anomaly repairs are considered a maintenance activity and therefore USACE 404 and state 401 WQC permits are not required.	
C-3	**"Purpose and Need" -** BEAT disputes the assertion that this project is needed to meet the current demand for gas in the region. Even during the coldest days last winter, there was enough gas in the region despite a compressor station being out of service in Delmont, Pennsylvania, to service all gas heating customers, but also to generate enough	Tennessee has provided a detailed Purpose and Need and also a detailed Alternatives Analysis as part of the DEIR.	Sections 1.1.1 and 3.0

TABLE 8-6
RESPONSE TO COMMENTS FROM BERKSHIRE ENVIRONMENTAL ACTION TEAM (7/3/2014)

Comment Number	Comment	Response	DEIR Section
	electricity to fill all the need, and extra capacity need, required by ISO-New England, and still sell electricity to New York state, and have 44 MW left over. (ISO-New England, January 2014 FERC Data Request *attached*). We believe that continued gains in energy efficiency can easily reduce the need for gas in the region both for heating homes and for producing electricity. The Department of Energy Resources is looking to encourage the adoption of cold-weather, high-efficiency heat pumps as an alternative to using gas or oil heating. Heat pumps are cost-competitive with gas, reduce our gas use for heating, and reduce greenhouse gas emissions. We request that before any new gas transmission pipeline is considered that there be an analysis of the costs and benefits of meeting the Low Demand Scenario of the New England States Committee on Electricity, Gas-Electricity Working Group Final Report dated March 28, 2014. (*attached*) According to this report (page 14), under the Low Demand Scenario there is no need for long-term infrastructure, but an analysis of the costs and benefits of the Low Demand Scenario has not been done. Before building any long-term infrastructure to bring in more fossil fuels, please require an analysis of the Low Demand Scenario which would be the **No Build Alternative**. (see also the *attached* ENE letter "Right-sizing infrastructure")		

TABLE 8-6
RESPONSE TO COMMENTS FROM BERKSHIRE ENVIRONMENTAL ACTION TEAM (7/3/2014)

Comment Number	Comment	Response	DEIR Section
C-4	**Segmentation** - We are concerned that separating this project from the Northeast Energy Direct pipeline project (as well as the other pipeline projects proposing to bring more gas from the Marcellus Shale hydraoulic fracturing fields into New England) could be interpreted as segmenting the project. We need a study to determine if any more gas infrastructure is truly needed.	Please refer to the Purpose and Need and Future Plans sections of the DEIR.	Sections 1.1.1 and 2.5
C-5	This proposed infrastructure will bring in a **diminishing, limited resource**. We do not believe the price of this fuel is likely to remain low. We should be investing instead in renewable energy long-term infrastructure to gather fuel that has no cost and no emissions.	Other fuel sources to meet the existing demand are examined in the Alternatives section of the DEIR	Section 3.0
C-6	**Greenhouse Gas Emission Study** - Please require a greenhouse gas emission study that includes emissions from well head to burner tip. This should include both CO_2 emissions as well as methane emissions not only from burning the increased amount of fuel, but also from leakage from drilling, gathering, compressing, and transporting this fuel. The leakage at drilling and gathering facilities can be enough to make using this gas worse for climate change than using coal. (Howarth presentation – Petron et al. 2012 direct landscape scale measurement showed 4% leakage at drilling and gathering areas – *slide attached*)	A greenhouse gas analysis has been performed for the Project. Please refer to sections 4.2.5, 5.2.6 and 6.2.4 of the DEIR. The full analysis is provided in Appendix K.	Sections 4.2.5, 5.2.6 and 6.2.4

TABLE 8-6
RESPONSE TO COMMENTS FROM BERKSHIRE ENVIRONMENTAL ACTION TEAM (7/3/2014)

Comment Number	Comment	Response	DEIR Section
C-7	**Permanently protected land** under our State Constitution, Article 97, should not be released from that permanent protection. The Senator and Representative for Sandisfield have stated publicly that they will not vote for, and indeed will argue against, releasing these lands from state protection.	The DEIR includes an evaluation of the Article 97 Easement that is needed for the Project, including analysis for avoiding Article 97 lands, minimizing impacts and mitigating impacts. Please see Section 2.7.	Section 2.7.
C-8	**Monitoring Plans -** Active Croplands - TGP proposes to implement a crop monitoring program where they go through crop land. We request that they implement a RESTORATION monitoring plan for the entire project area, especially wetlands and waterways, where an independent monitor is hired to determine if pre-construction conditions are restored, ensure that native vegetation is re-established, and ensure that invasive species are eliminated. This monitoring should be maintained for as long as the pipeline is in place.	As part of the FERC and federal and state permitting process, Tennessee is required to develop mitigation plans for all of the Project impacts. A draft wetland mitigation plan has been submitted and is located in Appendix D. All temporary impacts to wetlands will be restored in place, and long-term monitoring will occur. In addition, Tennessee has developed an Invasive Species Management Plan, also located in Appendix D, which will include a specific monitoring plan for a specified amount of time based on conditions of all applicable permits.	Appendix D
C-9	**Waterbody Construction and Minimization/Mitigation Procedures -** No construction equipment should be allowed in any of the waterbodies. Time of year restriction should be observed. All crossings should maintain the natural water flows and the crossings should be restored to a natural condition as quickly as possible.	Tennessee will follow the FERC timing restrictions for waterbody crossings. Tennessee has requested specific timing restriction information from MADFW which it will incorporate into the Project.	Table 5-4

TABLE 8-6
RESPONSE TO COMMENTS FROM BERKSHIRE ENVIRONMENTAL ACTION TEAM (7/3/2014)

Comment Number	Comment	Response	DEIR Section
C-10	**Stream crossings** - At the site visit we observed a stream crossing where TGP had placed pipes lengthwise in a stream. Evidently, when those pipes no longer functioned to serve TGP's purposes, they placed more pipes on top of the first pipes. These pipes are mostly rotted through. This is a barrier to fish and wildlife passage. TGP still includes this method, along with using sand bags, as a proper way to build a stream crossing. We request that the use of sand bags be severely limited – they always send sand into the stream. In addition, we ask that TGP be required to use temporary bridges to cross any streams. And they should be required to restore the stream crossing we visited to a natural condition, removing all pipes and parts thereof.	Tennessee has committed to removing the existing culverts at this location and will restore the stream banks, enhancing the aquatic habitat. In addition, Tennessee will provide temporary equipment access across streams at pipeline crossing locations. Once construction is complete, Tennessee will remove these crossings and restore the stream and banks to pre-existing conditions.	Section 6.1.1.3 provides additional information on Land Under Water Mitigation
C-11	**Vernal Pools** – The proponents mention that one certified vernal pool exists along the pipeline route. What steps have been taken to identify additional vernal pools along the construction route? BEAT would suggest requiring TGP to provide funding for Natural Heritage to hire experts next spring to look for and document vernal pools within the proposed work area.	Qualified biologists conducted vernal pool surveys along the entire Project alignment in Massachusetts in the spring 2014. The results of these surveys indicate that there are no certified vernal pools in the project area and that potential vernal pools will be avoided, to the extent practicable. These data are provided in the Vernal Pool Report in Appendix K of this DEIR.	Sections 4.1.2, 5.1.1.5, 6.1.2; and Appendix K

TABLE 8-6
RESPONSE TO COMMENTS FROM BERKSHIRE ENVIRONMENTAL ACTION TEAM (7/3/2014)

Comment Number	Comment	Response	DEIR Section
C-12	**Invasive species** - A. TGP should be required for both the proposed project and any work on their right-of way in Massachusetts – to come up with a project-specific plan to prevent the spread of invasive species, including washing their equipment between sites. An independent monitor should be required as long as the right-of-way exists. B. The proponent should not use hay bales for either the proposed work or work on their existing Right-of-way, as these frequently have seeds of invasive species. C. Brushing off the "mats" is not sufficient. ALL equipment used, especially in an area with invasive species, should be washed thoroughly when moving to a new area. This should be routine practice. D. It is obvious that TGP has failed to prevent the spread of invasive species to date. The right-of-way is heavily infested. TGP should devise a plan to prevent the further introduction and spread of invasive species and be required to monitor for invasive species spread in perpetuity.	Tennessee has provided an Invasive Species Plan in Appendix D of the DEIR. Straw bales will be utilized during construction to prevent the spread of weeds.	Appendix D and Section 6.2.3

TABLE 8-6
RESPONSE TO COMMENTS FROM BERKSHIRE ENVIRONMENTAL ACTION TEAM (7/3/2014)

Comment Number	Comment	Response	DEIR Section
C-13	**Off-Road Vehicles** - BEAT agrees with Mass Audubon's comments: "Utility corridors are frequently used illegally by all terrain vehicles (ATVs). The EENF describes a commitment to provide gates and signage, and to work on an ongoing basis with landowners to deter unauthorized access including by ATVs. However, there is no commitment made to work with local or state law enforcement authorities or to assist in the funding of chronically underfunded ATV enforcement programs. DCR does not have the capacity to effectively deter unauthorized ATV use on its properties, and the proposed expansion of this utility easement increases the likelihood of ATV enforcement problems at Otis State Forest."	Where rock was part of the surface features prior to construction of the pipeline loops, rock may be windrowed along the edge of and across the ROW to prevent unauthorized off-road vehicle traffic. In addition, Tennessee will consult with property owners to provide gates at road intersections to deter unauthorized vehicle and ATV use based on landowner requests.	Sections 2.3.1.3 and 5.2.1.1.4
C-14	**Pipeyard in Tyringham**. No wetlands were delineated at the time of the site visit. It was impossible to get an understanding of the potential impacts to the rare species habitat. This section of the ENF needs expanding! The proponent should be required to have a biologist with expertise in turtles on site when preparing the site. The entire work area should be surrounded by silt fence - well entrenched, taut, and angled outward to prevent turtles from climbing over it, and inspected several times a day if the fence is up during nesting/hatching times.	Wetlands have been identified in the vicinity of the Tyringham Pipeyard. All wetlands have been avoided at the proposed pipeyard location. Tennessee has worked with NHESP and will avoid impacts to identified species preventing a "take." The mitigation measures for for identified species are discussed in the DEIR in the referenced sections.	Sections 2.2.2.3, 4.1.3, 5.1.1.6, 6.1.3
C-15	All species used for replanting should be **native to the southern Berkshires.**	Tennessee will use only those species native to the region during restoration activities.	

TABLE 8-6
RESPONSE TO COMMENTS FROM BERKSHIRE ENVIRONMENTAL ACTION TEAM (7/3/2014)

Comment Number	Comment	Response	DEIR Section
C-16	**Proposed Facilities** A. page A-2 – We would like to note that at pig launching and receiving stations, methane along with whatever **chemical residuals from hydraulic fracturing** are released as a part of normal operating procedures. Unfortunately, our federal Clean Air Laws do not appear to protect us from this. B. page A-3 – We request that Tennessee Gas Pipeline Company be required to **disclose ALL potential "modifications"** that they will need on and along the right-of-way during the MEPA process. At a public meeting in Richmond, TGP said that they were showing two compressor stations – one in Wright, NY and one in Dracut, MA. We believe that it would be impossible for TGP to operate this pipeline over the hill towns of Massachusetts at high pressures with only those two compressor stations. While that misleading statement does not apply to the pipeline under discussion in this ENF, it is a major reason that we feel strongly that the MEPA process must be used to ferret out all the potential "modifications" that TGP is likely to add as this process moves along. C. **Incineration zone** – page A-15 - The ENF states that no residences are located within 50 feet of the construction work. What is the incineration zone if a pipeline of this size ruptures?	The Connecticut Expansion Project does not involve any modifications in Wright, New York or Dracut, Massachusetts. All modifications and facilities required as part of the Connecticut Expansion Project have been provided in the DEIR.	Section 2.0

TABLE 8-6
RESPONSE TO COMMENTS FROM BERKSHIRE ENVIRONMENTAL ACTION TEAM (7/3/2014)

Comment Number	Comment	Response	DEIR Section
C-17	**Blasting** - A. page A-16 – TGP claims "no blasting is anticipated". We find that hard to believe seeing the amount of ledge and bedrock at the site and knowing that they last time they put a pipeline in this location, not only did they have to do blasting, but it was the blasting that ruptured the adjacent pipeline so much of the town had to be evacuated. B. page A-17 – We would like a third party to evaluate any damage complaints.	Tennessee has identified shallow depth to bedrock along the Project alignment and has provided a Blasting Plan, in the event that blasting is needed, in Appendix F of the DEIR. In addition, areas potentially requiring blasting were assessed and are provided in Table 5-6. All damage complaints received during construction and operation of the Project will be handled by Tennessee's Land Division.	Appendix F, Table 5-6
C-18	**Air quality monitoring** - Appurtenant Facilities – page A-18 - Air quality monitoring should occur at the compressor station in Agawam and at the pigging facilities when they are active to determine the amount and composition of the gas released in these locations and the potential harm nearby residents could be exposed to.	The Connecticut Expansion Project does not require any modifications to the existing compressor station in Agawam. A Greenhouse Gas analysis has been performed for the Project and is provided in the DEIR.	Sections 4.2.5, 5.2.6, 6.2.4, and Appendix K
C-19	**Herbicides** - Operations and Maintenance – page A-18 – TGP claims they do not use herbicides, however they have a plan on file with the state of Massachusetts to allow them to use herbicides, and in the ENF they say they will not use herbicides within 100 feet of wetlands. We would like a statement in writing that no herbicides will be used.	Tennessee will perform routine vegetative maintenance as part of the operation of the pipeline once construction is completed. Tennessee will only apply herbicides for the control of vegetation around buildings, and herbicide applications will not occur along the pipeline ROW unless it is in response to invasive species and control of those invasive species. In these special circumstances, Tennessee will use a licensed applicator and will obtain any and all necessary permits to apply herbicides to invasive species along the ROW.	Sections 2.4 and 6.2.3

TABLE 8-6
RESPONSE TO COMMENTS FROM BERKSHIRE ENVIRONMENTAL ACTION TEAM (7/3/2014)

Comment Number	Comment	Response	DEIR Section
C-20	Future Plans and **Abandonment** – page A-19 – The state of Massachusetts is moving away from the use of fossil fuels. MEPA should require an abandonment plan.	Tennessee does not have plans for future expansion or abandonment of the facilities associated with this Project. Abandonment of natural gas pipelines requires approval from the Federal Energy Regulatory Commission and Tennessee would follow any and all applicable regulations regarding expansion or abandonment of the facilities.	Section 2.5
C-21	**Construction and Operation Impact** – page B-9 – This section lacks adequate detail on how TGP would deal with a high water table.	If required, Tennessee will dewater the trench in accordance with any permit conditions by local, state and federal agencies, as well as the Commission's Plan and Procedures.	Section 2.3.1.5
C-22	**Hydrostatic Test Water –** page B-17 – There should be an independent monitor to ensure that this procedure is carried out in compliance with NHESP restrictions. The water should be returned to an upland area up gradient of Spectacle Pond (assuming the pipeline coating is not toxic) and allowed to infiltrate into the soil.	Tennessee will obtain a NPDES General Permit for Remediation which cover hydrostatic testing of natural gas pipelines. All conditions of that permit will be met during the hydrostatic testing process. Tennessee plans to discharge the testwater to an upland area near the manifold site and has consulted with DCR regarding this component of the project. Attempting to discharge the testwater upgradient of Spectacle Pond would require additional impacts on the DCR property.	Sections 6.1.3.1.2 and 7.7.3

TABLE 8-6
RESPONSE TO COMMENTS FROM BERKSHIRE ENVIRONMENTAL ACTION TEAM (7/3/2014)

Comment Number	Comment	Response	DEIR Section
C-23	**Coating inside the pipes** - At the site visit, we requested information on what is used to coat the insides of these pipes. As far as I know, we have not had an answer. The water that will be withdrawn from rare species habitat of Spectacle Pond will be used to test these pipes and then be released into the environment. We would like a full list of the chemicals that water will be exposed to. Will the water be tested as it comes out of the pipes? While we would like that water to be returned to an upland area upstream of Spectacle Pond to infiltrate and make its was back to the pond, we would only like that if the water would be completely safe for the very sensitive species in the pond.	The pipeline sections will be coated internally with a chemical compound, Valspar flow liner, an epoxy intended to reduce friction during pipeline operations. The flow liner is applied by the manufacturer at the plant to the pipe sections and allowed to dry before shipping. Once dry, the chemical is inert and will not result in any type of leaching or off-gasing of chemicals into the hydrostatic testwater or surrounding environments following discharge from the pipe.	Section 5.1.1.6.1
C-24	**Alternatives** A. page C-1 – **Energy Conservation** – TGP presents no evidence that energy efficiency programs, demand generation, and planned renewable generation could not meet the supposed need. B. NESCOE's Gas-Electricity Working Group Final Report, March 28, 2014 (*attached*) - page 14 – states that the required analysis has not been done: "Reducing consumers' demand for electricity and natural gas to the extent assumed in the Low Demand Case eliminates the need for consumers to invest in infrastructure (beyond the pipeline currently in process toward commercialization). The associated cost of achieving a Low Demand Scenario is not known. Further analysis would be required to determine whether policies that would result in a Low Demand Scenario are cost-competitive with infrastructure investments."	Tennessee has provided an analysis of alternatives in the DEIR.	Section 3.0

TABLE 8-6
RESPONSE TO COMMENTS FROM BERKSHIRE ENVIRONMENTAL ACTION TEAM (7/3/2014)

Comment Number	Comment	Response	DEIR Section
C-25	TGP says this project will assist with "the Commission's goal of bringing new supplies of natural gas to market." Exactly what Commission are they referring to? The Berkshire Regional Planning Commission (BRPC) specifically states the need to move away from fossil fuels and produce more clean, renewable energy within the region.	Tennessee was referring to the Federal Energy Regulatory Commission.	
C-26	**BRPC Sustainable Berkshires – comprehensive, long-range master plan.** The underlying theme of the new master plan is the concept of economic resiliency and environmental sustainability. In the Climate and Energy section, on page CE-3 it states: A. **Shifting energy from an imported product to a local one.** As noted in the *Massachusetts Clean Energy and Climate Plan for 2020*, the state is at the "end of the energy pipeline," importing almost all of its energy from other parts of North America or the world. We are dependent on producers and market forces. This means that funds spent on importing fuel leave the state and the region, impacting economic stability. The estimated exported economic value of purchasing energy from outside Massachusetts for 2008 was $22 billion state-wide. B. **Job creation through clean energy economy investments**. Massachusetts is in a position to show the way to a clean energy economy and reap direct benefits in economic growth. Between 2007 and 2012 the number of photovoltaic systems installed in Massachusetts increased 20-fold, with jobs in solar manufacturing, installation and	Tennessee reviewed the Sustainable Berkshires Plan and included additional information in the DEIR.	Section 5.2.7

TABLE 8-6
RESPONSE TO COMMENTS FROM BERKSHIRE ENVIRONMENTAL ACTION TEAM (7/3/2014)

Comment Number	Comment	Response	DEIR Section
	services nearly tripling from 1,200 to 3,000. Two-thirds of these jobs are in manufacturing. In total, the Clean Energy Center estimates that at least 11,000 people were employed in the clean energy sector in 2010, up 65% from 2007. And on page CE-25 C. **Transitioning the region away from fossil fuels** could help the region stand out. As a standout leader, the region may attract green and clean tech businesses or green friendly businesses to locate here. The costs of inaction are therefore a concern to the future of the region.		
	Recommendations to Local Boards and Commissions for the Local Permitting Process:		
C-27	1. The Towns should not close public hearings on pending permits for this project prior to the conclusion of the MEPA process.	It is anticipated that MEPA process will be complete prior to individual permit actions taking place.	
C-28	2. The Towns should determine that they have the appropriate rules and regulations in place to hire outside consultants, at the proponent's expense, to review the project for wetlands, rare and endangered species and floodplain impacts.	Comment only	
C-29	3. The Conservation Commissions should include provisions for ongoing monitoring	Tennessee will comply with all permit conditions.	
C-30	4. Given careful management of refueling and servicing of construction equipment should be conducted, particularly in wetland and riverfront areas. The use of biodegradable plant-based hydraulic fluids should be considered.	No refueling will occur within 100 feet of wetlands unless impractical for specialized construction vehicles to relocate outside of this buffer.	

TABLE 8-6
RESPONSE TO COMMENTS FROM BERKSHIRE ENVIRONMENTAL ACTION TEAM (7/3/2014)

Comment Number	Comment	Response	DEIR Section
C-31	5. Tennessee should be required to provide periodic training of emergency responders in Sandisfield and all communities with whom the Sandisfield Volunteer Fire Department normally uses for mutual aid situations. This should be an ongoing commitment for the life of the pipeline. Ambulance and police should also be included, as well as the towns' Emergency Managers.	Tennessee has agreed to provide this training.	

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

Western Regional Office • 436 Dwight Street, Springfield MA 01103 • 413-784-1100

DEVAL L. PATRICK
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June 30, 2014

Maeve Vallely Bartlett, Secretary
Executive Office of Energy & Environmental Affairs
Massachusetts Environmental Policy Act Office
Alex Strysky, EEA No. 15205
100 Cambridge Street 9th Floor
Boston, MA 02114-2524

Re: Connecticut Expansion Project -
Sandisfield, Tyringham and Agawam

Dear Secretary Bartlett,

The Massachusetts Department of Environmental Protection (MassDEP), Western Regional Office (WERO) appreciates the opportunity to comment on the Environmental Notification Form (ENF) submitted for the proposed Connecticut Expansion Project (EEA #15205) in Sandisfield, Tyringham, and Agawam. Applicable MassDEP regulatory and permitting considerations regarding wetlands, waterways, wastewater, drinking water, air pollution, solid and hazardous waste, and waste site cleanup are discussed. MassDEP staff attended the MEPA site visit on June 10, 2014.

I. Project Description

The Connecticut Expansion Project involves improvements construct of approximately 3.8 miles of 36-inch outside diameter gas pipeline in Sandisfield, 0.11 miles of 24-inch outside diameter gas pipeline in Agawam, and appurtenances including a relocated mainline valve, two pig launchers, and a pig receiver. Both new pipelines will be located within or adjacent to the Tennessee Gas pipeline right-of-way. An approximately 2-acre pipe yard/staging area is proposed to be located in Tyringham. The project exceeds a threshold for a mandatory EIR.

The entire project includes the expansion of lines through New York and Connecticut. The Sandisfield portion of the work is to extend an existing pipeline 3.8 miles to create storage capacity of natural gas to meet increased demand.

The project will require filing a Notice of Intent (NOI) with each municipality where work is proposed, a 401 Water Quality Certificate from MassDEP, a permit from Army Corps

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

of Engineers, a permanent easement from DCR, and review by the Natural Heritage and Endangered Species Program. The EENF also includes a request for a Single EIR. The EENF includes the following environmental impacts:

- 19 l.f. Bank,
- 315,377 s.f temporary impacts to Bordering Vegetated Wetlands (BVW); 95,396 s.f permanent impacts,
- 18,295 s.f temporary impacts to Isolated Vegetated Wetlands (IVW); 0 s.f. permanent, and
- 96,267 s.f. temporary impacts to Riverfront Area; 24,828 s.f. permanent.

II. Required Mass DEP Permits and/or Applicable Regulations

F-1

Wetlands and Waterways
310 CMR 10.00
314 CMR 4.00
314 CMR 9.00
Wastewater
314 CMR 7.00
Air Pollution
310 CMR 7.00
Solid Waste
310 CMR 16.000
310 CMR 19.000
Bureau of Waste Site Cleanup
310 CMR 40.0000

III. Permit Discussion

Bureau of Resource Protection

Wetlands
The proposed project includes several miles of new gas pipeline installation, staging and system upgrades with work located in three communities. As noted by the Proponent in the EENF, the project area contains regulated resources areas of Bank (Inland), Bordering Vegetated Wetland, Riverfront Area and Isolated Vegetated Wetlands. Although not identified in the EENF, work may also impact Land Under Water Bodies as there are proposed stream crossings of the pipeline. The Proponent also identified at least one vernal pool.

F-2

The Proponent may consider filing an Abbreviated Notice of Resource Area Delineation (ANORAD) with each community Conservation Commission to legally establish the regulated resource areas, as the ANORAD may be extended and resource areas remain fixed. The Proponent may also consider filing the ANORAD for any preferred and alternative routes. This will allow the applicant to provide details regarding the replication and mitigation measures required.

When a NOI is submitted to the communities, the Conservation Commission should review the project for compliance with all of the provisions of the Act; prior to commencement of project construction, the Commissions must issue a final Order of Conditions. If a NOI is submitted prior to competition of the MEPA process, MassDEP will recommend that Commissions hold NOI hearings open until the Secretary issues a

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Certificate indicating the MEPA process is completed and the Army Corps of Engineers, and MassDEP (Section 401) issue permits, as applicable.

Isolated Vegetated Wetlands are not regulated under the Wetlands Protection Act (the Act). The Proponent should make every effort to distinguish between Isolated Vegetated Wetlands and Isolated Land Subject to Flooding when the ANORAD and/or NOI are filed with each community.

The Proponent is proposing to withdraw approximately 1,000,000 gallons of water from Lower Spectacle Pond at a rate of 2,000 gpm for the hydrostatic pressure testing of the pipeline. This withdrawal should be permitted though the Sandisfield Conservation
F-3 Commission NOI. The Proponent should consider consultation with the Massachusetts Department of Fish & Game when designing the withdrawal.

The project will result in conversion of resource areas such as conversion of forested wetland to scrub/shrub wetland.

F-4 The project should also comply with MassDEP's Stormwater Management Standards, as applicable.

F-5 *Water Quality Certification*
Section 401 Water Quality Certification (WQC) issued by MassDEP is required for this project. The Proponent is required to provide sufficient information to adequately describe cumulative impacts to "Waters of the United States within the Commonwealth" (Bordering and Isolated Vegetated Wetlands and Land Under Water). The WQC regulations require impacts to be avoided, minimized and mitigated.

F-6 *Limited Project Provisions*
The Proponent has noted that the work may be submitted for review under the Limited Project provision. Proposed work must, where possible, meet *General Performance Standards;* work that cannot meet *General Performance Standards* may be approved as a limited project. Limited Project status requires the Proponent to demonstrate practicable avoidance and minimization of alteration to jurisdictional resource areas, and then describe appropriate mitigation measures for remaining, unavoidable alteration.

Boundary Determination and Delineation
All delineation of jurisdictional resource areas should be accomplished through flagging in the field, surveying, and then presented on a scaled site plan. The Proponent is referred to MassDEP guidance documents and the regulations for specific requirements and methods for all resource delineations. MassDEP is available to provide additional assistance and offers the following guidance for specific delineations:

- Boundaries of Bordering Vegetated Wetlands (BVW) - *"Wetlands Protection Program Policy: Bordering Vegetated Wetlands Delineation Criteria and Methodology" (MassDEP 1995), Delineating Bordering Vegetated Wetlands Under the Massachusetts Wetlands Protection Act (MassDEP 1995). Submittal of properly prepared "MassDEP Bordering Vegetated Wetland Delineation Field Data Forms" (Appendix Gs)*
- F-7 Delineation of the Mean Annual High Water Line (MAHWL) of all perennial rivers on site should be performed in accordance with

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

regulations; the Proponent should be aware that use of "bankfull field indicators" may be necessary and justification of the methodology may be required.

- USGS topographic quadrangle maps reviewed to identify "presumptive" perennial streams; streams should be included in plans. Regulations stipulate requirements necessary to overcome the presumptive status of a mapped perennial stream.
- Jurisdictional intermittent streams should have the Bank resource area identified and not just the centerline.

Bordering Vegetated Wetland

F-8 MassDEP notes that there is no reference to "temporary impacts" in the Act or regulations. The Proponent should describe these activities in terms of "in-situ" replacement, i.e., the excavation and fill disturbance will be "replaced" in accordance with regulation within the footprint of that disturbance. The Proponent is also referred to *Massachusetts Inland Wetland Replication Guidelines" (DEP March 2002)* for the planning and construction of Bordering Vegetated Wetland "replacement area".

Bordering Land Subject to Flooding

F-9 Although not initially identified, the Proponent should confirm no impacts to floodplain will occur though any portion of the project as plans progress. If floodplain is identified, site plans should show the boundaries of the "Lower Floodplain" and the Proponent should demonstrate that adequate compensatory flood storage is provided. In addition, if the "Lower Floodplain" proposed to be altered is naturally vegetated and/or composed of a natural substrate, the applicant will be required to meet the General Performance Standard.

Riverfront Area

F-10 At least one stream crossing is proposed within the project area. Streams shown as intermittent or not shown on the latest USGS map should be reviewed as to whether they may be considered perennial in accordance with 310 CMR 10.58(2)(a)1 to establish jurisdiction.

F-11 Work conducted in undisturbed Riverfront Area, must meet General Performance Standards; work conducted within existing degraded Riverfront Area may be submitted as "redevelopment". The Limited Project provisions noted above may also be applicable to work conducted in the Riverfront Area.

Massachusetts River and Stream Crossing Standards

F-12 Although not proposed at this time, the Proponent should be aware that any new permanent jurisdictional stream crossings must comply with the *Massachusetts River and Stream Crossing Standards*. Any improvements proposed to existing culverts should comply with *Design Standards for Culvert Replacement* in that document.

F-13 The Proponent should consider whether crossings will impact high quality streams. These include: NHESP Living Water Cores, NHESP BioMap cores, ACECs, Anadromous Fish Runs, and Cold Water Fisheries. These are shown at: www.streamcontinuity.org/assessing_crossing_structures/prioritzing_streams.htm.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

F-14 Waterways
The Proponent has not identified work apparently subject to *Public Waterfront Act, Chapter 91.* Any Request for Determination of Applicability under 310 CMR 9.06, should be submitted to the MassDEP Boston Office Waterways Program.

F-15 Drinking Water & Wastewater
This project consists of several miles of new underground utility work within multiple municipalities. Although the proposed work lies within existing Rights of Way (ROWs) MassDEP strongly recommends contacting and coordinating within each community to ensure the routes do not include or potentially impact municipal water, sewer and stormwater structures.

F-16 *Groundwater and Surface Water Quality Standards*
The Proponent is referred to the following regulations for guidance regarding water quality standards:
310 CMR 4.00 Surface Water Quality Standards
310 CMR 40.0000 Massachusetts Contingency Plan

F-17 *National Pollutant Discharge Elimination System (NPDES)*
Discharge of the hydrostatic pressure testing of the new pipeline will require the Proponent to apply for and receive a NPDES permit. U.S. EPA requires the *Remediation General Permit* which would be issued jointly by EPA and MassDEP. Activities Category Section IV (3) of the General Permit identifies Hydrostatic Testing of Pipelines and Tanks:
http://www.epa.gov/region1/npdes/remediation/RGP2010_FactSheet.pdf
http://www.epa.gov/region1/npdes/remediation/Appendix-A.pdf

F-18 The Proponent is proposing to withdraw approximately 1,000,000 gallons of water from Lower Spectacle Pond; discharge is presently proposed to an upland area. The permitting process will include extensive testing to determine water quality and potential treatment.

Bureau of Waste Prevention

Air Pollution

Construction and Demolition Activities

F-19 The construction and demolition activity must conform to current Air Pollution Control Regulations. The proponent should implement measures to alleviate dust, noise, and odor nuisance conditions that may occur during the construction and demolition activities. Such measures must comply with the MassDEP's Bureau of Waste Prevention (BWP) Regulations 310 CMR 7.01, 7.09, and 7.10.

F-20 *Construction Equipment*
MassDEP believes it is necessary to mitigate the construction-period impacts of diesel emissions to the maximum extent feasible and recommends that the project proponent participate in the MassDEP Diesel Retrofit Program. As of June 1, 2010, all non-road engines shall be operated using only ultra low sulfur diesel (ULSD) with a sulfur content of no greater than 15 ppm pursuant to 40 CFR 80.510.

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Solid Waste

F-21 The Proponent shall properly manage and dispose of all solid waste generated by this proposed project pursuant to 310 CMR 16.00 and 310 CMR 19.000, including the regulations at 310 CMR 19.017 (waste ban).

F-22 Asphalt, brick and concrete (ABC) generated through crushing and reuse on-site must be handled in accordance with regulation and policy. Otherwise, the proponent would need to obtain a site assignment and facility permit for the crushing activity and a Beneficial Use Determination (BUD) for the reuse of the crushed material. More information regarding the handling of ABC, and a copy of the 30-day notification form may be found at the following website: http://www.mass.gov/eea/agencies/massdep/recycle/reduce/using-or-processing-asphalt-pavement-brick-and-concrete-.html.

F-23 The BUD regulations at 310 CMR 19.060 establish levels of assessment for four categories of beneficial use. Similarly, the fee regulations at 310 CMR 4.00, et seq. were amended. These amended regulations would be applicable to reuse of any materials generated by this project that would otherwise be considered solid waste.

The project Proponent should be advised that construction activity at the site must comply with both Solid Waste and Air Quality Control regulations. The appropriate Solid Waste provisions addressing this include M.G.L. Chapter 40, Section 54.

Bureau of Waste Site Cleanup

F-24 There are no active/open disposal sites governed by the Massachusetts Oil and Hazardous Material Release Prevention and Response Act, M.G.L. c. 21E, and the Massachusetts Contingency Plan (MCP) within the project site. MassDEP did receive an A2 Response Action Outcome (RAO) Statement in 2006 for Release Tracking Number (RTN) 1-14946 located within the proposed work area in Tyringham.

If soil and/or groundwater contamination is encountered during work activities, the Proponent should retain a Licensed Site Professional (LSP); the MCP details procedures to follow for the parties conducting remediation and cleanup work. MassDEP staff are available for guidance.

Blasting

F-25 Although the environmental impacts from the use of perchlorate-containing blasting agents and explosives have not been fully defined, MassDEP recommends that contractors take the following reasonable steps to minimize potential problems:

- To the extent practical, avoid the use of perchlorate-containing explosives
- When the use of perchlorate-containing products is unavoidable:
  - Determine the perchlorate content of blasting agents and explosives to be used
  - Institute rigorous "housekeeping" practices.
  - Take reasonable steps to prevent and address misfires
  - In all cases, the safety of workers and the general public is of paramount concern

The following link provides additional information:
http://www.mass.gov/eea/agencies/massdep/cleanup/regulations/contamination-perchlorate-containing-explosive-products.html

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F-26 *Spills Prevention*
A spills contingency plan addressing prevention and management of potential releases of oil and/or hazardous materials from pre- and post-construction activities should be presented to workers at the site and enforced. The plan should include but not be limited to, refueling of machinery, storage of fuels, and potential future on-site activity releases.

F-27 **IV. Section 61 Findings, Comments/Guidance**

This project is subject to the Greenhouse Gas initiative and Section 61 Findings. At this time, there is inadequate information regarding proposed mitigation associated with wetlands impacts; Section 61 Findings were not presented for comment. With regard to GHG, the Proponent should consider assessing potential impacts from construction as well as long term operation and maintenance of the pipeline.

As noted previously, the Proponent has requested that a Single EIR be allowed. Mass DEP has no objection to the Secretary granting that request as she deems appropriate. MassDEP has adequate authority through the permitting process for the NPDES and 401 WQC to determine the potential environmental impacts from the project and to ensure that all feasible measures are taken to avoid, minimize and mitigate any negative impacts as necessary.

MassDEP encourages pre-permitting of complex projects and have previously met with the Proponent in the initial phase of planning this project. MassDEP staff are available to provide further guidance and to meet with the Proponent upon request. If you have any questions regarding this comment letter or would like to schedule pre-permitting, please contact Catherine Skiba at (413) 755-2119 or catherine.skiba@state.ma.us.

Sincerely,

Michael Gorski
Regional Director

cc: MEPA File

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TABLE 8-7
TO COMMENTS FROM DEP WESTERN REGIONAL OFFICE (6/20/2014)

Comment Number	Comment	Response	DEIR Section
F-1	Required MA DEP Permits and/or Applicable Regulations Wetlands and Waterways - 310 CMR 10.00, 314 CMR 4.00, 314 CMR 9.00. Wastewater - 314 CMR 7.00. Air Pollution - 310 CMR 7.00. Solid Waste - 310 CMR 16.000, 310 CMR 19.000, Bureau of Waste Site Cleanup - 310 CMR 40.0000.	Table 1-3 in Section 1.7 provides a list of required permits.	Section 1.7
F-2	Consider filing an Abbreviated Notice of Resource Area Delineation (ANORAD) with each Con Com to legally establish the regulated resource areas.	Tennessee discusses its plans to seeking wetlands protection act and local bylaw approvals in Section 7.	Section 7
F-3	Withdrawal of water from Lower Spectacle Pond should be permitted through the Sandisfield Con Com NOI. Consultation with MA Fish &Game should be considered when designing the withdrawal.	As discussed in Section 7, Tennessee will file a NOI with the Sandisfield Conservation Commission and will continue its discussions with NHESP during project development and implementation.	Section 7
F-4	The project should also comply with MassDEP's Stormwater Management Standards as applicable.	The Project does comply with the MADEP Stormwater Policy standards, as described in Section 7 of this DEIR.	Section 7.1.7
F-5	Section 401 WQC issued by DEP is required. Provide sufficient information to adequately describe cumulative impacts to Waters of the United States within the Commonwealth (BVW, IVW, and Land Under Water). WQC regulations require impacts to be avoided, minimized and mitigated.	Tennessee will file an application for a Section 401 Water Quality Certificate with the MADEP. Information on the presence of, impact to, avoidance, and minimization to Waters of the United States and within the Commonwealth has been provided in the DEIR. Please refer to the corresponding Sections for more information.	Sections 4.1.1, 5.1.1 and 6.1.1

TABLE 8-7
TO COMMENTS FROM DEP WESTERN REGIONAL OFFICE (6/20/2014)

Comment Number	Comment	Response	DEIR Section
F-6	The project has noted the work may be submitted for review under the Limited Project provision. Work must, where possible, meet General Performance Standards, work that cannot meet those standards may be approved as a limited project. Limited Project status requires the Proponent to demonstrate practicable avoidance and minimization of alteration to jurisdictional resource areas, and then describe appropriate mitigation measures for remaining, unavoidable alteration.	Section 7.1.1 provides a discussion on the Limited Project Provision. Impacts to resource areas are provided in Section 5.0 and minimization and mitigation are provided in Section 6.0. All practicable measures are being implemented to meet all performance standards for each resource area.	Sections 5.0, 6.0 and 7.1.1
F-7	Delineation of Mean Annual High Water Line (MAHWL) of all perennial rivers on site should be performed in accordance with regulations; be aware that use of "bankfull field indicators" may be necessary and justification of the methodology may be required.	Mean annual highwater level indicators were included in the methodology for delineating bank of perennial streams.	
F-8	BVW Should describe temporary impacts in terms of in-situ replacement (i.e. the excavation and fill disturbance will be replaced in accordance with regulation within the footprint of that disturbance.) Should refer to Massachusetts Inland Wetland Replication Guidelines (DEP March 2002) for planning and construction of BVW replacement area.	Temporary and permanent impacts to BVW are described in the DEIR. To mitigate for the permanent fills associated with 0.11 acre of BVW, Tennessee will undertake wetland replication in accordance with the Massachusetts Inland Wetland Replication Guidelines. Section 7.1.2 provides a discussion on the Statutory and Regulatory Compliance for Bordering Vegetated Wetlands.	Sections 4.1.1.1, 5.1.1.1, 6.1.1.2 and 7.1.2

TABLE 8-7
TO COMMENTS FROM DEP WESTERN REGIONAL OFFICE (6/20/2014)

Comment Number	Comment	Response	DEIR Section
F-9	BLSF - Confirm no impacts to floodplain will occur. If floodplain is identified, site plans should show the boundaries of the "Lower Floodplain" and demonstrate that adequate compensatory flood storage is provided. If the "Lower Floodplain" is natural vegetated and/or composed of a natural substrate, the applicant will be required to meet the General Performance Standard.	One access road associated with the Massachusetts Loop crosses the flood zone for Spectacle Pond Brook and Lower Spectacle Pond, and is within mapped areas of Bordering Land Subject to Flooding ("BLSF"). In addition, a portion of the Tyringham Pipeyard is located within BLSF, in association with Hop Brook. These areas are mapped as Zone A (areas of 100-year flooding) as depicted on the FEMA drawings in Appendix J. No loss of flood storage is anticipated from these temporary workspaces.	Sections 4.1.1.4, 5.1.1.4, 6.1.1.5, and 7.1.6
F-10	Streams shown as intermittent or not shown on the latest USGS map should be reviewed as to whether they may be considered perennial in accordance with 310 CMR 10.58(2)(a)1 to establish jurisdiction.	Streams were assessed in the field by wetlands biologists to determine flow status.	
F-11	Riverfront Area work must meet General Performance Standards within existing Riverfront Area, work conducted within existing degraded RFA may be submitted as redevelopment, a Limited Project provision may be applicable to work conducted in RFA.	Tennessee addresses work in Riverfront Area Section 5 and the application of Limited Project Provision in Section 7.	Sections 5.1.1.3, and 7.1.1
F-12	Any new permanent jurisdictional stream crossing must comply with the MA River and Stream Crossing Standards. Any improvements to existing culverts should comply with Design Standards for Culvert Replacement in the document.	No new permanent culverts or permanent stream crossings are proposed for the Project.	

TABLE 8-7
TO COMMENTS FROM DEP WESTERN REGIONAL OFFICE (6/20/2014)

Comment Number	Comment	Response	DEIR Section
F-13	Quality streams include NHESP Living Water Cores, NHESP BioMap cores, ACECs, Anadromous Fish Runs, and Cold Water Fisheries shown at: www.streamcontinuity.org/assessing_crossing_structures/prioritzing_streams.htm	Tennessee has included data on these resources in its evaluation.	
F-14	The proponent has not identified work apparently subject to Public Waterfront Act Chapter 91. Any Request for Determination of Applicability under 310 CMR 9.06, should be submitted to the MassDEP Boston Office Waterways Program.	As discussed in Section 7, the Project is not subject to licensing under the Massachusetts Public Waterfront Act regulations.	Section 7.2
F-15	DEP strongly recommends contacting and coordinating within each community to ensure the routes do not include or potentially impact municipal water, sewer, and stormwater structures.	Tennessee has consulted with local, state and federal agencies on a wide range of topics and will continue to do so throughout the Project. The route does not cross or impact any municipal water, sewer, or stormwater structures.	Appendix C
F-16	Groundwater and Surface Water Quality Standards - check the following regulations for guidance: 310 CMR 4.00 Surface Water Quality Standards, 310 CMR 40.0000 Massachusetts Contingency Plan.	These standards have been reviewed.	

TABLE 8-7
TO COMMENTS FROM DEP WESTERN REGIONAL OFFICE (6/20/2014)

Comment Number	Comment	Response	DEIR Section
F-17	NPDES - Discharge of hydrostatic pressure testing of the new pipeline will require the proponent to apply for and receive a NPDES permit. US EPA requires Remediation General Permit which would be issued jointly by EPA and MassDEP. Activities Category Section IV (3) of the General Permit identifies Hydrostatic Testing of Pipelines and Tanks: http://www.epa.gov/region1/npdes/remediation/RGP2010_FactSheet.pdf, http://www.epa.gov/region1/npdes/remediation/Appendix-A.pdf	Tennessee will obtain a NPDES General Permit for Remediation which covers hydrostatic testing of natural gas pipelines.	7.7.3
F-18	Withdraw from Lower Spectacle Pond discharge presently proposed to an upland area. The permitting process will include extensive testing to determine water quality and potential treatment.	Section 7.7.3 describes EPA's Remediation General Permit and the required testing.	7.7.3
F-19	Air - Construction and Demolition Activities must conform to current Air Pollution Control Regulations. Implement measure to alleviate dust, noise, and odor nuisance conditions that may occur during construction and demolition activities. Comply with MassDEP's Bureau of Waste Prevention (BWP) Regulations 310 CMR 7.01, 7.09 and 7.10.	No demolition activities are planned for the Project. To minimize the amount of dust generated by construction activities, the extent of exposed/disturbed areas along the ROW at any one time will be minimized. Crushed stone pads will be added to points of ingress/egress along the ROW, as necessary, to minimize the potential for equipment to track dirt onto roads. In addition, to minimize dust, water may be used to wet down disturbed soils along the ROW, as needed. Upon review of the submitted Expanded Environmental Notification Form, the Executive Office of Energy and	Sections 5.2.3.1.2 and 7.6

TABLE 8-7
TO COMMENTS FROM DEP WESTERN REGIONAL OFFICE (6/20/2014)

Comment Number	Comment	Response	DEIR Section
		Environmental Affairs (EOEEA) requested that a GHG Emissions Policy and Protocol (Policy, last revised May 5, 2010) be provided. The Policy was established in accordance with the Massachusetts Environment Policy Act (MEPA). The purpose of the Policy is to inform the MEPA office of the quantity of GHG associated with proposed projects, by assessing the project baseline, considering where alternatives are available, and evaluating the feasibility and impact of performing the alternatives. The Policy applies to new projects which file an Environmental Notification Form which initiates MEPA review after the May 5, 2010 effective date of the revised Policy. A GHG Analysis was performed and documented in accordance with the Policy. GHG emissions were calculated for the Project baseline assuming standard practices. Alternative methodologies that could reduce GHG emissions were also evaluated for their applicability and plausibility. Those alternative methods that could be practically applied were chosen and new GHG emissions (if applicable) were determined assuming these mitigation options. The detailed GHG Analysis is in Appendix K.	

TABLE 8-7
TO COMMENTS FROM DEP WESTERN REGIONAL OFFICE (6/20/2014)

Comment Number	Comment	Response	DEIR Section
F-20	Construction Equipment - mitigate construction-period impacts of diesel emissions to the maximum extent feasible. Recommendations - participate in the MassDEP Diesel Retrofit Program. As of June 1, 2010, all non-road engines shall be operated using only ultra-low sulfur diesel (ULSD) with a sulfur content of no greater than 15 ppm pursuant to 40 CFR 80.510.	Tennessee has conducted a Greenhouse Gas analysis for the Project as discussed in the DEIR. Tennessee has committed to using ultra-low sulfur diesel. Discussions on additional mitigation techniques for the Project are provided in Section 6.2.4 and in Appendix K.	Sections 4.2.5, 5.2.6, 6.2.4 and Appendix K
F-21	Manage and dispose of all solid waste generated by this proposed project pursuant to 310 CMR 16.00 and 310 CMR 19.000, including regulations at 310 CMR 19.017 (waste ban).	Any solid waste generated by the Project will be managed in accordance with 310 CMR 16.00, 19.00, and 19.017. A waste management plan is provided in Appendix F.	Section 5.2.5.8 and Appendix F.
F-22	Asphalt, brick, and concrete (ABC) generated through crushing and reuse on-site must be handled in accordance with regulations and policy. Or need to obtain a site assignment and facility permit for the crushing activity and a Beneficial Use Determination (BUD) for the reuse of the crushed material. see http://www.mass.gov/eea/agencies/massdep/recycle/reduce/using-or-processing-asphalt-pavement-brick-and-concreate.html.	These materials are not anticipated to be generating during construction and operation of the Project. A waste management plan is provided in Appendix F.	Section 5.2.5.8 and Appendix F
F-23	BUD at regulations 310 CMR 19.060 establishes level of assessment for 4 categories of beneficial use.	A waste management plan is provided in Appendix F.	Section 5.2.5.8 and Appendix F

TABLE 8-7
TO COMMENTS FROM DEP WESTERN REGIONAL OFFICE (6/20/2014)

Comment Number	Comment	Response	DEIR Section
F-24	MassDEP received an A2 Response Action Outcome (RAO) Statement in 2006 for Release Tracking Number (RTN) 1-14946 located within the proposed work area in Tyringham. If soil and/or groundwater contamination is encountered during work activities, the Proponent should retain a Licensed Site Professional (LSP); the MCP details procedures to follow for the parties conducting remediation and cleanup work. MassDEP staff are available for guidance.	A discussion on environmental screening along with this particular site is provided in Section 4.2.6.1. Tennessee will implement standards set forth in the Commission's Plan and Procedures (Appendix E) to minimize or avoid any potential disturbances to contaminated materials encountered during construction and will dispose of or mitigate for any hazardous materials uncovered, in accordance with federal, state, and local requirements.	Section 4.2.6.1
F-25	DEP recommends that contractors take the following reasonable steps to minimize potential problems: Avoid the use of perchlorate-containing explosives to the extent practical. When the use of perchlorate-containing products in unavoidable - determine the perchlorate content of blasting agents and explosives to be used. Institute rigorous "housekepping" practices. Take reasonable steps to prevent and address misfires. In all cases, the safety of workers and general public is of paramount concern. http://www.mass.gov/eea/agencies/massdep/cleanup/regulations/contamination-perchlorate-containing-explosive-products.html.	To protect groundwater and surface water from potential contaminants, use of perchlorate-containing explosives will not be allowed on this Project. Any blasting operations in Massachusetts will be conducted in accordance with the State and Federal Regulations as more fully discussed in Section 5.2.1.1.	Section 5.2.1.1
F-26	Spill contingency plan addressing prevention and management of potential releases of oil and/or hazardous materials from pre- and post-construction activities should be presented to workers at the site and enforced. The plan must include but limited to, refueling of machinery, storage of fuels, and potential future on-site activity releases.	Tennessee has developed Spill Prevention and Response Procedures and has provided this in Appendix F.	Appendix F

TABLE 8-7
TO COMMENTS FROM DEP WESTERN REGIONAL OFFICE (6/20/2014)

Comment Number	Comment	Response	DEIR Section
F-27	The project is subject to GHG initiative and Section 61 Findings, consider assessing potential impacts from construction as well as long term operation and maintenance of the pipeline.	The Project has undertaken an extensive Greenhouse Gas analysis and has provided results in the DEIR. Section 61 Findings are included in Section 9 of the DEIR.	Sections 4.2.5, 5.2.6, 6.2.4, 7.6 and 9.0.

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Commonwealth of Massachusetts

Division of Fisheries & Wildlife

MassWildlife

Wayne F. MacCallum, *Director*

June 30, 2014

Secretary Maeve Vallely Bartlett
Executive Office of Environmental Affairs
Attention: MEPA Office, Alex Strysky, EEA No. 15205
100 Cambridge St.
Boston, Massachusetts 02114

Project Name:	Connecticut Expansion Project
Proponent:	Tennessee Gas Pipeline Company, LLC
Location:	Agawam, Sandisfield, Tyringham
Document Reviewed:	Expanded Environmental Notification Form (EENF)
Project Description:	3.8 miles of new pipeline
NHESP Tracking No.	13-32620

Dear Secretary Bartlett:

The Natural Heritage & Endangered Species Program (NHESP) of the Massachusetts Division of Fisheries & Wildlife (Division) has reviewed the Expanded Environmental Notification Form (EENF) for the Connecticut Expansion Project and would like to offer the following comments.

There are two potential areas associated with this project located within *Priority Habitat* and *Estimated Habitat* as indicated in the 13th Edition of the *MA Natural Heritage Atlas* and therefore the project requires review through a direct filing with NHESP for compliance with the Massachusetts Endangered Species Act (MESA 321 CMR 10.00) and its implementing regulations (MESA, 321 CMR 10.00). Review of the NHESP database indicates that the proposed pipeline corridor is located within mapped habitat for the Umber Shadowdragon (*Neurocordulia obsoleta*), a dragonfly listed as "Special Concern" pursuant to the MESA. The proposed pipeyard in Tyringham is mapped for Sedge Wren (*Cistothorus platensis*) and American Bittern (*Botaurus lentiginosus*); both birds are listed as "Endangered" pursuant to the MESA. Additionally, portions of this pipeyard area are mapped for the Wood Turtle (*Glyptemys insculpta*), a species listed as "Special Concern" pursuant to the MESA. Based on the preliminary information included in the EENF, it appears that the proposed activities (including the proposed hydrostatic pressure testing) could be conditioned to avoid a prohibited "take" of state-listed species. However, more detailed information on the limit of work, especially associated with the pipeyard, should be included in the MESA filing for review. The Division anticipates being able to resolve any outstanding state-listed species issues through the MESA review process.

The Division will not render a final decision until the MEPA review process and associated public and agency comment period is completed, and until all required MESA filing materials are submitted by the proponent to the Division. As our MESA review is ongoing, no alteration to the soil, surface, or vegetation and no work associated with the proposed project shall occur on the property until the Division has made a final determination. If you have any questions or need additional information, please contact Eve Schlüter, Ph.D., Senior Endangered Species Review Biologist, at (508) 389-6346 or eve.schluter@state.ma.us.

Division of Fisheries and Wildlife
Temporary Correspondence: 100 Hartwell Street, Suite 230, West Boylston, MA 01583
Permanent: Field Headquarters, North Drive, Westborough, MA 01581 (508) 389-6300 Fax (508) 389-7890
An Agency of the Department of Fish and Game

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FISHERIES COMMENTS

The Clam River itself is a coldwater fisheries resource. Fisheries surveys have yielded: Blacknose Dace (*Rhinichthys atratulus*), native Brook Trout (*Salvelinus fontinalis*), Brown Bullhead (*Ameiurus nebulosus*), reproducing Brown Trout (*Salmo trutta*), Common Shiner (*Notropis cornutus*), Creek Chub (*Semotilus atromaculatus*), Cutlips Minnow (*Exoglossum maxillingua*), Longnose Dace (*Rhinicthys cataractae*), Pumpkinseed (*Lepomis gibbosus*), Slimy Sculpin (*Cottus cognatus*), Smallmouth Bass (*Micropterus dolomieu*), Tessellated Darter (*Etheostoma olmstedi*), White Sucker (*Catastomus commersoni*) and Yellow Perch (*Perca flavescens*). Additionally, the river is annually stocked in the spring with Brook Trout, Brown Trout, Rainbow Trout (*Oncorhynchus mykiss*) and/or Tiger Trout (*Salmo trutta x Salvelinus fontinalis*). Coldwater fisheries resources are highly susceptible to changes in water quality and/or quantity such as siltation and run-off, water level fluctuations, loss of riparian habitat, stream fragmentation and alterations of the temperature regime. Therefore, the project must not in any way diminish the ability of the river to support coldwater fish species.

The Fisheries Section currently does not have fisheries survey information for the unnamed tributaries to the Clam River. However, surveys conducted by the Division have shown the importance of coldwater tributaries in helping maintain the coldwater status of their receiving waters. Until fisheries surveys are conducted, these unnamed tributaries should be treated as coldwater.

Fisheries surveys of Spectacle Pond Brook have yielded: Bluegill (*Lepomis macrochirus*), Brown Bullhead (*Ameiurus nebulosus*) and Largemouth Bass (*Micropterus salmoides*).

Lower Spectacle Pond contains a warmwater fishery. Fisheries surveys have yielded: Bluegill (*Lepomis macrochirus*), Brown Bullhead (*Ameiurus nebulosus*), Chain Pickerel (*Esox niger*), Golden Shiner (*Notemigonus crysoleucas*), Largemouth Bass (*Micropterus salmoides*), Pumpkinseed (*Lepomis gibbosus*) and Yellow Perch (*Perca flavescens*).

If you have any questions regarding fisheries information, please contact Rich Hartley, Fisheries Biologist, at (508) 389-6330 or richard.hartley@state.ma.us.

Sincerely,

Thomas W. French

Thomas W. French, Ph.D.
Assistant Director

cc: Mark Gardella, AECOM
Agawam Board of Selectmen
Agawam Conservation Commission
Agawam Planning Department
Sandisfield Board of Selectmen
Sandisfield Conservation Commission
Sandisfield Planning Department
Tyringham Board of Selectmen
Tyringham Conservation Commission
Tyringham Planning Department
DEP Western Regional Office, MEPA Coordinator

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AS

The COMMONWEALTH OF MASSACHUSETTS
BOARD OF UNDERWATER ARCHAEOLOGICAL RESOURCES
EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS
251 Causeway Street, Suite 800, Boston, MA 02114-2136
Tel. (617) 626-1200 Fax (617) 626-1240 Web Site: www.mass.gov/czm/buar/index.htm

June 25, 2014

RECEIVED
JUN 26 2014
MEPA

Maeve Vallely Bartlett, Secretary
Executive Office of Energy and Environmental Affairs
Attention: Alex Strysky, MEPA Unit
100 Cambridge St., Suite 900
Boston, MA 02114

RE: Connecticut Expansion Project, Agawam, Sandisfield and Tyringham (EEA#15205)

Dear Secretary Bartlett,

The staff of the Massachusetts Board of Underwater Archaeological Resources has reviewed the above referenced ENF #15205 prepared by the AECOM on behalf of the Tennessee Gas Pipeline Company. We offer the following comments.

The Board has conducted a preliminary review of its files and secondary literature sources to identify known and potential submerged cultural resources in the proposed project area. No record of any underwater archaeological resources was found for that area in the Board's records. Based on the results of this review and the nature of the proposed project, the Board expects that this project is unlikely to impact submerged cultural resources.

However, should heretofore-unknown submerged cultural resources be encountered during the course of the project, the Board expects that the project's sponsor will take steps to limit adverse affects and notify the Board, as well as other appropriate agencies, immediately in accordance with the Board's *Policy Guidance for the Discovery of Unanticipated Archaeological Resources* (updated 9/28/06).

The Board appreciates the opportunity to provide these comments as part of the review process. Should you have any questions regarding this letter, please do not hesitate to contact me at the address above, by email at victor.mastone@state.ma.us, or by telephone at (617) 626-1141.

Sincerely,

Victor T. Mastone
Director

/vtm

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From: Patrick Barrett [mailto:patrickbarrett09@gmail.com]
Sent: Tuesday, July 01, 2014 10:22 PM
To: Strysky, Alexander (EEA)
Subject: Sandisfield Selectmen Letter!

Commonwealth of Massachusetts
Executive Office of Energy and Environmental Affairs

To Whom It May Concern:

The Sandisfield Board of Selectmen is writing to request your assistance to STOP the proposed expansion of the Tennessee Gas Pipeline through our community and State owned land. Under this proposal a 36" high pressure pipe will be added to a 3.8 mile corridor that currently contains two 24" pipes that were constructed in 1952 and 1981 respectively. The pipeline expansion will double the width of the existing corridor from 75 feet to 150 feet. This will not only negatively affect numerous homeowners along the existing line, but it also travels through the sensitive environmental areas of Otis State Forest and Spectacle Pond.

On May17, 2014 Sandisfield residents who attended our Annual Town Meeting unanimously approved a non-bidding resolution banning the expansion of the Tennessee Gas Pipeline. If this proposal is allowed homeowners land will be destroyed and devalued causing further hardship for a community that relies primarily upon property taxes for its income. This will also increase the risk for health and safety issues within Sandisfield. Our town has first hand knowledge of the dangers associated with this gas line. In 1981, as construction was being done on the second gas line, a careless work crew punctured a hole in one of the lines causing the evacuation of parts of three towns.

In 2007, the State purchased 900 acres around Spectacle Pond in order to preserve this bucolic area for future generations to enjoy. At the time of purchase, Massachusetts Governor Deval Patrick declared *"The State's purchase of this spectacular property ensures its lasting protection and is an example of our prudent investment in the Commonwealth's rare and irreplaceable natural resources."* Ever since this land purchase, the State has been paying a reduced tax-rate on this property in the name of conservation, forcing residents in Sandisfield to pay more in order to keep our town running. Now this land and the entire Sandisfield community are facing a serious environmental risk with the expansion of this gas line. In the name of conservation, we ask the State to remain true to its stated purpose when purchasing this land and not allow a 36" gas pipe through this "spectacular property".

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This expansion project will not only affect Sandisfield, but also other communities in Berkshire County and other communities throughout the Commonwealth. The small communities of Berkshire County can't stand alone against a corporate giant such as Kinder Morgan. We need your assistance in helping to preserve the health, safety and environment of our beautiful State and town.

Sincerely,

Patrick Barrett, Chairman

Jeff Gray, Selectman

Rosario Messina, Selectman

--
Patrick W. Barrett
26 Rood Hill Road
Sandisfield, MA 01255
413.258.4707
patrickbarrett09@gmail.com

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AS #15205

RECEIVED
JUL 02 2014
MEPA

June 28, 2014

Secretary Richard K. Sullivan, Jr.
Executive office of Energy and Environmental Affairs
Attn. MEPA
100 Cambridge Street (Suite 900)
Boston, Ma 02114
Re: EEN Form from Tennessee Gas Pipeline-Connecticut Expansion Project

Dear Secretary Sullivan:
I am wring to you after reading the details of TGP'S ENP form of May 13, 2014 regarding their Connecticut Expansion Project to ask you to refuse them a waiver for the Mandatory EIR for the above sited project in Sandisfield, Massachusetts.

There are many false statements in TGP's May 14th report. I have owned a home with in Sandisfield since 1964 and I am disturbed by TGP's distortion of the facts and their proposal to "Loop" or more accurately, to use our community for STORAGE of **HUGE quantities of deadly and volatile fossil fuels beneath our town**. They use the term "loop" to avoid the truth… TGP's planned 3.8 miles of 36-inch pipes under our town are intended for storage of large quantities of explosive fossil fuels. These storage areas will dangerously increase our vulnerability for disastrous explosions." Loops " sound harmless but huge explosive gas storage is deadly!

We also do not deserve the creation of a "soft" target for terrorists in our community. We lack surveillance capabilities, a full time police force and have only part-time volunteer first responders in our town.

Please do not allow TGP to continue to lie its way to huge profits at Sandisfield's expense and demise.
Yours truly,

Thelma Esteves

P.S. To add insult to injury TGP states that the new expanded pipeline will provide a new source of fossil fuel for southern Massachusetts. NOT TRUE! NONE OF THE PIPELINE FUEL WILL BE DISTRIBUTED TO OUR AREA!!

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

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9.0 DRAFT SECTION 61 FINDINGS

This section provides a draft template for Section 61 Findings pursuant to the Secretary's EENF Certificate and in accordance with M.G.L. Ch. 30, Sec. 61, which states: "Any determination made by any agency of the Commonwealth shall include a finding describing the environmental impact, if any, of the project and a finding that all feasible measures have been taken to avoid or minimize said impact." This section contains draft Section 61 Findings for those issues that are within the scope of this DEIR, including the following state agencies, actions and/or statutory requirements:

- Massachusetts Department of Environmental Protection (MassDEP) - Individual Water Quality Certification;
- Natural Heritage and Endangered Species Program, Massachusetts Division of Fish & Wildlife (NHESP, DFW) – Massachusetts Endangered Species Act (MESA) "No Take" Determination;
- Massachusetts Historical Commission (MHC) - "Antiquities Act" Authorization; National Historic Preservation Act of 1966 Authorization;
- Massachusetts Department of Conservation and Recreation (DCR) – Temporary Construction License and Consistency with EEA Article 97 Land Disposition Policy;

Table 9-1 outlines the potential impacts from this Project and associated mitigation proposed.

TABLE 9-1
SUMMARY OF PROPOSED MITIGATION

Category	Impact	Mitigation Measures
Wetlands		
Bordering Land Subject to Flooding	Temporary use of existing access road and the Tyringham pipeyard within BLSF; no change in grades or other loss of flood storage.	Restore contours and temporary impacts in situ, No loss of flood storage or impacts to BLSF functions.
Bordering Vegetated Wetlands	Temporary alteration of 10.28 acres during construction; 2.2 acres to be permanently maintained within ROW; 0.11 acres of filling due to access road.	Restore wetland alterations in situ. Provide wetland replication for 0.11 acres of fill in accordance with 310 CMR 10.55 4(b). Provide additional mitigation for permanent impacts in accordance with MADEP and USACE requirements. Mitigation may include wetland replication, land preservation, and/or payment to the USACE In-Lieu Fee Program for Massachusetts.
Land Under Waterbodies and Waterways, Bank	Temporary impacts due to construction crossings.	Implement BMPs to avoid and minimize impacts. Restore the affected resource areas in situ. Perform construction under a SWPPP, which would include appropriate BMPs to avoid/minimize stormwater impacts.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

TABLE 9-1
SUMMARY OF PROPOSED MITIGATION

Category	Impact	Mitigation Measures
Riverfront Area	Temporary impact to Riverfront Area during construction, permanent impact due to conversion of forested overstory to scrub-shrub community.	Avoid tree canopy loss in those areas temporarily impacted.
Vernal Pools	Potential temporary impacts to several non-certified vernal pools.	Avoid and minimize impacts through project design, sequencing/timing, use of BMPs and control of sediment and erosion from adjacent areas. Restore any unavoidable impacted area in situ.
Rare Species	Limited activities within Priority Habitat or Estimated Habitats, along with acceptable construction BMPs, with an intent to achieve a "No Take" determination of listed species or listed species habitat.	Through active consultation with NHESP, develop and implement avoidance and minimization measures to protect rare species habitat and avoid direct species impacts. Avoid and minimize impacts through erosion and sedimentation controls, pre-construction surveys, contractor-awareness programs, and construction phase monitoring and relocation.
Cultural Resources	Potential impacts to culturally significant sites.	Avoid impacts to identified sites. Prepare and execute a Phase 3 data recovery plan for identified sites with unavoidable impact.
Energy	Determine public necessity, impacts to land, water, air, etc.	Compliance with conditions contained in Certificate of Public Convenience and Necessity issued by the Commission.
Local Traffic	Construction site access impacts to local street network, temporary street closures/ disruption to install lines	Prepare and implement a traffic management plan; time construction to non-peak hours where feasible.
Article 97 Land	Use of DCR land during construction, including three temporary access roads; 6.0 of these acres will be comprised of new permanent right-of-way adjacent to the existing right-of-way to accommodate the installation of the new 36-inch natural gas pipeline loop 7.3 acres of this area are on the existing ROW, and 17 acres would be within a temporary construction easement.	DCR negotiations ongoing to reach acceptable mitigation. It is anticipated that mitigation will include: - compensation for 6 acres for no net loss park lands and 17 acres for the temporary construction; - compensation for a permanent easement; and - - forest products mitigation from DCR land delivered to DCR site for sale, management and use.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

TABLE 9-1
SUMMARY OF PROPOSED MITIGATION

Category	Impact	Mitigation Measures
Noise	Construction related noise impacts to sensitive receptors.	Identify sensitive receptors in the potential impact area and time construction to off times where feasible. Ensure construction equipment is outfitted with noise reduction apparatus, as feasible.
Air Quality	Construction related emissions and dust.	Practice construction site BMPs to minimize fugitive dust, require contractors to ensure construction equipment is outfitted with appropriate emission controls.
Hazardous Materials and Contamination	Potential for excavation of contaminated soils and groundwater.	Manage the excavation and disposal of contaminated soils in accordance with the MCP under the oversight of an LSP.
Erosion Control	Potential impacts to wetlands, roadways, etc., during construction.	Implement Soil Erosion/Sediment Control Plan.
Invasive Species	Potential impacts to vegetated areas if invasive species are introduced or exhibit aggressive growth.	Implement Invasive Species Control and Monitoring Plan.
Public Outreach	Disruptions to local communities.	Keep stakeholders informed of the Project status including public education and communication.

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EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS

DIVISION OF WETLANDS AND WATERWAYS

MASSACHUSETTS DEPARTMENT OF ENVIRONMENTAL PROTECTION

DRAFT FINDING PURSUANT TO M.G.L. C 30, SECTION 61

PROJECT NAME: Connecticut Expansion Project

PROJECT LOCATION: Sandisfield, Agawam, and Tyringham

PROJECT PROPONENT: Tennessee Gas Pipeline Company, LLC (Tennessee)

EEA NUMBER: 15205

PERMIT: 401 Water Quality Certification (M.G.L. c. 21; 314 CMR 9.00)

PROJECT DESCRIPTION: The Connecticut Expansion Project (the "Project") includes the construction of three separate pipeline loops in Connecticut, Massachusetts and New York. For the purposes of this Finding, only those facilities located within Massachusetts are considered.

In Massachusetts, the Project consists of approximately 3.81 miles of new 36-inch outside diameter ("OD") pipeline, co-located within or adjacent to TGP's existing 200 Line right-of-way ("ROW") in Sandisfield, Massachusetts, and 0.11 miles of 24-inch OD pipeline co-located within or adjacent to TGP's 300 Line ROW in Agawam, Massachusetts, and modifications within the fenceline of existing Compressor Station 261 in Agawam, Massachusetts. Upon completion, the Project will increase delivery capability to the New York, Connecticut and southern Massachusetts by approximately 72.1 million dekatherms per day through the construction of the Project facilities and use of existing transportation capacity reserved for the Project. Construction of the Project will allow Tennessee to meet the market need for increased transportation capacity in high-demand markets in the northeast, as evidenced by the binding, long-term precedent agreements executed by three Project shippers. In addition, the proposed method of providing this expanded capacity through the construction of pipeline loops within and adjacent to existing ROWs, modifications to an existing compressor stations, and use of existing capacity reserved for the Project is an efficient use of existing pipeline infrastructure and previously-impacted resources, allowing the Project to avoid and minimize adverse environmental impacts to the greatest extent practicable.

MEPA HISTORY: The MEPA review was initiated on May 15, 2014 with the filing of an Expanded Environmental Notification Form (EENF) for the Project by Tennessee. On July 11, 2014, the EEA Secretary issued a Certificate stating that the Project required the filing of a Draft Environmental Impact Report (DEIR). The DEIR was submitted on September 30, 2014.

PROJECT IMPACTS AND MITIGATION: Refer to Table A for a list of impacts and corresponding mitigation relative to wetlands and waters.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Table A: Summary of Proposed Wetlands/Waterways Mitigation

Category	Impact	Mitigation Measures
Bordering Vegetated Wetlands	Potential temporary impacts and permanent alterations of wetlands.	Restore wetland alterations in situ. Provide additional mitigation for permanent impacts in accordance with MADEP and USACE requirements. Mitigation may include wetland replication, land preservation, and/or payment to the USACE In-Lieu Fee Program for Massachusetts.
Land Under Waterbodies and Waterways, Bank	Temporary impacts due to construction crossings.	Restore the affected resource areas in situ. Perform construction under a SWPPP, which would include appropriate BMPs to avoid/minimize stormwater impacts.
Vernal Pools	Potential impacts to non-certified vernal pools.	Avoid and minimize impacts through project design, sequencing/timing, use of BMPs and control of sediment and erosion from adjacent areas. Restore any unavoidable impacted area in situ.

FINDINGS: Based on its review of the MEPA documents, the permit application, public comments, and Massachusetts Department of Environmental Protection's regulations, MassDEP finds the terms and conditions to be incorporated into the permits required for the Project and the mitigation commitments set forth in the attached Table A will constitute all feasible measures to avoid damage to the environment and will minimize and mitigate such damage to the maximum extent practicable for those impacts subject to MassDEP's authority.

Appropriate conditions consistent with this Section 61 Finding are included in the Section 401 Water Quality Certification issued by the Department to describe more fully and ensure implementation of said measures.

DEPARTMENT OF ENVIRONMENTAL PROTECTION

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BY **DATE**

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS

DIVISION OF FISHERIES AND WILDLIFE

MASSACHUSETTS NATURAL HERITAGE AND ENDANGERED SPECIES PROGRAM

DRAFT FINDING PURSUANT TO M.G.L. C 30, SECTION 61

PROJECT NAME: Connecticut Expansion Project

PROJECT LOCATION: Sandisfield, Agawam, and Tyringham

PROJECT PROPONENT: Tennessee Gas Pipeline Company, LLC (Tennessee)

EEA NUMBER: 15205

PERMITS: Massachusetts Endangered Species Act (M.G.L. c.131A; 321 CMR 10.00)

PROJECT DESCRIPTION: The Connecticut Expansion Project (the "Project") includes the construction of three separate pipeline loops in Connecticut, Massachusetts and New York. For the purposes of this Finding, only those facilities located within Massachusetts are considered.

In Massachusetts, the Project consists of approximately 3.81 miles of new 36-inch outside diameter ("OD") pipeline, co-located within or adjacent to TGP's existing 200 Line right-of-way ("ROW") in Sandisfield, Massachusetts, and 0.11 miles of 24-inch OD pipeline co-located within or adjacent to TGP's 300 Line ROW in Agawam, Massachusetts, and modifications within the fenceline of existing Compressor Station 261 in Agawam, Massachusetts. Upon completion, the Project will increase delivery capability to the New York, Connecticut and southern Massachusetts by approximately 72.1 million dekatherms per day through the construction of the Project facilities and use of existing transportation capacity reserved for the Project. Construction of the Project will allow Tennessee to meet the market need for increased transportation capacity in high-demand markets in the northeast, as evidenced by the binding, long-term precedent agreements executed by three Project shippers. In addition, the proposed method of providing this expanded capacity through the construction of pipeline loops within and adjacent to existing ROWs modifications to an existing compressor stations, and use of existing capacity reserved for the Project is an efficient use of existing pipeline infrastructure and previously-impacted resources, allowing the Project to avoid and minimize adverse environmental impacts to the greatest extent practicable.

MEPA HISTORY: The MEPA review was initiated on May 15, 2014 with the filing of an Expanded Environmental Notification Form (EENF) for the Project by Tennessee. On July 11, 2014, the EEA Secretary issued a Certificate stating that the Project required the filing of a Draft Environmental Impact Report (DEIR). The DEIR was submitted on September 30, 2014.

PROJECT IMPACTS AND MITIGATION: Please refer to Table A for a list of impacts and corresponding mitigation.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Table A: Summary of Proposed Rare Species Mitigation

Category	Impact	Mitigation Measures
Rare Species	Limited activities within Priority Habitat or Estimated Habitats, along with acceptable construction BMPs, with an intent to achieve a "No Take" determination of listed species or listed species habitat	Through active consultation with NHESP, develop and implement avoidance and minimization measures to protect rare species habitat and avoid direct species impacts. Avoid and minimize impacts through erosion and sedimentation controls, pre-construction surveys, contractor-awareness programs, and construction phase monitoring and relocation.

FINDINGS: Based on its review of the MEPA documents, the permit application, public comments, and NHESP's regulations, NHESP finds the terms and conditions to be incorporated into the permits required for the Project and the mitigation commitments set forth in the attached Table A will constitute all feasible measures to avoid damage to the environment and will minimize and mitigate such damage to the maximum extent practicable for those impacts subject to NHESP's authority. Appropriate measures consistent with this Section 61 Finding are included in the proponent's commitments and "no-take" determination issued by the DFW-NHESP.

DIVISION OF FISHERIES AND WILDLIFE

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BY **DATE**

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

MASSACHUSETTS HISTORICAL COMMISSION

DRAFT FINDING PURSUANT TO M.G.L. C 30, SECTION 61

PROJECT NAME: Connecticut Expansion Project

PROJECT LOCATION: Sandisfield, Agawam, and Tyringham

PROJECT PROPONENT: Tennessee Gas Pipeline Company, LLC (Tennessee)

EEA NUMBER: 15205

PERMITS: "Antiquities Act" Authorization; National Historic Preservation Act of 1966 Authorization

PROJECT DESCRIPTION: The Connecticut Expansion Project (the "Project") includes the construction of three separate pipeline loops in Connecticut, Massachusetts and New York. For the purposes of this Finding, only those facilities located within Massachusetts are considered.

In Massachusetts, the Project consists of approximately 3.81 miles of new 36-inch outside diameter ("OD") pipeline, co-located within or adjacent to TGP's existing 200 Line right-of-way ("ROW") in Sandisfield, Massachusetts, and 0.11 miles of 24-inch OD pipeline co-located within or adjacent to TGP's 300 Line, ROW in Agawam, Massachusetts and modifications within the fenceline of existing Compressor Station 261 in Agawam, Massachusetts. Upon completion, the Project will increase delivery capability to the New York, Connecticut and southern Massachusetts by approximately 72.1 million dekatherms per day through the construction of the Project facilities and use of existing transportation capacity reserved for the Project. Construction of the Project will allow Tennessee to meet the market need for increased transportation capacity in high-demand markets in the northeast, as evidenced by the binding, long-term precedent agreements executed by three Project shippers. In addition, the proposed method of providing this expanded capacity through the construction of pipeline loops within and adjacent to existing ROWs, modifications to an existing compressor stations, and use of existing capacity reserved for the Project is an efficient use of existing pipeline infrastructure and previously-impacted resources, allowing the Project to avoid and minimize adverse environmental impacts to the greatest extent practicable.

MEPA HISTORY: The MEPA review was initiated on May 15, 2014 with the filing of an Expanded Environmental Notification Form (EENF) for the Project by Tennessee. On July 11, 2014, the EEA Secretary issued a Certificate stating that the Project required the filing of a Draft Environmental Impact Report (DEIR). The DEIR was submitted on September 30, 2014.

PROJECT IMPACTS AND MITIGATION: Please refer to Table A for a list of impacts and corresponding mitigation.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Table A: Summary of Proposed Cultural Resources Mitigation

FEIR Category	Impact	Mitigation Measures
Cultural Resources	Potential impacts to culturally significant sites	Avoid impacts to identified sites. Prepare and execute a Phase 3 data recovery plan for identified sites with unavoidable impact.

FINDINGS: Based on its review of the MEPA documents, the permit application, public comments, and Massachusetts Historical Commission's regulations, MHC finds the terms and conditions to be incorporated into the permits required for the Project and the mitigation commitments set forth in the attached Table A will constitute all feasible measures to avoid damage to the environment and will minimize and mitigate such damage to the maximum extent practicable for those impacts subject to MHC's authority. Appropriate conditions consistent with this Section 61 Finding are included in the "Antiquities Act" Authorization and the National Historic Preservation Act of 1966 Authorization issued by MHC to describe more fully and ensure implementation of said measures.

MASSACHUSETTS HISTORICAL COMMISSION

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20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

EXECUTIVE OFFICE OF ENERGY AND ENVIRONMENTAL AFFAIRS

DEPARTMENT OF CONSERVATION AND RECREATION

DRAFT FINDING PURSUANT TO M.G.L. C 30, SECTION 61

PROJECT NAME: Connecticut Expansion Project

PROJECT LOCATION: Sandisfield, Agawam, and Tyringham

PROJECT PROPONENT: Tennessee Gas Pipeline Company, LLC (Tennessee)

EEA NUMBER: 15205

PERMITS: Special Use Permit; Consistency with EEA Article 97 Land Disposition Policy

PROJECT DESCRIPTION: The Connecticut Expansion Project (the "Project") the construction of three separate pipeline loops in Connecticut, Massachusetts and New York. For the purposes of this Finding, only those facilities located within Massachusetts are considered. In Massachusetts, the Project consists of approximately 3.81 miles of new 36-inch outside diameter ("OD") pipeline, co-located within or adjacent to TGP's existing 200 Line right-of-way ("ROW") in Sandisfield, Massachusetts, and 0.11 miles of 24-inch OD pipeline co-located within or adjacent to TGP's 300 Line ROW in Agawam, Massachusetts and modifications within the fenceline of existing Compressor Station 261 in Agawam, Massachusetts. Upon completion, the Project will increase delivery capability to the New York, Connecticut and southern Massachusetts by approximately 72.1 million dekatherms per day through the construction of the Project facilities and use of existing transportation capacity reserved for the Project. Construction of the Project will allow Tennessee to meet the market need for increased transportation capacity in high-demand markets in the northeast, as evidenced by the binding, long-term precedent agreements executed by three Project shippers. In addition, the proposed method of providing this expanded capacity through the construction of pipeline loops within and adjacent to existing ROWs modifications to an existing compressor stations, and use of existing capacity reserved for the Project is an efficient use of existing pipeline infrastructure and previously-impacted resources, allowing the Project to avoid and minimize adverse environmental impacts to the greatest extent practicable.

MEPA HISTORY: The MEPA review was initiated on May 15, 2014 with the filing of an Expanded Environmental Notification Form (EENF) for the Project by Tennessee. On July 11, 2014, the EEA Secretary issued a Certificate stating that the Project required the filing of a Draft Environmental Impact Report (DEIR). The DEIR was submitted on September 30, 2014.

PROJECT IMPACTS AND MITIGATION: Please refer to Table A for a list of impacts and corresponding mitigation.

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Table A: Summary of Proposed Recreational Land Mitigation

Category	Impact	Mitigation Measures
Article 97 Land	Use of 30.23 acres pf DCR land during construction, including three temporary access roads; 6.0 of these acres will be comprised of new permanent right-of-way adjacent to the existing right-of-way to accommodate the installation of the new 36-inch natural gas pipeline loop 7.3 acres of this area are on the existing ROW, and 17 acres would be within a temporary construction easement.	DCR negotiations ongoing to reach acceptable mitigation. It is anticipated that mitigation will include: -compensation for 6 acres for no net loss of park land and 17 acres for the temporary construction; -compensation for a permanent easement; and - forest products from DCR land to be delivered to DCR site for sale, management and use.

FINDINGS: Based on its review of the MEPA documents, the permit application, public comments, and Massachusetts Department of Conservation and Recreation's regulations, DCR finds the terms and conditions to be incorporated into the permits required for the Project and the mitigation commitments set forth in the attached Table A will constitute all feasible measures to avoid damage to the environment and will minimize and mitigate such damage to the maximum extent practicable for those impacts subject to DCR's authority. Appropriate conditions consistent with this Section 61 Finding are included in the Special Use Permit issued by the DCR to describe more fully and ensure implementation of said measures.

DEPARTMENT OF CONSERVATION AND RECREATION

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BY **DATE**

20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

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20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

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20141112-5147 FERC PDF (Unofficial) 11/12/2014 9:23:40 AM

Document Content(s)

CT_Project-Supplmntl_Trnsmtl_(Draft EIR)(Nov12)_f.DOCX.....1-2

CT_Project_DEIR_AppA_USGS_Maps_Sept-30-2014.PDF.....3-8

CT_Project_DEIR_AppC_Agency_Consultation_Sept-30-2014.PDF.....9-174

CT_Project_DEIR_AppD_Mtgtn_Invve_Plans_Sept-30-2014.PDF.....175-238

CT_Project_DEIR_AppE_Best_Mgt_Practices_Sept-30-2014.PDF.....239-504

CT_Project_DEIR_AppF_W-B-S-T-UD_Plan_Sep-30-2014.PDF.....505-587

CT_Project_DEIR_AppG_NHESP_Review_Sept-30-2014.PDF.....588-630

CT_Project_DEIR_AppH_Land_Deed_Audubon_Sept-30-2014[1].PDF.....631-636

CT_Project_DEIR_AppI_DCR_Alts_Reroute_Sept-30-2014[1].PDF.....637-638

CT_Project_DEIR_AppJ_Wtd-Bdrk-FEMA_Mpng_Sept-30-2014[1].PDF.....639-665

CT_Project_DEIR_AppK__Vrn-Wtd_Grhs_Rpts_Sept-30-2014[1].PDF.....666-916

CT_Project_DEIR_Application_Sept-30-2014[1].PDF.....917-1283