TABLE 1

PSNH WATER CROSSINGS					
Water Body	**Town**	**Line #**	**Docket #**	**Order #**	**Date Order Issued**
Upper Ammonoosuc River	Stark	O154 - 115 kV	DE 01-110	23,761	08/16/2001
Otter Brook	Lancaster	D142 - 115 kV	Not Previously Licensed		
Israel River	Lancaster	D142 - 115 kV	Not Previously Licensed		
Johns River	Dalton	348X - 34.5 kV	Not Previously Licensed		
Pemigewasset River	Bridgewater/New Hampton	E115 - 115 kV	DE-75-186	12,023	10/03/1975
Pemigewasset River	New Hampton/Bristol	E115 - 115 kV	DE 75-173	12,022	08/04/1975
Pemigewasset River	New Hampton/Hill	A111 - 115 kV	DE 76-22	12,219	04/21/1975
Chance Pond	Franklin	M127 - 115 kV	DE 87-131	18,782	08/04/1987
Chance Pond	Franklin	F139 - 115 kV	DE 87-131	18,782	08/04/1987
Merrimack River	Franklin/Northfield	F139 - 115 kV	DE 76-22	12,219	03/12/1976
Turtle Pond	Concord	318 - 34.5 kV	DE 94-272	21,817	09/06/1995
Turtle Pond	Concord	P145 - 115 kV	DE 94-272	21,817	09/06/1995
Soucook River	Concord/Pembroke	P145 - 115 kV	Not Previously Licensed		
Soucook River	Concord/Pembroke	C189 (formerly V182) - 115 kV	DE 08-064	24,859	05/30/2008
Lamprey River	Deerfield	G146 - 115 kV	I-E8322	6,217	09/01/1953

Water Crossing Locations

Line List #	Water Name
6145.03	Pemigewasset River
6182	Pemigewasset River
6441	Pemigewasset River
7315	Chance Pond

Source: USGS 1:100,000 Topographic Quadrangles; NH GRANIT GIS Data; Vermont Center for Geographic Information; Esri; Burns & McDonnell.

Revised August 31, 2015

Water Crossing Locations

Line List #	Water Name
2233/2234*	Otter Brook
2235	Israel River
2825/2526*	Johns River
12556	Upper Ammonoosuc River

*Water crossing occurs at or near intersection of mentioned line lists.

Source: USGS 1:100,000 Topographic Quadrangles; NH GRANIT GIS Data; Vermont Center for Geographic Information; Esri; Burns & McDonnell.

Revised August 31, 2015

LEGEND
Project Area
Water Crossing
Existing Substation
Proposed Converter Station
Transition Station
Proposed Route
Existing Transmission ROW
Scenic Roads/Byways
City/Village
Town Boundary
County Boundary
State Boundary
Appalachian Trail
Airport
Public Lands and Conservation Easements
Primary Protecting Agency
Federal
State
Municipal/County
Other Public/Quasi-Public
Private
Map Index
North
Central
South
NEW HAMPSHIRE
Water Crossing Locations
Line List #
Water Name
7077 Merrimack River
7315 Chance Pond
8076 Turtle Pond
8951 Soucook River
9702** Lamprey River
**Water crossing occurs within the boundaries of LL9702.
Laconia S/S
Webster S/S
Proposed Converter Station
Farmwood S/S
Oak Hill S/S
Garvins S/S
Merrimack S/S
Pine Hill S/S
Deerfield S/S
Greggs Falls S/S
7315
7077
8076
8951
9702**
BELKNAP COUNTY
MERRIMACK COUNTY
ROCKINGHAM COUNTY
HILLSBOROUGH COUNTY
STRAFFORD COUNTY
Husten - Morgan State Forest
Opechee Bay State Forest
Governors State Park
Black Brook WMA
Sleeper - Agric. Pres. Rest.
Saltmarsh Pond Boat Launch Facility
Saltmarsh Pond State Forest
Ellacoya State Park
Belknap Mountain State Forest
Mount Major State Forest
Hidden Valley CE
Franklin Falls Reservoir
Welch - Agric. Pres. Rest.
Webster Lake WMA
Brennick Lochmere Archaeological Site
Lochmere Dam Site
Sanborn State Forest
Page State Forest
Meadow Pond State Forest
Rocky Pond Resteration Area
North Island
Ingalls Island
Daniel Webster Birthplace Historic Site
Alton Bay State Forest
Merrymeeting Lake Dam
Powdermill Fish Hatchery
Merrymeeting Marsh Dam - Alton
Coldrain Pond Remote Access Facility
Merrymeeting Marsh WMA
Salisbury State Forest Nursery
Ayers State Forest
Meeh, M.G. & Tr. Meeh & McCullough
Mitigation Tract Shaker State Forest Easement B Present
Shaker Village Easement G
Soucook River WMA
Smith Tract (Lot 2) Grady Tract
Bergeron WMA
Osborne WMA
Merrimack River State Forest
Hildreth - Agric. Pres. Rest.
Sanborn - Agric. Pres. Rest.
Morrill Pond WMA
Kimball WMA
Hall Road Marsh WMA
Hannah Dustin Historic Site
Hirst WMA
SPNHF(Blood)
Blood - Agric. Pres. Rest.
Sewalls Falls WMA
Sewall Falls WMA
Turtletown Pond WMA
Oak Hill Fire Tower
Soucook River State Forest
Allen State Forest
Mast Yard State Forest
Taylor State Forest
Technical Institute - Low Area
NHTI/Concord - Island Reserve
Ross - Agric. Pres. Rest. State Prison Farm + Quarries
Abbott State Forest
District #5 State Forest
Rossview Farm
Walker State Forest
Karner Blue Natl. Wildlife Refuge - Area B
Concord Municipal Airport
Frank J. Lyman Boat Launch Facility
Pittsfield
Barnstead
Farmington
Blue Job WMA
Loudon
Chichester
Epsom
Pembroke
Northwood
Deerfield
Allenstown
Bear Brook State Park
Suncook River - Access
Three Pond Boat Launch Facility
Pages Corner State Forest
Goodwin - Chandler State Forest
Upton-Morgan State Forest
Russell-Shea State Forest
Cilley State Forest
West Iron Works Road State Forest
White Farm
Mitigation Wetland
Cold Spring Pond Dam Site - Allenstown
Hopkinton-Everett Flood Control Reservoir
Clough State Park
Piscataquog State Forest
Kimball Pond Tract
Lambert Park Boat Launch Facility
Pawtuckaway State Park
Nottingham
Raymond
Candia
Hooksett
Dunbarton
Weare
Goffstown
Glen Lake + Gross Falls WMA
Rousseau-Hodgkins Lang Station State Forest Bram
Surrette Hillsborough County 4-H Foundation Miller (Todd)
Pinardville
New Boston
Auburn
South Hooksett
Manchester
Merrimack River Access
UNH - Manchester (Hackett Hill)
Youth Development Center Backland
Manchester-Portsmouth RR Bed
Forest Peters WMA
UNH - Saddleback Mountain
Woodman Marsh WMA
Woodman State Forest
Dolas Marsh WMA
Lamontagne WMA
Corey WMA
Northwood Meadows State Park
Pleasant Lake Boat Launch Facility
DOT - Epsom Scenic Easement
Laconia
Gilford
Belmont
Tilton
Franklin
Sanbornton
Canterbury
Boscawen
Webster
Alton
New Durham
Strafford
Farmington
Gilmanton
Northfield
Hopkinton
Bow
Suncook
Hooksett
Goffstown
Pittsfield
NORTH
7,000 3,500 0 7,000
Feet
Eversource Water Crossings South Section
Source: USGS 1:100,000 Topographic Quadrangles; NH GRANIT GIS Data; Vermont Center for Geographic Information; Esri; Burns & McDonnell.
Revised August 31, 2015

APPENDICES

OVERHEAD CROSSINGS

APPENDIX 1
O154 AC LINE
STRUCTURES O154-81 TO O154-82
UPPER AMMONOOSUC RIVER
STARK, NH

1. This crossing is shown on attached drawing 015443901

2. The location of the O154 line is shown on attached map titled Line List 12556.

3. The O154 line will cross the Upper Ammonoosuc River on steel structures. The energized conductor is in a vertical configuration using 795 kcmil ACSR. The structures will have ground wire. OPGW with sag coefficients similar to 19#10 Alumoweld will be used.

    a. O154-81 & O154-82 will be structures with suspension insulators. The energized conductors are separated approximately 0 feet horizontally and 12 feet vertically in a vertical configuration. The ground/OPGW wire is carried on the structure by a support bracket approximately 6 inches below the top of the structure. The ground/OPGW and energized conductor are separated vertically by approximately 13 feet and 5 feet horizontally.

4. Energized conductors will have a maximum tension of 9,000 pounds at NESC 250B Heavy weather case (0 degrees F, 4 pounds per square foot wind loading, ½-inch radial ice). Ground wires will have a maximum tension of 5,500 pounds at NESC 250B Heavy weather case (0 degrees F, 4 pounds per square foot wind loading, ½-inch radial ice).

5. All NESC clearances described in subsequent paragraphs have been met by exceeding the horizontal and/or vertical clearances required. Minimum distances to ground per the NESC have been met. A clearance of 45 feet between the energized conductor and ground has been achieved, which is greater than required 16.1 feet.

6. Flood water elevations were based on information contained flood insurance rate maps provided by FEMA. Table 232-1 of the NESC states that the minimum clearance over a water body is based on a 10 year flood elevation. In the absence of 10 year flood elevation data, the project has used 100 year flood elevations. All elevations provided are based on NAVD88 and location information is based on NAD83. Flood water elevations for the Upper Ammonoosuc River were based on information in FEMA Flood Insurance Rate Map (FIRM) # 33007C0760D Panel 760 of 1300. This document has an effective date of February 20, 2013. Based on 33007C0760D the information provided in the FIRM, the section of the Upper Ammonoosuc River where the O154 line crosses is in an area labeled “Zone A”. From the map legend, Zone A areas are determined to be inside of the 1% (100 year flood) annual chance floodplain with no base flood elevations determined. Due to the uncertainties and availability of flood data for this portion of the Upper Ammonoosuc River, Eversource has used the approximate top of the river bank as the peak elevation for this river. Based on the information given in the FIRM, Eversource feels this assumption is more than adequate for a 100 year flood elevation. At the time of survey the elevation at this section of the Upper Ammonoosuc River was 929 feet and elevation of the top of the river bank was 934 feet. The area of the crossing, as required by

the Section 232 of the NESC is approximately 143 acres (1180 feet x 5280 feet / 43560 square feet/acre).

7. The O154 line is a 115 kV alternating current (AC) line.

    a. Based on Table 232-1 of the NESC, for open supply conductors 750 V to 22kV to ground, the minimum clearance to the water surface during a normal flood (10 year flood as specified by the NESC, however the project has used the 100 year flood in absence of 10 year data) is 28.5 feet for waters 20-200 acres. NESC Rule 232.C.1.a states that an additional clearance of 1.59 feet or [(69.7 kV-22 kV)x 0.4]/12 is needed, which brings the total required minimum clearance to 30.1 feet.

    b. For overhead ground wires, the minimum required clearance to the water surface at the normal flood level is 25.5 feet. As the static wires are located above the energized conductors at all crossings, this NESC minimum clearance requirement will always be met.

    c. Table 235-1 of the NESC does not specify horizontal values for supply conductors of the same circuit for voltages greater than 50 kV. In the absence of this, the project will use values for different circuits. Based upon Table 235-1:

        i. 3.07 feet is required between 115 kV AC energized conductor and ground wire
        ii. 4.78 feet is required between 115 kV AC energized conductors

    d. Based on Table 235-3 of the NESC for horizontal clearance along the span for wires or conductors carried on the same support

        i. 5.69 feet is required between 115 kV AC energized conductors and ground wire
        ii. 6.96 feet is required between 115 kV AC energized conductors
        iii. These horizontal clearances assume conductor or wire sag of 35 feet which exceeds any sag at the location of these crossings.

    e. Based on Table 235-5 of the NESC the vertical clearance required at the supports for wires or conductors carried on the same supporting structure is:
        i. 3.37 feet is required between 115 kV AC energized conductors and ground wire
        ii. 5.07 feet is required between 115 kV AC energized conductors

    f. Based on Rule 235.C.2.b of the NESC, the vertical clearance required in the span for wires or conductors carried on the same supporting structure:
        i. 2.69 feet are required between 115 kV AC energized conductors and ground wire
        ii. 5.01 feet are required between 115 kV AC energized conductors

    g. Per Figure 235-1 of the NESC conductors or wires cannot encroach the envelope formed by the horizontal and vertical clearances prescribed above.

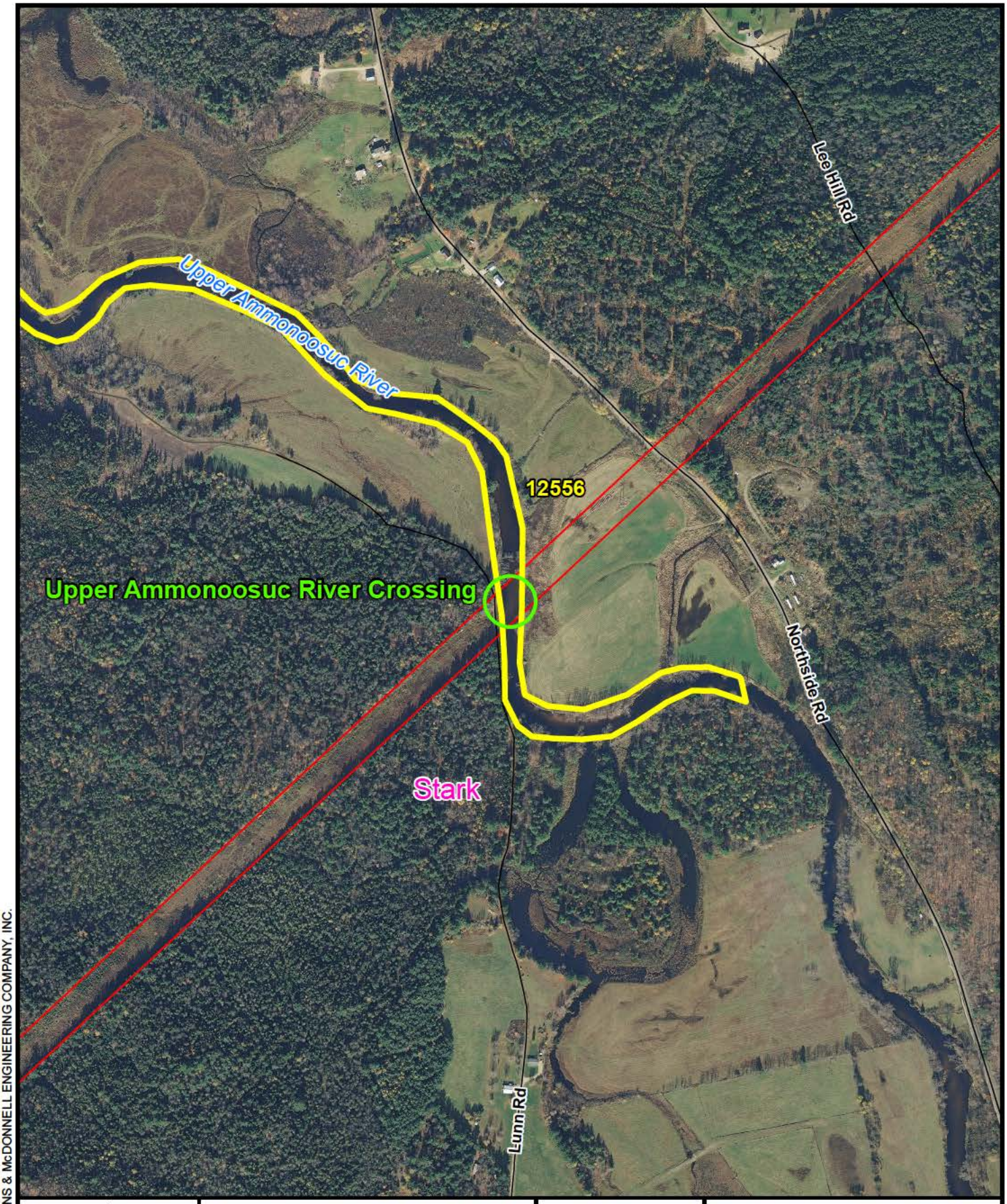
8. The sags and clearances to the water surface during a 100 year flood event for this crossing are as follows:

    h. Eversource has investigated a multitude of weather and loading conditions for its design. Eversource used these design conditions and combinations thereof to determine the minimum clearance of all conductors to the water and land surfaces, between the phase conductors and OPGW cable. Eversource has determined that the weather cases and combinations listed below results in the minimum clearance and control over all other weather conditions and combinations.

    i. Ground wires – Due to the fact that the ground wire is located above the energized conductor, its clearance to the water surface will always exceed the minimum required NESC distance.

    j. 285 degrees F – Maximum operating temperature (energized conductor) based on Eversource transmission standards, the maximum sag for this weather case results in a clearance to the water surface of 37 feet, this exceeds the minimum required clearance of 30.1 feet

Minimum clearance energized conductor to ground wires clearance – The weather case that would produce the minimum clearance between energized conductors and ground wires would be a combination of winter weather factors. First, the energized conductors would be at 30 degrees F immediately following an ice storm and would have recently dropped their ice. The ground wires would be at 32 degrees F and would still be iced with ½" of radial ice. Under these conditions the clearance would be 6.0 feet vertically and 3.0 feet horizontally from the ground wires to the closest energized conductor.



NORTH

0 300 600

Feet

LEGEND

- Water Crossing Area
- Parcel Boundary
- Project ROW
- Town Boundary

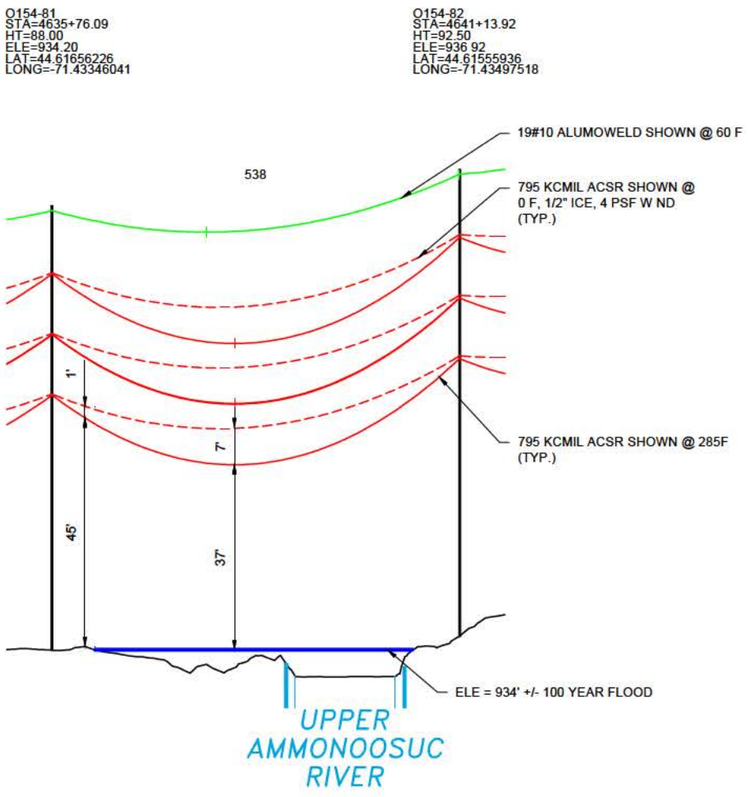
THE NORTHERN PASS

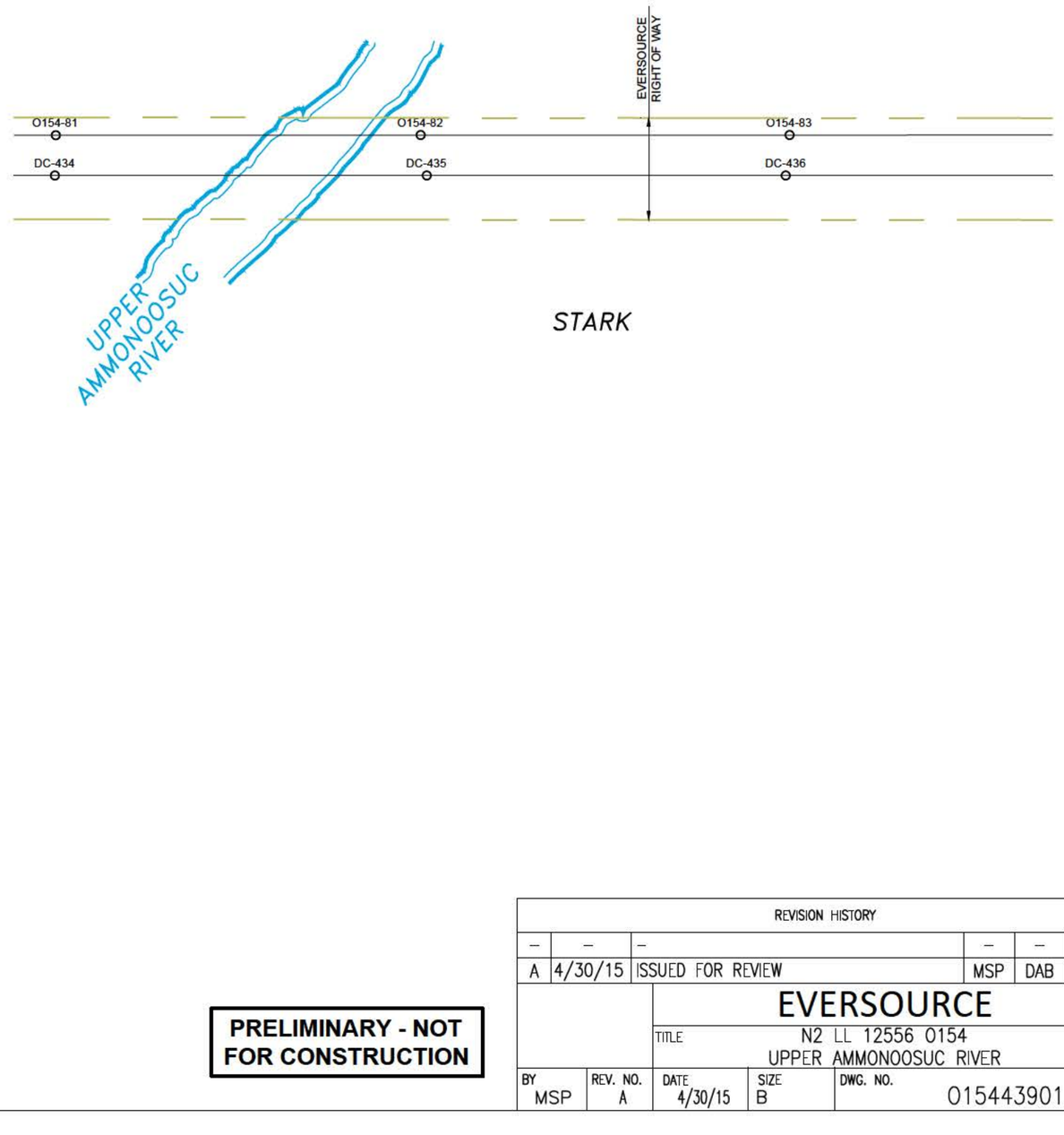
Line List 12556
Upper Ammonoosuc River
Water Crossing Permit
Location Map

Path: \\ESPSRV\data\Data2\Projects\NUS\53899_DC_Tline\GIS\DataFiles\ArcDocs\Water_Crossing_Maps\Water_Crossing_Permit_LL12556_Upper_Ammonoosuc_River_Lettersize.mxd rfraser 8/26/2015

Source: NH DOT 2011 Aerial Photography; NH GRANIT; Burns & McDonnell.

August 26, 2015





RIGHT OF WAY
EOR EDGE OF ROAD
PROPOSED MONOPOLE
PROPOSED TRANS STRUCTURE
EXIST NG H-FRAME
PROPOSED H-FRAME

200.0 ft. Horiz. Scale

30.0 ft. Vert. Scale

PRELIMINARY - NOT FOR CONSTRUCTION

REVISION HISTORY				
–	–	–	–	–
A	4/30/15	ISSUED FOR REVIEW	MSP	DAB

EVERSOURCE

TITLE: N2 LL 12556 0154 UPPER AMMONOOSUC RIVER

BY	REV. NO.	DATE	SIZE	DWG. NO.
MSP	A	4/30/15	B	015443901.DWG

05/04/2015 8:38am – mspepich – N:\NUSCO\58479 – NPT\Overhead\Cadd\01-Record Worksheets\02 Permits\Water Cross Permits\015443901.dwg

APPENDIX 2
D142 AC LINE
STRUCTURES D142-373 TO D142-376
OTTER BROOK / ISRAEL RIVER
LANCASTER, NH

1. This crossing is shown on attached drawing D14243901

2. The location of the D142 line is shown on attached maps titled Line List 2233/2234

3. The D142 line will cross the Israel River & Otter Brook on steel structures. The energized conductor is in a vertical configuration using 795 kcmil ACSR. The structures will have ground wire. OPGW with sag coefficients similar to 19#10 Alumoweld will be used.

    a. D142-374, D142-375, D142-376 will be structures with suspension insulators. The energized conductors are separated approximately 0 feet horizontally and 12 feet vertically in a vertical configuration. The ground/OPGW wire is carried on the structure by a support bracket approximately 6 inches below the top of the structure. The ground/OPGW and energized conductor are separated vertically by approximately 13 feet and 5 feet horizontally.
    b. D142-373 will be a structure with strain insulators. The energized conductors are separated approximately 0 feet horizontally and 12 feet vertically in a vertical configuration. The ground/OPGW wire is carried on the structure by a support bracket approximately 6 inches below the top of the structure. The ground/OPGW and energized conductor are separated vertically by approximately 13 feet and 0 feet horizontally.

4. Energized conductors will have a maximum tension of 9,000 pounds at NESC 250B Heavy weather case (0 degrees F, 4 pounds per square foot wind loading, ½-inch radial ice). Ground wires will have a maximum tension of 5,500 pounds at NESC 250B Heavy weather case (0 degrees F, 4 pounds per square foot wind loading, ½-inch radial ice).

5. All NESC clearances described in subsequent paragraphs have been met by exceeding the horizontal and/or vertical clearances required. Minimum distances to ground per the NESC have been met. A clearance of 47 feet between the energized conductor and ground has been achieved, which is greater than required 16.1 feet.

6. At the point of line crossing, the Israel River and Otter Brook are parallel to each other and approximately 1,200’ apart, however during the 100 year flood the 2 water bodies join. Flood water elevations were based on information contained flood insurance rate maps provided by FEMA. Table 232-1 of the NESC states that the minimum clearance over a water body is based on a 10 year flood elevation. In the absence of 10 year flood elevation data, the project has used 100 year flood elevations. All elevations provided are based on NAVD88 and location information is based on NAD83. Flood elevations are based on FEMA FIRM Map FM33007C0906D Panel 906 of 1300. The 100 year flood elevation for this portion of the rivers is approximately 926 feet. The area of the crossing, as required by the Section 232 of the NESC is approximately 182 acres (1500 feet x 5280 feet / 43560 square feet/acre).

7. The D142 line is a 115 kV alternating current (AC) line.

    a. Based on Table 232-1 of the NESC, for open supply conductors 750 V to 22kV to ground, the minimum clearance to the water surface during a normal flood (10 year flood as specified by the NESC, however the project has used the 100 year flood in absence of 10 year data) is 28.5 feet for waters 20-200 acres. NESC Rule 232.C.1.a states that an additional clearance of 1.59 feet or [(69.7 kV-22 kV)x 0.4]/12 is needed, which brings the total required minimum clearance to 30.1 feet.

    b. For overhead ground wires, the minimum required clearance to the water surface at the normal flood level is 25.5 feet. As the static wires are located above the energized conductors at all crossings, this NESC minimum clearance requirement will always be met.

    a. Table 235-1 of the NESC does not specify horizontal values for supply conductors of the same circuit for voltages greater than 50 kV. In the absence of this, the project will use values for different circuits. Based upon Table 235-1:

        i. 3.07 feet is required between 115 kV AC energized conductor and ground wire
        ii. 4.78 feet is required between 115 kV AC energized conductors

    b. Based on Table 235-3 of the NESC for horizontal clearance along the span for wires or conductors carried on the same support

        i. 5.69 feet is required between 115 kV AC energized conductors and ground wire
        ii. 6.96 feet is required between 115 kV AC energized conductors
        iii. These horizontal clearances assume conductor or wire sag of 35 feet which exceeds any sag at the location of these crossings.

    c. Based on Table 235-5 of the NESC the vertical clearance required at the supports for wires or conductors carried on the same supporting structure is:
        i. 3.37 feet is required between 115 kV AC energized conductors and ground wire
        ii. 5.07 feet is required between 115 kV AC energized conductors

    d. Based on Rule 235.C.2.b of the NESC, the vertical clearance required in the span for wires or conductors carried on the same supporting structure:
        i. 2.69 feet are required between 115 kV AC energized conductors and ground wire
        ii. 5.01 feet are required between 115 kV AC energized conductors

    c. Per Figure 235-1 of the NESC conductors or wires cannot encroach the envelope formed by the horizontal and vertical clearances prescribed above.

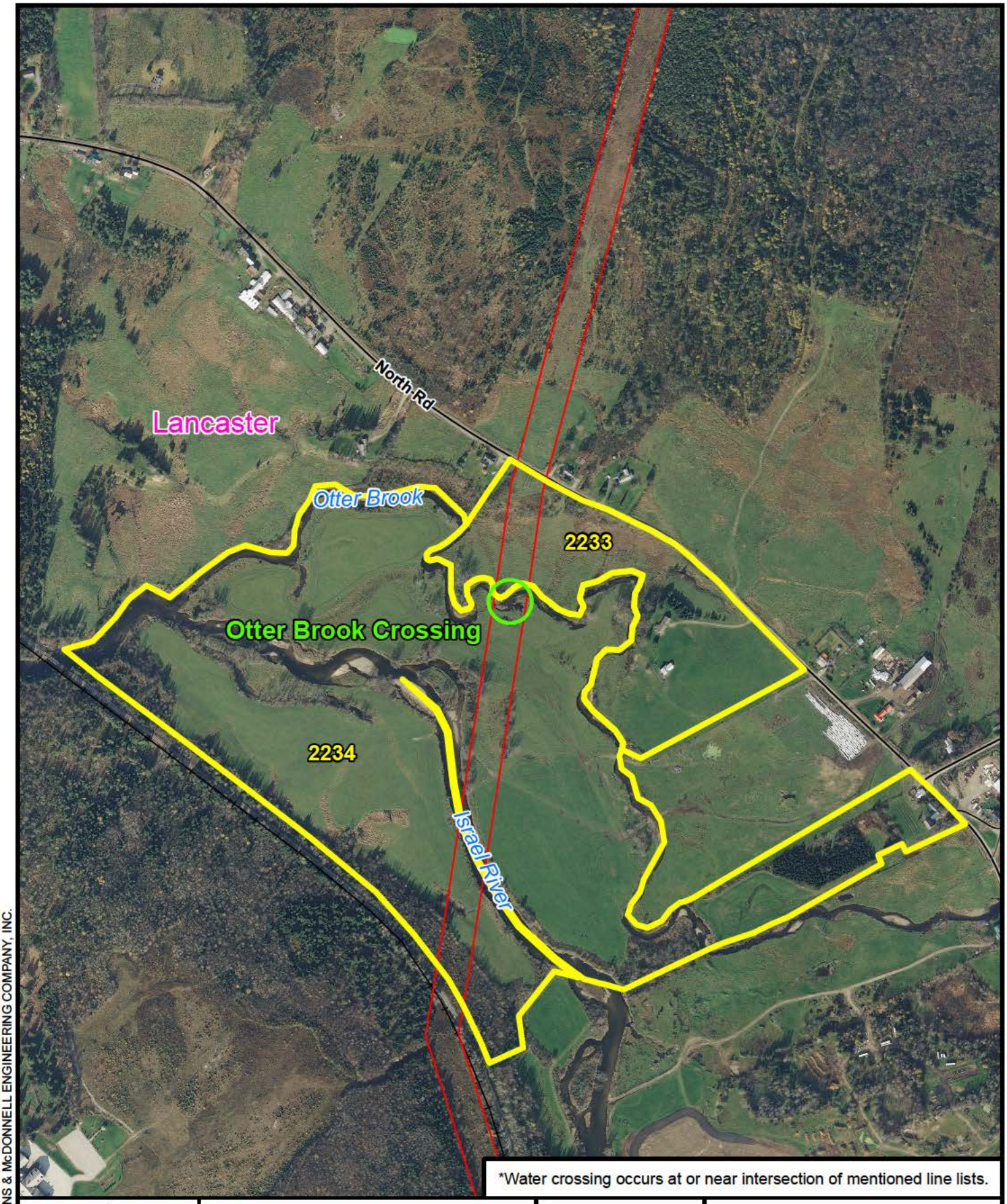
8. The sags and clearances to the water surface during a 100 year flood event for this crossing are as follows:

a. Eversource has investigated a multitude of weather and loading conditions for its design. Eversource used these design conditions and combinations thereof to determine the minimum clearance of all conductors to the water and land surfaces, between the phase conductors and OPGW cable. Eversource has determined that the weather cases and combinations listed below results in the minimum clearance and control over all other weather conditions and combinations.

b. Ground wires – Due to the fact that the ground wire is located above the energized conductor, its clearance to the water surface will always exceed the minimum required NESC distance.

c. 285 degrees F – Maximum operating temperature (energized conductor) based on Eversource transmission standards, the maximum sag for this weather case results in a clearance to the water surface of 35 feet, this exceeds the minimum required clearance of 30.1 feet

Minimum clearance energized conductor to ground wires clearance – The weather case that would produce the minimum clearance between energized conductors and ground wires would be a combination of winter weather factors. First, the energized conductors would be at 30 degrees F immediately following an ice storm and would have recently dropped their ice. The ground wires would be at 32 degrees F and would still be iced with ½" of radial ice. Under these conditions the clearance would be 12.3 feet vertically and 4.2 feet horizontally from the ground wires to the closest energized conductor.



*Water crossing occurs at or near intersection of mentioned line lists.

NORTH

0 300 600

Feet

LEGEND

- Water Crossing Area
- Parcel Boundary
- Project ROW
- Town Boundary

THE NORTHERN PASS

Line List 2233/2234*
Otter Brook
Water Crossing Permit
Location Map

Source: NH DOT 2011 Aerial Photography; NH GRANIT; Burns & McDonnell.

August 26, 2015

Path: \\ESPSRV\data\Data2\Projects\NUS\53899_DC_Tline\GIS\DataFiles\ArcDocs\Water_Crossing_Maps\Water_Crossing_Permit_LL2233-2234_Otter_Brook_Lettersize.mxd rfraser 8/26/2015

D142-373
STA=3509+39.81
HT=90.00
ELE=943.78
LAT=44.48248541
LONG=-71 54074109

D142-374
STA=3516+18.99
HT=97.00
ELE=920.60
LAT=44.48064503
LONG=-71 54114558

D142-375
STA=3521+30.48
HT=115.00
ELE=919.26
LAT=44.47925906
LONG=-71.54145019

D142-376
STA=3529+54 53
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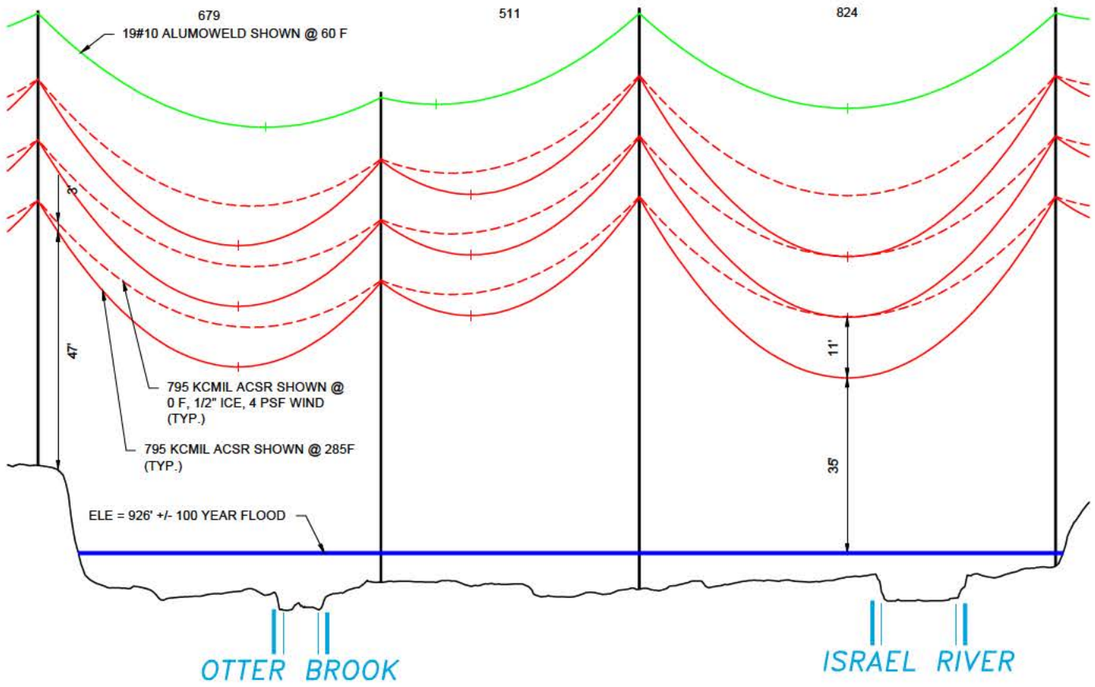
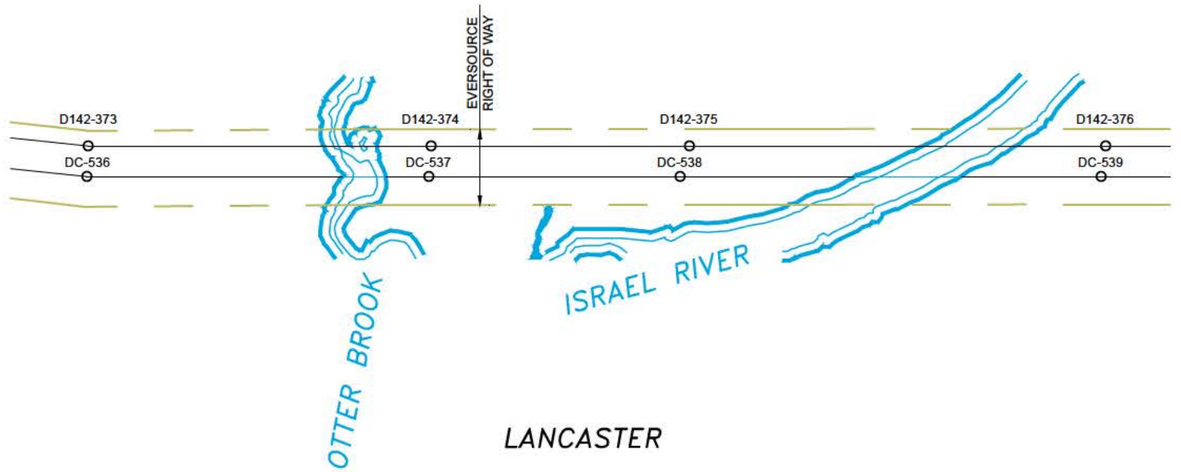




RIGHT OF WAY
EOR EDGE OF ROAD
PROPOSED MONOPOLE
PROPOSED TRANS STRUCTURE
EXIST NG H-FRAME
PROPOSED H-FRAME

300.0 ft. Horiz. Scale
30.0 ft. Vert. Scale

PRELIMINARY - NOT FOR CONSTRUCTION

REVISION HISTORY				
–	–	–	–	–
A	4/30/15	ISSUED FOR REVIEW	MSP	DAB

EVERSOURCE

TITLE: N2 LL 2233/2234 & 2235 D142
OTTER BROOK & ISRAEL RIVER

BY	REV. NO.	DATE	SIZE	DWG. NO.
MSP	A	4/30/15	B	D14243901.DWG

09/09/2015 1:04pm – mspepich – N:\NUSCO\58479 – NPT\Overhead\Cadd\01–Record Worksheets\02 Permits\Water Cross Permits\D14243901.dwg

APPENDIX 3
D142 AC LINE
STRUCTURES D142-373 TO D142-376
OTTER BROOK / ISRAEL RIVER
LANCASTER, NH

1. This crossing is shown on attached drawing D14243901

2. The location of the D142 line is shown on attached maps titled Line List 2235

3. The D142 line will cross the Israel River & Otter Brook on steel structures. The energized conductor is in a vertical configuration using 795 kcmil ACSR. The structures will have ground wire. OPGW with sag coefficients similar to 19#10 Alumoweld will be used.

    a. D142-374, D142-375, D142-376 will be structures with suspension insulators. The energized conductors are separated approximately 0 feet horizontally and 12 feet vertically in a vertical configuration. The ground/OPGW wire is carried on the structure by a support bracket approximately 6 inches below the top of the structure. The ground/OPGW and energized conductor are separated vertically by approximately 13 feet and 5 feet horizontally.
    b. D142-373 will be a structure with strain insulators. The energized conductors are separated approximately 0 feet horizontally and 12 feet vertically in a vertical configuration. The ground/OPGW wire is carried on the structure by a support bracket approximately 6 inches below the top of the structure. The ground/OPGW and energized conductor are separated vertically by approximately 13 feet and 0 feet horizontally.

4. Energized conductors will have a maximum tension of 9,000 pounds at NESC 250B Heavy weather case (0 degrees F, 4 pounds per square foot wind loading, ½-inch radial ice). Ground wires will have a maximum tension of 5,500 pounds at NESC 250B Heavy weather case (0 degrees F, 4 pounds per square foot wind loading, ½-inch radial ice).

5. All NESC clearances described in subsequent paragraphs have been met by exceeding the horizontal and/or vertical clearances required. Minimum distances to ground per the NESC have been met. A clearance of 47 feet between the energized conductor and ground has been achieved, which is greater than required 16.1 feet.

6. At the point of line crossing, the Israel River and Otter Brook are parallel to each other and approximately 1,200’ apart, however during the 100 year flood the 2 water bodies join. Flood water elevations were based on information contained flood insurance rate maps provided by FEMA. Table 232-1 of the NESC states that the minimum clearance over a water body is based on a 10 year flood elevation. In the absence of 10 year flood elevation data, the project has used 100 year flood elevations. All elevations provided are based on NAVD88 and location information is based on NAD83. Flood elevations are based on FEMA FIRM Map FM33007C0906D Panel 906 of 1300. The 100 year flood elevation for this portion of the rivers is approximately 926 feet. The area of the crossing, as required by the Section 232 of the NESC is approximately 182 acres (1500 feet x 5280 feet / 43560 square feet/acre).

7. The D142 line is a 115 kV alternating current (AC) line.

    a. Based on Table 232-1 of the NESC, for open supply conductors 750 V to 22kV to ground, the minimum clearance to the water surface during a normal flood (10 year flood as specified by the NESC, however the project has used the 100 year flood in absence of 10 year data) is 28.5 feet for waters 20-200 acres. NESC Rule 232.C.1.a states that an additional clearance of 1.59 feet or [(69.7 kV-22 kV)x 0.4]/12 is needed, which brings the total required minimum clearance to 30.1 feet.

    b. For overhead ground wires, the minimum required clearance to the water surface at the normal flood level is 25.5 feet. As the static wires are located above the energized conductors at all crossings, this NESC minimum clearance requirement will always be met.

    a. Table 235-1 of the NESC does not specify horizontal values for supply conductors of the same circuit for voltages greater than 50 kV. In the absence of this, the project will use values for different circuits. Based upon Table 235-1:

        i. 3.07 feet is required between 115 kV AC energized conductor and ground wire
        ii. 4.78 feet is required between 115 kV AC energized conductors

    b. Based on Table 235-3 of the NESC for horizontal clearance along the span for wires or conductors carried on the same support

        i. 5.69 feet is required between 115 kV AC energized conductors and ground wire
        ii. 6.96 feet is required between 115 kV AC energized conductors
        iii. These horizontal clearances assume conductor or wire sag of 35 feet which exceeds any sag at the location of these crossings.

    c. Based on Table 235-5 of the NESC the vertical clearance required at the supports for wires or conductors carried on the same supporting structure is:
        i. 3.37 feet is required between 115 kV AC energized conductors and ground wire
        ii. 5.07 feet is required between 115 kV AC energized conductors

    d. Based on Rule 235.C.2.b of the NESC, the vertical clearance required in the span for wires or conductors carried on the same supporting structure:
        i. 2.69 feet are required between 115 kV AC energized conductors and ground wire
        ii. 5.01 feet are required between 115 kV AC energized conductors

    c. Per Figure 235-1 of the NESC conductors or wires cannot encroach the envelope formed by the horizontal and vertical clearances prescribed above.

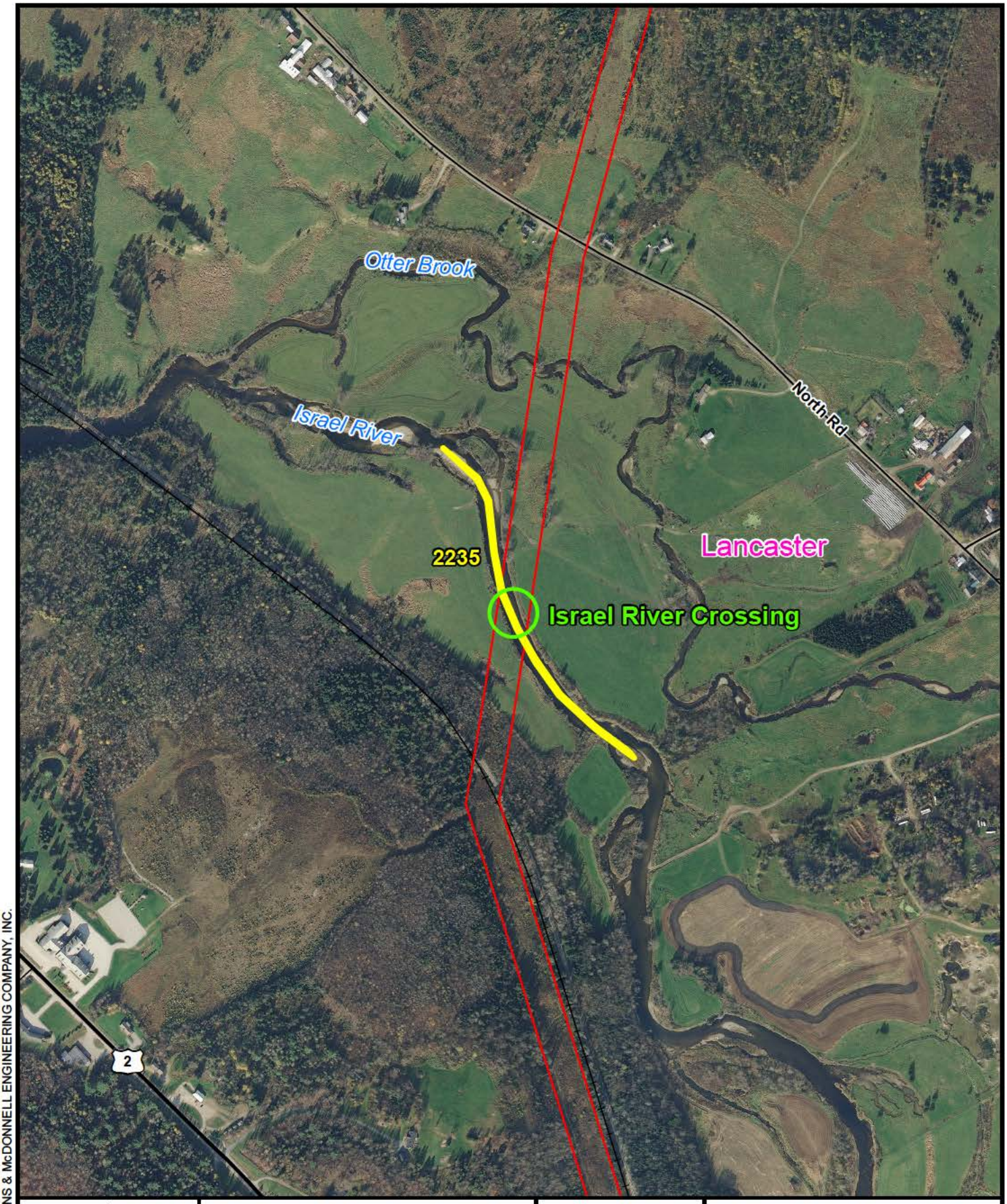
8. The sags and clearances to the water surface during a 100 year flood event for this crossing are as follows:

a. Eversource has investigated a multitude of weather and loading conditions for its design. Eversource used these design conditions and combinations thereof to determine the minimum clearance of all conductors to the water and land surfaces, between the phase conductors and OPGW cable. Eversource has determined that the weather cases and combinations listed below results in the minimum clearance and control over all other weather conditions and combinations.

b. Ground wires – Due to the fact that the ground wire is located above the energized conductor, its clearance to the water surface will always exceed the minimum required NESC distance.

c. 285 degrees F – Maximum operating temperature (energized conductor) based on Eversource transmission standards, the maximum sag for this weather case results in a clearance to the water surface of 35 feet, this exceeds the minimum required clearance of 30.1 feet

Minimum clearance energized conductor to ground wires clearance – The weather case that would produce the minimum clearance between energized conductors and ground wires would be a combination of winter weather factors. First, the energized conductors would be at 30 degrees F immediately following an ice storm and would have recently dropped their ice. The ground wires would be at 32 degrees F and would still be iced with ½" of radial ice. Under these conditions the clearance would be 12.3 feet vertically and 4.2 feet horizontally from the ground wires to the closest energized conductor.



NORTH

0 300 600

Feet

LEGEND

- Water Crossing Area
- Parcel Boundary
- Project ROW
- Town Boundary

THE NORTHERN PASS

Line List 2235
Israel River
Water Crossing Permit
Location Map

Source: NH DOT 2011 Aerial Photography; NH GRANIT; Burns & McDonnell.

August 25, 2015

Path: \\ESPSRV\data\Data2\Projects\NUS\53899_DC_Tline\GIS\DataFiles\ArcDocs\Water_Crossing_Maps\Water_Crossing_Permit_LL2235_Israel_River_Lettersize.mxd rfraser 8/25/2015

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LAT=44.48248541
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D142-375
STA=3521+30.48
HT=115.00
ELE=919.26
LAT=44.47925906
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D142-376
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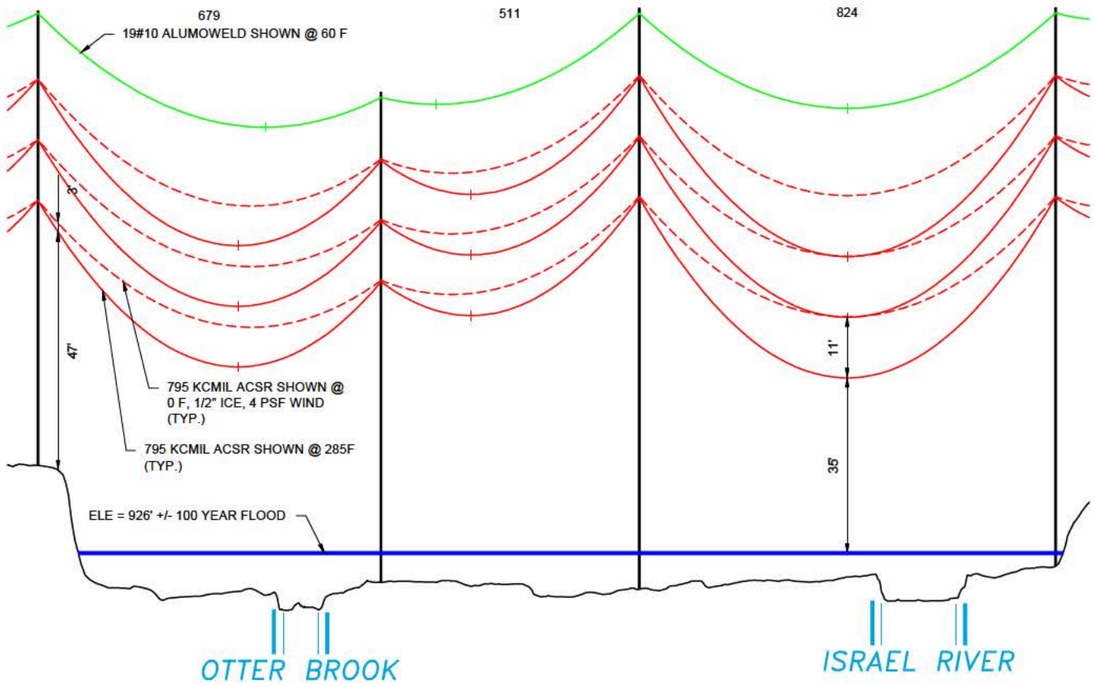
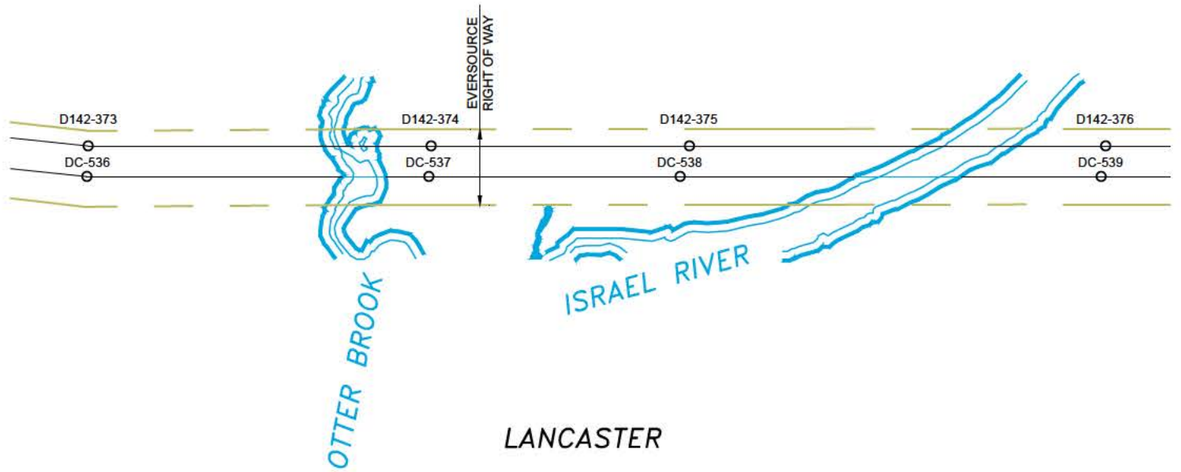




RIGHT OF WAY
EOR EDGE OF ROAD
PROPOSED MONOPOLE
PROPOSED TRANS STRUCTURE
EXIST NG H-FRAME
PROPOSED H-FRAME

300.0 ft. Horiz. Scale
30.0 ft. Vert. Scale

PRELIMINARY - NOT FOR CONSTRUCTION

REVISION HISTORY				
–	–	–	–	–
A	4/30/15	ISSUED FOR REVIEW	MSP	DAB

EVERSOURCE

TITLE: N2 LL 2233/2234 & 2235 D142
OTTER BROOK & ISRAEL RIVER

BY	REV. NO.	DATE	SIZE	DWG. NO.
MSP	A	4/30/15	B	D14243901.DWG

09/09/2015 1:04pm – mspepich – N:\NUSCO\58479 – NPT\Overhead\Cadd\01–Record Worksheets\02 Permits\Water Cross Permits\D14243901.dwg

APPENDIX 4
348X AC LINE
STRUCTURES 348X-013 TO 348-017
JOHNS RIVER
DALTON, NH

1. This crossing is shown on attached drawing B-7627-901

2. The location of the 348X line is shown on attached map titled Line List 2825/2826.

3. The 348X line will cross the Johns River on wood structures. The energized conductor is in a horizontal configuration using 477 kcmil ACSR. The neutral wire will 4/0 AWG 6/1 ACSR.

    a. Structures 348X-013 to 348X-017 will be distribution on wood poles. The energized conductors are separated approximately 5 feet horizontally and the middle phase will be approximately 1.5 feet higher than the outer phases. The neutral will be approximately 6 feet below phase conductors and 2 feet offset from center.

4. Energized conductors will have a maximum tension of 3,000 pounds at NESC 250B Heavy weather case (0 degrees F, 4 pounds per square foot wind loading, ½-inch radial ice). Neutral wires will have a maximum tension of 3,000 pounds at NESC 250B Heavy weather case (0 degrees F, 4 pounds per square foot wind loading, ½-inch radial ice).

5. All NESC clearances described in subsequent paragraphs have been met by exceeding the horizontal and/or vertical clearances required. Minimum distances to ground per the NESC have been met. A clearance of 35 feet between the lowest wire and ground has been achieved, which is greater than required 14.5 feet.

6. Flood water elevations were based on information contained flood insurance rate maps provided by FEMA. Table 232-1 of the NESC states that the minimum clearance over a water body is based on a 10 year flood elevation. In the absence of 10 year flood elevation data, the project has used 100 year flood elevations. All elevations provided are based on NAVD88 and location information is based on NAD83. Flood water elevations for the Johns River were based on information in FEMA Flood Insurance Rate Map (FIRM) # 33007C0915D Panel 915 of 1300. This document has an effective date of February 20, 2013. Based on the information provided in the FIRM, the section of the Johns River where the 348X line crosses is in an area labeled “Zone A”. From the map legend, Zone A areas are determined to be inside of the 1% (100 year flood) annual chance floodplain with no base flood elevations determined. Due to the uncertainties and availability of flood data for this portion of the Johns River, Eversource has used the approximate top of the river bank as the peak elevation for this river. Based on the information given in the FIRM, Eversource feels this assumption is more than adequate for a 100 year flood elevation. At the time of survey the elevation at this section of the Johns River was 865 feet and elevation of the top of the river bank was 871 feet. The area of the crossing, as required by the Section 232 of the NESC is approximately 30 acres (245 feet x 5280 feet / 43560 square feet/acre).

7. The 348X line is a 34.5 kV alternating current (AC) line.

a. Based on Table 232-1 of the NESC, for open supply conductors 750 V to 22kV to ground, the minimum clearance to the water surface during a normal flood (10 year flood as specified by the NESC, however the project has used the 100 year flood in absence of 10 year data) is 28.5 feet for waters 20-200 acres.

b. For neutral wires, the minimum required clearance to the water surface at the normal flood level is 25.5 feet.

2.

a. Based on Table 235-1 of the NESC for horizontal values for supply conductors of the same circuit.

   i. 1.4 feet is required between 34.5 kV AC energized conductor and neutral wire
   ii. 1.9 feet is required between 34.5 kV AC energized conductors

b. Based on Table 235-3 of the NESC for horizontal clearance along the span for wires or conductors carried on the same support

   i. 4.2 feet is required between 34.5 kV AC energized conductors and neutral wire
   ii. 4.6 feet is required between 34.5 kV AC energized conductors
   iii. These horizontal clearances assume conductor or wire sag of 30 feet which exceeds any sag at the location of these crossings.

c. Based on Table 235-5 of the NESC the vertical clearance required at the supports for wires or conductors carried on the same supporting structure is:
   i. 1.7 feet is required between 34.5 kV AC energized conductors and neutral wire
   ii. 2.3 feet is required between 34.5 kV AC energized conductors

d. Based on Rule 235.C.2.b of the NESC, the vertical clearance required in the span for wires or conductors carried on the same supporting structure:
   i. 1.3 feet are required between 34.5 kV AC energized conductors and neutral wire
   ii. 1.7 feet are required between 34.5 kV AC energized conductors

e. Per Figure 235-1 of the NESC conductors or wires cannot encroach the envelope formed by the horizontal and vertical clearances prescribed above.

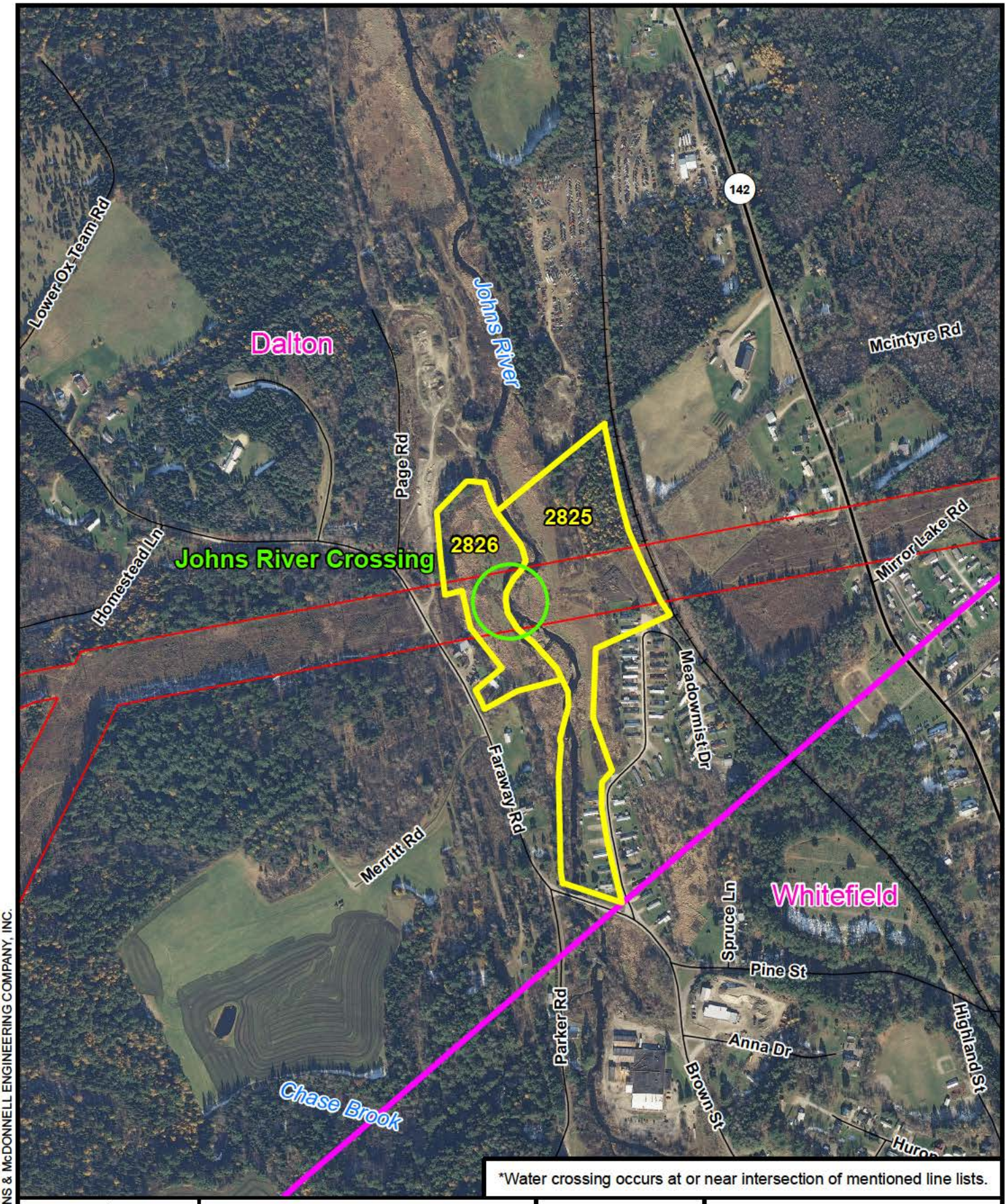
8. The sags and clearances to the water surface during a 100 year flood event for this crossing are as follows:

f. Eversource has investigated a multitude of weather and loading conditions for its design. Eversource used these design conditions and combinations thereof to determine the minimum clearance of all conductors to the water and land surfaces, between the phase conductors and OPGW cable. Eversource has determined that the weather cases and combinations listed below results in the minimum clearance and control over all other weather conditions and combinations.

g. Neutral wire- is located below the energized conductor and has a smaller required clearance, however energized conductor clearances have been achieved for the neutral wire.

h. 120 degrees F – Maximum operating temperature based Eversource distribution standards, the maximum sag for this weather case results in a clearance to the water surface of 30 feet, this exceeds the minimum required clearance of 28.5 feet

Minimum clearance between energized conductor to neutral wire clearance – The weather case that would produce the minimum clearance between energized conductors and neutral wire would be a combination of winter weather factors. First, the energized conductors would be at 32 degrees F and would still be iced with ½" of radial ice. The neutral wire would be at 30 degrees F immediately following an ice storm and would have recently dropped their ice. Under these conditions the clearance would be 3.1 feet vertically and 0.0 feet horizontally from the ground wires to the closest energized conductor.



*Water crossing occurs at or near intersection of mentioned line lists.

NORTH

0 300 600

Feet

LEGEND

- Water Crossing Area
- Parcel Boundary
- Project ROW
- Town Boundary

THE NORTHERN PASS

Line List 2825/2826*
Johns River
Water Crossing Permit
Location Map

Source: NH DOT 2011 Aerial Photography; NH GRANIT; Burns & McDonnell.

August 26, 2015

Path: \\ESPSRV\data\Data2\Projects\NUS\53899_DC_Tline\GIS\DataFiles\ArcDocs\Water_Crossing_Maps\Water_Crossing_Permit_LL2825-2826_Johns_River_Lettersize.mxd rfraser 8/26/2015

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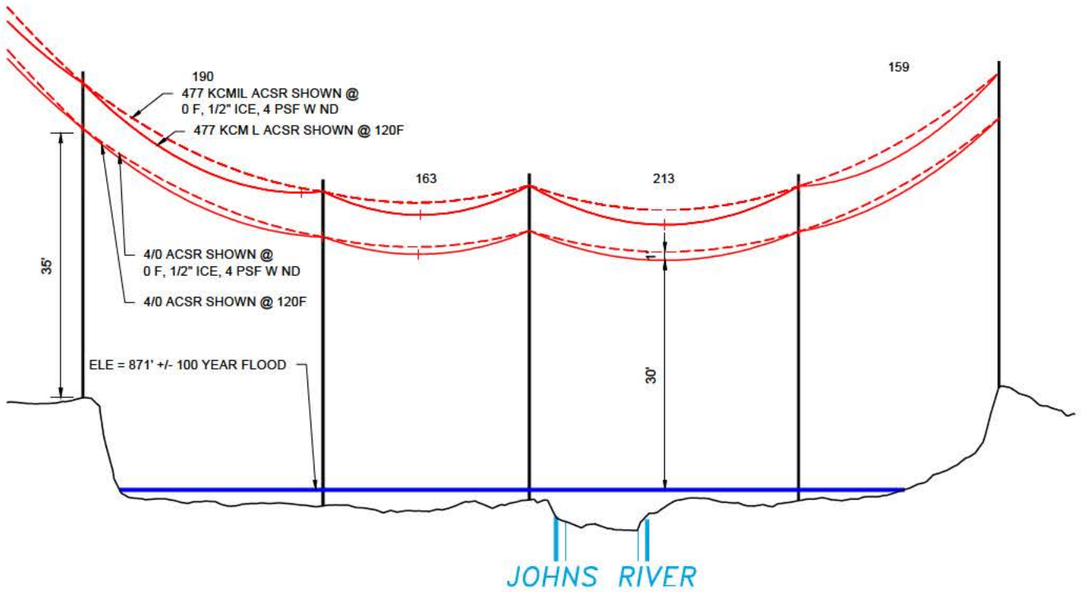
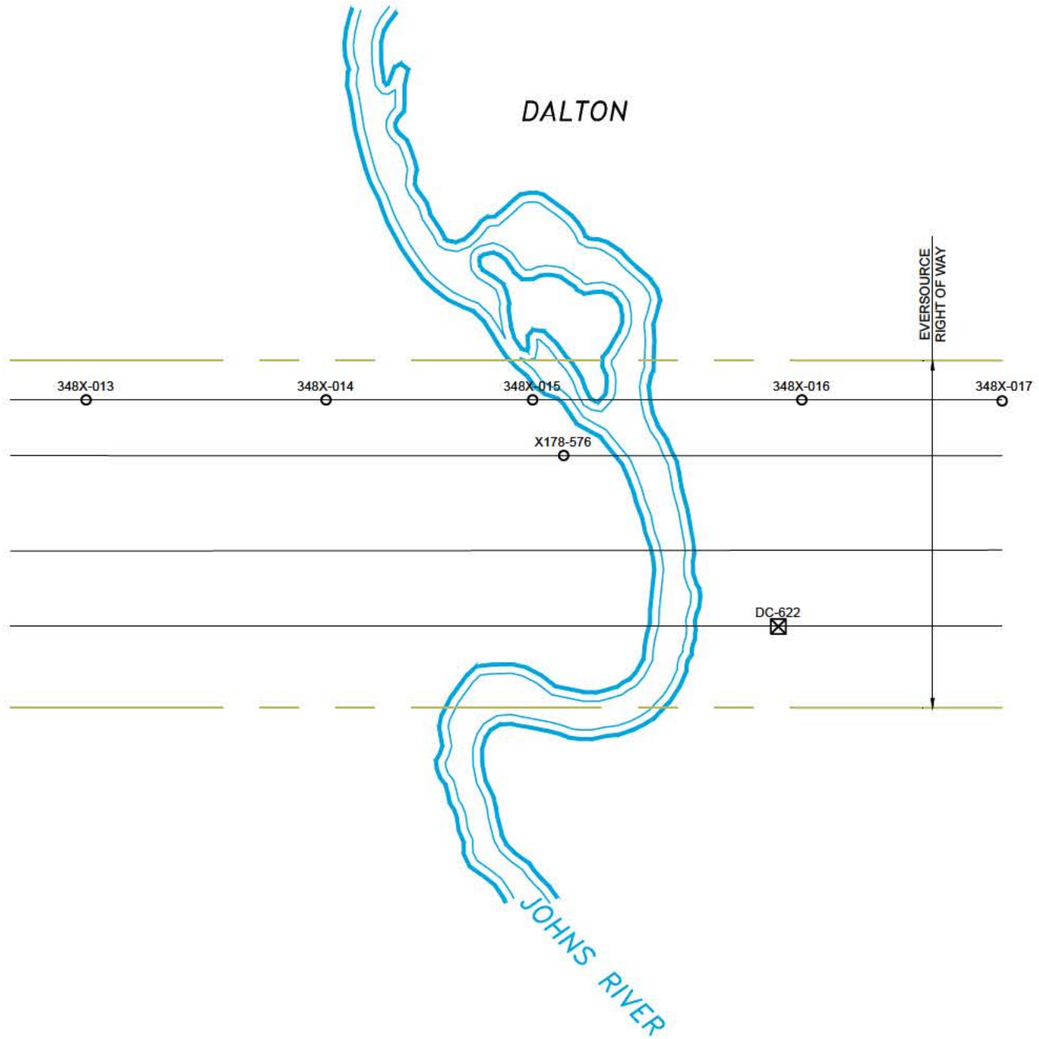




RIGHT OF WAY
EOR EDGE OF ROAD
PROPOSED MONOPOLE
PROPOSED TRANS STRUCTURE
EXIST NG H-FRAME
PROPOSED H-FRAME

120.0 ft. Horiz. Scale
20.0 ft. Vert. Scale

N

PRELIMINARY - NOT FOR CONSTRUCTION

REVISION HISTORY					
–	–	–		–	–
A	4/30/15	ISSUED FOR REVIEW		MSP	DAB

EVERSOURCE

TITLE: C1 LL 2825/2826 348X JOHNS RIVER

BY	REV. NO.	DATE	SIZE	DWG. NO.
MSP	A	4/30/15	B	B-7627-901.DWG

09/10/2015 8:12am – mspepich – N:\NUSCO\58479 – NPT\Overhead\Cadd\01-Record Worksheets\02 Permits\Water Cross Permits\B-7627-901.dwg

APPENDIX 5
E115 AC LINE
STRUCTURES E115-167 TO E115-168
PEMIGEWASSET RIVER
BRIDGEWATER/NEW HAMPTON, NH

1. This crossing is shown on attached drawing E11543902

2. The location of the E115 line is shown on attached map titled Line List 6145.03.

3. The E115 line will cross the Pemigewasset River on steel structures. The energized conductor is in a vertical configuration using 795 kcmil ACSR. The structures will have ground wire. OPGW with sag coefficients similar to 19#10 Alumoweld will be used.

    a. E115-167 & E115-168 will be structures with suspension insulators. The energized conductors are separated approximately 0 feet horizontally and 12 feet vertically in a vertical configuration. The ground/OPGW wire is carried on the structure by a support bracket approximately 6 inches below the top of the structure. The ground/OPGW and energized conductor are separated vertically by approximately 13 feet and 5 feet horizontally.

4. Energized conductors will have a maximum tension of 9,000 pounds at NESC 250B Heavy weather case (0 degrees F, 4 pounds per square foot wind loading, ½-inch radial ice). Ground wires will have a maximum tension of 5,500 pounds at NESC 250B Heavy weather case (0 degrees F, 4 pounds per square foot wind loading, ½-inch radial ice).

5. All NESC clearances described in subsequent paragraphs have been met by exceeding the horizontal and/or vertical clearances required. Minimum distances to ground per the NESC have been met. A clearance of 27 feet between the energized conductor and ground has been achieved, which is greater than required 16.1 feet.

6. Flood water elevations were based on information contained flood insurance rate maps provided by FEMA. Table 232-1 of the NESC states that the minimum clearance over a water body is based on a 10 year flood elevation. In the absence of 10 year flood elevation data, the project has used 100 year flood elevations. All elevations provided are based on NAVD88 and location information is based on NAD83. Flood water elevations for the Pemigewasset River were based on information in FEMA Flood Insurance Rate Map (FIRM) 33009C1020E Panel 1020 of 1185. This document has an effective date of February 20, 2008. The 100 year flood elevation for this portion of the river is approximately 469 feet. The area of the crossing, as required by the Section 232 of the NESC is approximately 50 acres (410 feet x 5280 feet / 43560 square feet/acre).

7. The E115 line is a 115 kV alternating current (AC) line.

    a. Based on Table 232-1 of the NESC, for open supply conductors 750 V to 22kV to ground, the minimum clearance to the water surface during a normal flood (10 year flood as specified by the NESC, however the project has used the 100 year flood in absence of 10 year data) is 28.5 feet for waters 20-200 acres. NESC Rule 232.C.1.a states that an

additional clearance of 1.59 feet or [(69.7 kV-22 kV)x 0.4]/12 is needed, which brings the total required minimum clearance to 30.1 feet.

b. For overhead ground wires, the minimum required clearance to the water surface at the normal flood level is 25.5 feet. As the static wires are located above the energized conductors at all crossings, this NESC minimum clearance requirement will always be met.

c. Table 235-1 of the NESC does not specify horizontal values for supply conductors of the same circuit for voltages greater than 50 kV. In the absence of this, the project will use values for different circuits. Based upon Table 235-1:

   i. 3.07 feet is required between 115 kV AC energized conductor and ground wire
   ii. 4.78 feet is required between 115 kV AC energized conductors

d. Based on Table 235-3 of the NESC for horizontal clearance along the span for wires or conductors carried on the same support

   i. 5.69 feet is required between 115 kV AC energized conductors and ground wire
   ii. 6.96 feet is required between 115 kV AC energized conductors
   iii. These horizontal clearances assume conductor or wire sag of 35 feet which exceeds any sag at the location of these crossings.

e. Based on Table 235-5 of the NESC the vertical clearance required at the supports for wires or conductors carried on the same supporting structure is:
   i. 3.37 feet is required between 115 kV AC energized conductors and ground wire
   ii. 5.07 feet is required between 115 kV AC energized conductors

f. Based on Rule 235.C.2.b of the NESC, the vertical clearance required in the span for wires or conductors carried on the same supporting structure:
   i. 2.69 feet are required between 115 kV AC energized conductors and ground wire
   ii. 5.01 feet are required between 115 kV AC energized conductors

g. Per Figure 235-1 of the NESC conductors or wires cannot encroach the envelope formed by the horizontal and vertical clearances prescribed above.

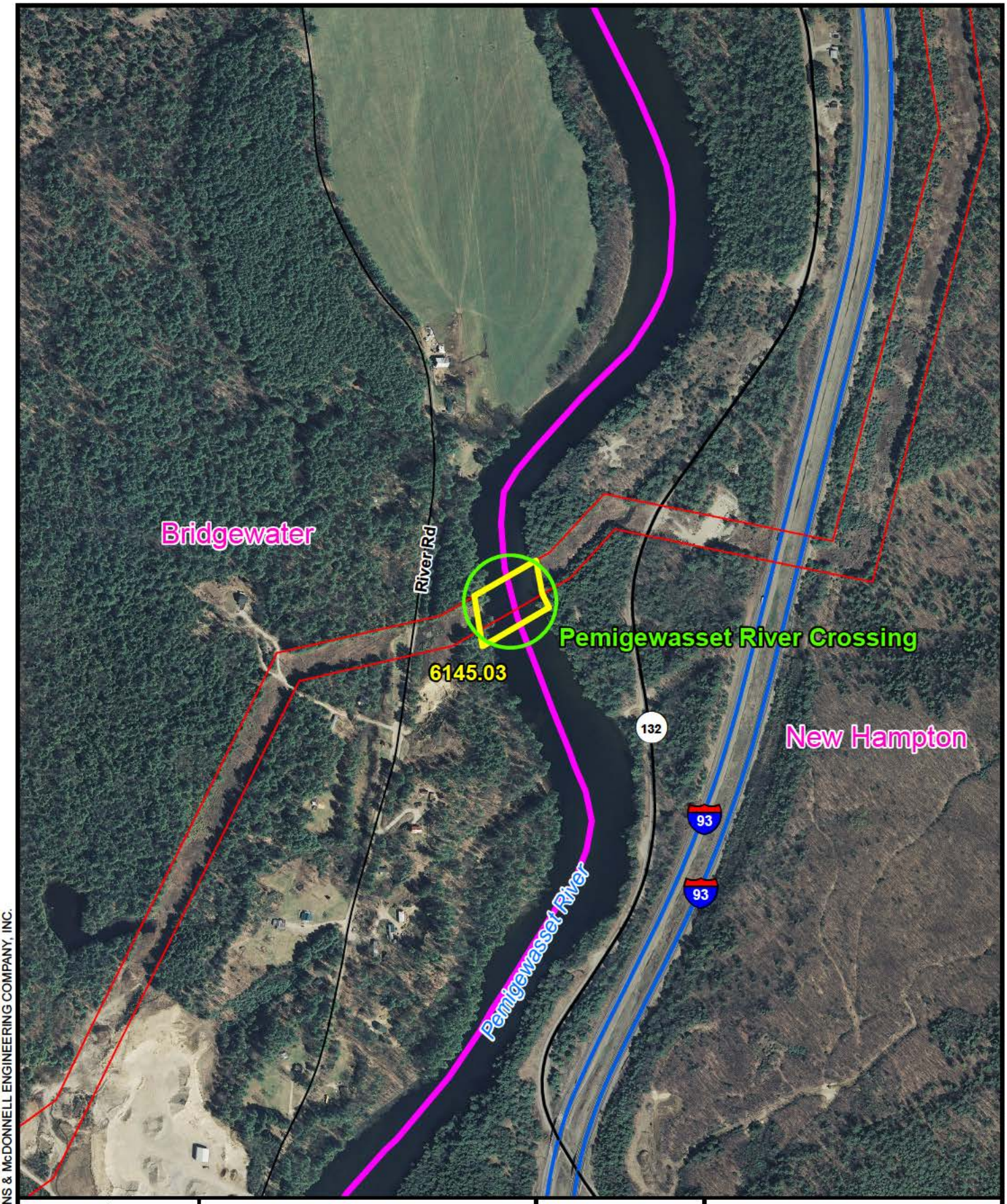
8. The sags and clearances to the water surface during a 100 year flood event for this crossing are as follows:

   h. Eversource has investigated a multitude of weather and loading conditions for its design. Eversource used these design conditions and combinations thereof to determine the minimum clearance of all conductors to the water and land surfaces, between the phase conductors and OPGW cable. Eversource has determined that the weather cases and combinations listed below results in the minimum clearance and control over all other weather conditions and combinations.

i. Ground wires – Due to the fact that the ground wire is located above the energized conductor, its clearance to the water surface will always exceed the minimum required NESC distance.

j. 285 degrees F – Maximum operating temperature (energized conductor) based on Eversource transmission standards, the maximum sag for this weather case results in a clearance to the water surface of 77 feet, this exceeds the minimum required clearance of 30.1 feet.

Minimum clearance energized conductor to ground wires clearance – The weather case that would produce the minimum clearance between energized conductors and ground wires would be a combination of winter weather factors. First, the energized conductors would be at 30 degrees F immediately following an ice storm and would have recently dropped their ice. The ground wires would be at 32 degrees F and would still be iced with ½" of radial ice. Under these conditions the clearance would be 12.5 feet vertically and 2.8 feet horizontally from the ground wires to the closest energized conductor.



NORTH

0 300 600

Feet

LEGEND

- Water Crossing Area
- Parcel Boundary
- Project ROW
- Town Boundary

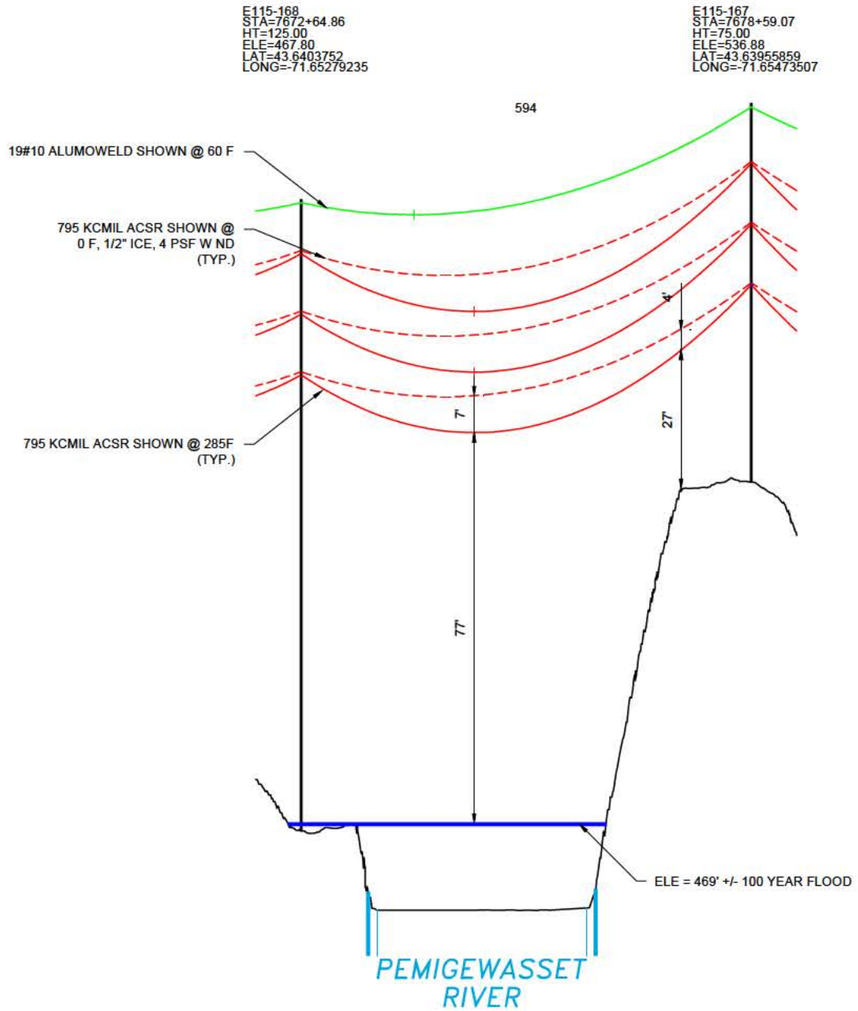
THE NORTHERN PASS

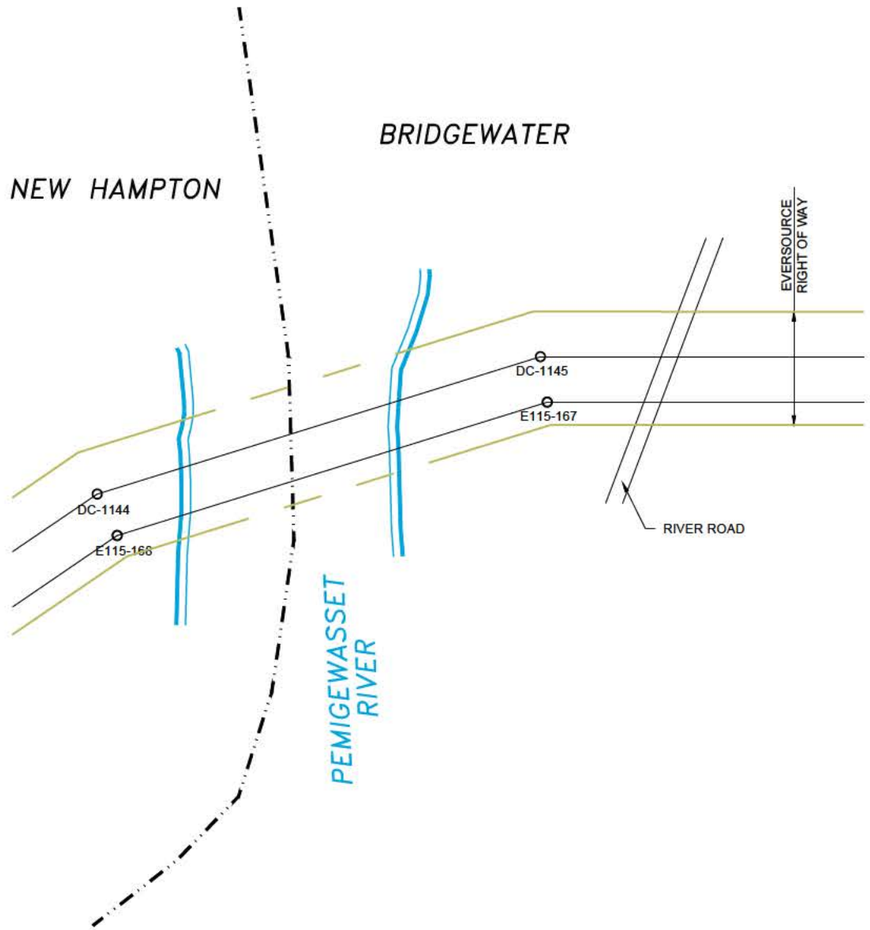
Line List 6145.03
Pemigewasset River
Water Crossing Permit
Location Map

Path: \\ESPSRV\data\Data2\Projects\NUS\53899_DC_Tline\GIS\DataFiles\ArcDocs\Water_Crossing_Maps\Water_Crossing_Permit_LL6145.03_Pemigewasset_River_Lettersize.mxd rfraser 8/25/2015

Source: NH DOT 2010 Aerial Photography; NH GRANIT; Burns & McDonnell.

August 25, 2015





RIGHT OF WAY

EOR EDGE OF ROAD

PROPOSED MONOPOLE

PROPOSED TRANS STRUCTURE

EXIST NG H-FRAME

PROPOSED H-FRAME

200.0 ft. Horiz. Scale

30.0 ft. Vert. Scale

N

PRELIMINARY - NOT FOR CONSTRUCTION

REVISION HISTORY					
–	–	–		–	–
A	4/30/15	ISSUED FOR REVIEW		MSP	DAB

EVERSOURCE

TITLE: C2 LL 6145.03 E115 PEMIGEWASSET RIVER

BY	REV. NO.	DATE	SIZE	DWG. NO.
MSP	A	4/30/15	B	E11543902.DWG

APPENDIX 6
E115 AC LINE
STRUCTURES E115-122 TO E115-123
PEMIGEWASSET RIVER
NEW HAMPTON/BRISTOL, NH

1. This crossing is shown on attached drawing E11543901

2. The location of the E115 line is shown on attached map titled Line List 6441.

3. The E115 line will cross the Pemigewasset on steel structures. The energized conductor is in a vertical configuration using 795 kcmil ACSR. The structures will have ground wire. OPGW with sag coefficients similar to 19#10 Alumoweld will be used.

    a. E115-122 & E115-123 will be structures with strain insulators. The energized conductors are separated approximately 0 feet horizontally and 12 feet vertically in a vertical configuration. The ground/OPGW wire is carried on the structure by a support bracket approximately 6 inches below the top of the structure. The ground/OPGW and energized conductor are separated vertically by approximately 13 feet and 0 feet horizontally.

4. Energized conductors will have a maximum tension of 9,000 pounds at NESC 250B Heavy weather case (0 degrees F, 4 pounds per square foot wind loading, ½-inch radial ice). Ground wires will have a maximum tension of 5,500 pounds at NESC 250B Heavy weather case (0 degrees F, 4 pounds per square foot wind loading, ½-inch radial ice).

5. All NESC clearances described in subsequent paragraphs have been met by exceeding the horizontal and/or vertical clearances required. Minimum distances to ground per the NESC have been met. A clearance of 73 feet between the energized conductor and ground has been achieved, which is greater than required 16.1 feet.

6. Flood water elevations were based on information contained flood insurance rate maps provided by FEMA. Table 232-1 of the NESC states that the minimum clearance over a water body is based on a 10 year flood elevation. In the absence of 10 year flood elevation data, the project has used 100 year flood elevations. All elevations provided are based on NAVD88 and location information is based on NAD83. Flood water elevations for the Pemigewasset River were based on information in FEMA Flood Insurance Rate Map (FIRM) # 33009C1180E Panel 1180 of 1185. This document has an effective date of February 20, 2008. Based on the information provided in the FIRM, the section of the Pemigewasset River where E115 line crosses is in an area labeled “Zone A”. From the map legend, Zone A areas are determined to be inside of the 1% (100 year flood) annual chance floodplain with no base flood elevations determined. Due to the uncertainties and availability of flood data for this portion of the Pemigewasset River, Eversource has used the approximate top of the river bank as the peak elevation for this river. Based on the information given in the FIRM, Eversource feels this assumption is more than adequate for a 100 year flood elevation. At the time of survey the elevation at this section of the Pemigewasset River was 452 feet and elevation of the top of the river bank was 453 feet. The area of the crossing, as required by the Section 232 of the NESC is approximately 162 acres (1340 feet x 5280 feet / 43560 square feet/acre).

7. The E115 line is a 115 kV alternating current (AC) line.

    a. Based on Table 232-1 of the NESC, for open supply conductors 750 V to 22kV to ground, the minimum clearance to the water surface during a normal flood (10 year flood as specified by the NESC, however the project has used the 100 year flood in absence of 10 year data) is 28.5 feet for waters 20-200 acres. NESC Rule 232.C.1.a states that an additional clearance of 1.59 feet or [(69.7 kV-22 kV)x 0.4]/12 is needed, which brings the total required minimum clearance to 30.1 feet.

    b. For overhead ground wires, the minimum required clearance to the water surface at the normal flood level is 25.5 feet. As the static wires are located above the energized conductors at all crossings, this NESC minimum clearance requirement will always be met.

    c. Table 235-1 of the NESC does not specify horizontal values for supply conductors of the same circuit for voltages greater than 50 kV. In the absence of this, the project will use values for different circuits. Based upon Table 235-1:

        i. 3.07 feet is required between 115 kV AC energized conductor and ground wire
        ii. 4.78 feet is required between 115 kV AC energized conductors

    d. Based on Table 235-3 of the NESC for horizontal clearance along the span for wires or conductors carried on the same support

        i. 5.69 feet is required between 115 kV AC energized conductors and ground wire
        ii. 6.96 feet is required between 115 kV AC energized conductors
        iii. These horizontal clearances assume conductor or wire sag of 35 feet which exceeds any sag at the location of these crossings.

    e. Based on Table 235-5 of the NESC the vertical clearance required at the supports for wires or conductors carried on the same supporting structure is:
        i. 3.37 feet is required between 115 kV AC energized conductors and ground wire
        ii. 5.07 feet is required between 115 kV AC energized conductors

    f. Based on Rule 235.C.2.b of the NESC, the vertical clearance required in the span for wires or conductors carried on the same supporting structure:
        i. 2.69 feet are required between 115 kV AC energized conductors and ground wire
        ii. 5.01 feet are required between 115 kV AC energized conductors

    g. Per Figure 235-1 of the NESC conductors or wires cannot encroach the envelope formed by the horizontal and vertical clearances prescribed above.

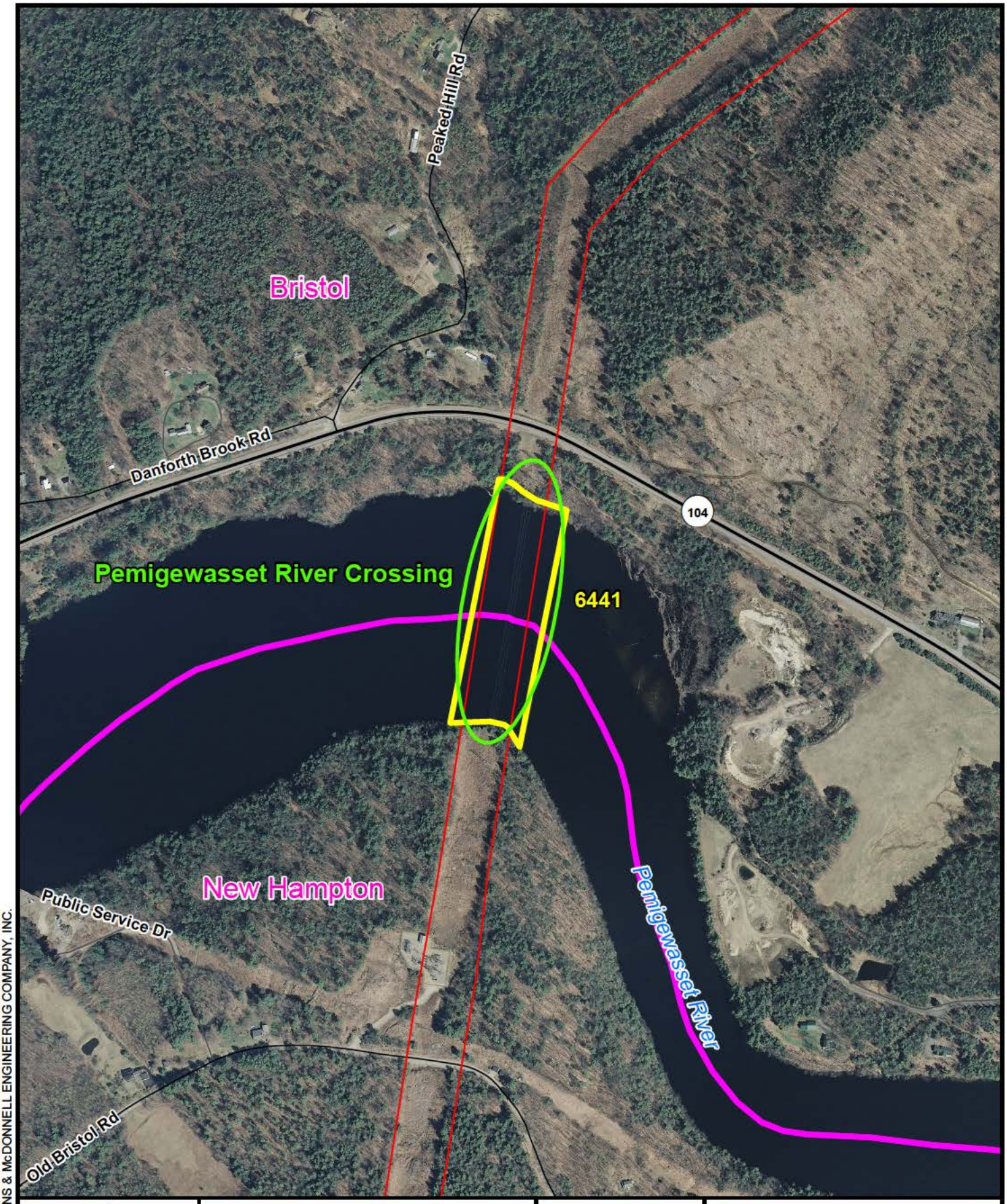
8. The sags and clearances to the water surface during a 100 year flood event for this crossing are as follows:

a. Eversource has investigated a multitude of weather and loading conditions for its design. Eversource used these design conditions and combinations thereof to determine the minimum clearance of all conductors to the water and land surfaces, between the phase conductors and OPGW cable. Eversource has determined that the weather cases and combinations listed below results in the minimum clearance and control over all other weather conditions and combinations.

b. Ground wires – Due to the fact that the ground wire is located above the energized conductor, its clearance to the water surface will always exceed the minimum required NESC distance.

c. 285 degrees F – Maximum operating temperature (energized conductor) based on Eversource transmission standards, the maximum sag for this weather case results in a clearance to the water surface of 43 feet, this exceeds the minimum required clearance of 30.1 feet

Minimum clearance energized conductor to ground wires clearance – The weather case that would produce the minimum clearance between energized conductors and ground wires would be a combination of winter weather factors. First, the energized conductors would be at 30 degrees F immediately following an ice storm and would have recently dropped their ice. The ground wires would be at 32 degrees F and would still be iced with ½" of radial ice. Under these conditions the clearance would be 12.5 feet vertically and 2.8 feet horizontally from the ground wires to the closest energized conductor.



NORTH

0 300 600

Feet

LEGEND

- Water Crossing Area
- Parcel Boundary
- Project ROW
- Town Boundary

THE NORTHERN PASS

Line List 6441
Pemigewasset River
Water Crossing Permit
Location Map

Path: \\ESPSRV\data\Data2\Projects\NUS\53899_DC_Tline\GIS\DataFiles\ArcDocs\Water_Crossing_Maps\Water_Crossing_Permit_LL6441_Pemigewasset_River_Lettersize.mxd rfraser 8/26/2015

Source: NH DOT 2010 Aerial Photography; NH GRANIT; Burns & McDonnell.

August 26, 2015

E115-123
STA=7878+52 66
HT=120.00
ELE=521.08
LAT=43.60319888
LONG=-71.70796896

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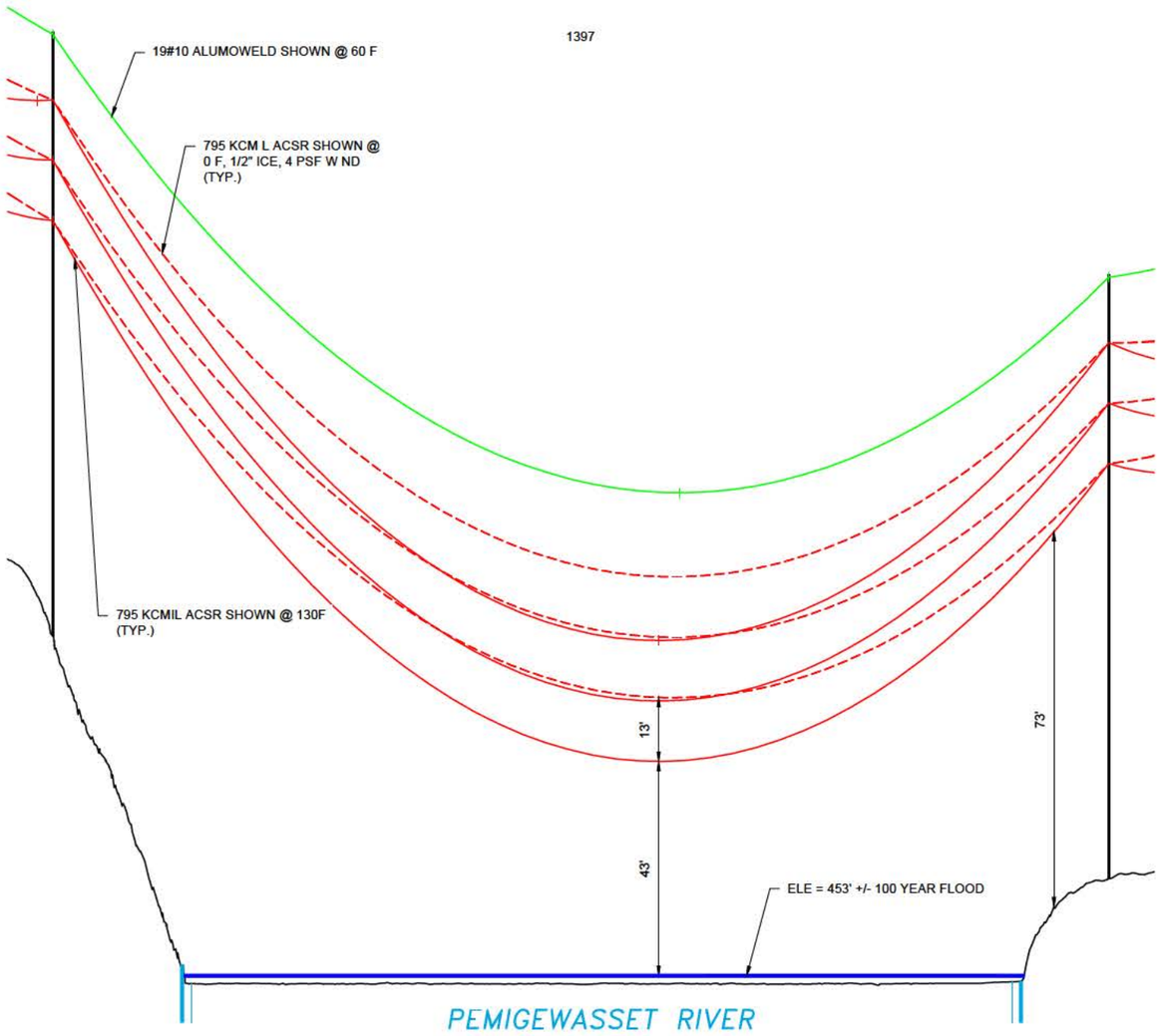
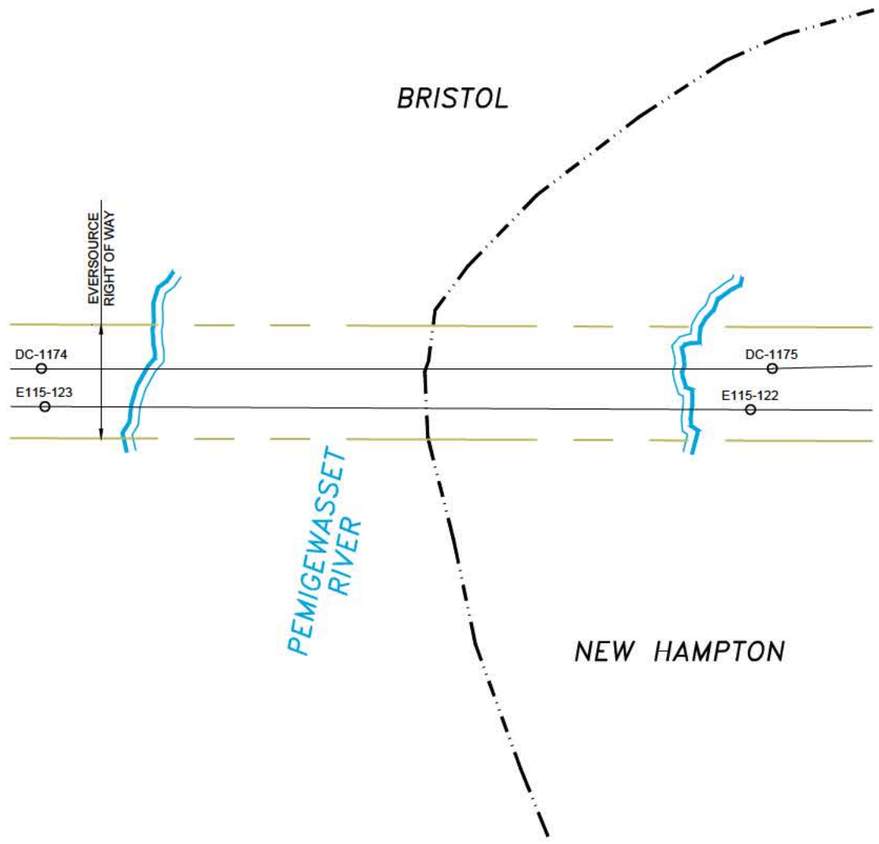
1397





RIGHT OF WAY
EOR EDGE OF ROAD
PROPOSED MONOPOLE
PROPOSED TRANS STRUCTURE
EXIST NG H-FRAME
PROPOSED H-FRAME

200.0 ft. Horiz. Scale
30.0 ft. Vert. Scale

PRELIMINARY - NOT FOR CONSTRUCTION

REVISION HISTORY					
–	–	–		–	–
A	4/30/15	ISSUED FOR REVIEW		MSP	DAB

EVERSOURCE

TITLE: C2 LL 6441 E115 PEMIGEWASSET RIVER

BY	REV. NO.	DATE	SIZE	DWG. NO.
MSP	A	4/30/15	B	E11543901.DWG

APPENDIX 7
A111 AC LINE
STRUCTURES A111-80A TO A111-80
PEMIGEWASSET RIVER
NEW HAMPTON/HILL, NH

1. This crossing is shown on attached drawing A11143902

2. The location of the A111 line is shown on attached map titled Line List 6182.

3. The A111 line will cross the Pemigewasset River on steel structures. The energized conductor is in a vertical configuration using 336 kcmil ACSR. The structures will have ground wire, 7#8 Alumoweld.

    a. A111-80A & A111-80 will be structures with strain insulators. The energized conductors are separated approximately 14 feet horizontally and 0 feet vertically in a horizontal configuration. The ground/OPGW wire is carried on the structure by a support bracket approximately 14 inches below the top of the structure. The ground/OPGW and energized conductor are separated vertically by approximately 4.8 feet and 7 feet horizontally.

4. Energized conductors will have a maximum tension of 3,500 pounds at NESC 250B Heavy weather case (0 degrees F, 4 pounds per square foot wind loading, ½-inch radial ice). Ground wires will have a maximum tension of 4,200 pounds at NESC 250B Heavy weather case (0 degrees F, 4 pounds per square foot wind loading, ½-inch radial ice).

5. All NESC clearances described in subsequent paragraphs have been met by exceeding the horizontal and/or vertical clearances required. Minimum distances to ground per the NESC have been met. A clearance of 51 feet between the energized conductor and ground has been achieved, which is greater than required 16.1 feet.

6. Flood water elevations were based on information contained flood insurance rate maps provided by FEMA. Table 232-1 of the NESC states that the minimum clearance over a water body is based on a 10 year flood elevation. In the absence of 10 year flood elevation data, the project has used 100 year flood elevations. All elevations provided are based on NAVD88 and location information is based on NAD83. Flood water elevations for the Pemigewasset River were based on information in FEMA Flood Insurance Rate Map (FIRM) #33013C0065E Panel 65 of 705. This document has an effective date of April 19, 2010. Based on the information provided in the FIRM, the section of the Pemigewasset River where the A111 line crosses is in an area labeled “Zone A”. From the map legend, Zone A areas are determined to be inside of the 1% (100 year flood) annual chance floodplain with no base flood elevations determined. Due to the uncertainties and availability of flood data for this portion of the Pemigewasset River, Eversource has used the approximate top of the river bank as the peak elevation for this river. Based on the information given in the FIRM, Eversource feels this assumption is more than adequate for a 100 year flood elevation. At the time of survey the elevation at this section of the Pemigewasset River was 309 feet and elevation of the top of the river bank was 326 feet. The area of the crossing, as required by the Section 232 of the NESC is approximately 70 acres (580 feet x 5280 feet / 43560 square feet/acre).

7. The A111 line is a 115 kV alternating current (AC) line.

    a. Based on Table 232-1 of the NESC, for open supply conductors 750 V to 22kV to ground, the minimum clearance to the water surface during a normal flood (10 year flood as specified by the NESC, however the project has used the 100 year flood in absence of 10 year data) is 28.5 feet for waters 20-200 acres. NESC Rule 232.C.1.a states that an additional clearance of 1.59 feet or [(69.7 kV-22 kV) x 0.4]/12 is needed, which brings the total required minimum clearance to 30.1 feet.

    b. For overhead ground wires, the minimum required clearance to the water surface at the normal flood level is 25.5 feet. As the static wires are located above the energized conductors at all crossings, this NESC minimum clearance requirement will always be met.

    c. Table 235-1 of the NESC does not specify horizontal values for supply conductors of the same circuit for voltages greater than 50 kV. In the absence of this, the project will use values for different circuits. Based upon Table 235-1:

        i. 3.07 feet is required between 115 kV AC energized conductor and ground wire
        ii. 4.78 feet is required between 115 kV AC energized conductors

    d. Based on Table 235-3 of the NESC for horizontal clearance along the span for wires or conductors carried on the same support

        i. 5.69 feet is required between 115 kV AC energized conductors and ground wire
        ii. 6.96 feet is required between 115 kV AC energized conductors
        iii. These horizontal clearances assume conductor or wire sag of 35 feet which exceeds any sag at the location of these crossings.

    e. Based on Table 235-5 of the NESC the vertical clearance required at the supports for wires or conductors carried on the same supporting structure is:
        i. 3.37 feet is required between 115 kV AC energized conductors and ground wire
        ii. 5.07 feet is required between 115 kV AC energized conductors

    f. Based on Rule 235.C.2.b of the NESC, the vertical clearance required in the span for wires or conductors carried on the same supporting structure:
        i. 2.69 feet are required between 115 kV AC energized conductors and ground wire
        ii. 5.01 feet are required between 115 kV AC energized conductors

    g. Per Figure 235-1 of the NESC conductors or wires cannot encroach the envelope formed by the horizontal and vertical clearances prescribed above.

8. The sags and clearances to the water surface during a 100 year flood event for this crossing are as follows:

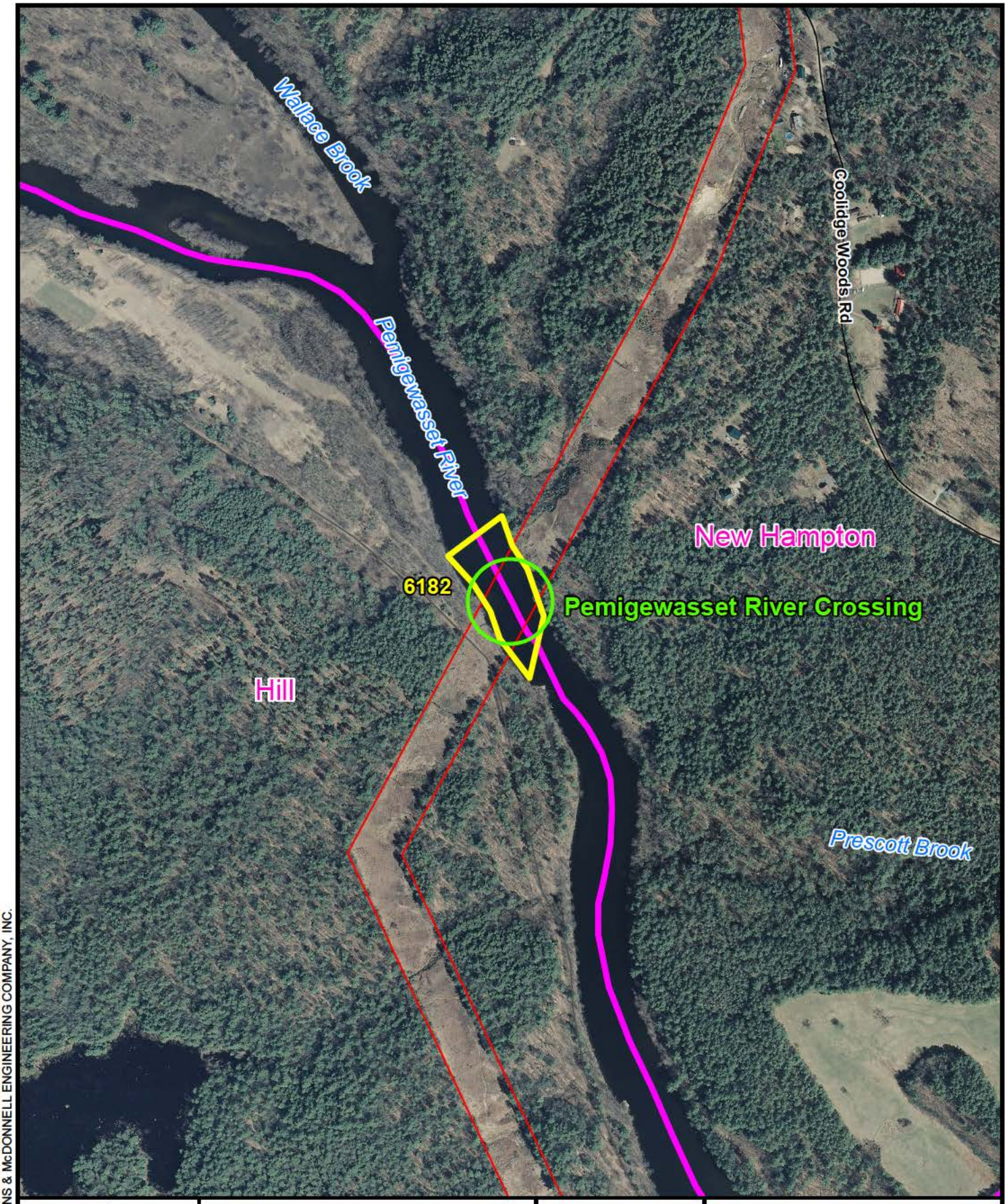
    h. Eversource has investigated a multitude of weather and loading conditions for its design. Eversource used these design conditions and combinations thereof to

determine the minimum clearance of all conductors to the water and land surfaces, between the phase conductors and OPGW cable. Eversource has determined that the weather cases and combinations listed below results in the minimum clearance and control over all other weather conditions and combinations.

i. Ground wires – Due to the fact that the ground wire is located above the energized conductor, its clearance to the water surface will always exceed the minimum required NESC distance.

j. 285 degrees F – Maximum operating temperature (energized conductor) based on Eversource transmission standards, the maximum sag for this weather case results in a clearance to the water surface of 65 feet, this exceeds the minimum required clearance of 30.1 feet

Minimum clearance energized conductor to ground wires clearance – The weather case that would produce the minimum clearance between energized conductors and ground wires would be a combination of winter weather factors. First, the energized conductors would be at 30 degrees F immediately following an ice storm and would have recently dropped their ice. The ground wires would be at 32 degrees F and would still be iced with ½" of radial ice. Under these conditions the clearance would be 0.2 feet vertically and 7 feet horizontally from the ground wires to the closest energized conductor.



NORTH

0 300 600

Feet

LEGEND

- Water Crossing Area
- Parcel Boundary
- Project ROW
- Town Boundary

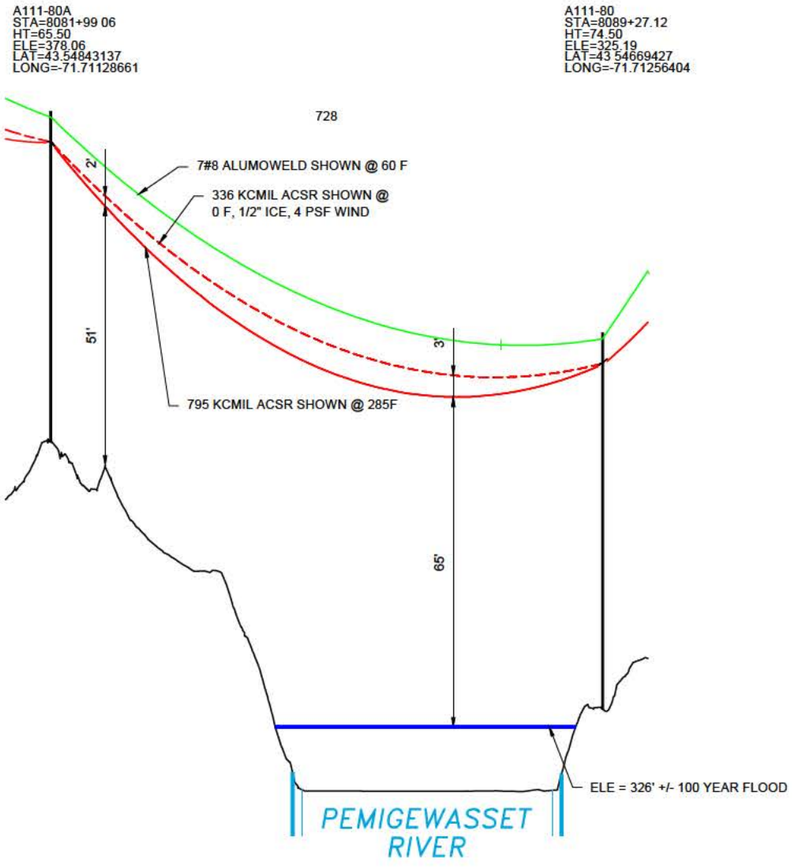
THE NORTHERN PASS

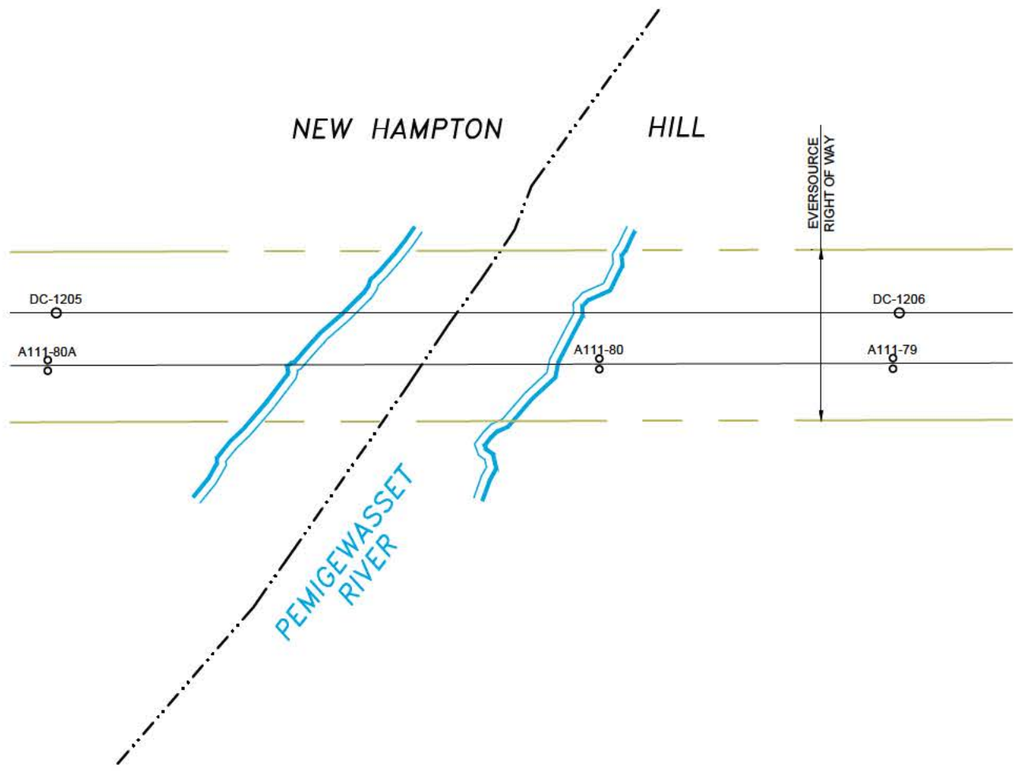
Line List 6182
Pemigewasset River
Water Crossing Permit
Location Map

Source: NH DOT 2010 Aerial Photography; NH GRANIT; Burns & McDonnell.

August 25, 2015

Path: \\ESPSRV\data\Data2\Projects\NUS\53899_DC_Tline\GIS\DataFiles\ArcDocs\Water_Crossing_Maps\Water_Crossing_Permit_LL6182_Pemigewasset_River_Lettersize.mxd rfraser 8/25/2015





RIGHT OF WAY

EOR EDGE OF ROAD

PROPOSED MONOPOLE

PROPOSED TRANS STRUCTURE

EXIST NG H-FRAME

PROPOSED H-FRAME

100.0 ft. Horiz. Scale

30.0 ft. Vert. Scale

PRELIMINARY - NOT FOR CONSTRUCTION

REVISION HISTORY				
–	–	–	–	–
A	4/30/15	ISSUED FOR REVIEW	MSP	DAB

EVERSOURCE

TITLE C2 LL 6182 A111
PEMIGEWASSET RIVER

BY	REV. NO.	DATE	SIZE	DWG. NO.
MSP	A	4/30/15	B	A11143902.DWG

09/25/2015 8:51am – mspepich – N:\NUSCO\58479 – NPT\Overhead\Cadd\01–Record Worksheets\02 Permits\Water Cross Permits\A11143902.dwg

APPENDIX 8
M127 AC LINE
STRUCTURES M127-1 TO M127-2
CHANCE POND
FRANKLIN, NH

1. This crossing is shown on attached drawing M12743901

2. The location of the M127 line is shown on attached map titled Line List 7315.

3. The M127 line will cross the Chance Pond on steel structures. The energized conductor is in a horizontal configuration transitioning to a delta configuration using 795 kcmil ACSR. The structures will have ground wire. OPGW with sag coefficients similar to 19#10 Alumoweld will be used.

    a. M127-1 will be a structure with strain insulators. The energized conductors are separated approximately 14 feet horizontally and 0 feet vertically in a horizontal configuration. The ground/OPGW wire is carried on the structure by a support bracket approximately 14 inches below the top of the structure. The ground/OPGW and the energized conductor are separated vertically by approximately 4.83 feet and 14 feet horizontally.

    b. M127-2 will be a structure with suspension insulators. The energized conductors are separated in a delta configuration approximately 20 feet horizontally and 12 feet vertically. The ground/OPGW wire is carried on the structure by a support bracket approximately 6 inches below the top of the structure. The ground/OPGW and top energized conductor are separated vertically by approximately 15 feet and 10 feet horizontally.

4. Energized conductors will have a maximum tension of 9,000 pounds at NESC 250B Heavy weather case (0 degrees F, 4 pounds per square foot wind loading, ½-inch radial ice). Ground wires will have a maximum tension of 5,500 pounds at NESC 250B Heavy weather case (0 degrees F, 4 pounds per square foot wind loading, ½-inch radial ice).

5. All NESC clearances described in subsequent paragraphs have been met by exceeding the horizontal and/or vertical clearances required. Minimum distances to ground per the NESC have been met. A clearance of 49 feet between the energized conductor and ground has been achieved, which is greater than required 16.1 feet.

6. Flood water elevations were based on information contained flood insurance rate maps provided by FEMA. Table 232-1 of the NESC states that the minimum clearance over a water body is based on a 10 year flood elevation. In the absence of 10 year flood elevation data, the project has used 100 year flood elevations. All elevations provided are based on NAVD88 and location information is based on NAD83. Flood water elevations for Chance Pond were based on information in FEMA Flood Insurance Rate Map (FIRM) 33013C0158E Panel 158 of 705. This document has an effective date of April 19, 2010. The 100 year flood elevation for this portion of the river is approximately 400 feet. The area of the crossing, as required by the Section 232 of the NESC is approximately 40 acres (330 feet x 5280 feet / 43560 square feet/acre).

7. The M127 line is a 115 kV alternating current (AC) line.

    a. Based on Table 232-1 of the NESC, for open supply conductors 750 V to 22kV to ground, the minimum clearance to the water surface during a normal flood (10 year flood as specified by the NESC, however the project has used the 100 year flood in absence of 10 year data) is 28.5 feet for waters 20-200 acres. NESC Rule 232.C.1.a states that an additional clearance of 1.59 feet or [(69.7 kV-22 kV)x 0.4]/12 is needed, which brings the total required minimum clearance to 30.1 feet.

    b. For overhead ground wires, the minimum required clearance to the water surface at the normal flood level is 25.5 feet. As the static wires are located above the energized conductors at all crossings, this NESC minimum clearance requirement will always be met.

    c. Table 235-1 of the NESC does not specify horizontal values for supply conductors of the same circuit for voltages greater than 50 kV. In the absence of this, the project will use values for different circuits. Based upon Table 235-1:

        i. 3.07 feet is required between 115 kV AC energized conductor and ground wire
        ii. 4.78 feet is required between 115 kV AC energized conductors

    d. Based on Table 235-3 of the NESC for horizontal clearance along the span for wires or conductors carried on the same support

        i. 5.69 feet is required between 115 kV AC energized conductors and ground wire
        ii. 6.96 feet is required between 115 kV AC energized conductors
        iii. These horizontal clearances assume conductor or wire sag of 35 feet which exceeds any sag at the location of these crossings.

    e. Based on Table 235-5 of the NESC the vertical clearance required at the supports for wires or conductors carried on the same supporting structure is:
        i. 3.37 feet is required between 115 kV AC energized conductors and ground wire
        ii. 5.07 feet is required between 115 kV AC energized conductors

    f. Based on Rule 235.C.2.b of the NESC, the vertical clearance required in the span for wires or conductors carried on the same supporting structure:
        i. 2.69 feet are required between 115 kV AC energized conductors and ground wire
        ii. 5.01 feet are required between 115 kV AC energized conductors

    g. Per Figure 235-1 of the NESC conductors or wires cannot encroach the envelope formed by the horizontal and vertical clearances prescribed above.

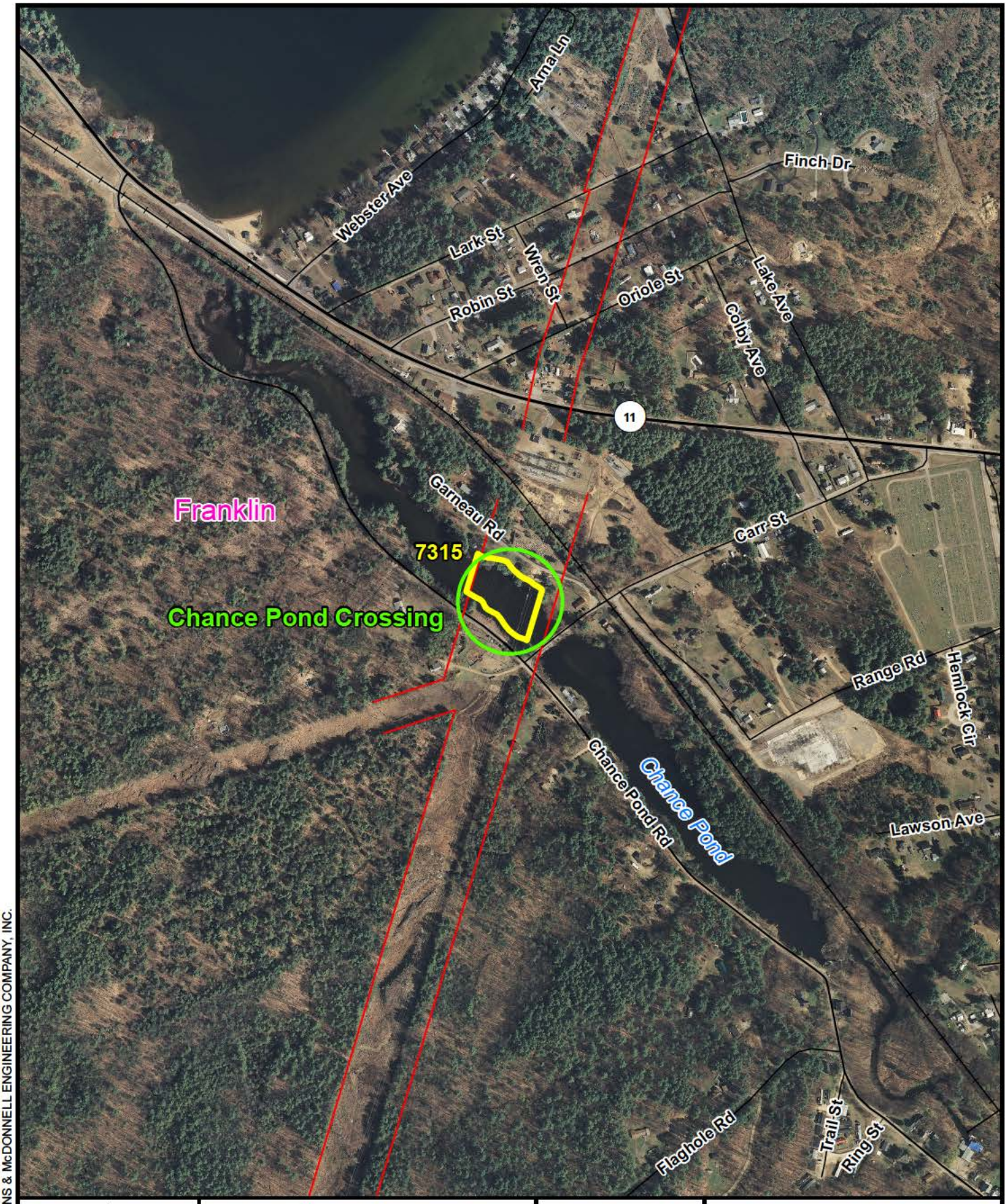
8. The sags and clearances to the water surface during a 100 year flood event for this crossing are as follows:

h. Eversource has investigated a multitude of weather and loading conditions for its design. Eversource used these design conditions and combinations thereof to determine the minimum clearance of all conductors to the water and land surfaces, between the phase conductors and OPGW cable. Eversource has determined that the weather cases and combinations listed below results in the minimum clearance and control over all other weather conditions and combinations.

i. Ground wires – Due to the fact that the ground wire is located above the energized conductor, its clearance to the water surface will always exceed the minimum required NESC distance.

j. 285 degrees F – Maximum operating temperature (energized conductor) based on Eversource transmission standards, the maximum sag for this weather case results in a clearance to the water surface of 55 feet, this exceeds the minimum required clearance of 30.1 feet

Minimum clearance energized conductor to ground wires clearance – The weather case that would produce the minimum clearance between energized conductors and ground wires would be a combination of winter weather factors. First, the energized conductors would be at 30 degrees F immediately following an ice storm and would have recently dropped their ice. The ground wires would be at 32 degrees F and would still be iced with ½" of radial ice. Under these conditions the clearance would be 5.0 feet vertically and 7.0 feet horizontally from the ground wires to the closest energized conductor.



NORTH

0 300 600

Feet

LEGEND

- Water Crossing Area
- Parcel Boundary
- Project ROW
- Town Boundary

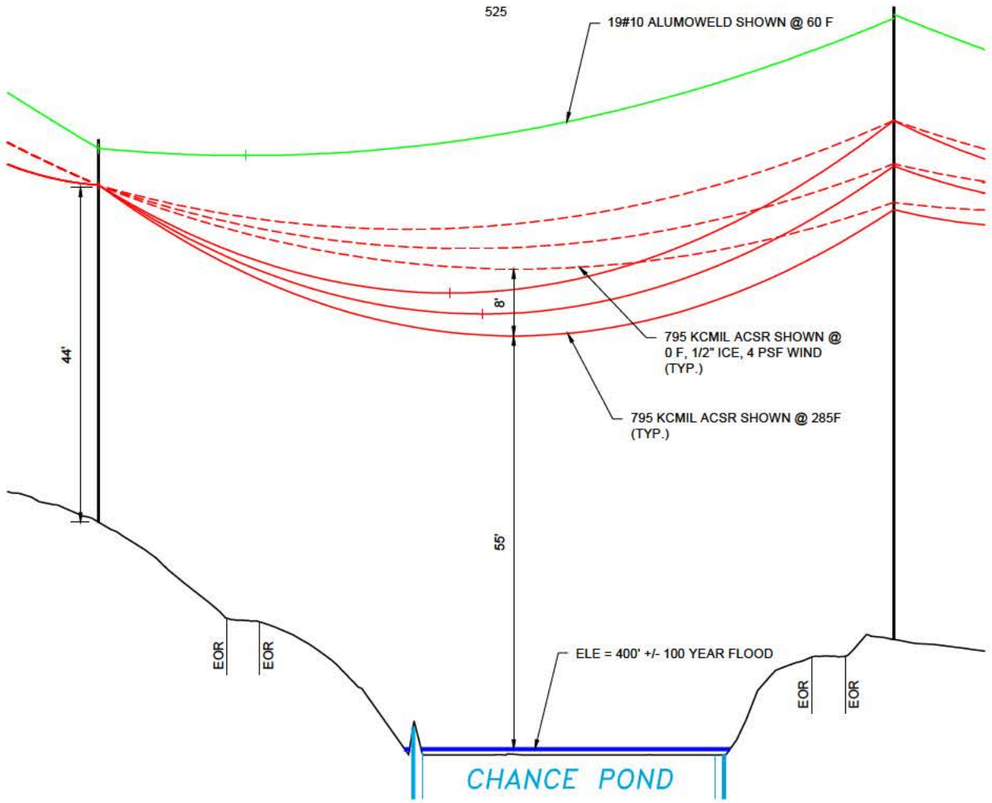
THE NORTHERN PASS

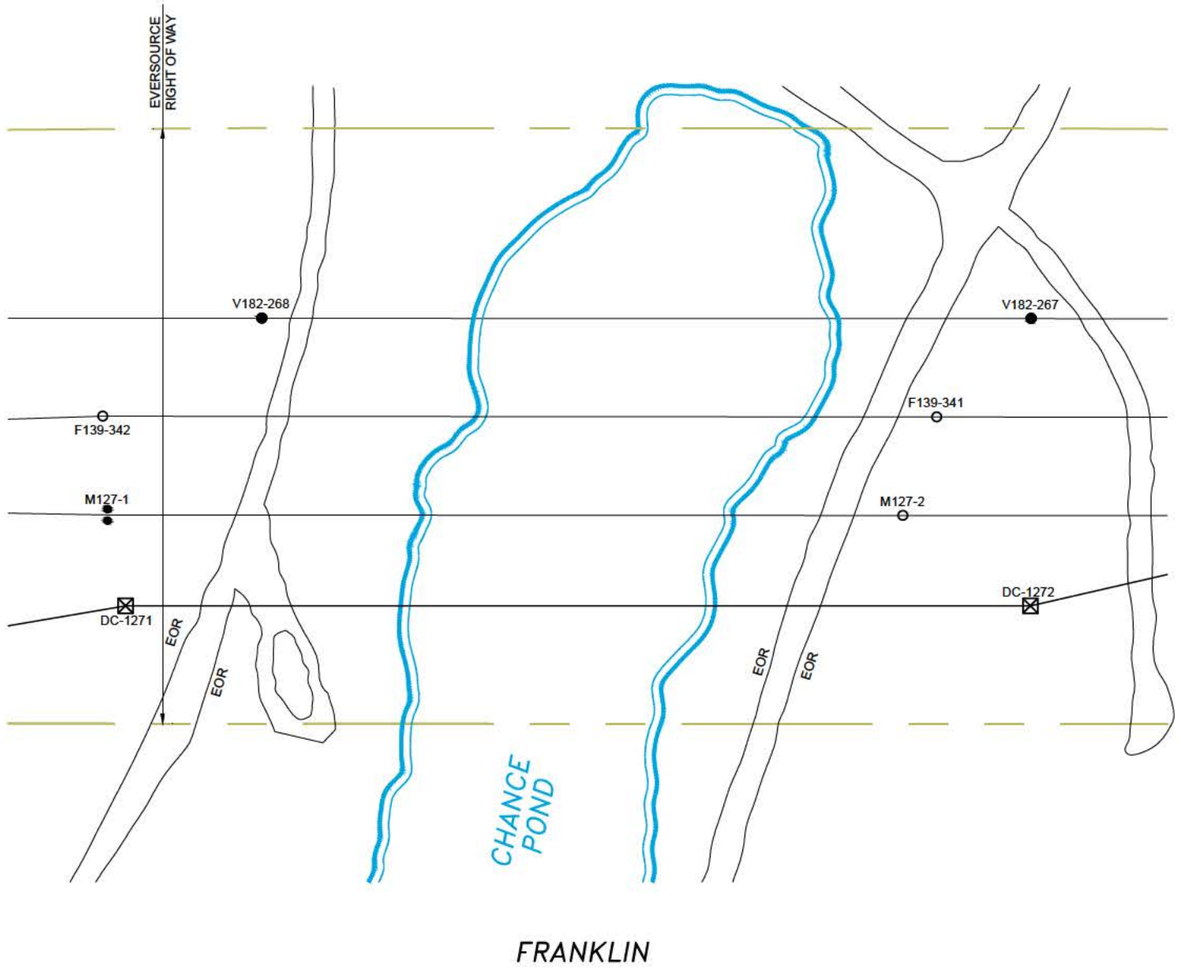
Line List 7315
Chance Pond
Water Crossing Permit
Location Map

Source: NH DOT 2010 Aerial Photography; NH GRANIT; Burns & McDonnell.

August 26, 2015

Path: \\ESPSRV\data\Data2\Projects\NUS\53899_DC_Tline\GIS\DataFiles\ArcDocs\Water_Crossing_Maps\Water_Crossing_Permit_LL7315_Chance_Pond_Lettersize.mxd rfraser 8/26/2015





RIGHT OF WAY
EOR EDGE OF ROAD
PROPOSED MONOPOLE
PROPOSED TRANS STRUCTURE
EXIST NG H-FRAME
PROPOSED H-FRAME
EXSIST NG MONOPOLE

100.0 ft. Horiz. Scale

20.0 ft. Vert. Scale

PRELIMINARY - NOT FOR CONSTRUCTION

REVISION HISTORY					
–	–	–		–	–
A	4/30/15	ISSUED FOR REVIEW		MSP	DAB

EVERSOURCE

TITLE: C2 LL 7315 M127 CHANCE POND

BY	REV. NO.	DATE	SIZE	DWG. NO.
MSP	A	4/30/15	B	M12743901.DWG

APPENDIX 9
F139 AC LINE
STRUCTURES F139-341 TO F139-342
CHANCE POND
FRANKLIN, NH

1. This crossing is shown on attached drawing F13943902

2. The location of the F139 line is shown on attached map titled Line List 7315.

3. The F139 line will cross the Chance Pond on steel structures. The energized conductor is in a horizontal configuration transitioning to a delta configuration using 795 kcmil ACSR. The structures will have ground wire. OPGW with sag coefficients similar to 19#10 Alumoweld will be used.

    a. F139-341 & F139-342 will be a structure with suspension insulators. The energized conductors are separated in a delta configuration approximately 20 feet horizontally and 12 feet vertically. The ground/OPGW wire is carried on the structure by a support bracket approximately 6 inches below the top of the structure. The ground/OPGW and top energized conductor are separated vertically by approximately 15 feet and 10 feet horizontally.

4. Energized conductors will have a maximum tension of 9,000 pounds at NESC 250B Heavy weather case (0 degrees F, 4 pounds per square foot wind loading, ½-inch radial ice). Ground wires will have a maximum tension of 5,500 pounds at NESC 250B Heavy weather case (0 degrees F, 4 pounds per square foot wind loading, ½-inch radial ice).

5. All NESC clearances described in subsequent paragraphs have been met by exceeding the horizontal and/or vertical clearances required. Minimum distances to ground per the NESC have been met. A clearance of 54 feet between the energized conductor and ground has been achieved, which is greater than required 16.1 feet.

6. Flood water elevations were based on information contained flood insurance rate maps provided by FEMA. Table 232-1 of the NESC states that the minimum clearance over a water body is based on a 10 year flood elevation. In the absence of 10 year flood elevation data, the project has used 100 year flood elevations. All elevations provided are based on NAVD88 and location information is based on NAD83. Flood water elevations for Chance Pond were based on information in FEMA Flood Insurance Rate Map (FIRM) 33013C0158E Panel 158 of 705. This document has an effective date of April 19, 2010. The 100 year flood elevation for this portion of the river is approximately 400 feet. The area of the crossing, as required by the Section 232 of the NESC is approximately 40 acres (330 feet x 5280 feet / 43560 square feet/acre).

7. The F139 line is a 115 kV alternating current (AC) line.

    a. Based on Table 232-1 of the NESC, for open supply conductors 750 V to 22kV to ground, the minimum clearance to the water surface during a normal flood (10 year flood as specified by the NESC, however the project has used the 100 year flood in absence of 10 year data) is 28.5 feet for waters 20-200 acres. NESC Rule 232.C.1.a states that an

additional clearance of 1.59 feet or [(69.7 kV-22 kV)x 0.4]/12 is needed, which brings the total required minimum clearance to 30.1 feet.

b. For overhead ground wires, the minimum required clearance to the water surface at the normal flood level is 25.5 feet. As the static wires are located above the energized conductors at all crossings, this NESC minimum clearance requirement will always be met.

c. Table 235-1 of the NESC does not specify horizontal values for supply conductors of the same circuit for voltages greater than 50 kV. In the absence of this, the project will use values for different circuits. Based upon Table 235-1:

   i. 3.07 feet is required between 115 kV AC energized conductor and ground wire
   ii. 4.78 feet is required between 115 kV AC energized conductors

d. Based on Table 235-3 of the NESC for horizontal clearance along the span for wires or conductors carried on the same support

   i. 5.69 feet is required between 115 kV AC energized conductors and ground wire
   ii. 6.96 feet is required between 115 kV AC energized conductors
   iii. These horizontal clearances assume conductor or wire sag of 35 feet which exceeds any sag at the location of these crossings.

e. Based on Table 235-5 of the NESC the vertical clearance required at the supports for wires or conductors carried on the same supporting structure is:
   i. 3.37 feet is required between 115 kV AC energized conductors and ground wire
   ii. 5.07 feet is required between 115 kV AC energized conductors

f. Based on Rule 235.C.2.b of the NESC, the vertical clearance required in the span for wires or conductors carried on the same supporting structure:
   i. 2.69 feet are required between 115 kV AC energized conductors and ground wire
   ii. 5.01 feet are required between 115 kV AC energized conductors

g. Per Figure 235-1 of the NESC conductors or wires cannot encroach the envelope formed by the horizontal and vertical clearances prescribed above.

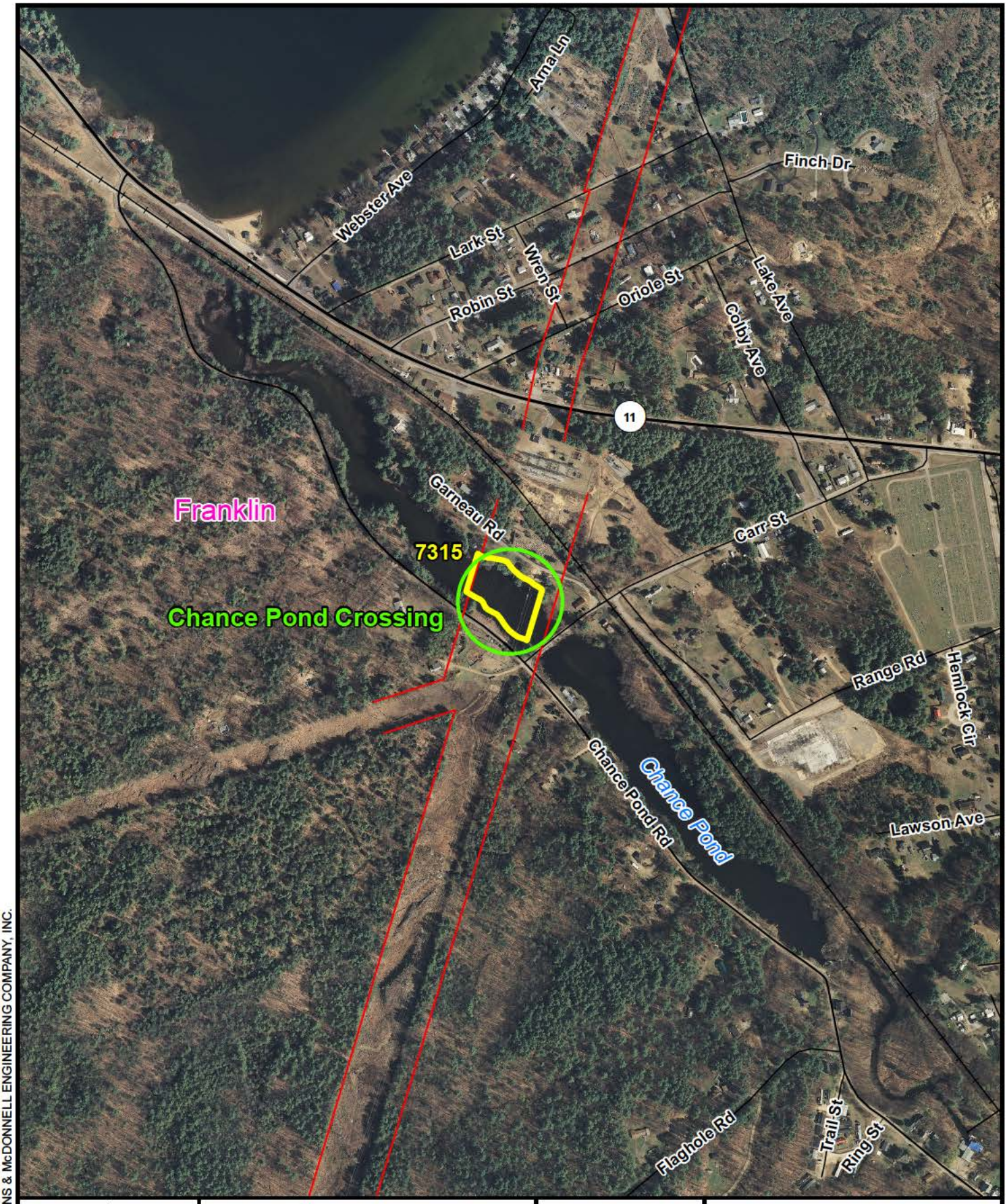
8. The sags and clearances to the water surface during a 100 year flood event for this crossing are as follows:

   h. Eversource has investigated a multitude of weather and loading conditions for its design. Eversource used these design conditions and combinations thereof to determine the minimum clearance of all conductors to the water and land surfaces, between the phase conductors and OPGW cable. Eversource has determined that the weather cases and combinations listed below results in the minimum clearance and control over all other weather conditions and combinations.

i. Ground wires – Due to the fact that the ground wire is located above the energized conductor, its clearance to the water surface will always exceed the minimum required NESC distance.

j. 285 degrees F – Maximum operating temperature (energized conductor) based on Eversource transmission standards, the maximum sag for this weather case results in a clearance to the water surface of 60 feet, this exceeds the minimum required clearance of 30.1 feet

Minimum clearance energized conductor to ground wires clearance – The weather case that would produce the minimum clearance between energized conductors and ground wires would be a combination of winter weather factors. First, the energized conductors would be at 30 degrees F immediately following an ice storm and would have recently dropped their ice. The ground wires would be at 32 degrees F and would still be iced with ½" of radial ice. Under these conditions the clearance would be 13.8 feet vertically and 8.6 feet horizontally from the ground wires to the closest energized conductor.



NORTH

0 300 600

Feet

LEGEND

- Water Crossing Area
- Parcel Boundary
- Project ROW
- Town Boundary

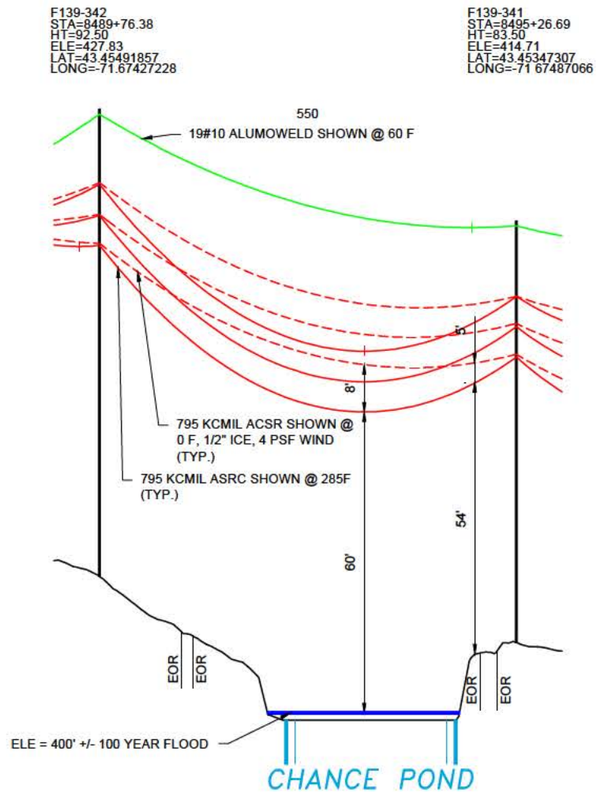
THE NORTHERN PASS

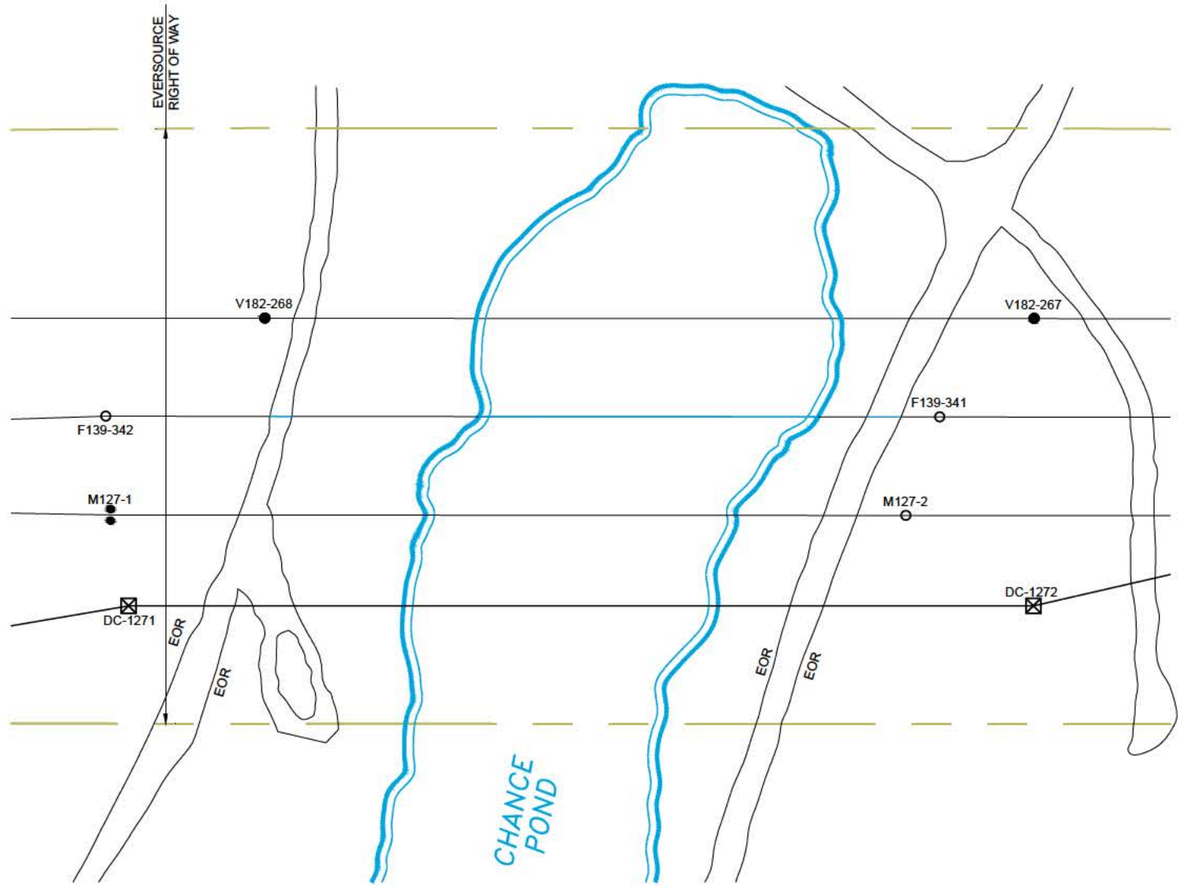
Line List 7315
Chance Pond
Water Crossing Permit
Location Map

Source: NH DOT 2010 Aerial Photography; NH GRANIT; Burns & McDonnell.

August 26, 2015

Path: \\ESPSRV\data\Data2\Projects\NUS\53899_DC_Tline\GIS\DataFiles\ArcDocs\Water_Crossing_Maps\Water_Crossing_Permit_LL7315_Chance_Pond_Lettersize.mxd rfraser 8/26/2015





RIGHT OF WAY

EOR EDGE OF ROAD

PROPOSED MONOPOLE

PROPOSED TRANS STRUCTURE

EXIST NG H-FRAME

PROPOSED H-FRAME

200.0 ft. Horiz. Scale

30.0 ft. Vert. Scale

N

PRELIMINARY - NOT FOR CONSTRUCTION

REVISION HISTORY					
–	–	–		–	–
A	4/30/15	ISSUED FOR REVIEW		MSP	DAB

EVERSOURCE

TITLE: C2 LL 7315 F139 CHANCE POND

BY	REV. NO.	DATE	SIZE	DWG. NO.
MSP	A	4/30/15	B	F13943902.DWG

APPENDIX 10
F139 AC LINE
STRUCTURES F139-280 TO F139-281
MERRIMACK RIVER
FRANKLIN/NORTHFIELD, NH

1. This crossing is shown on attached drawing F13943901

2. The location of the F139 line is shown on attached map titled Line List 7077.

3. The F139 line will cross the Merrimack River on steel structures. The energized conductor is in a vertical configuration using 795 kcmil ACSR. The structures will have ground wire. OPGW with sag coefficients similar to 19#10 Alumoweld will be used.

    a. F139-280 will be a structure with suspension insulators. The energized conductors are separated approximately 0 feet horizontally and 12 feet vertically in a vertical configuration. The ground/OPGW wire is carried on the structure by a support bracket approximately 6 inches below the top of the structure. The ground/OPGW and energized conductor are separated vertically by approximately 13 feet and 5 feet horizontally

    b. F139-281 will be structures with strain insulators. The energized conductors are separated approximately 0 feet horizontally and 12 feet vertically in a vertical configuration. The ground/OPGW wire is carried on the structure by a support bracket approximately 6 inches below the top of the structure. The ground/OPGW and energized conductor are separated vertically by approximately 13 feet and 0 feet horizontally.

4. Energized conductors will have a maximum tension of 9,000 pounds at NESC 250B Heavy weather case (0 degrees F, 4 pounds per square foot wind loading, ½-inch radial ice). Ground wires will have a maximum tension of 5,500 pounds at NESC 250B Heavy weather case (0 degrees F, 4 pounds per square foot wind loading, ½-inch radial ice).

5. All NESC clearances described in subsequent paragraphs have been met by exceeding the horizontal and/or vertical clearances required. Minimum distances to ground per the NESC have been met. A clearance of 51 feet between the energized conductor and ground has been achieved, which is greater than required 16.1 feet.

6. Flood water elevations were based on information contained flood insurance rate maps provided by FEMA. Table 232-1 of the NESC states that the minimum clearance over a water body is based on a 10 year flood elevation. In the absence of 10 year flood elevation data, the project has used 100 year flood elevations. All elevations provided are based on NAVD88 and location information is based on NAD83. Flood water elevations for the Merrimack River were based on information in FEMA Flood Insurance Rate Map (FIRM) FM33013C0169E Panel 169 of 705. This document has an effective date of April 19, 2010. The 100 year flood elevation for this portion of the river is approximately 267 feet. The area of the crossing, as required by the Section 232 of the NESC is approximately 45 acres (370 feet x 5280 feet / 43560 square feet/acre).

7. The F139 line is a 115 kV alternating current (AC) line.

    a. Based on Table 232-1 of the NESC, for open supply conductors 750 V to 22kV to ground, the minimum clearance to the water surface during a normal flood (10 year flood as specified by the NESC, however the project has used the 100 year flood in absence of 10 year data) is 28.5 feet for waters 20-200 acres. NESC Rule 232.C.1.a states that an additional clearance of 1.59 feet or [(69.7 kV-22 kV) x 0.4]/12 is needed, which brings the total required minimum clearance to 30.1 feet.

    b. For overhead ground wires, the minimum required clearance to the water surface at the normal flood level is 25.5 feet. As the static wires are located above the energized conductors at all crossings, this NESC minimum clearance requirement will always be met.

    c. Table 235-1 of the NESC does not specify horizontal values for supply conductors of the same circuit for voltages greater than 50 kV. In the absence of this, the project will use values for different circuits. Based upon Table 235-1:

        i. 3.07 feet is required between 115 kV AC energized conductor and ground wire
        ii. 4.78 feet is required between 115 kV AC energized conductors

    d. Based on Table 235-3 of the NESC for horizontal clearance along the span for wires or conductors carried on the same support

        i. 5.69 feet is required between 115 kV AC energized conductors and ground wire
        ii. 6.96 feet is required between 115 kV AC energized conductors
        iii. These horizontal clearances assume conductor or wire sag of 35 feet which exceeds any sag at the location of these crossings.

    e. Based on Table 235-5 of the NESC the vertical clearance required at the supports for wires or conductors carried on the same supporting structure is:
        i. 3.37 feet is required between 115 kV AC energized conductors and ground wire
        ii. 5.07 feet is required between 115 kV AC energized conductors

    f. Based on Rule 235.C.2.b of the NESC, the vertical clearance required in the span for wires or conductors carried on the same supporting structure:
        i. 2.69 feet are required between 115 kV AC energized conductors and ground wire
        ii. 5.01 feet are required between 115 kV AC energized conductors

    g. Per Figure 235-1 of the NESC conductors or wires cannot encroach the envelope formed by the horizontal and vertical clearances prescribed above.

8. The sags and clearances to the water surface during a 100 year flood event for this crossing are as follows:

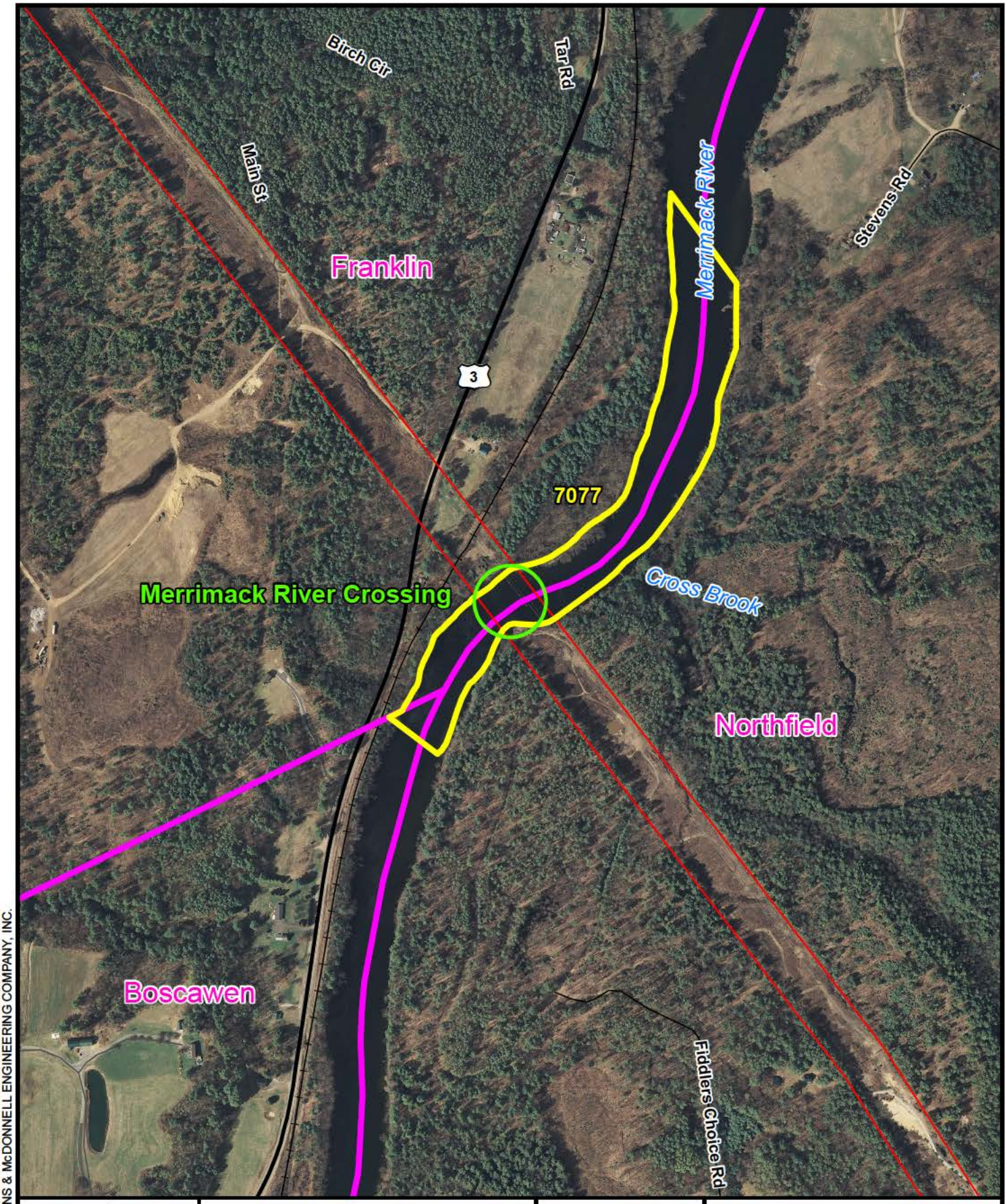
    h. Eversource has investigated a multitude of weather and loading conditions for its design. Eversource used these design conditions and combinations thereof to

determine the minimum clearance of all conductors to the water and land surfaces, between the phase conductors and OPGW cable. Eversource has determined that the weather cases and combinations listed below results in the minimum clearance and control over all other weather conditions and combinations.

i. Ground wires – Due to the fact that the ground wire is located above the energized conductor, its clearance to the water surface will always exceed the minimum required NESC distance.

j. 285 degrees F – Maximum operating temperature (energized conductor) based on Eversource transmission standards, the maximum sag for this weather case results in a clearance to the water surface of 55 feet, this exceeds the minimum required clearance of 30.1 feet

Minimum clearance energized conductor to ground wires clearance – The weather case that would produce the minimum clearance between energized conductors and ground wires would be a combination of winter weather factors. First, the energized conductors would be at 30 degrees F immediately following an ice storm and would have recently dropped their ice. The ground wires would be at 32 degrees F and would still be iced with ½" of radial ice. Under these conditions the clearance would be 12.7 feet vertically and 1.9 feet horizontally from the ground wires to the closest energized conductor.



NORTH

0 300 600

Feet

LEGEND

- Water Crossing Area
- Parcel Boundary
- Project ROW
- Town Boundary

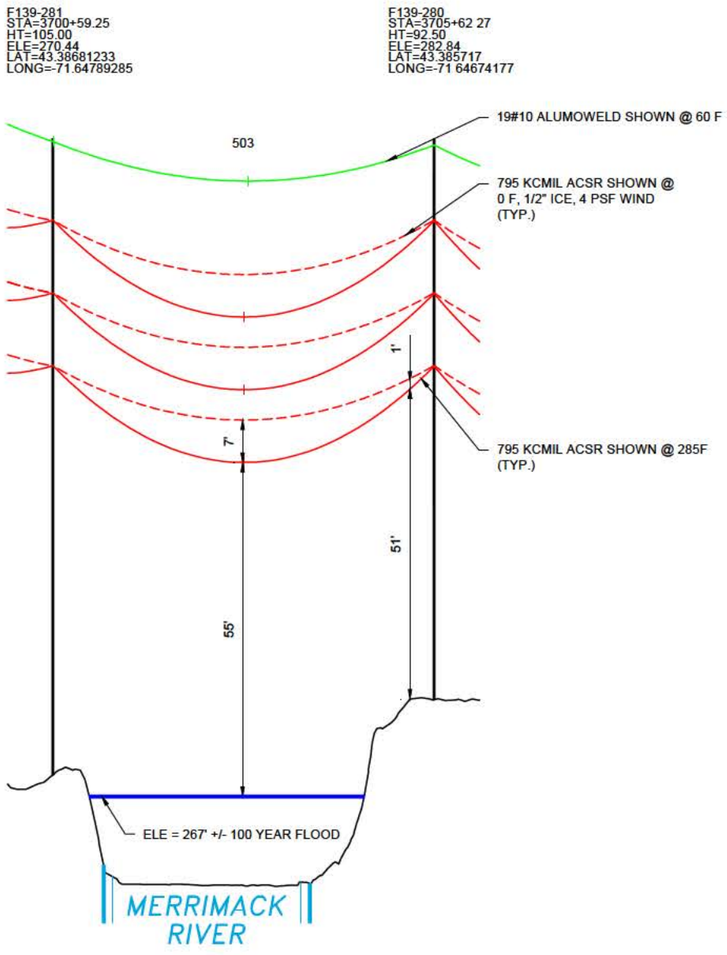
THE NORTHERN PASS

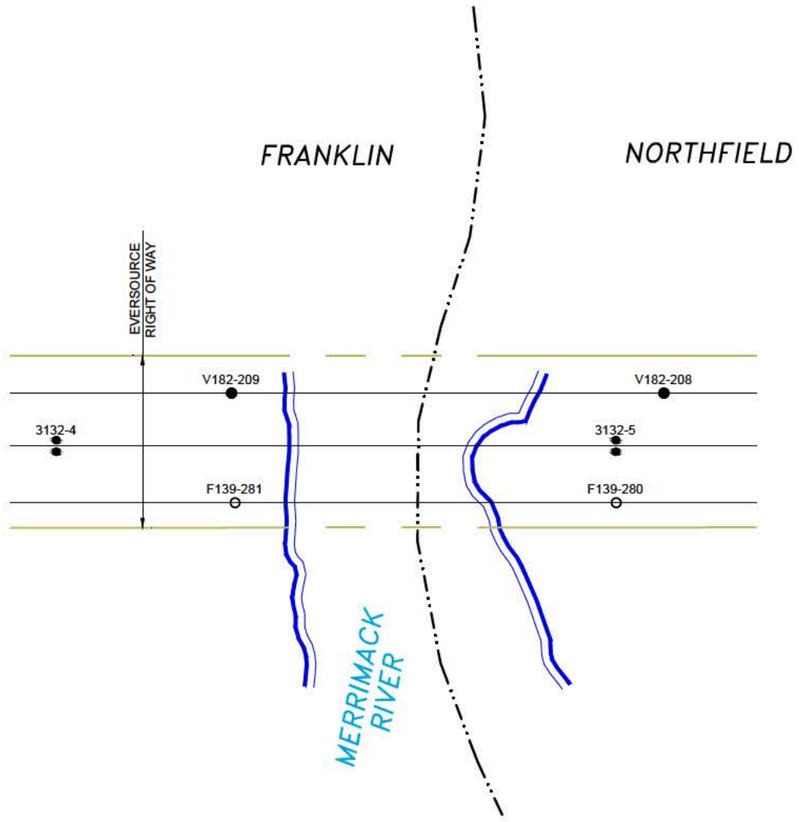
Line List 7077
Merrimack River
Water Crossing Permit
Location Map

Source: NH DOT 2010 Aerial Photography; NH GRANIT; Burns & McDonnell.

August 26, 2015

Path: \\ESPSRV\data\Data2\Projects\NUS\53899_DC_Tline\GIS\DataFiles\ArcDocs\Water_Crossing_Maps\Water_Crossing_Permit_LL7077_Merrimack_River_Lettersize.mxd rfraser 8/26/2015





RIGHT OF WAY

EOR EDGE OF ROAD

PROPOSED MONOPOLE

EXIST NG MONOPOLE

PROPOSED TRANS STRUCTURE

EXIST NG H-FRAME

PROPOSED H-FRAME

200.0 ft. Horiz. Scale

25.0 ft. Vert. Scale

PRELIMINARY - NOT FOR CONSTRUCTION

REVISION HISTORY				
–	–	–	–	–
A	4/30/15	ISSUED FOR REVIEW	MSP	DAB

EVERSOURCE

TITLE: S1 LL 7077 F139 MERRIMACK RIVER

BY	REV. NO.	DATE	SIZE	DWG. NO.
MSP	A	4/30/15	B	F13943901.DWG

APPENDIX 11
318 AC LINE
STRUCTURES 318-52 TO 318-70
TURTLE POND
CONCORD, NH

1. This crossing is shown on attached drawing B-6128-901

2. The location of the 318 line is shown on attached map titled Line List 8076.

3. The 318 line will cross Turtle Pond on wood structures. The energized conductor is in a horizontal configuration using 477 kcmil ACSR. The neutral wire will 4/0 AWG 6/1 ACSR.

    a. Structures 318-52 to 318-70 will be distribution on wood poles. The energized conductors are separated approximately 5 feet horizontally and the middle phase will be approximately 1.5 feet higher than the outer phases. The neutral will be approximately 6 feet below phase conductors and 2 feet offset from center.

4. Energized conductors will have a maximum tension of 3,000 pounds at NESC 250B Heavy weather case (0 degrees F, 4 pounds per square foot wind loading, ½-inch radial ice). Neutral wires will have a maximum tension of 3,000 pounds at NESC 250B Heavy weather case (0 degrees F, 4 pounds per square foot wind loading, ½-inch radial ice).

5. All NESC clearances described in subsequent paragraphs have been met by exceeding the horizontal and/or vertical clearances required. Minimum distances to ground per the NESC have been met. A clearance of 32 feet between the lowest wire and ground has been achieved, which is greater than required 14.0 feet.

6. Flood water elevations were based on information contained flood insurance rate maps provided by FEMA. Table 232-1 of the NESC states that the minimum clearance over a water body is based on a 10 year flood elevation. In the absence of 10 year flood elevation data, the project has used 100 year flood elevations. All elevations provided are based on NAVD88 and location information is based on NAD83. Flood water elevations for Turtle Pond were based on information in FEMA Flood Insurance Rate Map (FIRM) 33013C0345E. This document has an effective date of April 19, 2010. Based on the information provided in the FIRM, the section of the Turtle Pond where the 3132 line crosses is in an area unlabeled. Due to the uncertainties and availability of flood data for this portion of the Turtle Pond, Eversource has used the approximate top of the pond bank as the peak elevation for this pond. Based on the information given in the FIRM, Eversource feels this assumption is more than adequate for a 100 year flood elevation since it is neither labeled with base flood elevation or Zone A classification. At the time of survey the elevation at this section of the Turtle Pond was 316 feet and elevation of the top of the Turtle Pond bank was 317 feet. These elevations are based on the North American Vertical Datum of 1988. The area of the crossing, as required by the Section 232 of the NESC is approximately 150 acres.

7. The 318 line is a 34.5 kV alternating current (AC) line.

a. Based on Table 232-1 of the NESC, for open supply conductors 750 V to 22kV to ground, the minimum clearance to the water surface during a normal flood (10 year flood as specified by the NESC, however the project has used the 100 year flood in absence of 10 year data) is 28.5 feet for waters 20-200 acres.

b. For neutral wires, the minimum required clearance to the water surface at the normal flood level is 25.5 feet.

2.

a. Based on Table 235-1 of the NESC for horizontal values for supply conductors of the same circuit.

   i. 1.4 feet is required between 34.5 kV AC energized conductor and neutral wire
   ii. 1.9 feet is required between 34.5 kV AC energized conductors

b. Based on Table 235-3 of the NESC for horizontal clearance along the span for wires or conductors carried on the same support

   i. 4.2 feet is required between 34.5 kV AC energized conductors and neutral wire
   ii. 4.6 feet is required between 34.5 kV AC energized conductors
   iii. These horizontal clearances assume conductor or wire sag of 30 feet which exceeds any sag at the location of these crossings.

c. Based on Table 235-5 of the NESC the vertical clearance required at the supports for wires or conductors carried on the same supporting structure is:
   i. 1.7 feet is required between 34.5 kV AC energized conductors and neutral wire
   ii. 2.3 feet is required between 34.5 kV AC energized conductors

d. Based on Rule 235.C.2.b of the NESC, the vertical clearance required in the span for wires or conductors carried on the same supporting structure:
   i. 1.3 feet are required between 34.5 kV AC energized conductors and neutral wire
   ii. 1.7 feet are required between 34.5 kV AC energized conductors

e. Per Figure 235-1 of the NESC conductors or wires cannot encroach the envelope formed by the horizontal and vertical clearances prescribed above.

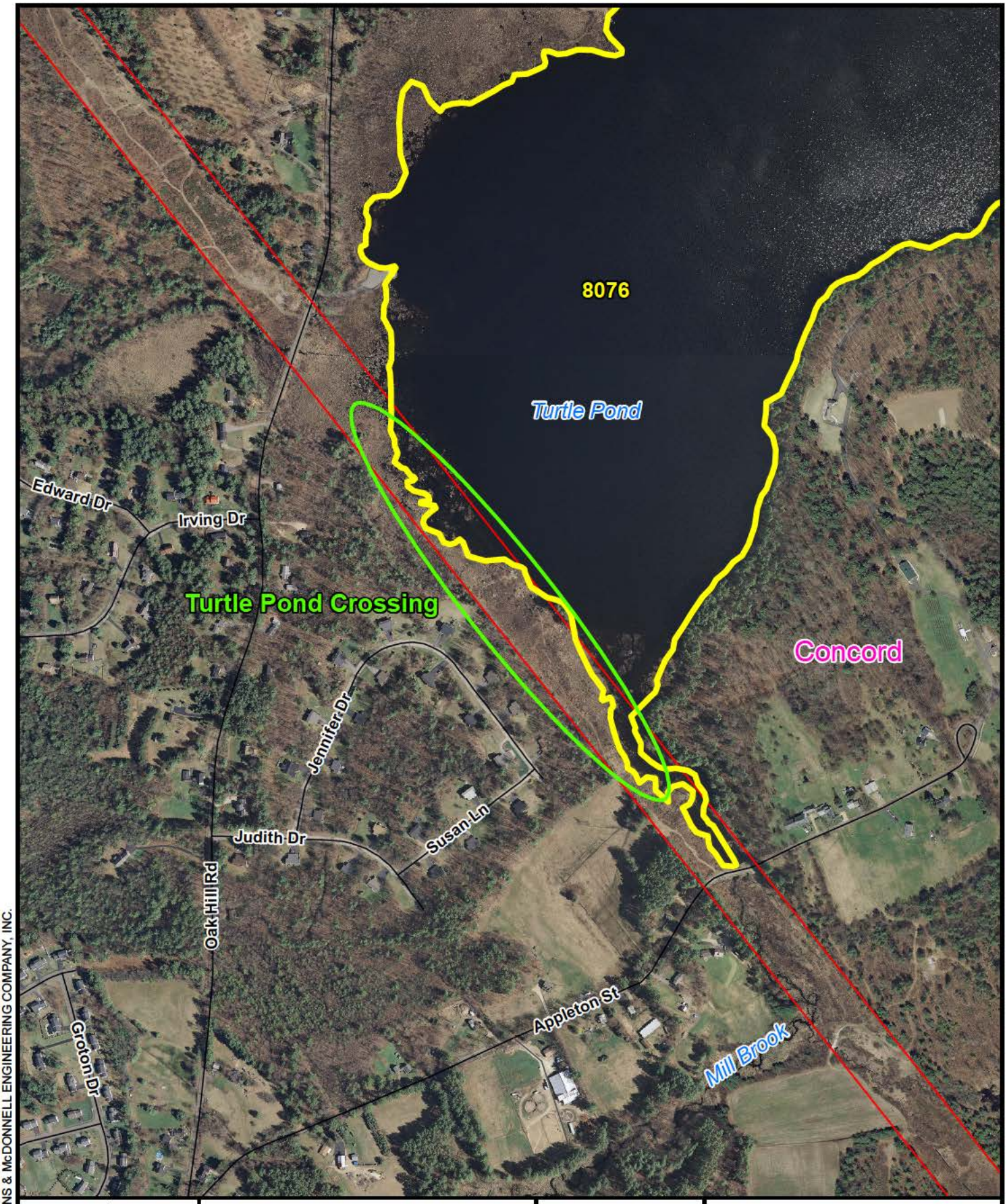
8. The sags and clearances to the water surface during a 100 year flood event for this crossing are as follows:

f. Eversource has investigated a multitude of weather and loading conditions for its design. Eversource used these design conditions and combinations thereof to determine the minimum clearance of all conductors to the water and land surfaces, between the phase conductors and OPGW cable. Eversource has determined that the weather cases and combinations listed below results in the minimum clearance and control over all other weather conditions and combinations.

g. Neutral wire- is located below the energized conductor and has a smaller required clearance, however energized conductor clearances have been achieved for the neutral wire.

h. 120 degrees F – Maximum operating temperature based Eversource distribution standards, the maximum sag for this weather case results in a clearance to the water surface of 32 feet, this exceeds the minimum required clearance of 28.5 feet

Minimum clearance between energized conductor to neutral wire clearance – The weather case that would produce the minimum clearance between energized conductors and neutral wire would be a combination of winter weather factors. First, the energized conductors would be at 32 degrees F and would still be iced with ½" of radial ice. The neutral wire would be at 30 degrees F immediately following an ice storm and would have recently dropped their ice. Under these conditions the clearance would be 2.8 feet vertically and 0.1 feet horizontally from the ground wires to the closest energized conductor.



NORTH

0 300 600

Feet

LEGEND

- Water Crossing Area
- Parcel Boundary
- Project ROW
- Town Boundary

THE NORTHERN PASS

Line List 8076
Turtle Pond
Water Crossing Permit
Location Map

Path: \\ESPSRV\data\Data2\Projects\NUS\53899_DC_Tline\GIS\DataFiles\ArcDocs\Water_Crossing_Maps\Water_Crossing_Permit_LL8076_Turtle_Pond_Lettersize.mxd rfraser 8/26/2015

Source: NH DOT 2010 Aerial Photography; NH GRANIT; Burns & McDonnell.

August 26, 2015

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318-62
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318-61
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318-59
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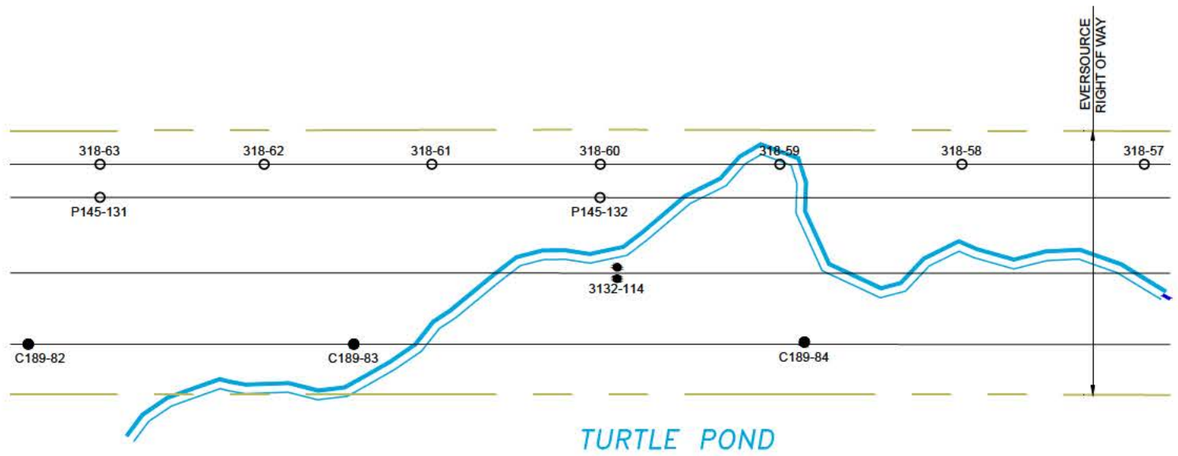
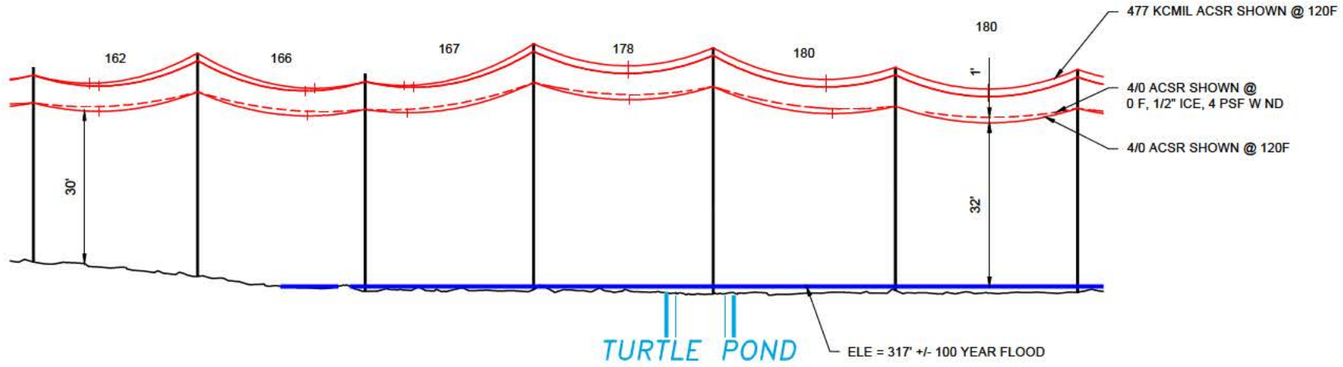




TOP WIRE SHOWN AT 120° F ONLY FOR CLARITY

RIGHT OF WAY
EOR EDGE OF ROAD
PROPOSED MONOPOLE
EXIST NG MONOPOLE
PROPOSED TRANS STRUCTURE
EXIST NG H-FRAME
PROPOSED H-FRAME

150.0 ft. Horiz. Scale
30.0 ft. Vert. Scale

N

PRELIMINARY - NOT FOR CONSTRUCTION

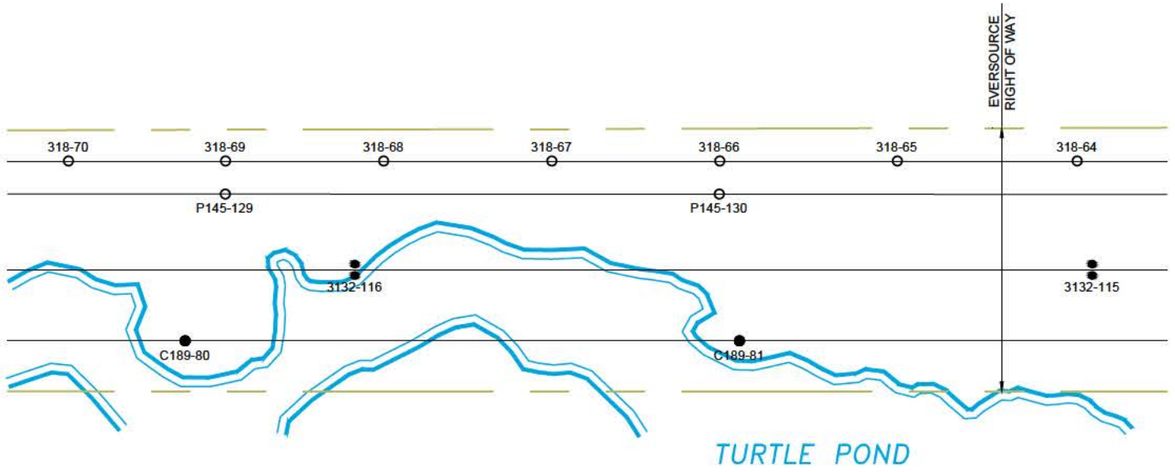
REVISION HISTORY					
–	–	–		–	–
A	4/30/15	ISSUED FOR REVIEW		MSP	DAB

EVERSOURCE

TITLE: S1 LL 8076 318
TURTLE POND sh 2 OF 3

BY	REV. NO.	DATE	SIZE	DWG. NO.
MSP	A	4/30/15	B	B-6128-901.DWG

05/05/2015 10:26am – mspepich – N:\NUSCO\58479 – NPT\Overhead\Cadd\01-Record Worksheets\02 Permits\Water Cross Permits\B-6128-901.dwg



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RIGHT OF WAY
EOR EDGE OF ROAD
PROPOSED MONOPOLE
EXIST NG MONOPOLE
PROPOSED TRANS STRUCTURE
EXIST NG H-FRAME
PROPOSED H-FRAME

150.0 ft. Horiz. Scale

30.0 ft. Vert. Scale

N

PRELIMINARY - NOT FOR CONSTRUCTION

REVISION HISTORY					
–	–	–		–	–
A	4/30/15	ISSUED FOR REVIEW		MSP	DAB

EVERSOURCE

TITLE: S1 LL 8076 318
TURTLE POND sh 1 OF 3

BY	REV. NO.	DATE	SIZE	DWG. NO.
MSP	A	4/30/15	B	B-6128-901.DWG

05/05/2015 10:26am – mspepich – N:\NUSCO\58479 – NPP\Overhead\Cadd\01-Record Worksheets\02 Permits\Water Cross Permits\B-6128-901.dwg

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HT=47.50
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318-52
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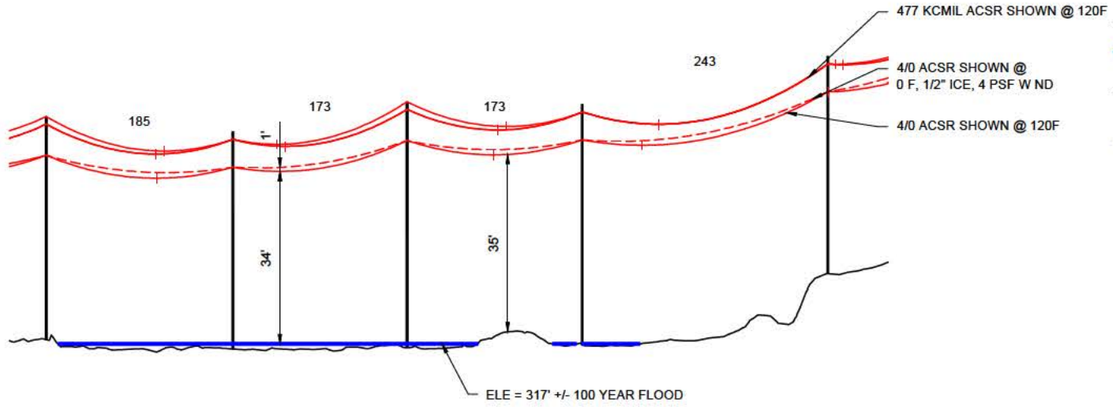
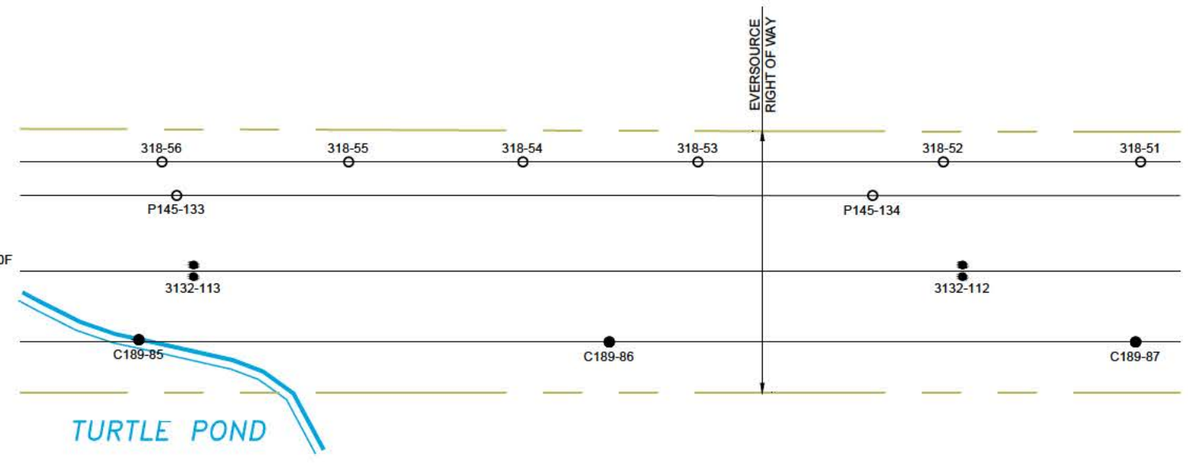


TOP WIRE SHOWN AT 120° F ONLY FOR CLARITY



RIGHT OF WAY
EOR EDGE OF ROAD
PROPOSED MONOPOLE
EXIST NG MONOPOLE
PROPOSED TRANS STRUCTURE
EXIST NG H-FRAME
PROPOSED H-FRAME

150.0 ft. Horiz. Scale
30.0 ft. Vert. Scale

N

PRELIMINARY - NOT FOR CONSTRUCTION

REVISION HISTORY				
–	–	–	–	–
A	4/30/15	ISSUED FOR REVIEW	MSP	DAB

EVERSOURCE

TITLE: S1 LL 8076 318
TURTLE POND sh 3 OF 3

BY	REV. NO.	DATE	SIZE	DWG. NO.
MSP	A	4/30/15	B	B-6128-901.DWG

APPENDIX 12
P145 AC LINE
STRUCTURES P145-134 TO P145-128
TURTLE POND
CONCORD, NH

1. This crossing is shown on attached drawing P14543902

2. The location of the P145 line is shown on attached map titled Line List 8076.

3. The P145 line will cross Turtle Pond on steel structures. The energized conductor is in a vertical configuration using 795 kcmil ACSR. The structures will have ground wire. OPGW with sag coefficients similar to 19#10 Alumoweld will be used.

    a. P145-133, P145-132, P145-131, P145-130, P145-128 will be structures with suspension insulators. The energized conductors are separated approximately 0 feet horizontally and 12 feet vertically in a vertical configuration. The ground/OPGW wire is carried on the structure by a support bracket approximately 6 inches below the top of the structure. The ground/OPGW and energized conductor are separated vertically by approximately 13 feet and 5 feet horizontally.
    b. P145-134 & P145-129 will be a structure with strain insulators. The energized conductors are separated approximately 0 feet horizontally and 12 feet vertically in a vertical configuration. The ground/OPGW wire is carried on the structure by a support bracket approximately 6 inches below the top of the structure. The ground/OPGW and energized conductor are separated vertically by approximately 13 feet and 0 feet horizontally.

4. Energized conductors will have a maximum tension of 9,000 pounds at NESC 250B Heavy weather case (0 degrees F, 4 pounds per square foot wind loading, ½-inch radial ice). Ground wires will have a maximum tension of 5,500 pounds at NESC 250B Heavy weather case (0 degrees F, 4 pounds per square foot wind loading, ½-inch radial ice).

5. All NESC clearances described in subsequent paragraphs have been met by exceeding the horizontal and/or vertical clearances required. Minimum distances to ground per the NESC have been met. A clearance of 30 feet between the energized conductor and ground has been achieved, which is greater than required 16.1 feet.

6. Flood water elevations were based on information contained flood insurance rate maps provided by FEMA. Table 232-1 of the NESC states that the minimum clearance over a water body is based on a 10 year flood elevation. In the absence of 10 year flood elevation data, the project has used 100 year flood elevations. All elevations provided are based on NAVD88 and location information is based on NAD83. Flood water elevations for Turtle Pond were based on information in FEMA Flood Insurance Rate Map (FIRM) 33013C0345E. This document has an effective date of April 19, 2010. Based on the information provided in the FIRM, the section of the Turtle Pond where the P145 line crosses is in an area unlabeled. Due to the uncertainties and availability of flood data for this portion of the Turtle Pond, Eversource has used the approximate top of the pond bank as the peak elevation for this pond. Based on the information given in the FIRM, Eversource feels this assumption is more than adequate for a 100

year flood elevation since it is neither labeled with base flood elevation or Zone A classification. At the time of survey the elevation at this section of the Turtle Pond was 316 feet and elevation of the top of the Pond bank was 317 feet. These elevations are based on the North American Vertical Datum of 1988. The area of the crossing, as required by the Section 232 of the NESC is approximately 150 acres.

7. The P145 line is a 115 kV alternating current (AC) line.

    a. Based on Table 232-1 of the NESC, for open supply conductors 750 V to 22kV to ground, the minimum clearance to the water surface during a normal flood (10 year flood as specified by the NESC, however the project has used the 100 year flood in absence of 10 year data) is 28.5 feet for waters 20-200 acres. NESC Rule 232.C.1.a states that an additional clearance of 1.59 feet or [(69.7 kV-22 kV)x 0.4]/12 is needed, which brings the total required minimum clearance to 30.1 feet.

    b. For overhead ground wires, the minimum required clearance to the water surface at the normal flood level is 25.5 feet. As the static wires are located above the energized conductors at all crossings, this NESC minimum clearance requirement will always be met.

    a. Table 235-1 of the NESC does not specify horizontal values for supply conductors of the same circuit for voltages greater than 50 kV. In the absence of this, the project will use values for different circuits. Based upon Table 235-1:

        i. 3.07 feet is required between 115 kV AC energized conductor and ground wire
        ii. 4.78 feet is required between 115 kV AC energized conductors

    b. Based on Table 235-3 of the NESC for horizontal clearance along the span for wires or conductors carried on the same support

        i. 5.69 feet is required between 115 kV AC energized conductors and ground wire
        ii. 6.96 feet is required between 115 kV AC energized conductors
        iii. These horizontal clearances assume conductor or wire sag of 35 feet which exceeds any sag at the location of these crossings.

    c. Based on Table 235-5 of the NESC the vertical clearance required at the supports for wires or conductors carried on the same supporting structure is:
        i. 3.37 feet is required between 115 kV AC energized conductors and ground wire
        ii. 5.07 feet is required between 115 kV AC energized conductors

    d. Based on Rule 235.C.2.b of the NESC, the vertical clearance required in the span for wires or conductors carried on the same supporting structure:
        i. 2.69 feet are required between 115 kV AC energized conductors and ground wire
        ii. 5.01 feet are required between 115 kV AC energized conductors

    c. Per Figure 235-1 of the NESC conductors or wires cannot encroach the envelope formed by the horizontal and vertical clearances prescribed above.

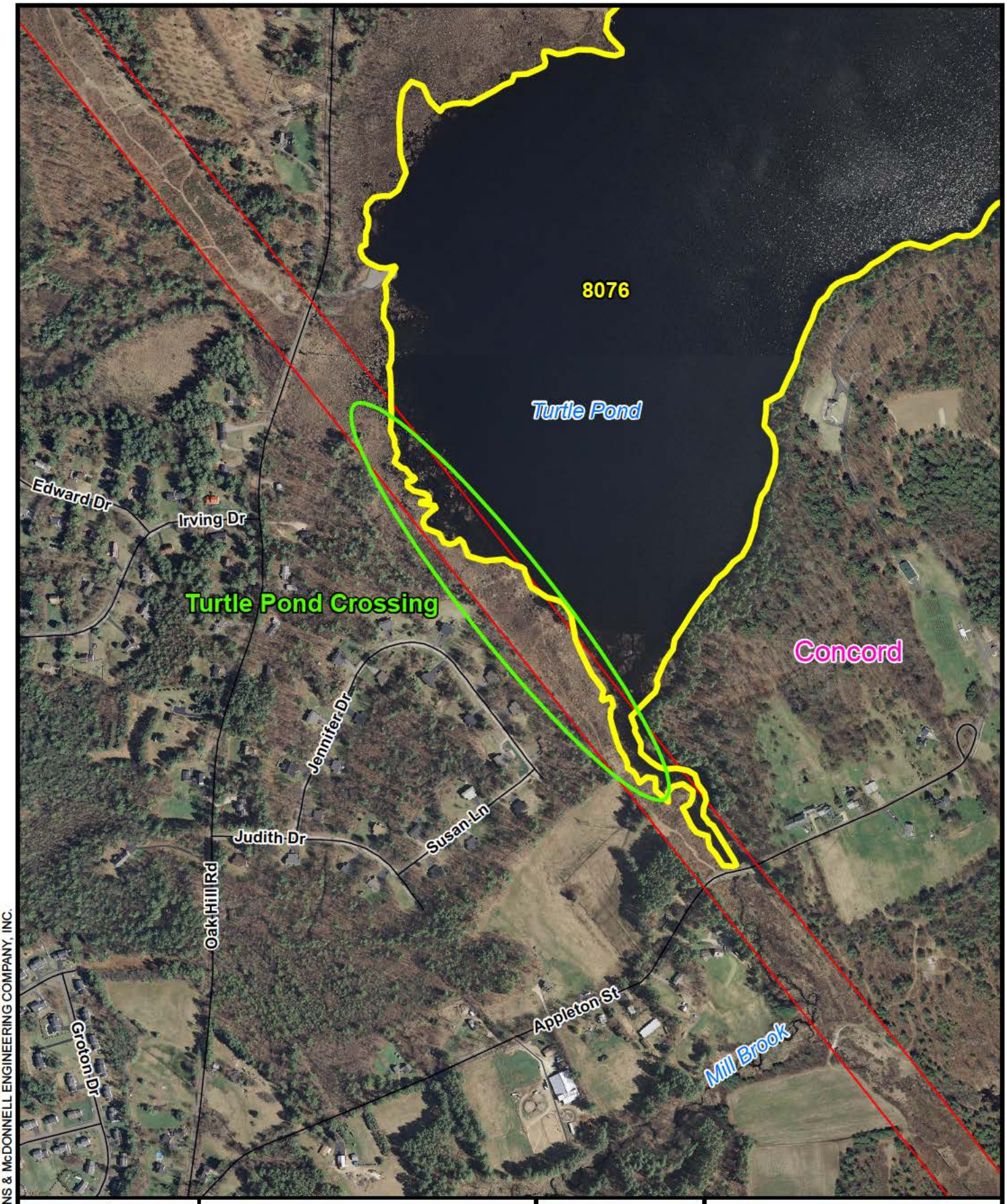
8. The sags and clearances to the water surface during a 100 year flood event for this crossing are as follows:

    a. Eversource has investigated a multitude of weather and loading conditions for its design. Eversource used these design conditions and combinations thereof to determine the minimum clearance of all conductors to the water and land surfaces, between the phase conductors and OPGW cable. Eversource has determined that the weather cases and combinations listed below results in the minimum clearance and control over all other weather conditions and combinations.

    b. Ground wires – Due to the fact that the ground wire is located above the energized conductor, its clearance to the water surface will always exceed the minimum required NESC distance.

    c. 285 degrees F – Maximum operating temperature (energized conductor) based on Eversource transmission standards, the maximum sag for this weather case results in a clearance to the water surface of 33 feet, this exceeds the minimum required clearance of 30.1 feet

Minimum clearance energized conductor to ground wires clearance – The weather case that would produce the minimum clearance between energized conductors and ground wires would be a combination of winter weather factors. First, the energized conductors would be at 30 degrees F immediately following an ice storm and would have recently dropped their ice. The ground wires would be at 32 degrees F and would still be iced with ½" of radial ice. Under these conditions the clearance would be 12.5 feet vertically and 2.0 feet horizontally from the ground wires to the closest energized conductor.



NORTH

0 300 600

Feet

LEGEND

- Water Crossing Area
- Parcel Boundary
- Project ROW
- Town Boundary

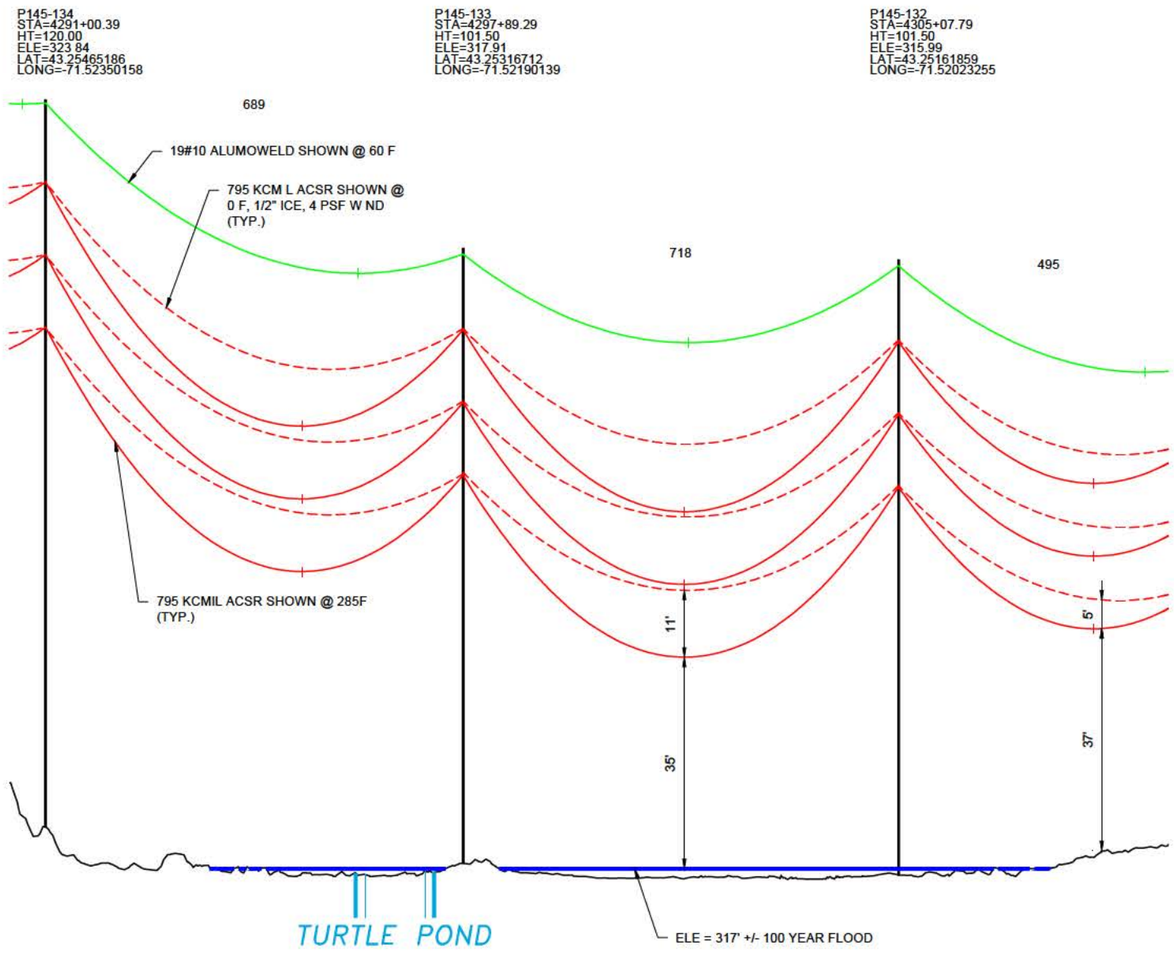
THE NORTHERN PASS

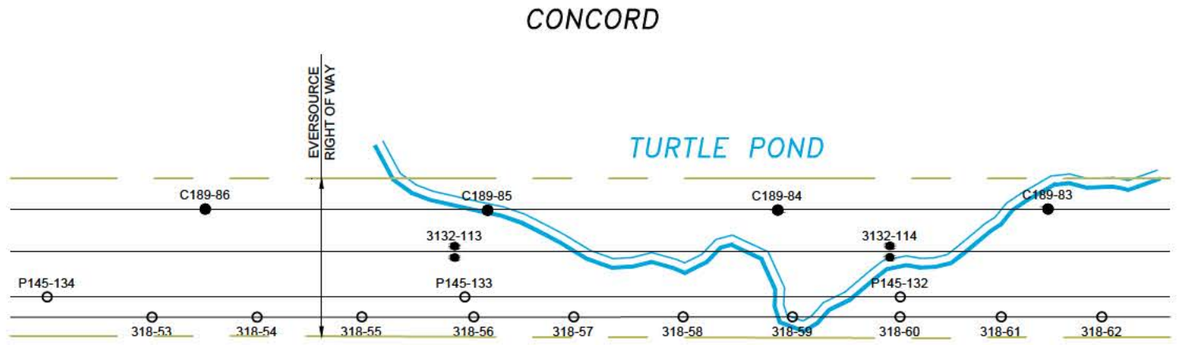
Line List 8076
Turtle Pond
Water Crossing Permit
Location Map

Path: \\ESPSRV\data\Data2\Projects\NUS\53899_DC_Tline\GIS\DataFiles\ArcDocs\Water_Crossing_Maps\Water_Crossing_Permit_LL8076_Turtle_Pond_Lettersize.mxd rfraser 8/26/2015

Source: NH DOT 2010 Aerial Photography; NH GRANIT; Burns & McDonnell.

August 26, 2015





RIGHT OF WAY

EOR EDGE OF ROAD

PROPOSED MONOPOLE

EXIST NG MONOPOLE

PROPOSED TRANS STRUCTURE

EXIST NG H-FRAME

PROPOSED H-FRAME

250.0 ft. Horiz. Scale

25.0 ft. Vert. Scale

N

PRELIMINARY - NOT FOR CONSTRUCTION

REVISION HISTORY				
–	–	–	–	–
A	4/30/15	ISSUED FOR REVIEW	MSP	DAB

EVERSOURCE

TITLE: S1 LL 8076 P145 TURTLE POND sh 1 OF 2

BY	REV. NO.	DATE	SIZE	DWG. NO.
MSP	A	4/30/15	B	P14543902.DWG

09/09/2015 3:09pm – mspepich – N:\NUSCO\58479 – NPT\Overhead\Cadd\01–Record Worksheets\02 Permits\Water Cross Permits\P14543902.dwg

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HT=79.00
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LONG=-71.51908224

P145-130
STA=4315+34.26
HT=88.00
ELE=317.39
LAT=43.24940624
LONG=-71.51784853

P145-129
STA=4320+23.54
HT=100.00
ELE=320.57
LAT=43.24835168
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P145-128
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HT=97.00
ELE=316.74
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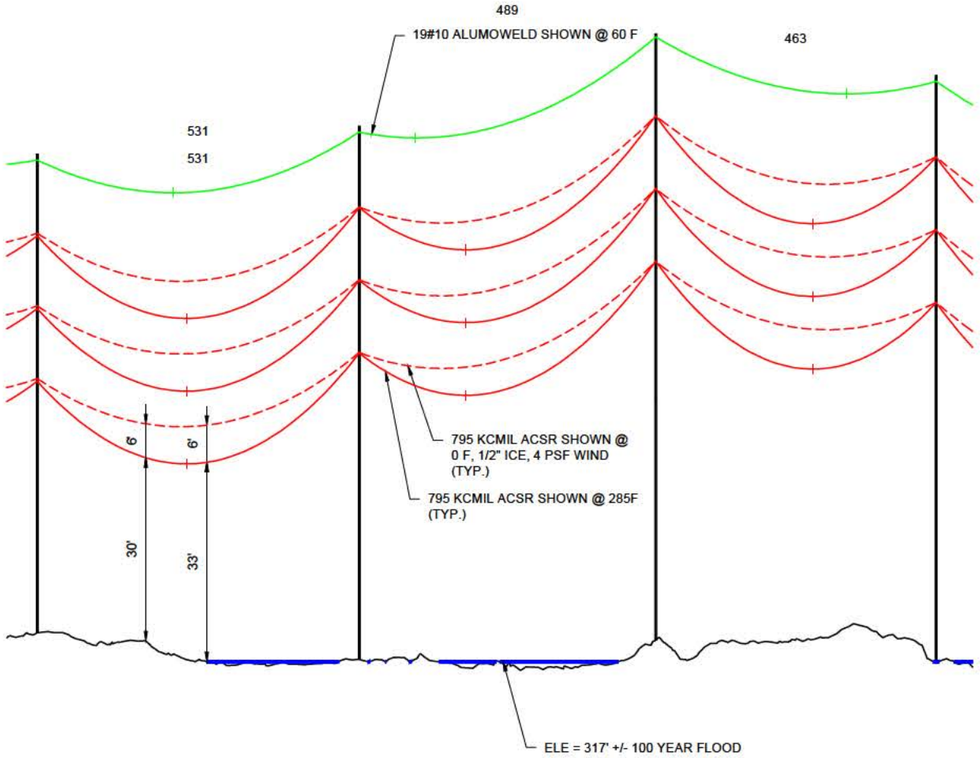
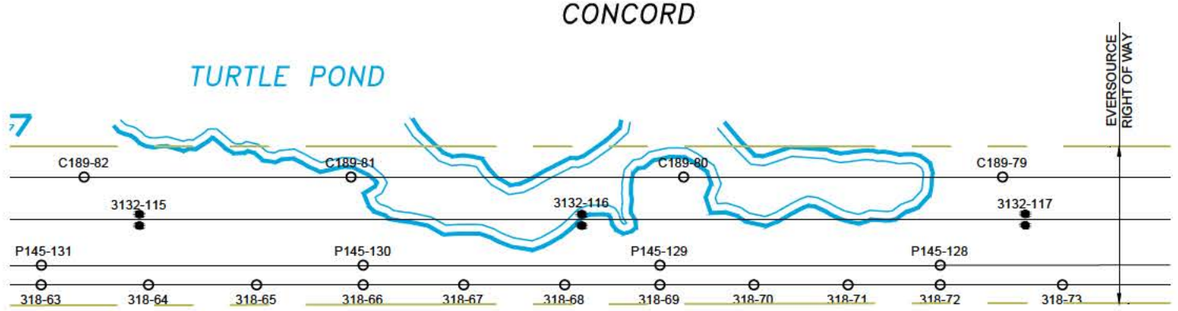


CONCORD



RIGHT OF WAY
EOR EDGE OF ROAD
PROPOSED MONOPOLE
PROPOSED TRANS STRUCTURE
EXIST NG H-FRAME
PROPOSED H-FRAME

250.0 ft. Horiz. Scale
25.0 ft. Vert. Scale

N

PRELIMINARY - NOT FOR CONSTRUCTION

REVISION HISTORY				
–	–	–	–	–
A	4/30/15	ISSUED FOR REVIEW	MSP	DAB

EVERSOURCE

TITLE: S1 LL 8076 P145
TURTLE POND sh 2 OF 2

BY	REV. NO.	DATE	SIZE	DWG. NO.
MSP	A	4/30/15	B	P14543902.DWG

09/09/2015 3:09pm – mspepich – N:\NUSCO\58479 – NPT\Overhead\Cadd\01–Record Worksheets\02 Permits\Water Cross Permits\P14543902.dwg

APPENDIX 13
P145 LINE
STRUCTURES P145-72 TO P145-73
SOUCOOK RIVER
CONCORD/PEMBROKE, NH

1. This crossing is shown on attached drawing P14543901

2. The location of the P145 line is shown on attached map titled Line List 8951.

3. The P145 line will cross the Soucook River on steel structures. The energized conductor is in a vertical configuration using 795 kcmil ACSR. The structures will have ground wire. OPGW with sag coefficients similar to 19#10 Alumoweld will be used.

    a. P145-72 & P145-73 will be structures with strain insulators. The energized conductors are separated approximately 0 feet horizontally and 12 feet vertically in a vertical configuration. The ground/OPGW wire is carried on the structure by a support bracket approximately 6 inches below the top of the structure. The ground/OPGW and energized conductor are separated vertically by approximately 13 feet and 0 feet horizontally.

4. Energized conductors will have a maximum tension of 9,000 pounds at NESC 250B Heavy weather case (0 degrees F, 4 pounds per square foot wind loading, ½-inch radial ice). Ground wires will have a maximum tension of 5,500 pounds at NESC 250B Heavy weather case (0 degrees F, 4 pounds per square foot wind loading, ½-inch radial ice).

5. All NESC clearances described in subsequent paragraphs have been met by exceeding the horizontal and/or vertical clearances required. Minimum distances to ground per the NESC have been met. A clearance of 31 feet between the energized conductor and ground has been achieved, which is greater than required 16.1 feet.

6. Flood water elevations were based on information contained flood insurance rate maps provided by FEMA. Table 232-1 of the NESC states that the minimum clearance over a water body is based on a 10 year flood elevation. In the absence of 10 year flood elevation data, the project has used 100 year flood elevations. All elevations provided are based on NAVD88 and location information is based on NAD83. Flood water elevations for the Soucook River were based on information in FEMA Flood Insurance Rate Map (FIRM) 33013C0553E Panel 553 of 705. This document has an effective date of April 19, 2010. The 100 year flood elevation for this portion of the river is approximately 250 feet. The area of the crossing, as required by the Section 232 of the NESC is approximately 17 acres (140 feet x 5280 feet / 43560 square feet/acre).

7. The P145 line is a 115 kV alternating current (AC) line.

    a. Based on Table 232-1 of the NESC, for open supply conductors 750 V to 22kV to ground, the minimum clearance to the water surface during a normal flood (10 year flood as specified by the NESC, however the project has used the 100 year flood in absence of 10 year data) is 28.5 feet for waters 20-200 acres. NESC Rule 232.C.1.a states that an

additional clearance of 1.59 feet or [(69.7 kV-22 kV)x 0.4]/12 is needed, which brings the total required minimum clearance to 30.1 feet.

b. For overhead ground wires, the minimum required clearance to the water surface at the normal flood level is 25.5 feet. As the static wires are located above the energized conductors at all crossings, this NESC minimum clearance requirement will always be met.

c. Table 235-1 of the NESC does not specify horizontal values for supply conductors of the same circuit for voltages greater than 50 kV. In the absence of this, the project will use values for different circuits. Based upon Table 235-1:

   i. 3.07 feet is required between 115 kV AC energized conductor and ground wire
   ii. 4.78 feet is required between 115 kV AC energized conductors

d. Based on Table 235-3 of the NESC for horizontal clearance along the span for wires or conductors carried on the same support

   i. 5.69 feet is required between 115 kV AC energized conductors and ground wire
   ii. 6.96 feet is required between 115 kV AC energized conductors
   iii. These horizontal clearances assume conductor or wire sag of 35 feet which exceeds any sag at the location of these crossings.

e. Based on Table 235-5 of the NESC the vertical clearance required at the supports for wires or conductors carried on the same supporting structure is:
   i. 3.37 feet is required between 115 kV AC energized conductors and ground wire
   ii. 5.07 feet is required between 115 kV AC energized conductors

f. Based on Rule 235.C.2.b of the NESC, the vertical clearance required in the span for wires or conductors carried on the same supporting structure:
   i. 2.69 feet are required between 115 kV AC energized conductors and ground wire
   ii. 5.01 feet are required between 115 kV AC energized conductors

g. Per Figure 235-1 of the NESC conductors or wires cannot encroach the envelope formed by the horizontal and vertical clearances prescribed above.

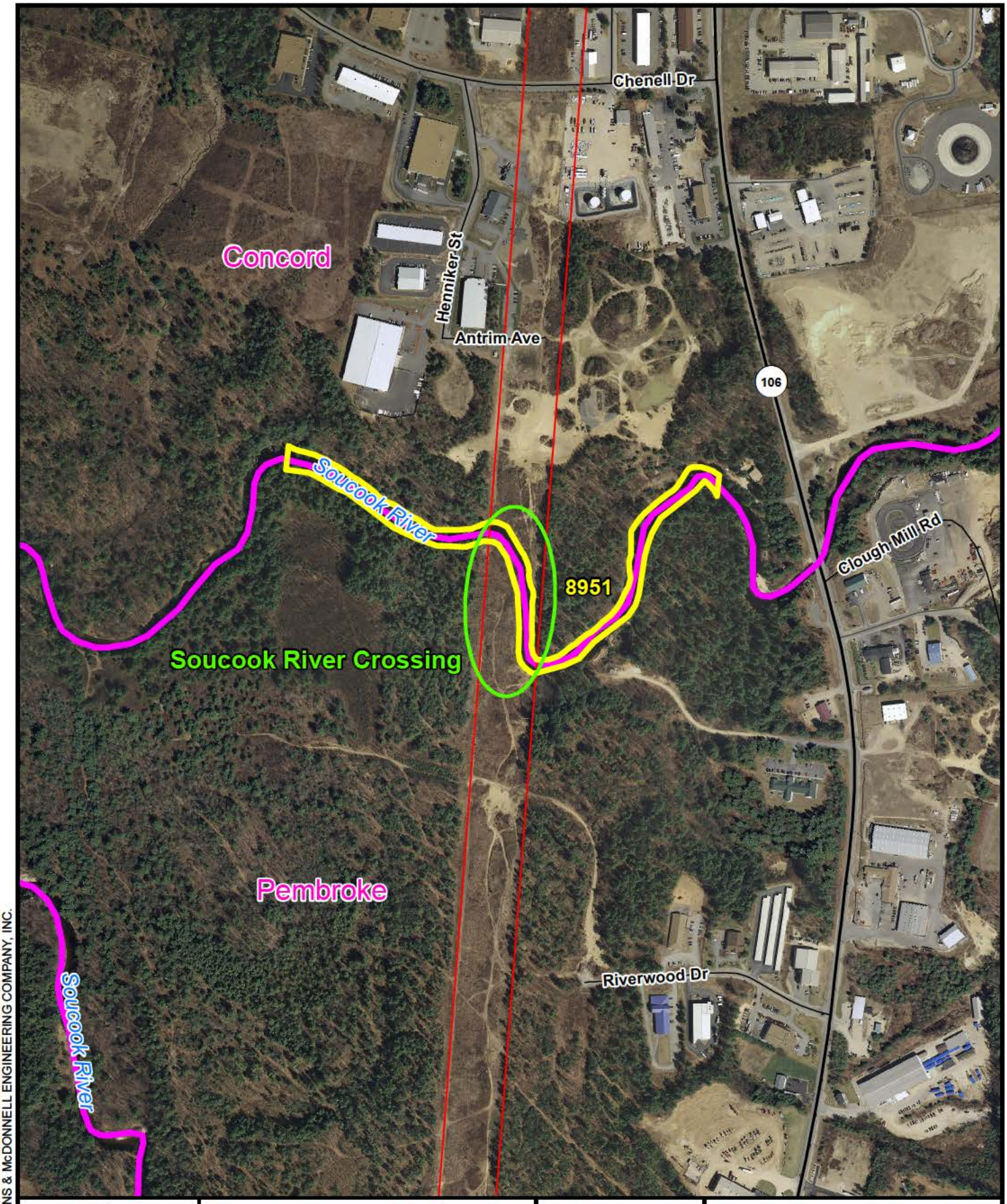
8. The sags and clearances to the water surface during a 100 year flood event for this crossing are as follows:

   h. Eversource has investigated a multitude of weather and loading conditions for its design. Eversource used these design conditions and combinations thereof to determine the minimum clearance of all conductors to the water and land surfaces, between the phase conductors and OPGW cable. Eversource has determined that the weather cases and combinations listed below results in the minimum clearance and control over all other weather conditions and combinations.

i. Ground wires – Due to the fact that the ground wire is located above the energized conductor, its clearance to the water surface will always exceed the minimum required NESC distance.

j. 285 degrees F – Maximum operating temperature (energized conductor) based on Eversource transmission standards, the maximum sag for this weather case results in a clearance to the water surface of 59 feet, this exceeds the minimum required clearance of 30.1 feet.

Minimum clearance energized conductor to ground wires clearance – The weather case that would produce the minimum clearance between energized conductors and ground wires would be a combination of winter weather factors. First, the energized conductors would be at 30 degrees F immediately following an ice storm and would have recently dropped their ice. The ground wires would be at 32 degrees F and would still be iced with ½" of radial ice. Under these conditions the clearance would be 12.7 feet vertically and 2.5 feet horizontally from the ground wires to the closest energized conductor.



NORTH

0 300 600

Feet

LEGEND

- Water Crossing Area
- Parcel Boundary
- Project ROW
- Town Boundary

THE NORTHERN PASS

Line List 8951
Soucook River
Water Crossing Permit
Location Map

Path: \\ESPSRV\data\Data2\Projects\NUS\53899_DC_Tline\GIS\DataFiles\ArcDocs\Water_Crossing_Maps\Water_Crossing_Permit_LL8951_Soucook_River_Lettersize.mxd frraser 8/26/2015

Source: NH DOT 2011 Aerial Photography; NH GRANIT; Burns & McDonnell.

August 26, 2015

P145-73
STA=4529+33.41
HT=90.00
ELE=328.53
LAT=43.20117576
LONG=-71.48679165

P145-72
STA=4541+05.68
HT=105.00
ELE=268.89
LAT=43.1979693
LONG=-71.48713527

1172

19#10 ALUMOWELD SHOWN @ 60 F

795 KCMIL ACSR SHOWN @ 0 F, 1/2" ICE, 4 PSF WIND (TYP.)

795 KCM L ACSR SHOWN @ 285F (TYP.)

10'

11'

59'

31'

ELE = 250' +/- 100 YEAR FLOOD

SOUCOOK RIVER

PEMBROKE

CONCORD

EVERSOURCE RIGHT OF WAY

C189-32

C189-31

3132-159

3132-160

P145-73

P145-72

SOUCOOK RIVER

RIGHT OF WAY

EOR EDGE OF ROAD

PROPOSED MONOPOLE

PROPOSED TRANS STRUCTURE

EXIST NG H-FRAME

PROPOSED H-FRAME

200.0 ft. Horiz. Scale

30.0 ft. Vert. Scale

N

PRELIMINARY - NOT FOR CONSTRUCTION

REVISION HISTORY					
–	–	–		–	–
A	4/30/15	ISSUED FOR REVIEW		MSP	DAB

EVERSOURCE

TITLE: S1 LL 8951 P145 SOUCOOK RIVER

BY	REV. NO.	DATE	SIZE	DWG. NO.
MSP	A	4/30/15	B	P14543901.DWG

05/04/2015 10:25am – mspepich – N:\NUSCO\58479 – NPT\Overhead\Cadd\01 –Record Worksheets\02 Permits\Water Cross Permits\P14543901.dwg

APPENDIX 14
C189 LINE
STRUCTURES C189-31 TO C189-32
SOUCOOK RIVER
CONCORD/PEMBROKE, NH

1. This crossing is shown on attached drawing C18943901

2. The location of the C189 line is shown on attached map titled Line List 8951.

3. The C189 line will cross the Soucook River on steel structures. The energized conductor is in a vertical configuration using 1590 kcmil ACSR. The structures will have ground wire. OPGW with sag coefficients similar to 19#10 Alumoweld will be used.

    a. C189-32 & C189-31 will be structures with strain insulators. The energized conductors are separated approximately 0 feet horizontally and 12 feet vertically in a vertical configuration. The ground/OPGW wire is carried on the structure by a support bracket approximately 6 inches below the top of the structure. The ground/OPGW and energized conductor are separated vertically by approximately 13 feet and 0 feet horizontally.

4. Energized conductors will have a maximum tension of 11,400 pounds at NESC 250B Heavy weather case (0 degrees F, 4 pounds per square foot wind loading, ½-inch radial ice). Ground wires will have a maximum tension of 5,500 pounds at NESC 250B Heavy weather case (0 degrees F, 4 pounds per square foot wind loading, ½-inch radial ice).

5. All NESC clearances described in subsequent paragraphs have been met by exceeding the horizontal and/or vertical clearances required. Minimum distances to ground per the NESC have been met. A clearance of 39 feet between the energized conductor and ground has been achieved, which is greater than required 16.1 feet.

6. Flood water elevations were based on information contained flood insurance rate maps provided by FEMA. Table 232-1 of the NESC states that the minimum clearance over a water body is based on a 10 year flood elevation. In the absence of 10 year flood elevation data, the project has used 100 year flood elevations. All elevations provided are based on NAVD88 and location information is based on NAD83. Flood water elevations for the Soucook River were based on information in FEMA Flood Insurance Rate Map (FIRM) 33013C0553E Panel 553 of 705. This document has an effective date of April 19, 2010. The 100 year flood elevation for this portion of the river is approximately 304 feet. The area of the crossing, as required by the Section 232 of the NESC is approximately 17 acres (140 feet x 5280 feet / 43560 square feet/acre).

7. The C189 line is a 115 kV alternating current (AC) line.

    a. Based on Table 232-1 of the NESC, for open supply conductors 750 V to 22kV to ground, the minimum clearance to the water surface during a normal flood (10 year flood as specified by the NESC, however the project has used the 100 year flood in absence of 10 year data) is 28.5 feet for waters 20-200 acres. NESC Rule 232.C.1.a states that an

additional clearance of 1.59 feet or [(69.7 kV-22 kV)x 0.4]/12 is needed, which brings the total required minimum clearance to 30.1 feet.

b. For overhead ground wires, the minimum required clearance to the water surface at the normal flood level is 25.5 feet. As the static wires are located above the energized conductors at all crossings, this NESC minimum clearance requirement will always be met.

c. Table 235-1 of the NESC does not specify horizontal values for supply conductors of the same circuit for voltages greater than 50 kV. In the absence of this, the project will use values for different circuits. Based upon Table 235-1:

   i. 3.07 feet is required between 115 kV AC energized conductor and ground wire
   ii. 4.78 feet is required between 115 kV AC energized conductors

d. Based on Table 235-3 of the NESC for horizontal clearance along the span for wires or conductors carried on the same support

   i. 5.69 feet is required between 115 kV AC energized conductors and ground wire
   ii. 6.96 feet is required between 115 kV AC energized conductors
   iii. These horizontal clearances assume conductor or wire sag of 35 feet which exceeds any sag at the location of these crossings.

e. Based on Table 235-5 of the NESC the vertical clearance required at the supports for wires or conductors carried on the same supporting structure is:
   i. 3.37 feet is required between 115 kV AC energized conductors and ground wire
   ii. 5.07 feet is required between 115 kV AC energized conductors

f. Based on Rule 235.C.2.b of the NESC, the vertical clearance required in the span for wires or conductors carried on the same supporting structure:
   i. 2.69 feet are required between 115 kV AC energized conductors and ground wire
   ii. 5.01 feet are required between 115 kV AC energized conductors

g. Per Figure 235-1 of the NESC conductors or wires cannot encroach the envelope formed by the horizontal and vertical clearances prescribed above.

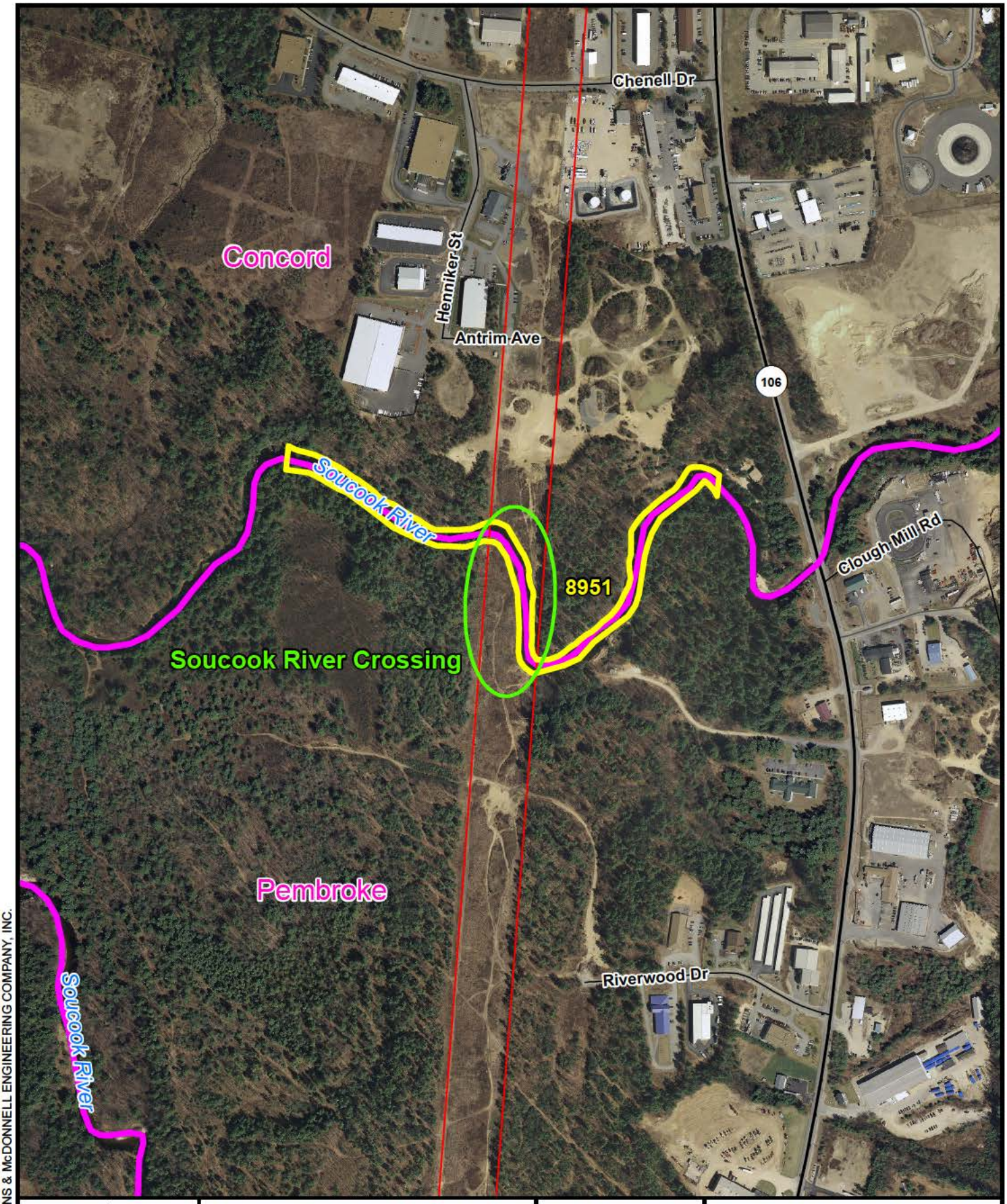
8. The sags and clearances to the water surface during a 100 year flood event for this crossing are as follows:

   h. Eversource has investigated a multitude of weather and loading conditions for its design. Eversource used these design conditions and combinations thereof to determine the minimum clearance of all conductors to the water and land surfaces, between the phase conductors and OPGW cable. Eversource has determined that the weather cases and combinations listed below results in the minimum clearance and control over all other weather conditions and combinations.

i. Ground wires – Due to the fact that the ground wire is located above the energized conductor, its clearance to the water surface will always exceed the minimum required NESC distance.

j. 285 degrees F – Maximum operating temperature (energized conductor) based on Eversource transmission standards, the maximum sag for this weather case results in a clearance to the water surface of 33 feet, this exceeds the minimum required clearance of 30.1 feet.

Minimum clearance energized conductor to ground wires clearance – The weather case that would produce the minimum clearance between energized conductors and ground wires would be a combination of winter weather factors. First, the energized conductors would be at 30 degrees F immediately following an ice storm and would have recently dropped their ice. The ground wires would be at 32 degrees F and would still be iced with ½" of radial ice. Under these conditions the clearance would be 12.7 feet vertically and 2.5 feet horizontally from the ground wires to the closest energized conductor.



NORTH

0 300 600

Feet

LEGEND

- Water Crossing Area
- Parcel Boundary
- Project ROW
- Town Boundary

THE NORTHERN PASS

Line List 8951
Soucook River
Water Crossing Permit
Location Map

Path: \\ESPSRV\data\Data2\Projects\NUS\53899_DC_Tline\GIS\DataFiles\ArcDocs\Water_Crossing_Maps\Water_Crossing_Permit_LL8951_Soucook_River_Lettersize.mxd frraser 8/26/2015

Source: NH DOT 2011 Aerial Photography; NH GRANIT; Burns & McDonnell.

August 26, 2015

C189-32
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HT=75.00
ELE=339.60
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LONG=-71.48626682

C189-31
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HT=95.00
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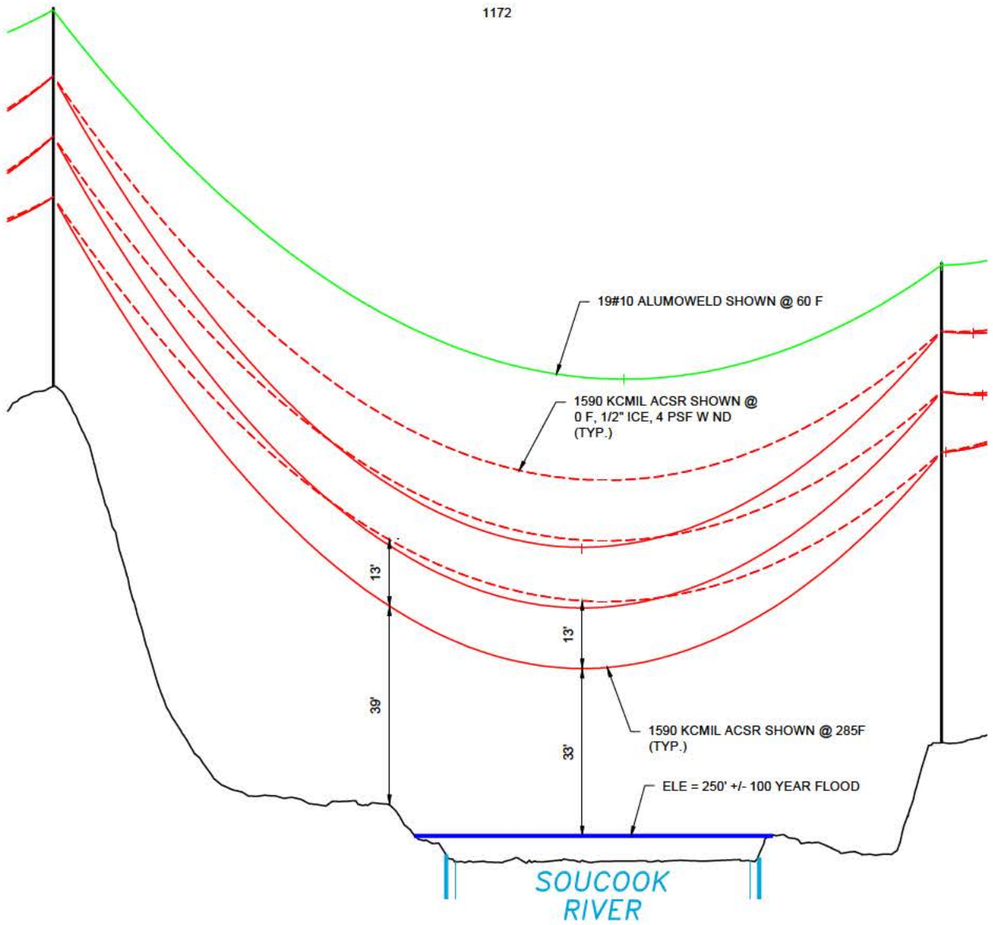
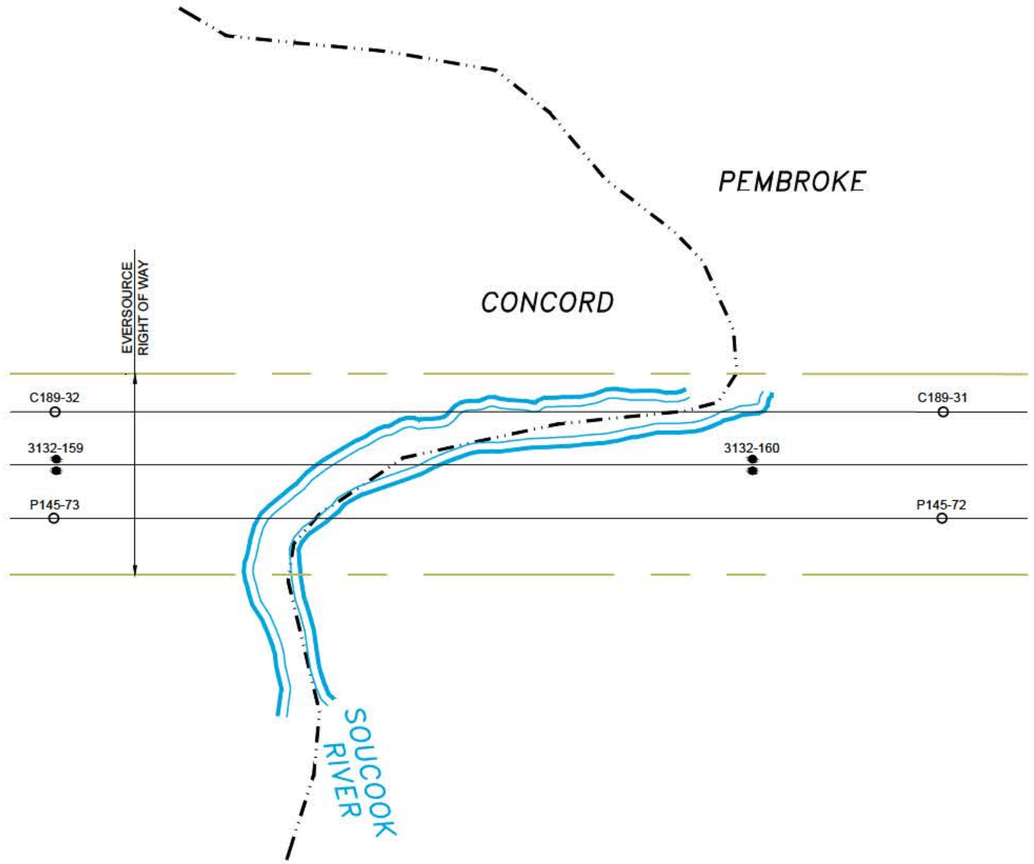
LONG=-71.48661092

1172





RIGHT OF WAY
EOR EDGE OF ROAD
PROPOSED MONOPOLE
PROPOSED TRANS STRUCTURE
EXIST NG H-FRAME
PROPOSED H-FRAME

200.0 ft. Horiz. Scale
30.0 ft. Vert. Scale

PRELIMINARY - NOT FOR CONSTRUCTION

REVISION HISTORY				
–	–	–	–	–
A	4/30/15	ISSUED FOR REVIEW	MSP	DAB

EVERSOURCE

TITLE: S1 LL 8951 C189 SOUCOOK RIVER

BY	REV. NO.	DATE	SIZE	DWG. NO.
MSP	A	4/30/15	B	C18943901.DWG

APPENDIX 15
G146 LINE
STRUCTURES G146-26 TO G146-27
LAMPREY RIVER
DEERFIELD, NH

1. This crossing is shown on attached drawing G14643901

2. The location of the G146 line is shown on attached map titled Line List 9702

3. The G146 line will cross the Lamprey River on steel structures. The energized conductor is in a vertical configuration using 1272 kcmil ACSR. The structures will have ground wire. OPGW with sag coefficients similar to 19#10 Alumoweld will be used.

    a. G146-27 will be a structure with post insulators. The energized conductors are separated approximately 0 feet horizontally and 12 feet vertically in a vertical configuration. The ground/OPGW wire is carried on the structure by a support bracket approximately 6 inches below the top of the structure. The ground/OPGW and energized conductor are separated vertically by approximately 7 feet and 3 feet horizontally.
    b. G146-26 will be a structure with strain insulators. The energized conductors are separated approximately 0 feet horizontally and 12 feet vertically in a vertical configuration. The ground/OPGW wire is carried on the structure by a support bracket approximately 6 inches below the top of the structure. The ground/OPGW and energized conductor are separated vertically by approximately 13 feet and 0 feet horizontally.

4. Energized conductors will have a maximum tension of 10,000 pounds at NESC 250B Heavy weather case (0 degrees F, 4 pounds per square foot wind loading, ½-inch radial ice). Ground wires will have a maximum tension of 5,500 pounds at NESC 250B Heavy weather case (0 degrees F, 4 pounds per square foot wind loading, ½-inch radial ice).

5. All NESC clearances described in subsequent paragraphs have been met by exceeding the horizontal and/or vertical clearances required. Minimum distances to ground per the NESC have been met. A clearance of 49 feet between the energized conductor and ground has been achieved, which is greater than required 16.1 feet.

6. Flood water elevations were based on information contained flood insurance rate maps provided by FEMA. Table 232-1 of the NESC states that the minimum clearance over a water body is based on a 10 year flood elevation. In the absence of 10 year flood elevation data, the project has used 100 year flood elevations. All elevations provided are based on NAVD88 and location information is based on NAD83. Flood water elevations for the Lamprey River were based on information in FEMA Flood Insurance Rate Map (FIRM) # 33015C0090E Panel 90 of 681. This document has an effective date of May 17, 2005. Based on the information provided in the FIRM, the section of the Lamprey River where the G146 line crosses is in an area labeled "Zone A". From the map legend, Zone A areas are determined to be inside of the 1% (100 year flood) annual chance floodplain with no base flood elevations determined. Due to the uncertainties and availability of flood data for this portion of the Lamprey River, Eversource has

used the approximate top of the river bank as the peak elevation for this river. Based on the information given in the FIRM, Eversource feels this assumption is more than adequate for a 100 year flood elevation. At the time of survey the elevation at this section of the Lamprey River was 369 feet and elevation of the top of the river bank was 382 feet. The area of the crossing, as required by the Section 232 of the NESC is approximately 38 acres (310 feet x 5280 feet / 43560 square feet/acre).

7. The G146 line is a 115 kV alternating current (AC) line.

    a. Based on Table 232-1 of the NESC, for open supply conductors 750 V to 22kV to ground, the minimum clearance to the water surface during a normal flood (10 year flood as specified by the NESC, however the project has used the 100 year flood in absence of 10 year data) is 28.5 feet for waters 20-200 acres. NESC Rule 232.C.1.a states that an additional clearance of 1.59 feet or [(69.7 kV-22 kV)x 0.4]/12 is needed, which brings the total required minimum clearance to 30.1 feet.

    b. For overhead ground wires, the minimum required clearance to the water surface at the normal flood level is 28.5 feet. As the static wires are located above the energized conductors at all crossings, this NESC minimum clearance requirement will always be met.

    c. Table 235-1 of the NESC does not specify horizontal values for supply conductors of the same circuit for voltages greater than 50 kV. In the absence of this, the project will use values for different circuits. Based upon Table 235-1:

        i. 3.07 feet is required between 115 kV AC energized conductor and ground wire
        ii. 4.78 feet is required between 115 kV AC energized conductors

    d. Based on Table 235-3 of the NESC for horizontal clearance along the span for wires or conductors carried on the same support

        i. 5.69 feet is required between 115 kV AC energized conductors and ground wire
        ii. 6.96 feet is required between 115 kV AC energized conductors
        iii. These horizontal clearances assume conductor or wire sag of 35 feet which exceeds any sag at the location of these crossings.

    e. Based on Table 235-5 of the NESC the vertical clearance required at the supports for wires or conductors carried on the same supporting structure is:
        i. 3.37 feet is required between 115 kV AC energized conductors and ground wire
        ii. 5.07 feet is required between 115 kV AC energized conductors

    f. Based on Rule 235.C.2.b of the NESC, the vertical clearance required in the span for wires or conductors carried on the same supporting structure:
        i. 2.69 feet are required between 115 kV AC energized conductors and ground wire
        ii. 5.01 feet are required between 115 kV AC energized conductors

g. Per Figure 235-1 of the NESC conductors or wires cannot encroach the envelope formed by the horizontal and vertical clearances prescribed above.

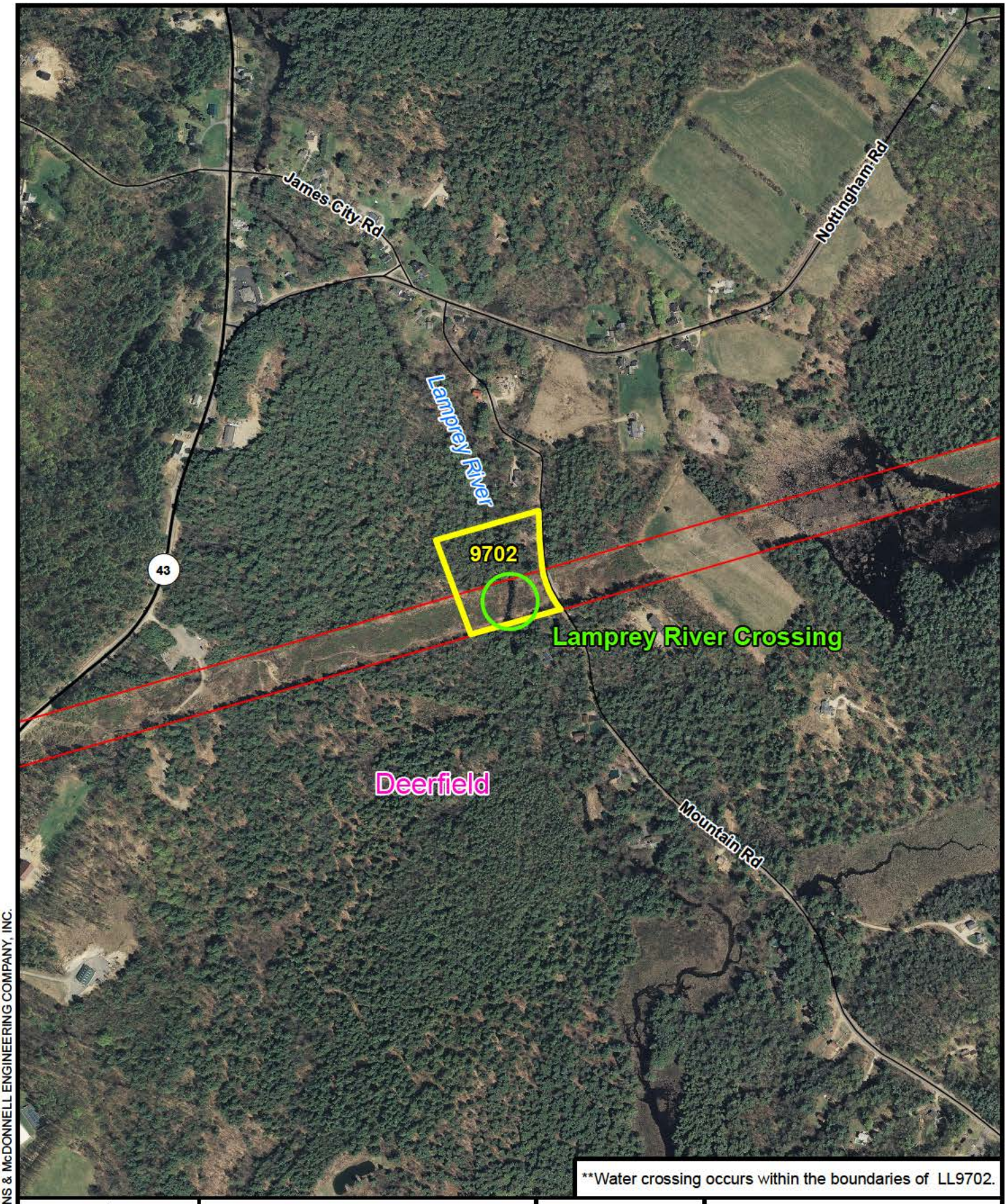
8. The sags and clearances to the water surface during a 100 year flood event for this crossing are as follows:

    h. Eversource has investigated a multitude of weather and loading conditions for its design. Eversource used these design conditions and combinations thereof to determine the minimum clearance of all conductors to the water and land surfaces, between the phase conductors and OPGW cable. Eversource has determined that the weather cases and combinations listed below results in the minimum clearance and control over all other weather conditions and combinations.

    i. Ground wires – Due to the fact that the ground wire is located above the energized conductor, its clearance to the water surface will always exceed the minimum required NESC distance.

    j. 285 degrees F – Maximum operating temperature (energized conductor) based on Eversource transmission standards, the maximum sag for this weather case results in a clearance to the water surface of 64 feet, this exceeds the minimum required clearance of 30.1 feet.

Minimum clearance energized conductor to ground wires clearance – The weather case that would produce the minimum clearance between energized conductors and ground wires would be a combination of winter weather factors. First, the energized conductors would be at 30 degrees F immediately following an ice storm and would have recently dropped their ice. The ground wires would be at 32 degrees F and would still be iced with ½" of radial ice. Under these conditions the clearance would be 6.0 feet vertically and 3.0 feet horizontally from the ground wires to the closest energized conductor.



**Water crossing occurs within the boundaries of LL9702.

NORTH

0 300 600

Feet

LEGEND

- Water Crossing Area
- Parcel Boundary
- Project ROW
- Town Boundary

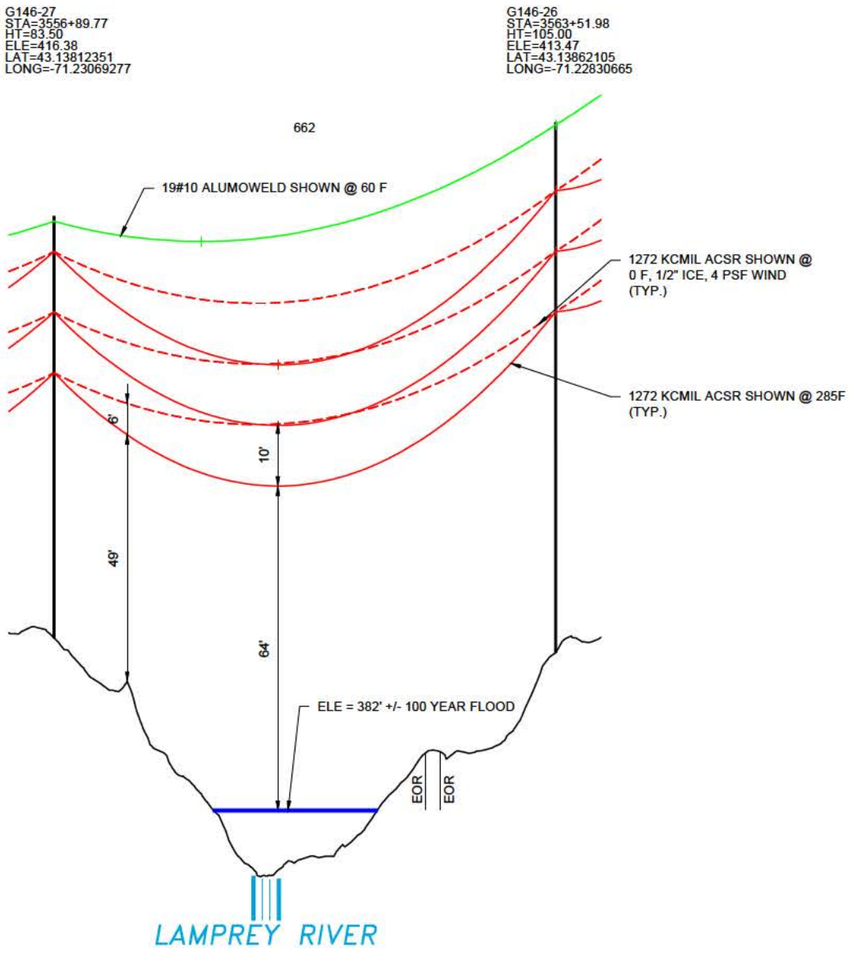
THE NORTHERN PASS

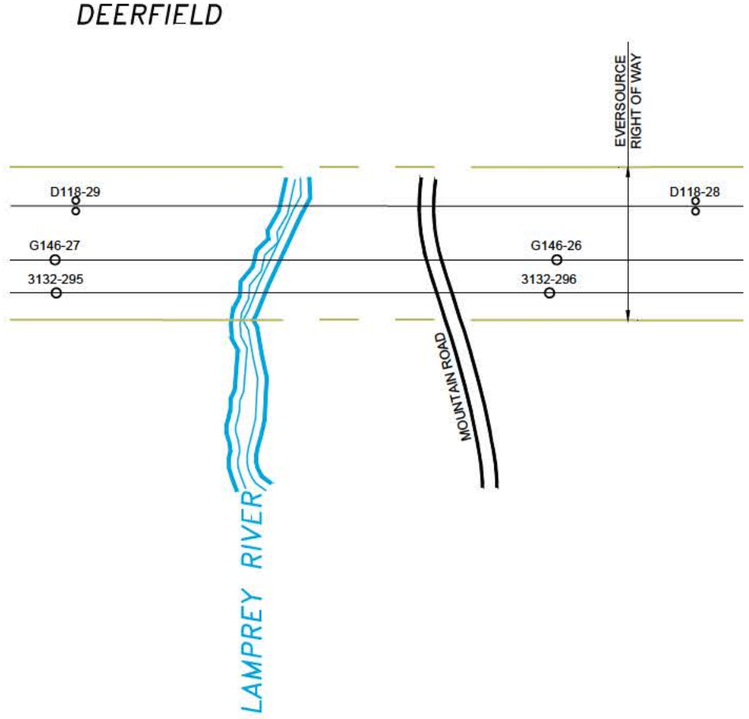
Line List 9702**
Lamprey River
Water Crossing Permit
Location Map

Path: \\ESPSRV\data\Data2\Projects\NUS\53899_DC_Tline\GIS\DataFiles\ArcDocs\Water_Crossing_Maps\Water_Crossing_Permit_LL9702_Lamprey_River_Lettersize.mxd rfraser 8/26/2015

Source: NH DOT 2010 Aerial Photography; NH GRANIT; Burns & McDonnell.

August 26, 2015





RIGHT OF WAY
EOR EDGE OF ROAD
PROPOSED MONOPOLE
PROPOSED TRANS STRUCTURE
EXIST NG H-FRAME
PROPOSED H-FRAME

200.0 ft. Horiz. Scale

30.0 ft. Vert. Scale

N

PRELIMINARY - NOT FOR CONSTRUCTION

REVISION HISTORY					
–	–	–		–	–
A	4/30/15	ISSUED FOR REVIEW		MSP	DAB

EVERSOURCE

TITLE: S1 LL 9702 G146 LAMPREY RIVER

BY	REV. NO.	DATE	SIZE	DWG. NO.
MSP	A	4/30/15	B	G14643901.DWG

09/03/2015 2:05pm – mspepich – N:\NUSCO\58479 – NPT\Overhead\Cadd\01–Record Worksheets\02 Permits\Water Cross Permits\G14643901.dwg