# NORTHERN PASS

## TRANSMISSION (NPT) PROJECT

SUGAR HILL EASTERN BYPASS (SHEB) UNDERGROUND ALIGNMENT

PERMIT PACKAGE — NH DOT DISTRICT 1

DECEMBER 13, 2016

### PRELIMINARY - NOT FOR CONSTRUCTION
BORING BH70
STA 182+29
BORING DEPTH 15.5'
ROCK NOT ENCOUNTERED
THERMAL RESISTIVITY 80

PRELIMINARY - NOT FOR CONSTRUCTION
BORING BH12B
STA 275+85
BORING DEPTH 65'
ROCK DEPTH 49.5'
THERMAL RESISTIVITY 100

UG ALIGNMENT PROFILE
HOR. SCALE: 1"=30'
VER. SCALE: 1"=10'

PRELIMINARY - NOT FOR CONSTRUCTION
BORING BH86
STA 355+49
BORING DEPTH 15.5'
ROCK NOT ENCOUNTERED
THERMAL RESISTIVITY 75
2' MIN COVER
FROM UTILITY, TYP
30" MIN COVER
PRELIMINARY - NOT FOR CONSTRUCTION
THE NORTHERN PASS
BORING BH88
STA 372+82
BORING DEPTH 15.5'
ROCK NOT ENCOUNTERED
THERMAL RESISTIVITY 85

2' MIN COVER FROM UTILITY, TYP
30" MIN COVER

PRELIMINARY - NOT FOR CONSTRUCTION

THE NORTHERN PASS
SHEBC126
UG ALIGNMENT PROFILE
HOR. SCALE: 1"=30'
VER. SCALE: 1"=10'

UG ALIGNMENT PLAN
SCALE: 1"=30'
BORING BH90
STA 392+83
BORING DEPTH 15.5'
ROCK NOT ENCOUNTERED
THERMAL RESISTIVITY 75

30" MIN COVER

PRELIMINARY - NOT FOR CONSTRUCTION
BORING BH96
STA 459+21
BORING DEPTH 15.5'
ROCK NOT ENCOUNTERED
THERMAL RESISTIVITY 95

2' MIN COVER FROM UTILITY, TYP
30" MIN COVER

PRELIMINARY - NOT FOR CONSTRUCTION

UG ALIGNMENT PROFILE
HOR. SCALE: 1"=30'
VER. SCALE: 1"=10'

UG ALIGNMENT PLAN
SCALE: 1"=30'

THE NORTHERN PASS SHEBC136
UG ALIGNMENT PROFILE
HOR. SCALE: 1"=30'
VER. SCALE: 1"=10'

UG ALIGNMENT PLAN
SCALE: 1"=30'

PRELIMINARY - NOT FOR CONSTRUCTION
UG ALIGNMENT PLAN

HOR. SCALE: 1"=30'
VER. SCALE: 1"=10'

UG ALIGNMENT PROFILE

HOR. SCALE: 1"=30'
VER. SCALE: 1"=10'

TRANSMISSION BUSINESS NETWORK

THE NORTHERN PASS

N/P
EASTON RD (REPTO)
N/P
EASTON RD (REPTO)
N/P
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EASTON RD (REPTO)
BORING BH101
STA 586+32
BORING DEPTH 16.5' ROCK NOT ENCOUNTERED
THERMAL RESISTIVITY 110

2' MIN COVER FROM UTILITY, TYP
30" MIN COVER

THE NORTHERN PASS

UG ALIGNMENT PROFILE
HOR. SCALE: 1"=30'
VER. SCALE: 1"=10'

PRELIMINARY - NOT FOR CONSTRUCTION
PT: 590+51.78
PC: 595+52.52
PT: 596+36.09

BORING BH102
STA 596+71
BORING DEPTH 15.5' ROE

THERMAL RESISTIVITY 85
2' MIN COVER FROM UTILITY, TYP
30" MIN COVER

THE NORTHERN PASS SHEB SHEBC152
UG ALIGNMENT PROFILE
HOR. SCALE: 1"=30'
VER. SCALE: 1"=10'

UG ALIGNMENT PLAN
SHEBC152
PRELIMINARY - NOT FOR CONSTRUCTION
PT: 616+81.04
PC: 620+76.15
PT: 621+31.91
PC: 621+62.81
PT: 622+06.37

BORING BH104
STA 615+127
BORING DEPTH 15.5'
ROCK NOT ENCOUNTERED
THERMAL RESISTIVITY 90

BORING BH20A
STA 623+93
BORING DEPTH 65'
ROCK DEPTH 3.5'
THERMAL RESISTIVITY 45

2' MIN COVER FROM UTILITY, TYP
30'' MIN COVER

PRELIMINARY - NOT FOR CONSTRUCTION

UG ALIGNMENT PROFILE
HOR. SCALE: 1"=30'
VER. SCALE: 1"=10'

UG ALIGNMENT PLAN
SCALE: 1"=30'

THE NORTHERN PASS SHEBC155
Transmission Business

THE  NORTHERN  PASS
SHEB
BORING BH107
STA 659+76
BORING DEPTH 15'
ROCK NOT ENCOUNTERED
THERMAL RESISTIVITY 85
2' MIN COVER FROM UTILITY, TYP
30" MIN COVER

PRELIMINARY - NOT FOR CONSTRUCTION

THE NORTHERN PASS
SHEBC160
UG ALIGNMENT PROFILE
HOR. SCALE: 1"=30'
VER. SCALE: 1"=10'

UG ALIGNMENT PLAN
SCALE: 1"=30'

CONSTRUCTION ACTIVITY
CONTRIBUTING TRAFFIC CONTROL LAYOUT ON SHEET NUMBER
BORING BH108
STA 669+68
BORING DEPTH 15'
ROCK NOT ENCOUNTERED
THERMAL RESISTIVITY 85

2' MIN COVER
FROM UTILITY, TYP
30" MIN COVER

THE NORTHERN PASS
SHEB
UG ALIGNMENT PROFILE
HOR. SCALE: 1"=30'
VER. SCALE: 1"=10'

UG ALIGNMENT PLAN
SCALE: 1"=30'

PRELIMINARY - NOT FOR CONSTRUCTION
PT: 692+12.59
BORING BH22C
STA 699+93
BORING DEPTH 61'
ROCK NOT ENCOUNTERED
THERMAL RESISTIVITY 60

BORING BH22B
STA 694+30
BORING DEPTH 60.5'
ROCK NOT ENCOUNTERED
THERMAL RESISTIVITY 75

PRELIMINARY - NOT FOR CONSTRUCTION

THE NORTHERN PASS
SHEB
SHEBC164
UG ALIGNMENT PROFILE
HOR. SCALE: 1"=30'
VER. SCALE: 1"=10'

UG ALIGNMENT PLAN
SCALE 1"=30'

CONSTRUCTION ACTIVITY
CORRESPONDING TRAFFIC CONTROL LAYOUT (BY SHEET NUMBER) NONE REQUIRED
Quick Reference Tables

Table 6C-1. Recommended Advance Warning Sign Minimum Spacing

<table>
<thead>
<tr>
<th>Road Type</th>
<th>Distance Between Signs</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
</tr>
<tr>
<td>Urban (low speed)</td>
<td>150 feet</td>
</tr>
<tr>
<td>Urban (high speed)</td>
<td>350 feet</td>
</tr>
<tr>
<td>Rural</td>
<td>550 feet</td>
</tr>
<tr>
<td>Expressway/Freeway</td>
<td>1,000 feet</td>
</tr>
</tbody>
</table>

* Speed category is determined by the highway agency.

Table 6C-2. Taper Length Criteria for Temporary Traffic Control Zones

<table>
<thead>
<tr>
<th>Type of Taper</th>
<th>Taper Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Work Zone Taper</td>
<td>at least 3/8</td>
</tr>
<tr>
<td>Slippery Taper</td>
<td>at least 3/8</td>
</tr>
<tr>
<td>Oversized Taper</td>
<td>at least 3/8</td>
</tr>
<tr>
<td>One Lane, Two Lane Traffic Taper</td>
<td>at least 3/8</td>
</tr>
</tbody>
</table>

Table 6C-3. Taper Length Formulas for Determining Taper Length

<table>
<thead>
<tr>
<th>Speed (S)</th>
<th>Taper Length (L) in Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>All speed &lt; 30</td>
<td>L = 0.25 * S</td>
</tr>
<tr>
<td>All speed &gt; 30</td>
<td>L = 0.5 * S</td>
</tr>
</tbody>
</table>

Note: Use Table 6C-4 for vehicles.
Table 6C-1. Recommended Advance Warning Sign Minimum Spacing

| Road Type               | Distance Between Signs
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>A</td>
</tr>
<tr>
<td>Urban (low speed)</td>
<td>100 feet</td>
</tr>
<tr>
<td>Urban (high speed)</td>
<td>300 feet</td>
</tr>
<tr>
<td>Rural</td>
<td>500 feet</td>
</tr>
<tr>
<td>Expressway / Freeway</td>
<td>1,500 feet</td>
</tr>
</tbody>
</table>

* Speed category to be determined by the highway agency.
* The column headings A, B, and C are the dimensions shown in Figures 6-1 through 6-6. The A dimension is the distance from the transition point on or nearest to the first sign. The B dimension is the distance between the transition point and a sign. The C dimension is the distance between the transition point and the end of the work zone. The "end sign" is the sign that is furthest upstream from the ITS zone.

Table 6C-3. Taper Length Criteria for Temporary Traffic Control Zones

<table>
<thead>
<tr>
<th>Type of Taper</th>
<th>Taper Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>Changing Type</td>
<td>amount</td>
</tr>
<tr>
<td>Driving Type</td>
<td>amount (L.H.)</td>
</tr>
<tr>
<td>- Lane, Two Way Traffic, Taper</td>
<td>50 feet minimum, 100 feet maximum</td>
</tr>
<tr>
<td>Downstream Taper</td>
<td>50 feet minimum, 100 feet maximum</td>
</tr>
</tbody>
</table>

Table 6C-4. Formulas for Determining Taper Length

For Taper Lengths (L) in Feet

<table>
<thead>
<tr>
<th>Speed (S)</th>
<th>Taper Length (L) in Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>40 mph or less</td>
<td>L = S/3</td>
</tr>
<tr>
<td>41 mph or more</td>
<td>L = S/2</td>
</tr>
</tbody>
</table>

Where:
- L = length in feet
- S = speed of other traffic
- Taper length is calculated from the speed of the other traffic or from the speed limit in the ITS zone, whichever is lower.
LEGEND

REFLECTORIZED PLASTIC DRUM
EXISTING TRAVEL LANE
PROPOSED TRAVEL LANE
PROPOSED SIGN
WORK ZONE
FLAGGER
TYPE 3 BARRICADE

X = SPACING OF REFLECTORIZED PLASTIC DRUM. SPACING SHALL EQUAL THE POSTED SPEED LIMIT. (EXAMPLE: 35 MPH SPEED LIMIT = 35' DRUM SPACING)

1/2 L MIN.
1/3 L MIN.

G20-2

4S IN FT. WHERE S IS MPH (TYP)

50' BUFFER
11' MIN.

W1-4R

50 TO 100'
40 TO 180'

WORK AREA FOR SPlicing OPERATIONS OR HDD STAGING AREA

WORK ZONE FOR SPlicing OPERATIONS OR HDD STAGING AREA

WORK AREA FOR TEMPORARY SIGNAL

WORK ZONE FOR HDD STAGING AREA

WORK AREA FOR HDD STAGING AREA

WORK ZONE FOR HDD STAGING AREA

UTILITY WORK AHEAD

WORK ZONE FOR HDD STAGING AREA

WORK ZONE FOR HDD STAGING AREA

PREPARED FOR CONSTRUCTION

C

G20-2

ALTernative lane closure for splicing Operations or HDD staging areas

NOT TO SCALE

G20-2

QUICK REFERENCE TABLES

Table 6C-1. Recommended Advance Warning Sign Minimum Spacing

<table>
<thead>
<tr>
<th>Road Type</th>
<th>Distance Between Signs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Traffic</td>
<td>A</td>
</tr>
<tr>
<td>Urban (low speed)</td>
<td>100 feet</td>
</tr>
<tr>
<td>Urban (high speed)</td>
<td>200 feet</td>
</tr>
<tr>
<td>Rural</td>
<td>300 feet</td>
</tr>
<tr>
<td>Expressway/Freeway</td>
<td>1,000 feet</td>
</tr>
</tbody>
</table>

1. Spacing category is determined by the highway agency.
2. The column headings A, B, and C are the dimensions shown in Figures 6.1 through 6.2. The A dimension is the distance from the location of a sign to the location of the sign. B dimension is the distance between the location of the sign and the centerline of the travel lane. C dimension is the distance between the location of the sign and the edge of the travel lane.

Table 6C-3. Taper Length Criteria for Temporary Traffic Control Zones

<table>
<thead>
<tr>
<th>Type of Taper</th>
<th>Taper Length</th>
</tr>
</thead>
<tbody>
<tr>
<td>ReflectORIZED plastic drum</td>
<td>10 ft minimum, 15 ft maximum</td>
</tr>
<tr>
<td>Concrete barrier</td>
<td>30 ft minimum, 50 ft maximum</td>
</tr>
</tbody>
</table>

Table 6C-4. Formulas for Determining Taper Length

<table>
<thead>
<tr>
<th>Speed (MPH)</th>
<th>Taper Length (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>20</td>
<td>10 ft</td>
</tr>
<tr>
<td>30</td>
<td>15 ft</td>
</tr>
<tr>
<td>40</td>
<td>20 ft</td>
</tr>
<tr>
<td>50</td>
<td>25 ft</td>
</tr>
<tr>
<td>60</td>
<td>30 ft</td>
</tr>
<tr>
<td>70</td>
<td>35 ft</td>
</tr>
</tbody>
</table>

Value of Taper Length (L)
LEGEND

- REFLECTORIZED PLASTIC DRUM
- EXISTING TRAVEL LANE
- PROPOSED TRAVEL LANE
- PROPOSED SIGN
- WORK ZONE
- TYPE 3 BARRICADE

X = SPACING OF REFLECTORIZED PLASTIC DRUM. SPACING SHALL EQUAL THE POSTED SPEED LIMIT. (EXAMPLE: 35 MPH SPEED LIMIT = 35’ DRUM SPACING)

TYPICAL LANE CLOSURE FOR LONGITUDINAL TRENCH/SPlice ENCLOSURE INSTALLATION IN DOWNTOWN WITH SIDEWALK ON BOTH SIDES OF THE ROAD (<850 VPH)

TYPICAL WORK ZONE = 700'

NOT TO SCALE

QUICK REFERENCE TABLES

Table 6C-1. Recommended Advance Warning Sign Minimum Spacing

<table>
<thead>
<tr>
<th>Road Type</th>
<th>Distance Between Signs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban (low speed)</td>
<td>100 feet</td>
</tr>
<tr>
<td>Urban (high speed)</td>
<td>150 feet</td>
</tr>
<tr>
<td>Rural</td>
<td>200 feet</td>
</tr>
<tr>
<td>Expressways/Freeways</td>
<td>1,000 feet</td>
</tr>
</tbody>
</table>

Table 6C-2. Taper Length Criteria for Temporary Traffic Control Zones

<table>
<thead>
<tr>
<th>Type of Taper</th>
<th>Taper Length (L) as Recommended</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shoulder Taper</td>
<td>at least 4 ft.</td>
</tr>
<tr>
<td>Median Taper</td>
<td>at least 8 ft.</td>
</tr>
<tr>
<td>Central Island Taper</td>
<td>at least 8 ft.</td>
</tr>
</tbody>
</table>

Table 6C-3. Quick Reference Tables

<table>
<thead>
<tr>
<th>Value of Taper Length (L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
</tr>
<tr>
<td>----</td>
</tr>
<tr>
<td>10</td>
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</tbody>
</table>

Table 6C-4. Formulas for Determining Taper Length

<table>
<thead>
<tr>
<th>Speed (mph)</th>
<th>Taper Length (L) in Feet</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 mph or more</td>
<td>L = 40</td>
</tr>
<tr>
<td>0 mph or more</td>
<td>L = 50</td>
</tr>
</tbody>
</table>

Note: See Notes 6C-4 for tabulation.

6C-4. Quick Reference Tables

Note: L = taper length in feet.
6 = width of road in feet.
T = total length of the work zone in feet.
8 = width of median or full carriageway in feet.
1,000 = total project length in feet.

Reference: 6C-4. Quick Reference Tables

PRELIMINARY - NOT FOR CONSTRUCTION
TRAFFIC CONTROL FOR THE INTERSECTION OF MAIN STREET (RT 18/116) AND CHURCH STREET (RT 116) - FRANCONIA, NH
MICROTUNNELING TRAFFIC CONTROL
INTERSECTION OF MAIN STREET (RT 18/116) AND CHURCH STREET (RT 116) - FRANCONIA, NH
NOTES:
GENERAL
1. VERIFY ALL DIMENSIONS AND ELEVATIONS SHOWN ON THESE PLANS PRIOR TO INSTALLING THE ALIGNMENTS. IF DISCREPANCIES ARE NOTED, NOTIFY BRECROEY SO THAT APPROPRIATE REVISIONS CAN BE MADE TO THE HDD DESIGN.
2. IF UTILITIES WILL INTERFERE WITH INSTALLATION OF THE ALIGNMENTS AS SHOWN ON THESE DRAWINGS, NOTIFY BRECROEY SO THAT APPROPRIATE REVISIONS CAN BE MADE TO THE HDD DESIGN.
3. PERFORM HDD CONSTRUCTION IN ACCORDANCE WITH THE CONTRACT REQUIREMENTS AND CONFORM TO ALL APPLICABLE SAFETY REGULATIONS INCLUDING THE PROVISIONS OF FEDERAL OSHA.
4. PROVIDE PROTECTIVE BARRIER AROUND ALL EXCAVATIONS THAT CONFORMS TO ALL APPLICABLE SAFETY REGULATIONS.
5. ALL UTILITIES DISCOVERED DURING DESIGN ARE INDICATED ON THE PROJECT DRAWINGS. THE SUBCONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE LOCATION, SIZE AND ELEVATION OF ALL EXISTING UTILITIES PRIOR TO THE START OF ANY CONSTRUCTION. ALL UTILITIES WITHIN 10 FEET OF THE DRILL PATH SHALL BE EXPOSED AND PROTECTED DURING CONSTRUCTION. THE ENGINEER SHALL BE NOTIFIED IN WRITING OF ANY UTILITIES FOUND INTERFERING WITH THE PROPOSED CONSTRUCTION AND APPROPRIATE REMEDIAL ACTION AGREED TO BY THE ENGINEER BEFORE PROCEEDING WITH THE WORK.
6. THE SUBCONTRACTOR SHALL BE RESPONSIBLE FOR CONTACTING Digsafe AT 811, AT LEAST 72 HOURS BEFORE DIGGING OR DRILLING AND SHALL MAINTAIN AN ACTIVE PERMIT DURING ALL SUBSURFACE WORK. A COPY OF THIS PERMIT SHALL BE ON SITE AND AVAILABLE FOR VIEWING BY THE OWNER AND OWNERS REPRESENTATIVES DURING ALL SUBSURFACE WORK.
7. REFER TO TEST BORING LOGS FOR SPECIFIC DETAILS OF SUBSURFACE CONDITIONS ENCOUNTERED.
8. ACTUAL SOIL CONDITIONS MAY VARY SIGNIFICANTLY FROM THOSE INDICATED ON THE PLANS. SUBCONTRACTOR SHALL BE RESPONSIBLE FOR REVIEWING EXISTING SUBSURFACE INFORMATION, AND SELECTING THE APPROPRIATE MEANS AND METHODS FOR COMPLETING THE WORK.
9. THE SUBCONTRACTOR SHALL VERIFY PROJECT COORDINATES, AZIMUTHS AND ELEVATIONS PRIOR TO CONSTRUCTION.
10. ALL DIRECTIONAL DRILLING SHALL BE COMPLETED IN ACCORDANCE WITH THE CONTRACT DOCUMENTS, AND SPECIFICATION SECTION 1640 - HORIZONTAL DIRECTIONAL DRILL INSTALLATION.
11. SUBCONTRACTOR SHALL BE RESPONSIBLE FOR THE CONTAINMENT, CLEANUP AND DISPOSAL OF ALL DRILLING FLUIDS IN ACCORDANCE WITH APPROVED DRILL FLUID MANAGEMENT AND CONTINGENCY RELEASE PLAN, INCLUDING INADVERTENT SURFACE RETURN.
12. SUBCONTRACTOR SHALL BE RESPONSIBLE FOR ALL NECESSARY TRAFFIC CONTROL.
13. THE PLANS AND PROFILES WERE DEVELOPED INCORPORATING THE INFORMATION AVAILABLE AT THE TIME OF DESIGN.

SITE LEGEND

ELEVATION CONTOUR
EX. EDGE OF PAVEMENT
PROPERTY LINES
RIGHT OF WAY LIMIT
EX. OVERHEAD ELECTRIC
EX. BUILDING
EX. WATER
EX. SANITARY
EX. UTILITY RISE
EX. STORM DRAIN
EX. GAS
EX. COMMUNICATIONS
EX. ELECTRIC
EX. FENCE

TEST BORING LEGEND