Exception Request: No. 7
Section: WBR3
Station: 2531+00 to 2575+20
Drawing No.: WBR3 C223 to C229
Survey Report Cross Reference No.: WBR3 C220 to C225
Exception Type: Alignment in Pavement
Splice Enclosure in Pavement
Crossing Over Existing Utility/Drainage

Summary of Justification for Exception

NPT is requesting an exception from the UAM guidelines for the location of the cable trench in the pavement on US 3, Daniel Webster Highway from station 2531+00 to 2575+20 of the NPT WBR3 underground alignment section, sheets WBR3 C223 to C229 and the splice enclosure at STA 2561+80. Due to limited ROW space and conflicts with terrain, slope and existing utilities/drainage structures, construction outside the pavement is not possible. NPT does not have the necessary property rights to construct outside the NHDOT ROW. The proposed alignment is located beneath the pavement at a 5-foot offset from existing utilities to avoid future conflicts with repairs or replacement or disruption to the existing utilities.

In addition, the exception request in this area includes multiple crossings above existing utilities and drainage structures, specifically, a 15-inch reinforced concrete pipe (RCP) culvert and a 12-inch clay sewer. The proposed alignment is set within the pavement and over the existing utilities to avoid road closures and increased construction width that will extend the duration of construction and traffic impacts.

Technical Discussion of Justification of Exception

Alignment in Pavement/Splice Enclosure in Pavement
The ductbank alignment in the roadway at this location is constrained by existing utilities and drainage structures on both the eastern and western sides of US 3. Due to limited ROW space, relocating utility and stormwater infrastructure (including catch basins, sewer manholes and water main components) would result in significant traffic impacts from having to reconstruct multiple utilities.

We have reviewed the alignment in this area and have proposed a change in the alignment to eliminate the road crossing at station 2523+48, as shown in Exhibit A. Due to the utility conflicts, the alignment would still be in the pavement but would be able to be constructed much closer to the edge of pavement than on the west side as currently proposed. This change would also eliminate a road crossing.

Finally, there may be some locations where it might initially appear that the alignment could be moved closer to the edge of pavement for short sections and then moved back out to avoid utilities. However, these adjustments over short distances would produce additional cable bends that increase the cable pulling tensions during installation. These increased tensions could damage the cable and the embedded fiber that monitors the safe loading limits of the cable. In addition, the cumulative effect of the additional cable bends limit the length that the cable can be pulled through the conduit and would result in the need for additional splice enclosures which would further encumber the roadway.

Excavation limits and work areas are shown on the attached drawings. During construction, one lane will remain open to traffic at all times.

Crossing Over Existing Utility/Drainage
The proposed alignment is set within the pavement and over multiple existing utilities to avoid road closures, unreasonable costs associated with a deeper excavation and increased construction width that will extend the duration of construction and traffic impacts, as further described below.

1. *15-inch RCP Culvert*
   NPT's exception request includes crossing above an existing 15-inch RCP culvert on US 3, Daniel Webster Highway at STA 2539+75. There is 13 feet of cover over the culvert. The attached Exhibits A and B have been provided for this location to illustrate the constraints associated with installing the ductbank below the existing RCP culvert. See Exhibit B.

2. *12-inch clay sewer main*
   NPT's exception request includes crossing above an existing 12-inch clay sewer main on US 3, Daniel Webster Highway at STA 2573+75. There is 12 feet of cover over the sewer. The attached Exhibits A and C have been provided for this location to illustrate the constraints associated with installing the ductbank below the sewer main. See Exhibit C.

The vertical positioning of the cable trench is constrained by the depth of the existing utilities. (See Exhibits A and C). Crossing under the existing culvert to meet the required 2-foot minimum separation will require a greater separation of the conduits and cable to accommodate thermal design criteria for the electric cables resulting from the additional depth. In addition, in order to maintain the minimum separation between the two conduits and cables, the crossing will require two separate crossings. This trench width and additional offsets necessary for construction would likely require either complete road closures or result in significant traffic impacts, including extended duration of construction within roadway to allow for sheeting installation and removal and extensive excavation due to the depth and width of the trench. We estimate that these construction alternatives will add one to two weeks to the traffic impacts. Finally, we estimate the increase in cost associated with crossing underneath the utilities would be approximately $200,000 for each of these two sections for a total of $400,000. (See Exhibit D.) Road closures are not needed for the proposed installation, which thereby minimizes traffic impacts and attendant safety issues.

We have also evaluated a trenchless option to pass under the three sewer lines. The trenchless installation will be unreasonably costly (a net estimated increase of $2,069,100 to cross under the sewer lines). (See cost estimate attached in Exhibit D). Also, traffic impacts would be increased for a trenchless installation due to the addition of trenchless work areas and the extended duration of installation.

Impacts

Alignment in Pavement
The design, as proposed, will not adversely affect the design, construction, stability, traffic, safety, environmental commitments, maintenance, or operation of the highway. The installation of the ductbank and pavement restoration will be designed and constructed in accordance with conditions outlined in the NHDOT's April 3, 2017 letter to the New Hampshire Site Evaluation Committee. The

installation's proposed depth meets NHDOT's criteria relating to the structural box to minimize any potential conflicts with maintenance and future highway projects. A traffic control plan has been submitted to the NHDOT for this design and complies with the Manual on Uniform Traffic Control Devices.

Splice Enclosure in Pavement
The design, as proposed, will not adversely affect the design, construction, stability, traffic, safety, environmental commitments, maintenance, or operation of the highway. The proposed splice enclosure and ancillary closures will be of a minimum rating of HS-20, in accordance with NHDOT requirements. The additional fiber splice box at this location is proposed outside the pavement. The installation of the enclosure and pavement restoration will be designed and constructed in accordance with conditions outlined in the NHDOT's April 3, 2017 letter to the New Hampshire Site Evaluation Committee. The installation's proposed depth meets NHDOT's criteria relating to the structural box to minimize any potential conflicts with maintenance and future highway projects.

Crossing over Existing Utilities/Drainage
In connection with future maintenance activities, especially related to sewer main and culverts, NPT will provide any and all required support, including but not limited to, providing crews to assist while work is being conducted in the vicinity of the utilities/culvert.

<u>Supporting Documentation</u>

Alignment in Pavement/Splice Enclosure in Pavement
See attached Exhibit A showing plans, and profiles for the proposed installation.

Crossing over Existing Utilities/Drainage
See attached Exhibits A through C showing plans, profiles, and sections. Cost estimates are included in Exhibit D.

Exhibit D - Exception 7 Cost Estimates

Additional Cost for each of the Trenches Under Culvert

Length	200'			
Max Depth	15.9			
Min Depth	6.7'			
	Quantity	Units	Unit Price	Total
Trench Cost for Deeper Trench	200	LF	$1,150.00	$230,000.00
Deduct for Base Trench Cost	200	LF	$150.00	($30,000.00)
Net Additional Cost for each trench				$200,000.00

1. Cost assumes rock excavation not required.
2. Costs based on contractual unit pricing for the project.
3. 200 foot minimum length required for the trenching installation is required to accommodate the gradual slope necessary to accommodate the minimum bend.
4. The crossing will require two separate trenches to maintain minimum separation to accommodate the thermal design criteria. The total estimated cost for the two 200 LF trenches for a total of $400,000.

Additional Cost for Installing HDD Under Culvert

Length	900'			
Max Depth	27.5'			
Min Depth	6.7'			
	Quantity	Units	Unit Price	Total
HDD (2-8" Bores)	900	LF	$2,490.00	$2,241,000.00
Deduct for Base Trench Cost	900	LF	$150.00	($135,000.00)
Deduct for Surface Restoration	900	LF	$41.00	($36,900.00)
Net Additional Cost				$2,069,100.00

1. Cost assumes rock excavation not required.
2. Costs based on contractual unit pricing for the project.
3. 900 foot minimum length required for HDD installation to accommodate minimum bending requirements.