

**Exception Request No.: 101**  
**Section: SHEB**  
**Town: Bethlehem**  
**Highway: NH 18 /NH 116 (Tier 3)**  
**Station: 157+18 to 164+31**  
**Drawing No.: SHEB010-1 and SHEB010-2; ROCK C119; SHEB C101 to C102**  
**Survey Report Reference No.: ROCK C118 to C119 and SHEB C099**  
**Exception Type: HDD Pits Within Pavement**  
**HDD Alignment Passing Under Pavement**

#### Traffic Information

NHS: No  
ADT: 1181  
Traffic Control Type: Alt 1-way  
Traffic Control Duration: Traffic control duration for the proposed installation is estimated to be approximately 3-5 weeks.

#### Summary of Justification for Exception

NPT is requesting an exception from the UAM guidelines regarding the location of the HDD 010 entry and exit pits relative to the existing NH 18/NH 116 pavement limits. HDD 010 extends from approximately STA 157+18 to 164+31, and is required to allow installation of the duct below two 30" CMP culverts. This location involves two separate bores. Each HDD installation requires two entry pits and two exit pits. Given the dimensions of the pits, the need to maintain separation between the two bores and separation from the edge of ROW, and the limited space available off the paved roadway at this location, one of the entry pits and one of the exit pits must be in the paved roadway.

In addition, NPT is requesting an exception from the UAM guidelines to allow the location of the HDD 010 bore paths beneath the NH 18/NH 116 pavement. The HDD bore paths will have no impact on the NHDOT highway structural box.

#### Technical Discussion of Justification of Exception

##### *HDD Pits Within Pavement*

Each of the bores requires an entry pit and an exit pit (4 pits total). These pits will be approximately 4 feet x 4 feet in plan dimension (each). The HDD bores must be separated by approximately 20 feet at their maximum depth (31 feet) to minimize the risk of interference during drilling, and to accommodate thermal design criteria of the electric cables. The HDD entry and exit points at grade are approximately 10 feet apart, and at least 10 feet from the edge of ROW (for equipment access). (Note: because the typical degree of accuracy with HDD is +/- 5-feet, the bore paths have been designed to maintain minimum separation of approximately 10 feet from each other.)

The following elements are required to construct the pits: (i) the center of the 2 entry pits (and the 2 exit pits) must be approximately 10 feet apart at grade; (ii) the 4 foot by 4 foot dimension of each pit; (iii) the need to start the bore at least 10 feet from the ROW edge; and (iv) the need for a level work area for the drill equipment. Consequently, NPT would need approximately 30 feet of level, stable, non-vegetated

clear space from the edge of pavement to the edge of the ROW at the location of the entry pits and approximately 25 feet at exit pits to avoid impacting the paved area entirely.

The alignment of the cable system adjacent to the entry location is on the south side of NH 18/NH 116. The HDD 010 entry location is located on the south side of NH 18 due to the availability of work space in this area and to address the NHDOT's comment to avoid road crossings where feasible. (See photograph #1 of entry location in Exhibit A and Sheet SHEB010-1).

The north side of NH 18/NH 116 is not a feasible location for the entry location because it is occupied by a soil slope and mature trees, which would need to be removed. In addition, use of the north side for the entry location would require an open-trench road crossing (and NHDOT exception approval for such a crossing).

There is not sufficient clear space at the HDD 010 entry location to keep both pits off the paved roadway. The distance between the edge of pavement and edge of ROW is approximately 12 feet (less than the required 30 feet).

The HDD 010 exit is located on the south side of NH 18/NH 116 (see photograph #2 of exit location in Exhibit A and Sheet SHEB010-1). There is not sufficient clear space at the HDD 010 exit location to keep both pits off the paved roadway. The clear space on the south side of NH 18 off the paved road is approximately 10 feet (less than the required 25 feet), which is not enough space to keep both entry pits off the paved area. In addition, the north side of NH 18 is occupied by a forested soil slope, which will require tree cutting, and will be difficult to access. Use of the north side of Route 18 for the exit location would require an open-trench road crossing (and NHDOT exception approval for such a crossing).

In summary, given the constraints at this HDD installation, NPT is seeking an exception to allow one of the HDD entry pits and one of the HDD exit pits to be located within the paved area.

Note: Where the entry and/or exit pits are located in the paved area, the alignment transitions back to the area off the paved roadway over as short an area as possible, consistent with physical constraints at the location, the bending radius of the cable, and the bending radius of the HDD pipe. The precise distance between the location of the pit(s) in the road and the point where the alignment leaves the paved road is location-specific and cannot be stated with technically-accurate specificity until final engineering plans are completed. Under typical conditions, where one entry pit or one exit pit is located within the pavement approximately 5 feet from the edge of the road and there are no physical constraints off the edge of ROW, the transition back to the unpaved area will occur within approximately 50 linear feet of the pit.

#### *HDD Alignment Passing Under Pavement*

From approximately Station 157+18 to 164+31, one or both of the bore paths are located beneath the pavement, as shown in drawing SHEB010-1 attached. The distance between the edge of Route 18 pavement and the ROW (plan distance) is approximately 12 to 20 feet on either side of the road. With two (2) bores spaced at 20 feet and an offset of 5 feet from the ROW, it is not possible to avoid drilling beneath the pavement at this location.

The proposed bore paths are placed up to 31-feet below the pavement and well below the pavement structural components of the highway and frost depths. Therefore, the design has no impact on the existing NHDOT facilities because it is below the structural box, frost zone, and all utilities.

The depth of installation and trenchless construction method eliminate risk of settlement differential, pavement distress, or frost heaving that could adversely impact winter maintenance activities or the drivability of the roadway. Similarly, pavement matching concerns do not exist because there is no disturbance to the pavement. Moreover, the trenchless design in each of the requested exception locations is below all existing utilities and drainage structures, thereby eliminating potential for any impacts upon future maintenance activities or operations.

### Impacts

The design, as proposed, will not adversely affect the design, construction, stability, traffic, safety, environmental commitments, maintenance, or operation of Route 18/Route 116. 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 proposed depth of the installation 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.

As to the portions of the HDD alignment under the NHDOT structural box, the proposed trenchless construction techniques will not impact the structural components of the highway, the frost zone, or other utilities, and therefore the proposed design will not adversely affect the design, construction, stability, traffic, safety, environmental commitments, maintenance, or operation of the highway.

The surface workspace limits required for HDD 010 are shown on sheet SHEB010-2. The workspace shown will allow at least one lane of traffic flow through the site at all times. This is in keeping with the submitted traffic control plan.

### Supporting Documentation

See photographs in Exhibit A. See attached drawing SHEB010-1 showing the proposed HDD design geometry in plan and profile, and drawing SHEB010-2 for the required workspace. Also included for reference are duct bank drawings for the areas on both sides of this HDD. (See ROCK C119; SHEB C101 to C102.)

Exception Request No.: 101  
Exhibit A

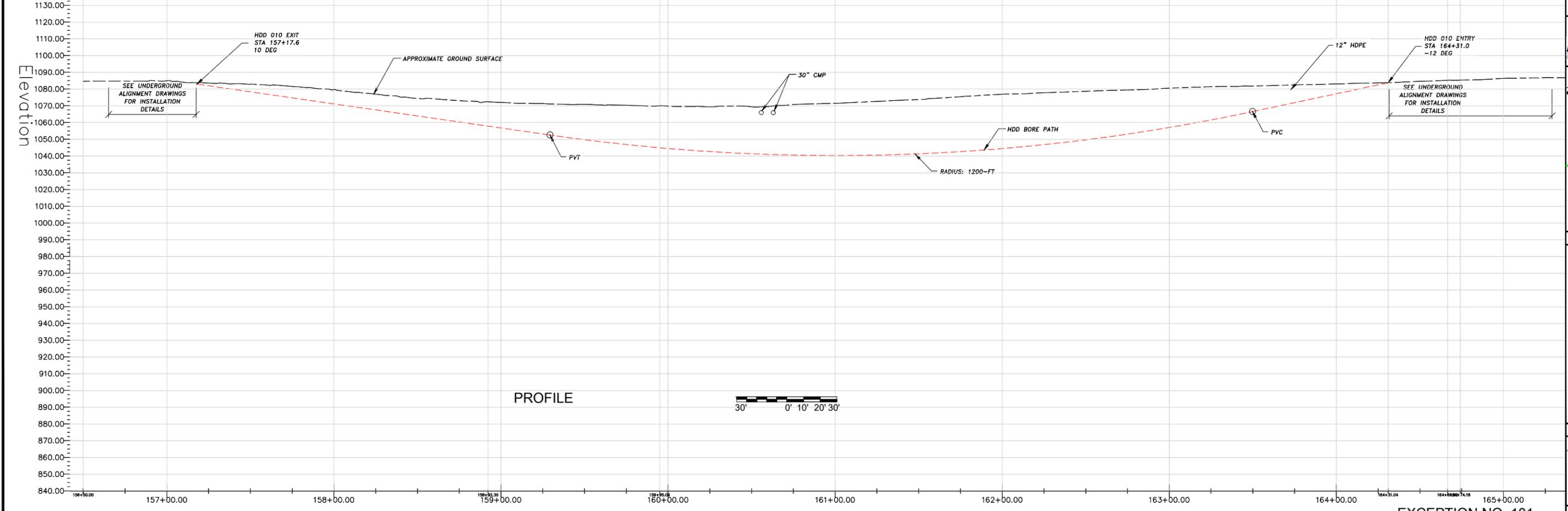
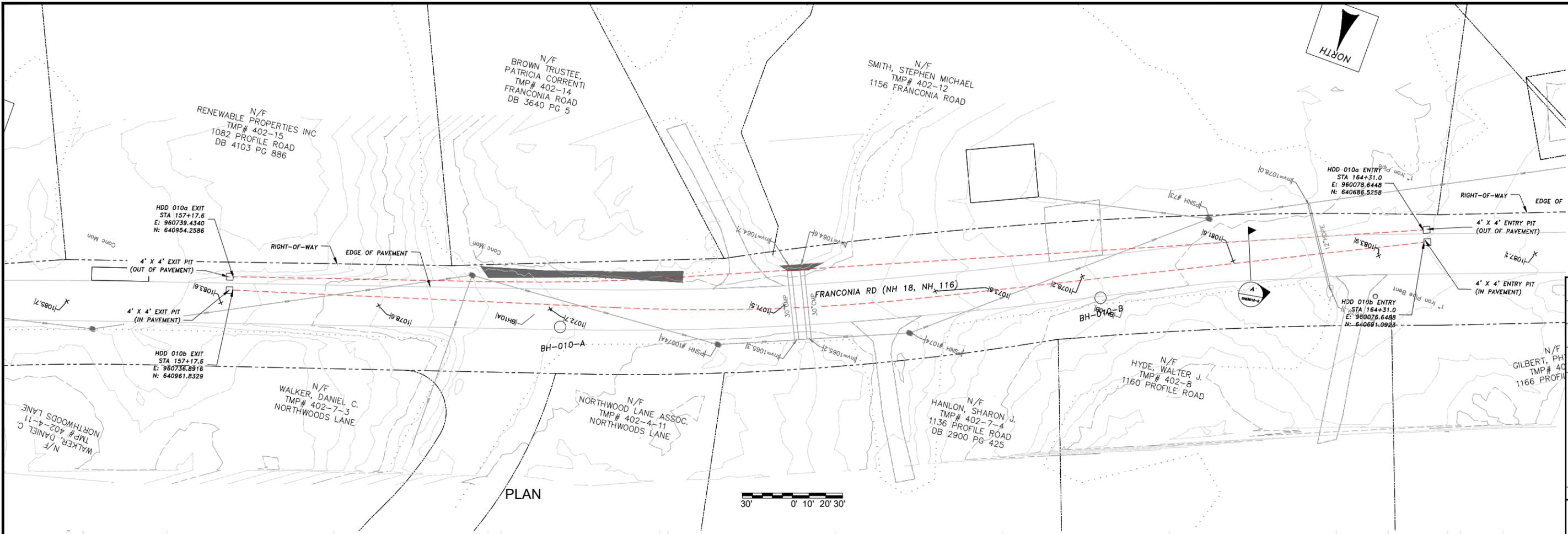


Photograph #1 – HDD 010 entry area, facing east.



Photograph #2 – HDD 010 exit area, facing east.

PRELIMINARY - NOT FOR CONSTRUCTION



NO.	PRELIMINARY DESIGN	REVISION	DATE	BY	CHKD	APPR.

BRIERLEY ASSOCIATES  
Creating Space Underground



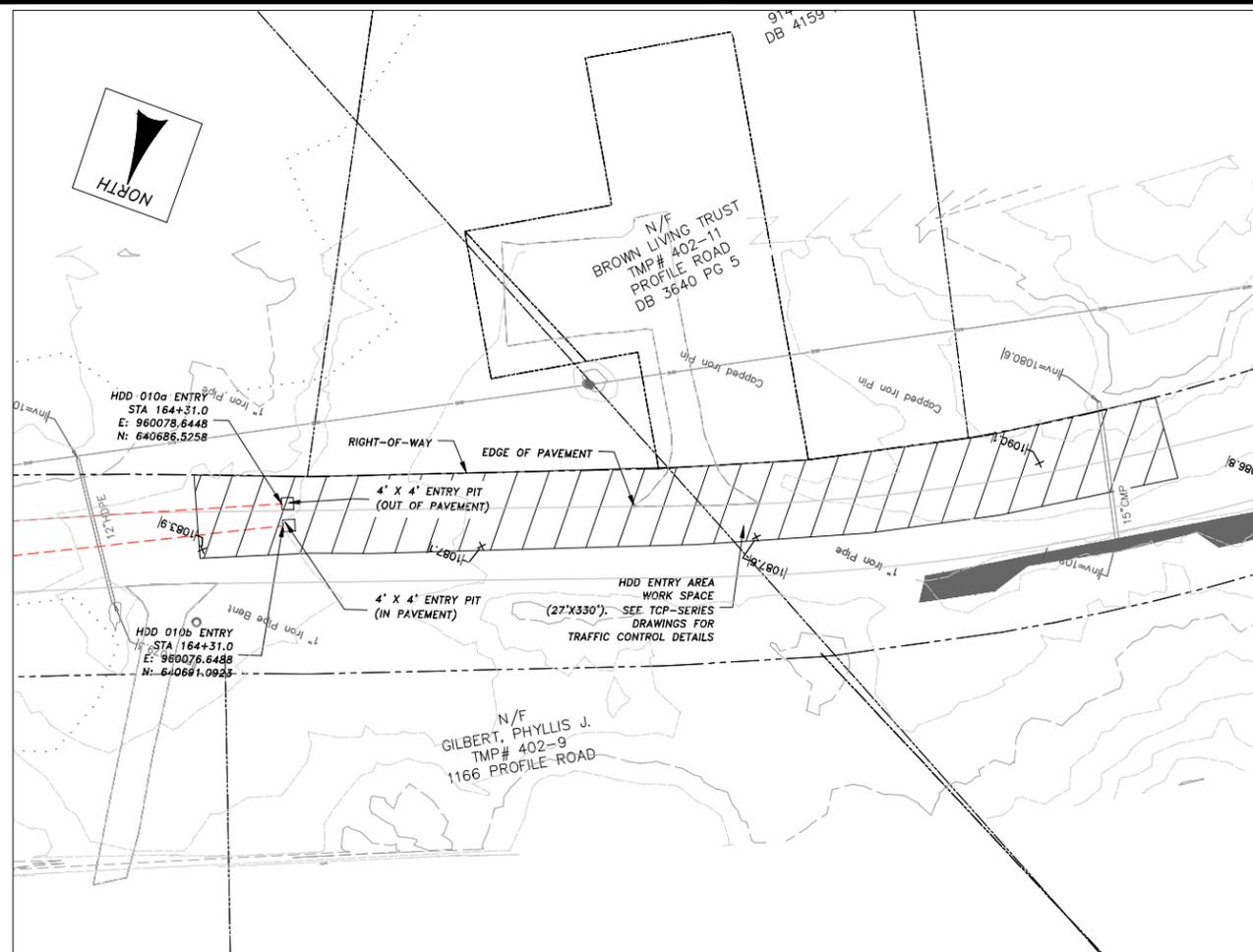
Transmission Business

NPT  
UNDERGROUND ALIGNMENT  
TRENCHLESS CROSSINGS  
SCALE: 1" = 30'  
DATE: 10/7/2016

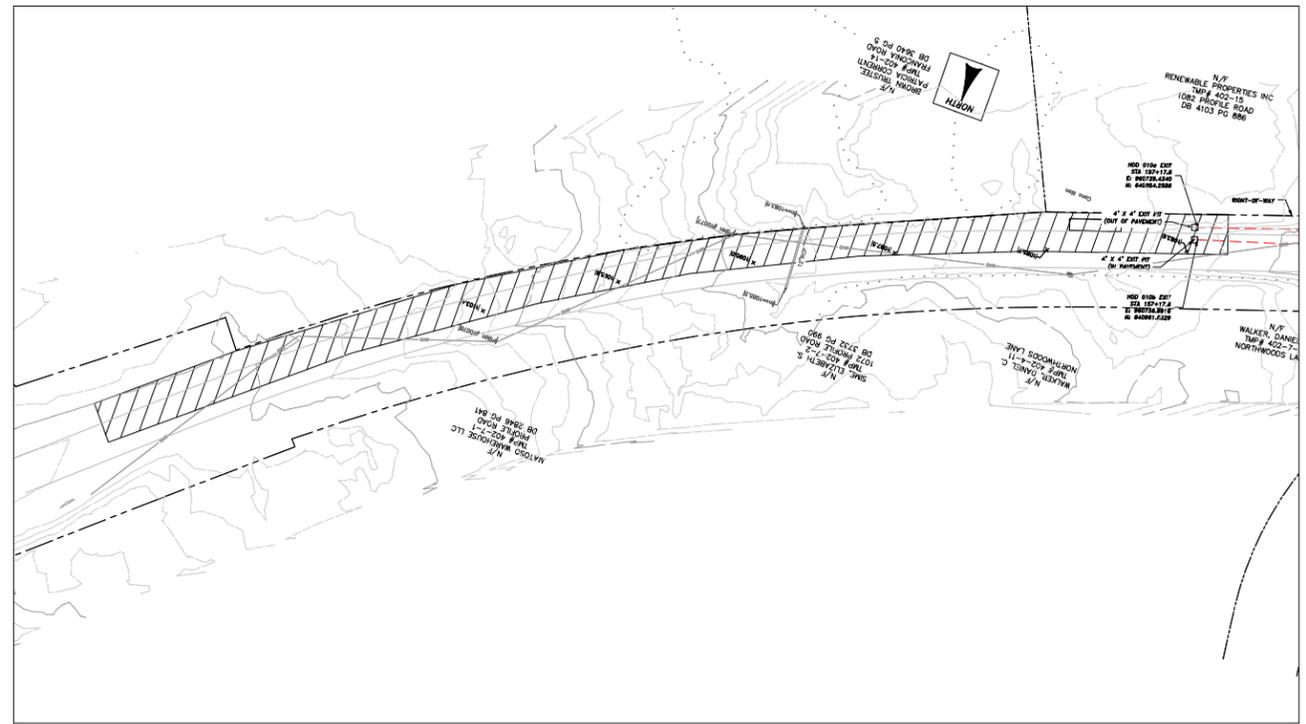
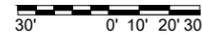
DES: CHK:  
DRW: APR:  
TOWN: BETHLEHEM

TRANSMISSION LINE:  
SHEB  
SHEET  
SHEB010-1

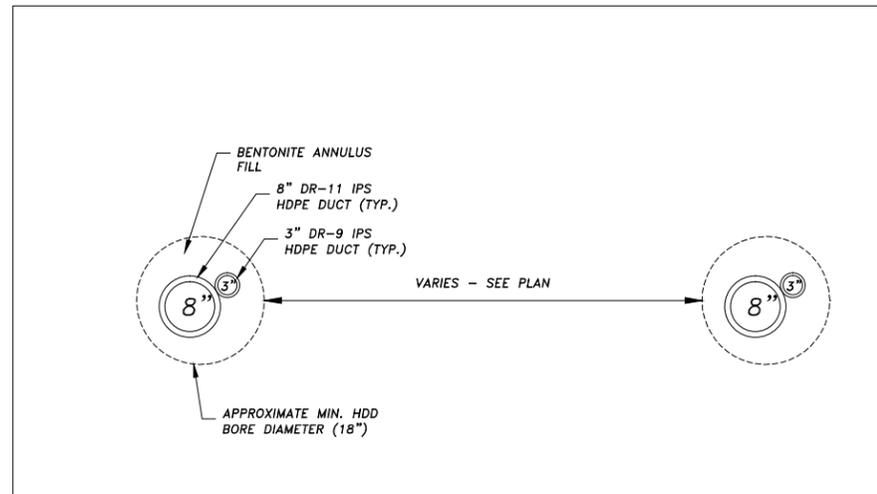
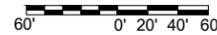
EXCEPTION NO. 101



HDD 010 ENTRY AREA WORK SPACE



HDD 010 EXIT AREA WORK SPACE



DETAIL A - HDD 010 DUCT BUNDLE  
SCALE: N.T.S.

PRELIMINARY - NOT FOR CONSTRUCTION

NO.	PRELIMINARY DESIGN REVISION	DATE	DRWN	CHKD	APPRD

BRIERLEY ASSOCIATES  
Creating Space Underground



Transmission Business

NPT UNDERGROUND ALIGNMENT TRENCHLESS CROSSINGS  
SCALE: 1" = 30'  
DATE: 10/7/2016

DES: CHK:  
DRW: APR:

TOWN: BETHLEHEM

TRANSMISSION LINE:

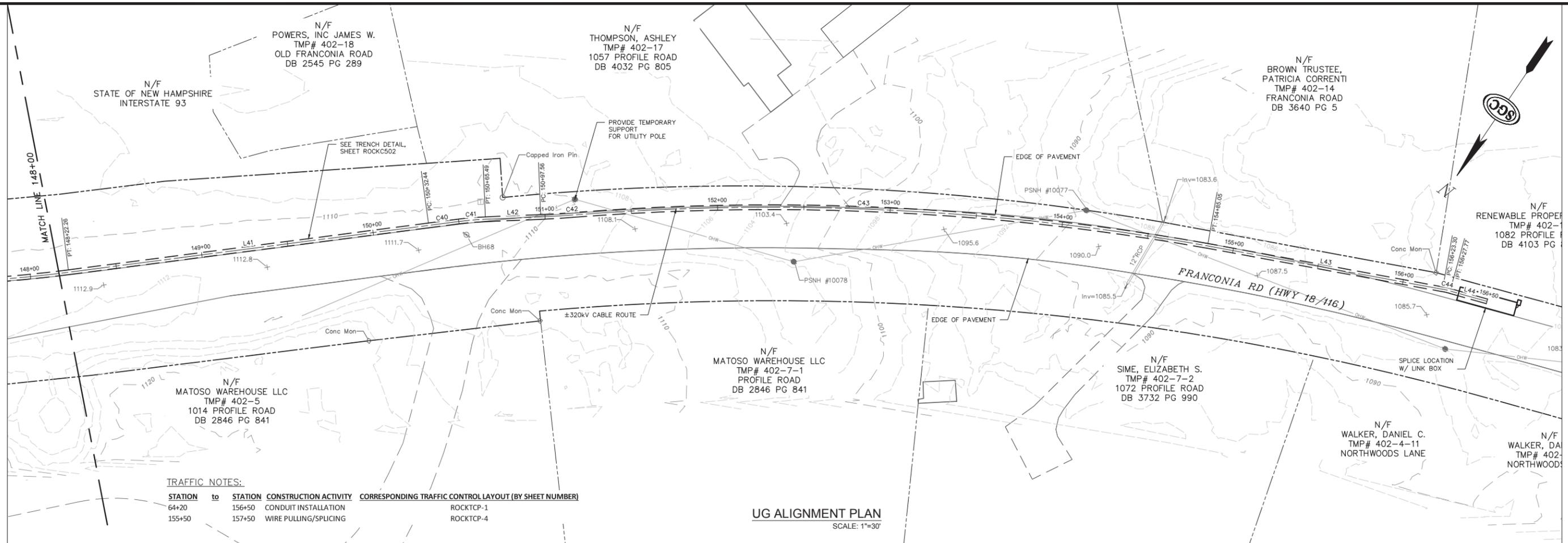
SHEB

SHEET

SHEB010-2

EXCEPTION NO. 101

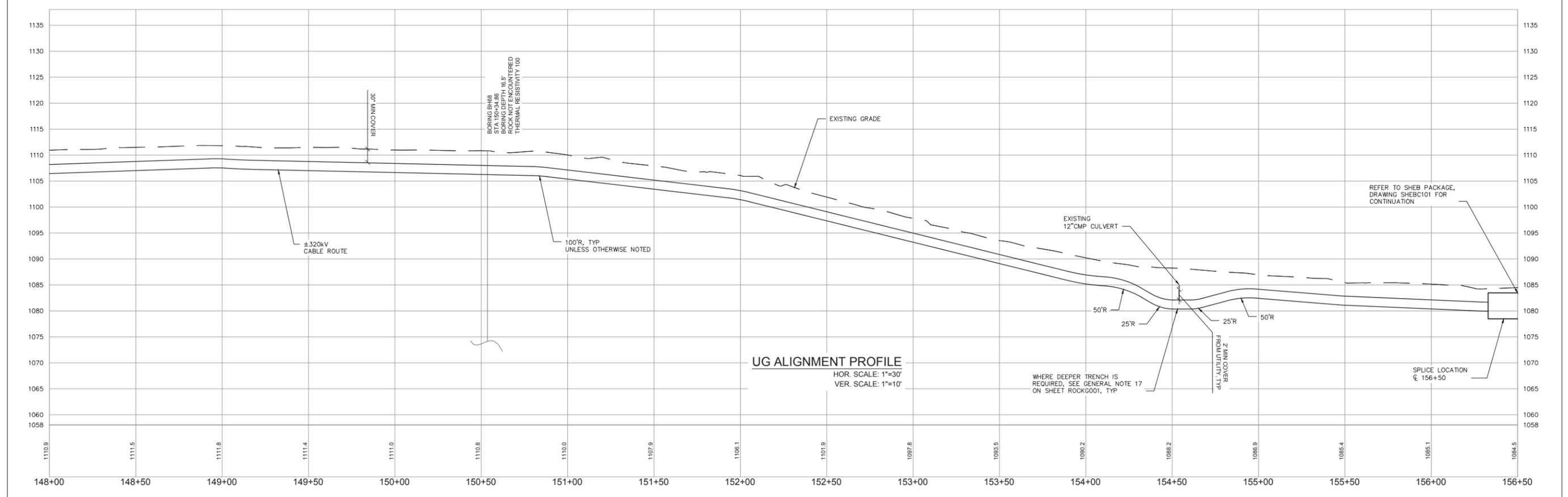
**PRELIMINARY - NOT FOR CONSTRUCTION**



**TRAFFIC NOTES:**

STATION	to	STATION	CONSTRUCTION ACTIVITY	CORRESPONDING TRAFFIC CONTROL LAYOUT (BY SHEET NUMBER)
64+20		156+50	CONDUIT INSTALLATION	ROCKTCP-1
155+50		157+50	WIRE PULLING/SPLICING	ROCKTCP-4

**UG ALIGNMENT PLAN**  
SCALE: 1"=30'



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

NO.	REVISION	DATE	BY	CHKD	APPRV.
1	ISSUED FOR PERMIT	12/21/16	DGR	TWD	TWD
2	ISSUED FOR REVIEW-PAGE TURN	12/27/16	DGR	TWD	TWD
3	ISSUED FOR REVIEW	12/27/16	DGR	TWD	TWD
4	ISSUED FOR REVIEW	12/27/16	DGR	TWD	TWD



Transmission Business

C

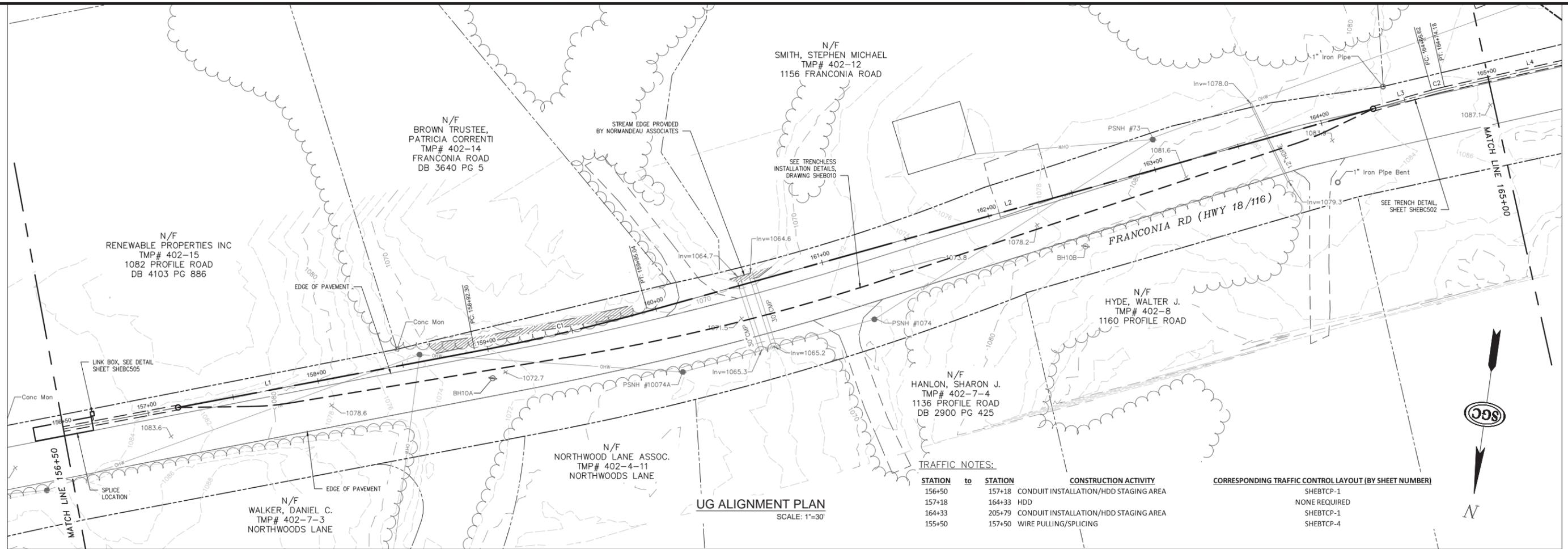
NPT  
ROCK-UNDERGROUND ALIGNMENT  
STA 148+00 TO 156+50  
DATE: 12/13/2016  
SCALE: 1"=30', V. 1"=10'

DES: TDD  
CHKD: TDD  
DRW: DGR  
APR: TWD  
TOWN: BETHLEHEM

TRANSMISSION LINE:  
**ROCK**

**ROCK119**

**PRELIMINARY - NOT FOR CONSTRUCTION**

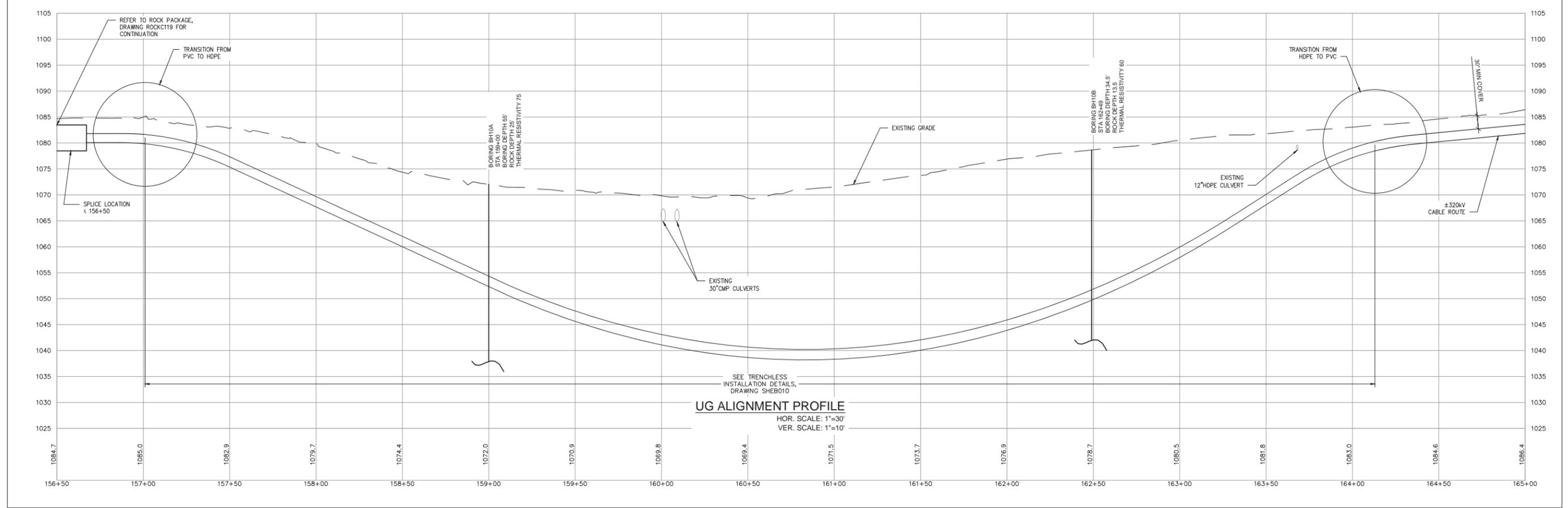


**TRAFFIC NOTES:**

STATION	to	STATION	CONSTRUCTION ACTIVITY
156+50		157+18	CONDUIT INSTALLATION/HDD STAGING AREA
157+18		164+33	HDD
164+33		205+79	CONDUIT INSTALLATION/HDD STAGING AREA
155+50		157+50	WIRE PULLING/SPLICING

**CORRESPONDING TRAFFIC CONTROL LAYOUT (BY SHEET NUMBER)**

SHEBTCP-1
NONE REQUIRED
SHEBTCP-1
SHEBTCP-4



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



NO.	DATE	BY	CHKD	APPRV.
1	12/21/16	TDD	TMH	TMH
2	12/28/16	TDD	TMH	TMH
3	11/18/16	TDD	TMH	TMH

SGC Engineering, LLC  
 PAR  
 THE NORTHERN PASS  
 Transmission Business

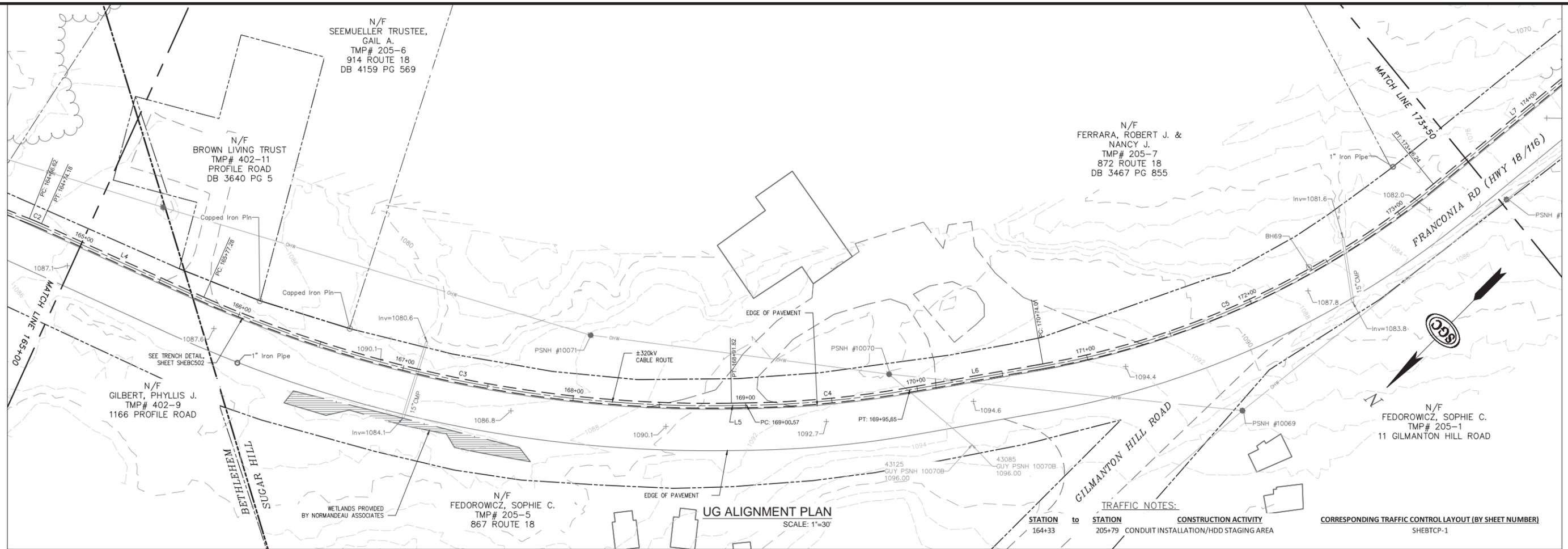
NPT  
 SHEB - UNDERGROUND ALIGNMENT  
 STA 156+41 TO 164+00  
 DATE: 12/13/2016  
 SCALE: H: 1"=30', V: 1"=10'

DES: TDD  
 CHK: TMH  
 DRW: TDD  
 APR: TMH  
 TOWN: BETHLEHEM

TRANSMISSION LINE:  
**SHEB**

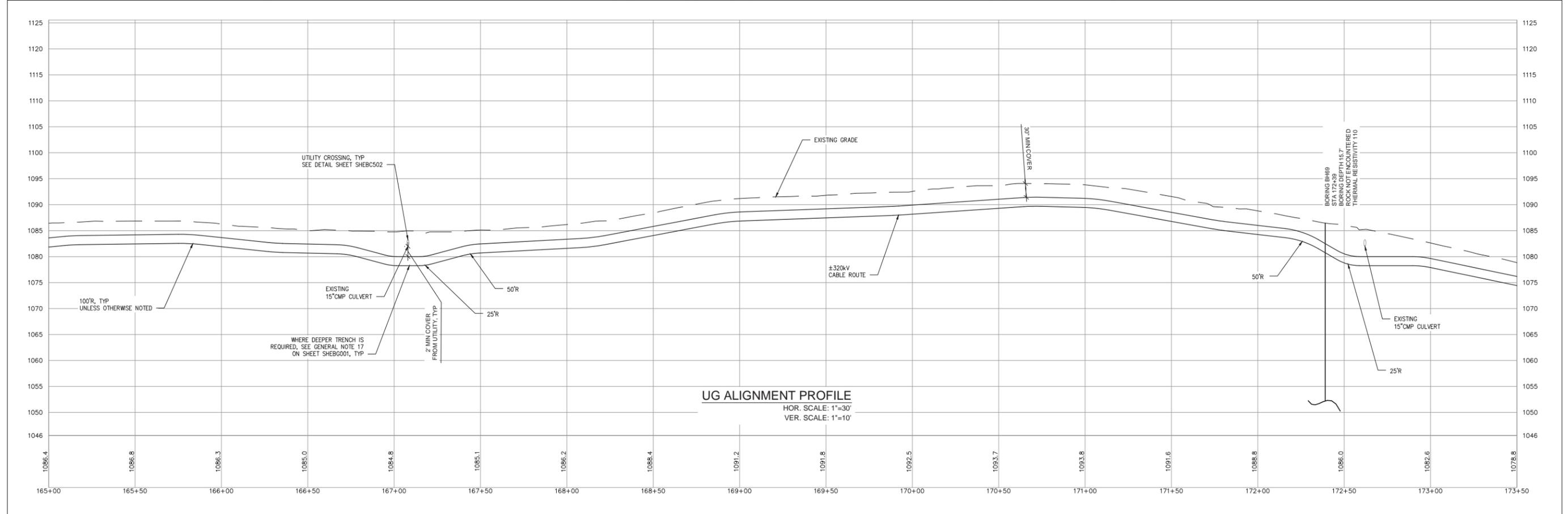
SHEBC101

**PRELIMINARY - NOT FOR CONSTRUCTION**



TRAFFIC NOTES:

STATION	to	STATION	CONSTRUCTION ACTIVITY	CORRESPONDING TRAFFIC CONTROL LAYOUT (BY SHEET NUMBER)
164+33		205+79	CONDUIT INSTALLATION/HDD STAGING AREA	SHEBTCP-1



NO.	DATE	BY	CHKD	APPROV.
1	12/21/16	TDD	TDD	TDD
2	12/28/16	TDD	TDD	TDD
3	11/18/16	TDD	TDD	TDD

SGC Engineering, LLC  
 PAR  
 THE NORTHERN PASS  
 Transmission Business

NPT  
 SHEB - UNDERGROUND ALIGNMENT  
 STA 165+00 TO 173+50  
 DATE: 12/12/2016  
 SCALE: H: 1"=30', V: 1"=10'  
 DES: TDD  
 CHK: TDD  
 DRW: TDD  
 APR: TDD  
 TOWN: BETHLEHEM/SUGAR HILL  
 TRANSMISSION LINE: SHEB  
 SHEBC102