PJM Facilities Study Report

For

Network Upgrade N9112

Transition Cycle #1

June 2025

Introduction

This Facilities Study has been prepared in accordance with the PJM Open Access Transmission Tariff and PJM Manuals. The Transmission Owner (TO) is Virginia Electric and Power Company (VEPCO or Dominion).

A. Project Description

The System Impact Study for PJM Interconnection Transition Cycle #1 has identified the need for PJM Network Upgrade N9112. The scope of this Network Upgrade includes the following:

- Upgrade 12.4 Miles of 230kV transmission line 259 from Basin to Chesterfield

B. Transmission Owner Facilities Study Results

1. Detailed Scope of work for Network Upgrade N9112:

The following is a detailed description of Transmission Owner Upgrades for Network Upgrade N9112. These facilities shall be designed according to the Transmission Owner's Applicable Technical Requirements and Standards. Once built the Transmission Owner will own, operate, and maintain these facilities.

See Preliminary Scoping Summaries located in the Appendices, Attachment #1, #2 and #3.

2. MILESTONE SCHEDULE FOR COMPLETION OF DOMINION WORK

Facilities outlined in this report are estimated to take 46 months to construct, from the time of full execution of the Generation Interconnection Agreement and completion of a construction kickoff call. This schedule may be impacted by the timeline for procurement and installation of long lead items and the ability to obtain outages to construct and test the proposed facilities.

Description	Start month	Finish month
Engineering	1	30
Permitting/Procurement	3	38
Construction	36	46

3. ASSUMPTIONS IN DEVELOPING SCOPE/COST/SCHEDULE

- The preliminary construction schedule is dependent on outage availability.
- See Attachment 1 and 2– Preliminary Scoping Summary – Substation for additional assumptions
- See Attachment 3 – Preliminary Scoping Summary – Transmission line for additional assumptions

4. LAND REQUIREMENTS

Dominion will be responsible for the following expectations in the area of Real Estate:

- Any additional land needed for Storm Water Management, Landscaping, and Wetlands/Wetlands Mitigation.
- Any other Land/Permitting requirements required by the Network Upgrade

5. ENVIRONMENTAL AND PERMITING

The Dominion will be responsible for the following expectations in the area of Environmental and Permitting:

- Assessment of environmental impacts related to the Network Upgrade including:
    - Environmental Impact Study requirements
    - Environmental Permitting
- A stormwater easement and/or specific stormwater design BMP's to allow access to and use of the facilities, including a maintenance agreement for said stormwater facilities.
- Conditional Use Permit for Substation
- Any additional land needed for Storm Water Management, Landscaping, and Wetlands/Wetlands Mitigation
- Any other Permitting requirements required by the Network Upgrade

C. APPENDICES

Attachment #1: Preliminary Scoping Summary – Substation Basin

Attachment #2: Preliminary Scoping Summary – Substation Chesterfield

Attachment #3: Preliminary Scoping Summary – Transmission

Attachment #1

Project Number: N9112 – Basin Substation

Project Description: Replace Line Lead for Line 259

SUBSTATION SCOPE OF WORK

Date: 06/20/2025

Revision Number: 0

Project Summary

Network upgrade N9112 provides for the uprate of line 259 at Basin Substation in Richmond City, Virginia

Purchase and install substation material – Network Upgrade:

1. Conductors, connectors, and grounding materials as per engineering standards

Purchase and install relay material – Network Upgrade:

1. One (1), 1341 – 24” dual SEL-411L DCB/PLC Straight bus panel

Remove relay material – Network Upgrade:

1. Remove Panel No. 41

Attachment #2

Project Number: N9112 – Chesterfield Substation

Project Description: Replace Line Lead for Line 259

SUBSTATION SCOPE OF WORK

Date: 06/20/2025

Revision Number: 0

Project Summary

Network upgrade N9112 provides for the uprate of line 259 at Chesterfield Substation in Chesterfield County, Virginia.

Purchase and install substation material – Network Upgrade:

2. Conductors, connectors, and grounding materials as per engineering standards

Purchase and install relay material – Network Upgrade:

2. One (1), 1340 – 24” dual SEL-411L DCB/PLC line panel

Remove relay material – Network Upgrade:

1. Remove Panel No. 11

Attachment #3

230 kV LINE #259

Basin Sub – Chesterfield Sub

PROJECT N9112

PRELIMINARY SCOPING SUMMARY

This project serves to rebuild 230kV line 259 from Basin Substation to Chesterfield Substation for approximately 12.4 miles, which is located in Richmond City and Chesterfield County, VA. See **Figure 1** for the project location. The proposed work will require additional right of way in certain areas of the project. The project will install a total of one hundred and ten (110) new structures. This project will require a CPCN filing.

Line 259 utilizes double circuit structures and shares the existing structures with the following circuits: 208, 282, and 2065. The existing line consists of painted steel, galvanized steel, and weathering steel double circuit monopoles and double circuit towers built between 1962 and 1980. The proposed structures to be installed are double circuit engineered steel monopoles. The existing conductors are single (1) 2500 ACAR, single (1) 1033.5 ACSR "Ortolan", twin bundled (2) 721 ACAR, and twin bundled (2) 636 ACSR "Rook" will be replaced with twin bundled (2) 768 ACSS/TW/HS "Maumee" conductor. The existing shield wire and OPGW are 3#6 Alumoweld, Fibral F292, and S1-95/47 96 fiber, which will be replaced with two (2) DNO-11410 OPGW.

Design Considerations:

EXISTING FACILITIES TO BE REMOVED:

1. Remove two (2) existing 230 kV double circuit weathering steel suspension monopoles as follows:
    a. Structures 259/60 (282/112) and 259/61 (282/111)

2. Remove twenty (20) existing 230 kV double circuit painted steel suspension monopoles as follows:
    a. Structures 259/13-14 (2065/160-159), 259/16 (2065/157), 259/21 (2065/152), 259/23-25 (2065/150-148), 259/27-29 (2065/146-144), 259/36 (282/137), 259/44-48 (282/129-125), and 259/50-53 (282/123-120)

3. Remove one (1) existing 230 kV double circuit galvanized steel suspension monopole as follows:
    a. Structure 259/36A (282/137A)

4. Remove one (1) existing 230 kV double circuit painted steel suspension monopole as follows:
    a. Structure 259/91A (208/81A)

5. Remove two (2) existing 230 kV double circuit weathering steel double-dead end monopole as follows:

a. Structures 259/4 (2065/169) and 259/62 (282/110)

6. Remove twenty-three (23) existing 230 kV double circuit painted steel double-dead end monopole as follows:
    a. Structures 259/15 (2065/158), 259/17-20 (2065/156-153), 259/22 (2065/151), 259/26 (2065/147), 259/31-35 (282/142-138), 259/37-43 (282/136-130), 259/49 (282/124), 259/53A (282/119), and 259/54-55 (282/118-117)

7. Remove three (3) existing 230 kV double circuit galvanized steel double-dead end monopole as follows:
    a. Structures 259/90-92 (208/80-82)

8. Remove seventeen (17) existing 230 kV double circuit weathering steel suspension towers as follows:
    a. Structures 259/2 (2065/171), 259/6-11 (2065/167-162), and 259/63-72 (282/109-100)

9. Remove sixteen (16) existing 230 kV double circuit galvanized steel suspension towers as follows:
    a. Structures 259/81-88 (208/71-78), 259/93-94 (208/83-84), 259/96-100 (208/68-90), and 259/102 (208/92)

10. Remove thirteen (13) existing 230 kV double circuit weathering steel double-dead end towers as follows:
    a. Structures 259/1 (2065/172), 259/3 (2065/170), 259/5 (2065/168), 259/12 (2065/161), 259/57-59 (282/115-113), 259/74-78 (282/98-94), and 259/106 (208/96)

11. Remove eight (8) existing 230 kV double circuit galvanized steel double-dead end towers as follows:
    a. Structures 259/79-80 (208/69-70), 259/89 (208/79), 259/95 (208/85), 259/101 (208/91), and 259/103-105 (208/93-95)

12. Remove one (1) existing 230 kV double circuit weathering steel running angle tower as follows:
    a. Structure 259/73 (282/99)

13. Remove one (1) existing 230 kV single circuit painted steel double-dead end monopole as follows:
    a. Structure 259/30

14. Remove one (1) existing 230 kV quadruple circuit painted steel double-dead end 2-pole H-frame as follows:
    a. Structure 259/56 (282/116, 53/246, 72/246)

15. Remove approximately 4.92 miles of single (1) 2500 ACAR conductor as follows:
    a. 0.05 miles from existing structure 259/1 (2065/172) to existing backbone 259/1A
    b. 4.55 miles from existing structure 259/57 (282/115) to existing structure 259/12 (2065/161)
    c. 0.32 miles from existing backbone 259/106A (2003/1A) to existing structure 259/104 (208/94)

16. Remove approximately 3.82 miles of single (1) 1033.5 ACSR “Ortolan” conductor from existing structure 259/104 (208/94) to existing structure 259/78 (282/94).

17. Remove approximately 3.32 miles of twin bundled (2) 721 ACAR conductor as follows:
    a. 1.33 miles from existing structure 259/12 (2065/161) to existing structure 259/1 (2065/172)
    b. 0.21 miles from existing structure 259/59 (282/113) to existing structure 259/57 (282/115)
    c. 1.78 miles from existing structure 259/78 (282/94) to existing structure 259/62 (282/110)

18. Remove approximately 0.34 miles of twin bundled (2) 636 ACSR “Rook” conductor from existing structure 259/62 (282/110) to existing structure 259/59 (282/113).

19. Remove approximately 5.86 miles of one (1) Fibral F292 (12 fiber) from existing backbone 259/1A to existing structure 259/54 (282/118).

20. Remove approximately 5.86 miles of one (1) S1-95/47 96 OPGW from existing backbone 259/1A to existing structure 259/54 (282/118).

21. Remove approximately 0.11 miles of one (1) DNO-11410 OPGW from existing structure 259/79 (208/69) to existing structure 259/80 (208/70).

22. Remove approximately 6.71 miles of two (2) 3#6 Alumoweld shield wire from existing structure 259/53A (282/119) to existing structure 259/106 (208/95).

EXISTING FACILITIES TO BE MODIFIED:

1. Cut and transfer the existing one (1) DNO-11410 OPGW for Line 282 from ahead side of proposed structure 259/79 (208/69) to the back side of existing structure 282/93.
2. Transfer existing single (1) 2500 ACAR for Line 2065 from ahead side of existing backbone 2065/172A to the back side of proposed structure 259/1 (2065/172).
3. Transfer existing twin bundled (2) 721 ACAR for Line 2065 onto proposed structures to be installed from ahead side of existing structure 259/1 (2065/172) to the back side of existing

structure 259/12 (2065/161).

4. Transfer the existing single (1) 2500 ACAR for Line 2065 onto new structures to be installed from ahead side of existing structure 259/12 (2065/161) to the back side of existing structure 2065/143 (282/143).
5. Transfer the existing single (1) 2500 ACAR for Line 282 onto new structures to be installed from ahead side of existing structure 282/143 (2065/143) to the back side of existing structure 259/57 (282/115).
6. Transfer the existing twin bundled (2) 721 ACAR for Line 282 onto new structures to be installed from ahead side of existing structure 259/57 (282/115) to the back side of existing structure 259/59 (282/113).
7. Transfer the existing twin bundled (2) 636 ACSR "Rook" for Line 282 onto new structures to be installed from ahead side of existing structure 259/59 (282/113) to the back side of existing structure 259/62 (282/110).
8. Transfer the existing twin bundled (2) 721 ACAR for Line 282 onto new structures to be installed from ahead side of existing structure 259/62 (282/110) to the back side of existing structure 282/93.
9. Transfer the existing single (1) 1033.5 ACSR "Ortolan" for Line 208 onto new structures to be installed from ahead side of existing structure 259/79 (208/69) to the back side of existing structure 259/106 (208/96).
10. Replace three (3) conductor strain assemblies [Reference Drawing 32.338] and two (2) OPGW strain assemblies [Reference Drawing 96.060] on the following two (2) structures:
    a. Structures 259/1A and 259/106A (2003/1A)

PERMANENT FACILITIES TO BE INSTALLED:

1. Install fifty-seven (57) 230kV engineered steel double circuit suspension monopoles [Reference Drawing 12.610] on foundations as follows:
    a. Structures 259/2 (2065/171) , 259/6-11 (2065/167-162), 259/13-14 (2065/160-159), 259/16 (2065/157), 259/21 (2065/152), 259/23-25 (2065/150-148), 259/27-29 (2065/146-144), 259/36 (2065/137), 259/36A (282/137A), 259/44-48 (282/129-125), 259/50-53 (282/123-120), 259/60-61 (282/112-111), 259/63-72 (282/109-100), 259/81-88 (208/71-78), 259/91A (208/81A), 259/93-94 (208/83-84), 259/96-100 (208/86-90), and 259/102 (208/92)
    b. See **Figure 2** for a visual of the proposed structure design.

2. Install fifty (50) 230kV engineered steel double circuit double deadend monopoles [Reference Drawing 12.614] on foundations as follows:
    a. Structures 259/1 (2065/172), 259/3-5 (2065/170-168), 259/12 (2065/161), 259/15 (2065/158), 259/17-20 (2065/156-154), 259/22 (2065/151), 259/26 (2065/147), 259/31-35 (282/142-138), 259/37-43 (282/136-130), 259/49 (282/124), 259/53A (282/119), 259/54-55 (282/118-117), 259/57-59 (282/115-113), 259/62 (282/110), 259/73-78 (282/99-94), 259/79-80 (208/69-70), 259/89-91 (208/79-81), 259/92 (208/82), 259/95 (208/85), 259/101 (208/91), and 259/103-106 (208/93-96)
    b. See **Figure 3** for a visual of the proposed structure design

3. Install one (1) 230kV engineered steel single circuit double deadend monopole [Reference Drawing 12.414] on foundations as follows:
    a. Structure 259/30

4. Install two (2) 230kV engineered steel double circuit double deadend monopoles [Reference drawing 12.614] on foundations for structure:
    a. Structures 259/56 (282/116) (53/246) (72/246)

5. Install approximately 12.4 miles of 3-phase twin bundled (2) 768.2 ACSS/TW/HS (20/7) “Maumee” conductor from existing backbone 259/1A to existing backbone 259/106A.

6. Install approximately 12.4 miles of two (2) DNO-11410 OPGW from existing backbone 259/1A to existing backbone 259/106A.
    a. This includes the installation of fourteen (14) splices as follows:
        i. Two (2) splices on each structure 259/1A, 259/20 (2065/153), 259/40 (282/133), 259/62 (282/110), 259/80 (208/70), 259/92 (208/82), and 259/106A (2003/1A).

CONCEPTUAL SCOPE NOTES:

1. No PLS-CADD modeling was done for this project. Instead, a design span was used to determine the difference in sags between the existing and proposed conductors at max sag conditions. The resulting change in max sags between twin bundled (2) 768 ACSS/TW/HS "Maumee" conductor to single (1) 2500 ACAR conductor is approximately 31 ft. The resulting change in max sags between twin bundled (2) 768 ACSS/TW/HS "Maumee" conductor to single (1) 1033.5 ACSR "Ortolan" conductor is approximately 6.5 ft. These changes in sag are substantial enough to assume that the line must be rebuilt.

   The resulting change in max sags between twin bundled (2) 768 ACSS/TW/HS "Maumee" conductor to twin bundled (2) 721 ACAR and twin bundled (2) 636 ACSR "Rook" conductor would be sufficient to reconductor. However, the existing line consists primarily of double circuit weathering steel towers installed between 1962 and 1980 where twin bundled (2) 721 ACAR and twin bundled (2) 636 ACSR "Rook" conductor is strung. These structures are considered insufficient for the proposed conductor, resulting in the need for the line to be rebuilt. Structures were replaced like for like and estimated using typical transmission right of way characteristics.

2. Structures are designed based off the following NESC code parameters: NESC Heavy, 90 mph wind, ¾” Ice & 30 mph wind regardless of project location.
3. It is assumed for detailed engineering that a LiDAR survey will be required.
4. Existing structures 259/55 (282/117) and 259/40 (282/133) support a cellular antennas. It is assumed that any antenna will be transferred to new engineered steel structures.
5. Any potential height restrictions were not accounted for in this design.
6. A wetland delineation has not been completed as part of this conceptual package.

7. The existing right of way varies within the project based off MapViewer. See below for the ROW widths in the project area:
    a. 130 ft from existing structure 259/1A at Basin Substation to existing structure 259/12 (2065/161).
    b. 80 ft from existing structure 259/12 (2065/161) to existing structure 259/35 (282/138).
        i. An additional 20 ft of ROW will need to be acquired in this portion of the project.
    c. 10 ft from existing structure 259/35 (282/138) to existing structure 259/41 (282/131).
        i. It is assumed that no additional ROW is able to be acquired due to the pole line easement since there are adjacent distribution lines and highway. Proposed structures are to be located on existing centerline.
    d. 70 ft from existing structure 259/41 (282/131) to existing structure 259/53A (282/119).
        i. An additional 30 ft of ROW will need to be acquired in this portion of the project.
    e. 130 ft from existing structure 259/53A (282/119) to existing structure 259/56 (282/116).
    f. 10 ft from existing structure 259/57 (282/115) to existing structure 259/73 (282/99).
        i. It is assumed that no additional ROW is able to be acquired due to the pole line easement since there are adjacent distribution lines and railroad. Proposed structures are to be located on existing centerline.
    g. 150 ft from existing structure 259/73 (282/99) to existing structure 259/76 (282/96).
    h. 125 ft from existing structure 259/76 (282/96) to existing structure 259/79 (208/69).
    i. 300 ft from 259/79 (208/69) to 259/106A (2003/1A) at Chesterfield Substation
8. Wire reel lengths were not accounted for this line design. The assumed pull pad locations to avoid tension splices will be determined during detailed design.
9. This project N9112 scope assumes that it is independent of other network upgrades included in Transition Cycle 1 - Phase 3. The following projects may impact the project scope if this assumption is incorrect.
    a. N9264 - Replace 230 kV wave trap at basin
    b. N9226 - Replace circuit breaker at Basin 230 kV
10. Onelines were not provided for lines 282, 208, and 2065 since those lines are not changing the type of conductor being installed.
11. Two (2) DNO-11410 OPGW will be installed throughout the entirety of this project. However, custom fiber may be needed due to existing S1-95/47 96 OPGW and Fibral F292 (12 fiber).
12. Critical crossings for project N9112 are:
    a. Between structures 259/17 (2065/156) and 259/18 (2065/155) over Interstate 95
    b. Between structures 259/20 (2065/153) and 259/21 (2065/152) over Walmsley Blvd
    c. Between structures 259/35 (282/138) and 259/38 (282/135) over Highway 150
    d. Between structures 259/39 (282/134) and 259/42 (282/131) over Interstate 95
    e. Between structures 259/53A (282/119) and 259/54 (282/118) over Interstate 95
    f. Between structures 259/56 (282/116, 53/246, 72/246) and 259/57 (282/115) over railroad

g. Between structures 259/60 (282/112) and 259/61 (282/111) over Highway 1
h. Between structures 259/72 (282/100) and 259/73 (282/99) over railroad
i. Between structures 259/77 (282/95) and 259/78 (282/94) over Highway 288
j. Between structures 259/79 (208/69) and 259/80 (208/70) over Highway 145
k. Between structures 259/90 (208/80) and 259/91 (208/81) over Highway 288
l. Between structures 259/91 (208/81) and 259/92 (208/82) over Highway 1
m. Between structures 259/94 (208/84) and 259/95 (208/85) over Interstate 95
n. Between structures 259/99 (208/89) and 259/101 (208/91) over railroads
o. Between structures 259/104 (208/94) and 259/105 (208/95) over railroads

CONCEPTUAL ESTIMATE NOTES:

1. Engineered steel pole costs were determined based off typical wind and weight spans, line angles, and average structure heights in the typical right of way associated with the structure type.

2. Steel pole foundation costs were based off the projects' location and structure type in the regional soil profile map. The regional soil profile map used for this project is Piedmont.

3. Project N9112 crosses over multiple underground gas lines. An AC mitigation study will need to occur for cathodic protection to cross the utility. An additional $50K will be added to the scope for this study

4. The conceptual estimate assumes that a laydown yard is required for this project.

5. Prior to detailed engineering, a full land rights review would be required. A desktop review was completed to estimate the project cost.

6. Access estimate cost inputs include the following assumptions:
   a. Work pad totals based on provided SOW and assumptions from kmz file. Assume 15 mats for tangents and 30 mats for angles at each work pad for reconductor work and 50 mats per pull pad.
   b. DDE structures assumed based off of wire reel lengths - based off of pull pad locations.
   c. Pull pad locations based on location of major road/water crossings and line mileage.
   d. Assuming that existing stone in Substations will be used for access per SOW and that access is existing or will be built by others before the start of construction. Assumes that the substations will be constructed with access roads built to and from Substations and work from inside the substations for Backbone installation.
   e. Assumes no delays due to permitting or real estate issues after work begins. Assume no schedule compressions from SOC/PJM.
   f. Assumes all clearing and forestry costs have been captured by others. No access costs for forestry activities included in this pricing.
   g. Stream crossing based on estimates from aerial imagery.

h. Assumes that all existing roads may be dressed with stone that can remain at the end of the project. Assumes existing two track roads in many locations will be impermeable. No costs for stone road removal are included.
i. Estimate accounts for Crane mats used primarily for spanning the ditches for access and work pads.

Figure 1 – Project Location

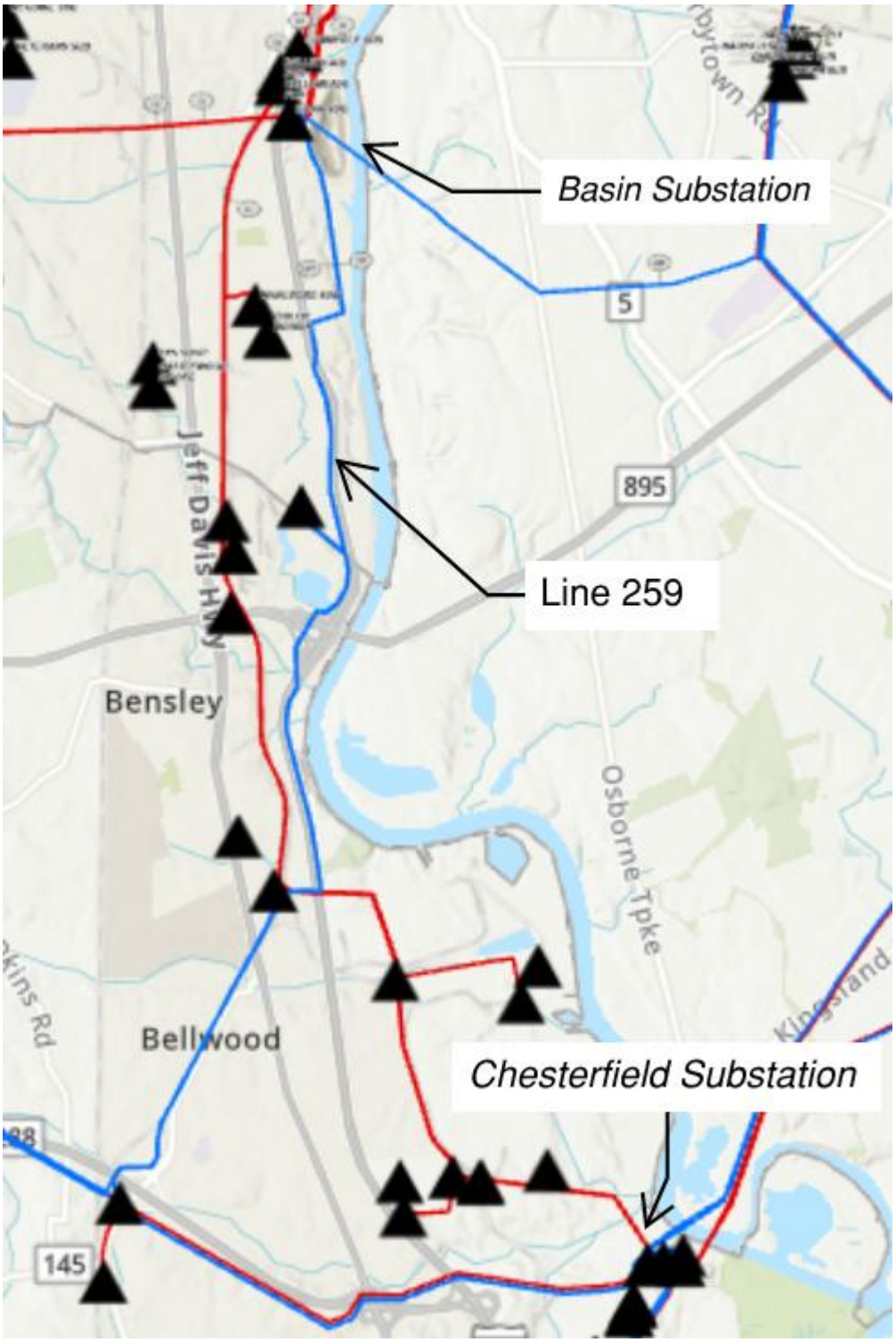


Figure 2 – Proposed Suspension Structure Configuration

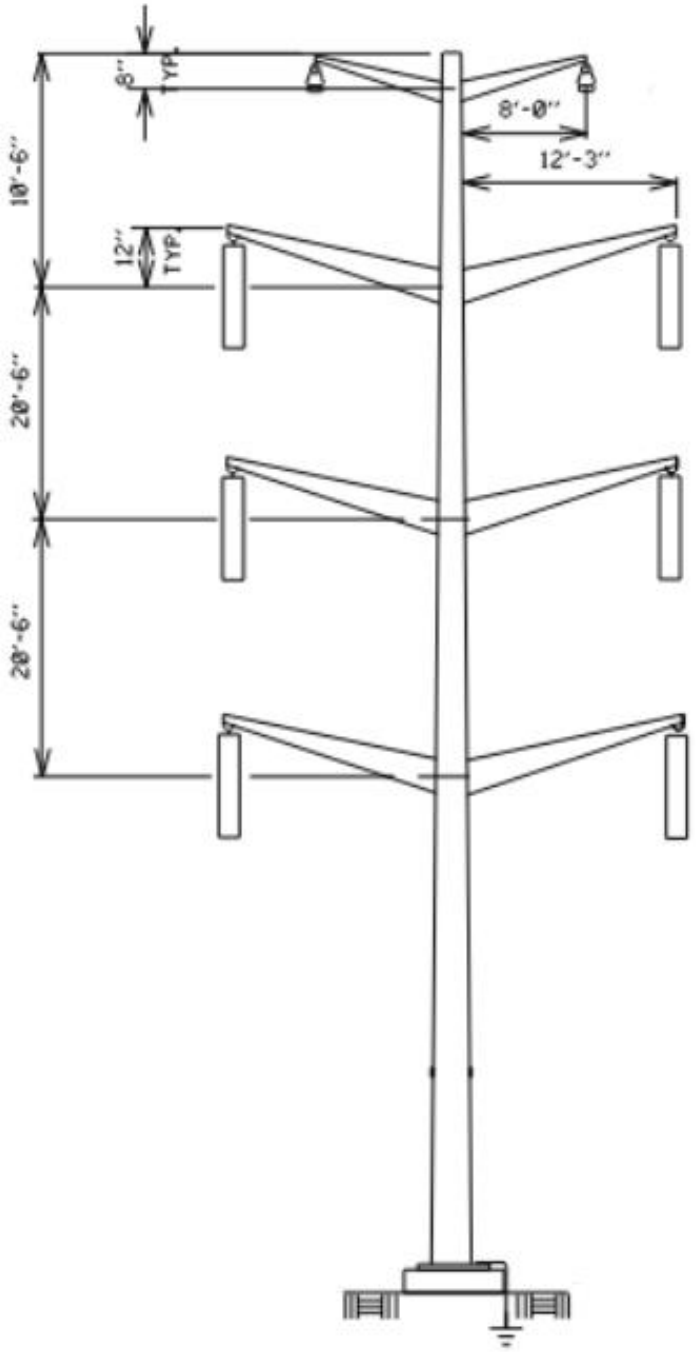
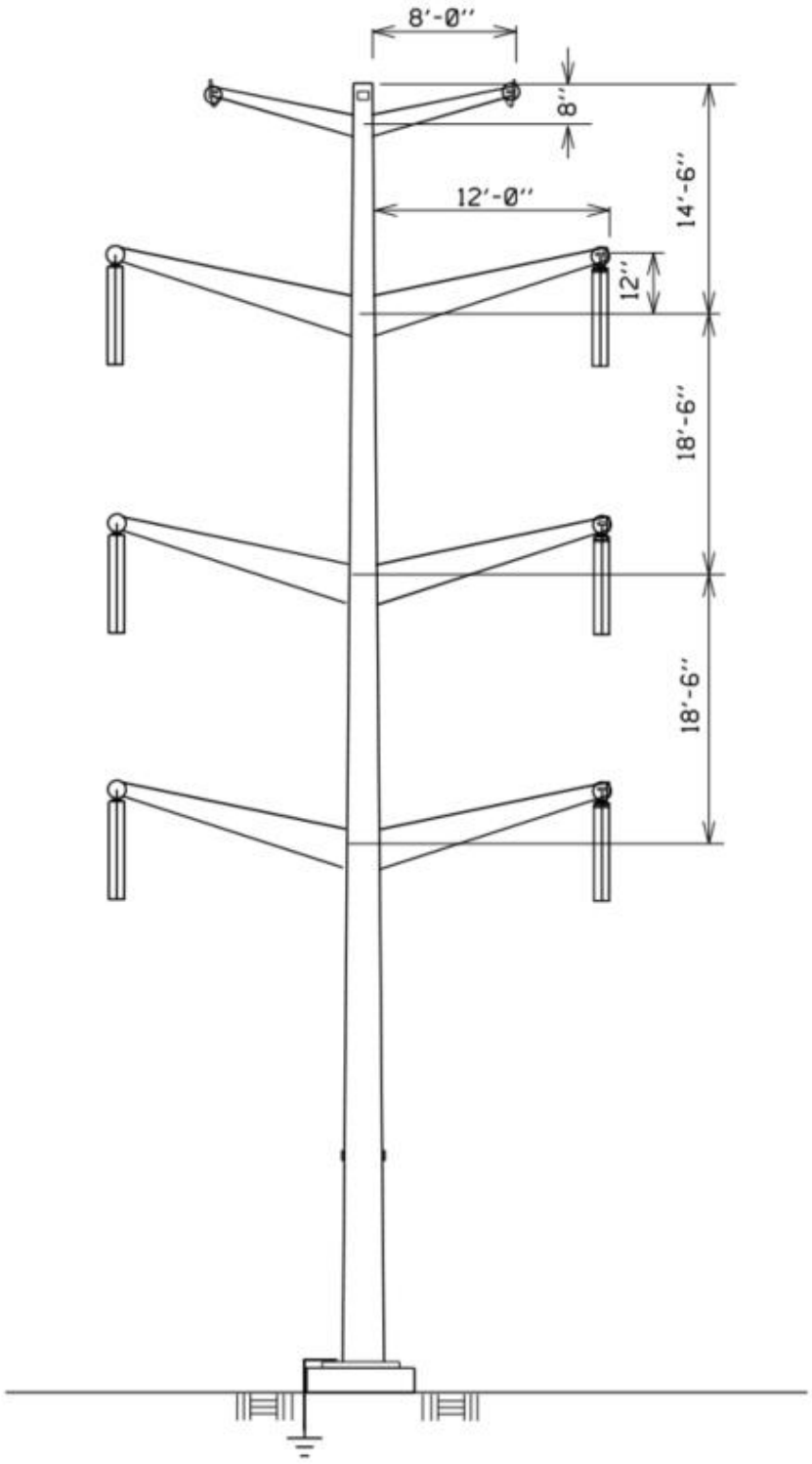


Figure 3 – Proposed Deadend Structure Configuration



Required Material Summary

Item	Qty
Engineered Structures	110
12,000-Ft OPGW Reels	14
12,000-Ft Conductor Reels	38