FirstEnergy

76 South Main Street
Akron, Ohio 44308

February 10, 2022

Ms. Tanowa Troupe
Docketing Division, Ohio Power Siting Board
The Public Utilities Commission of Ohio
180 East Broad Street
Columbus, OH 43215-3793

Certificate of Environmental Compatibility and Public Need
Wood County 138 kV Reinforcement Project
Case No. 18-1335-EL-BTX

Dear Ms. Troupe:

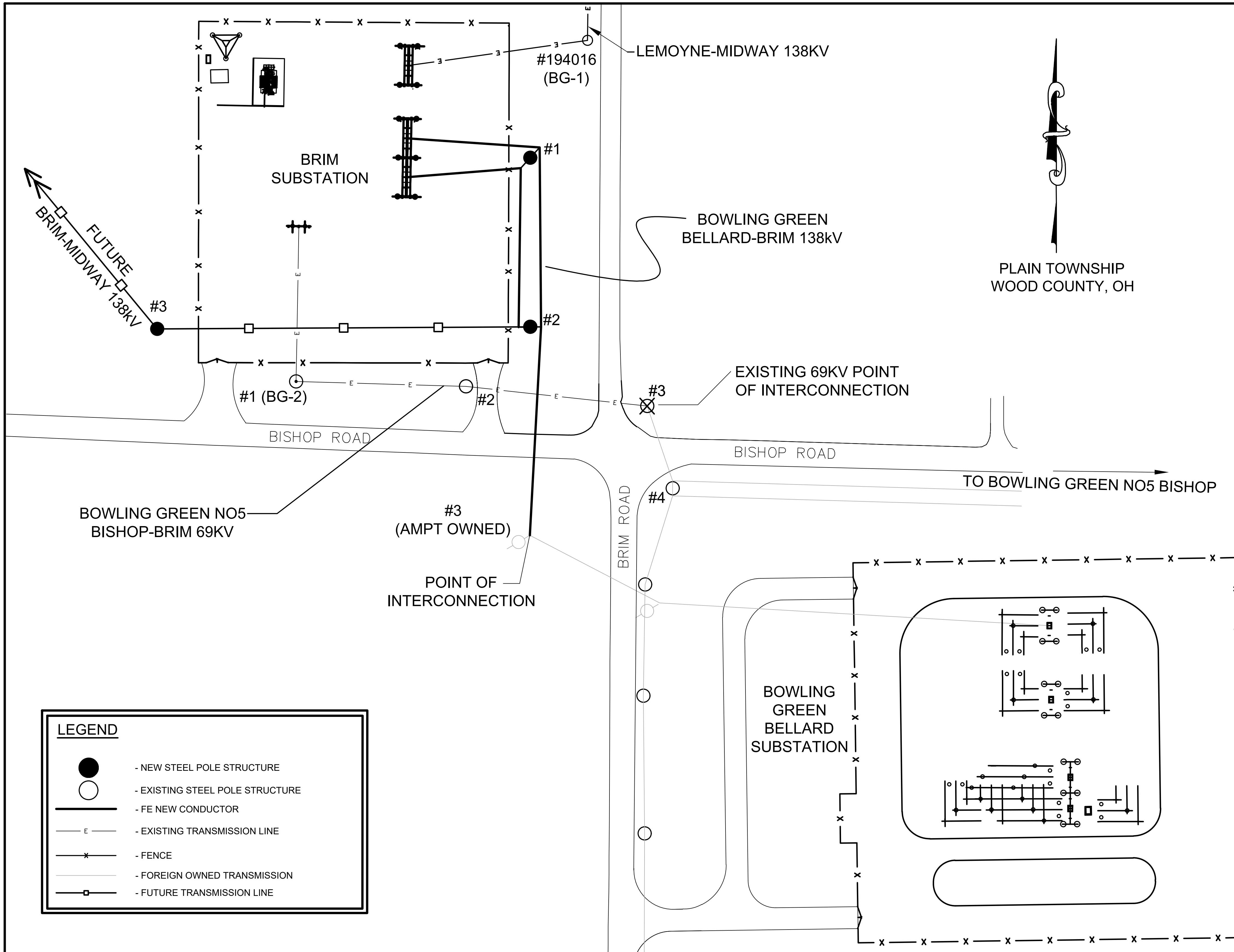
Please find enclosed for Staff's review the following materials relative to the first phase of construction for the Wood County 138 kV Reinforcement Project and as required by the Certificate issued in the above-referenced case:

- One set of detailed engineering drawings of the final Project design, and a set of the Project access maps depicting the temporary and permanent access roads, construction staging areas, and material laydown areas (per Condition 3);
- A copy of the complaint resolution process to address potential public complaints resulting from facility construction and operation (per Condition 8).
- A copy of geotechnical report for Structures 1 & 2 (per Condition 9).
- A copy of FAA Determination of No Hazard Letters for Structures 1 & 2 (per Condition 16).

If you have any questions about this Project, please contact me at (330) 384-2526.

Sincerely,

Scott M. Humphrys
Transmission Siting Supervisor
Transmission and Substation Design
FirstEnergy Service Company



GENERAL WORK SCOPE:

CONSTRUCT A NEW 138KV TIE LINE TO AMPT (BOWLING GREEN) FROM BRIM SUBSTATION. STRUCTURES WILL BE MUTUAL WITH THE FUTURE BRIM-MIDWAY 138KV LINE.

DETAILED WORK SCOPE:

STRUCTURE #1:
INSTALL DOUBLE-CIRCUIT STEEL MONOPOLE ON CONCRETE CAISSON FOUNDATION (TZ-7523-B). STEEL POLE SHALL BE ERECTED PER VENDOR DRAWING VND-0654 AND FRAMED PER FE STANDARD TR-138375.

STRUCTURE #2:
INSTALL DOUBLE-CIRCUIT STEEL MONOPOLE ON CONCRETE CAISSON FOUNDATION (TZ-7523-B). STEEL POLE SHALL BE ERECTED PER VENDOR DRAWING VND-0654 AND FRAMED PER DRAWING TZ-7262-A.

STRUCTURE #3 (AMPT OWNED):
DEADEND SHIELD WIRE AND CONDUCTOR ON AMPT OWNED STRUCTURE. POINT OF INTERCONNECT (POI) IS THE QUADRANT STRAIN CLAMP ON THE BRIM SIDE OF THE STRUCTURE. AMPT TO SUPPLY ALL HARDWARE FOR STRUCTURE #3.

SPANS BRIM SS TO STRUCTURE #3:

CONDUCTOR:
STRING 795 KCMIL 26/7 ACSR (DRAKE) CONDUCTOR. CLIP-IN TENSIONS SHALL BE PER STRINGING CHART TZ-7308-A.

SHIELD WIRE:
THE SHIELD WIRE ABOVE THE BOWLING GREEN BELLARD-BRIM 138KV LINE SHALL BE 7#8 ALUMOWELD. THE SHIELD WIRE ABOVE THE FUTURE BRIM-MIDWAY 138KV LINE SHALL BE 7#8 ALUMOWELD FROM BRIM SS TO STR. #1 AND OPGW FROM STR. #1 TO STR. #2. CLIP-IN TENSIONS SHALL BE PER TZ-7309-A & TZ-7310-A RESPECTIVELY.

NOT TO BE REVISED AFTER CONSTRUCTION COMPLETE

DWG. NO.	REFERENCE
TZ-3315-F	PLAN & PROFILE, SH. 1
TZ-7531-B	WIRE ARRANGEMENT (BG BELLARD-BRIM 138KV)
TZ-7532-B	WIRE ARRANGEMENT (BRIM-MIDWAY 138KV)
TZ-7530-B	CONSTRUCTION LIST
TZ-7307-A	DRAWING INDEX, SH. 3 (BG BELLARD-BRIM 138KV)
TZ-7260-A	DRAWING INDEX, SH. 3 (BRIM-MIDWAY 138KV)

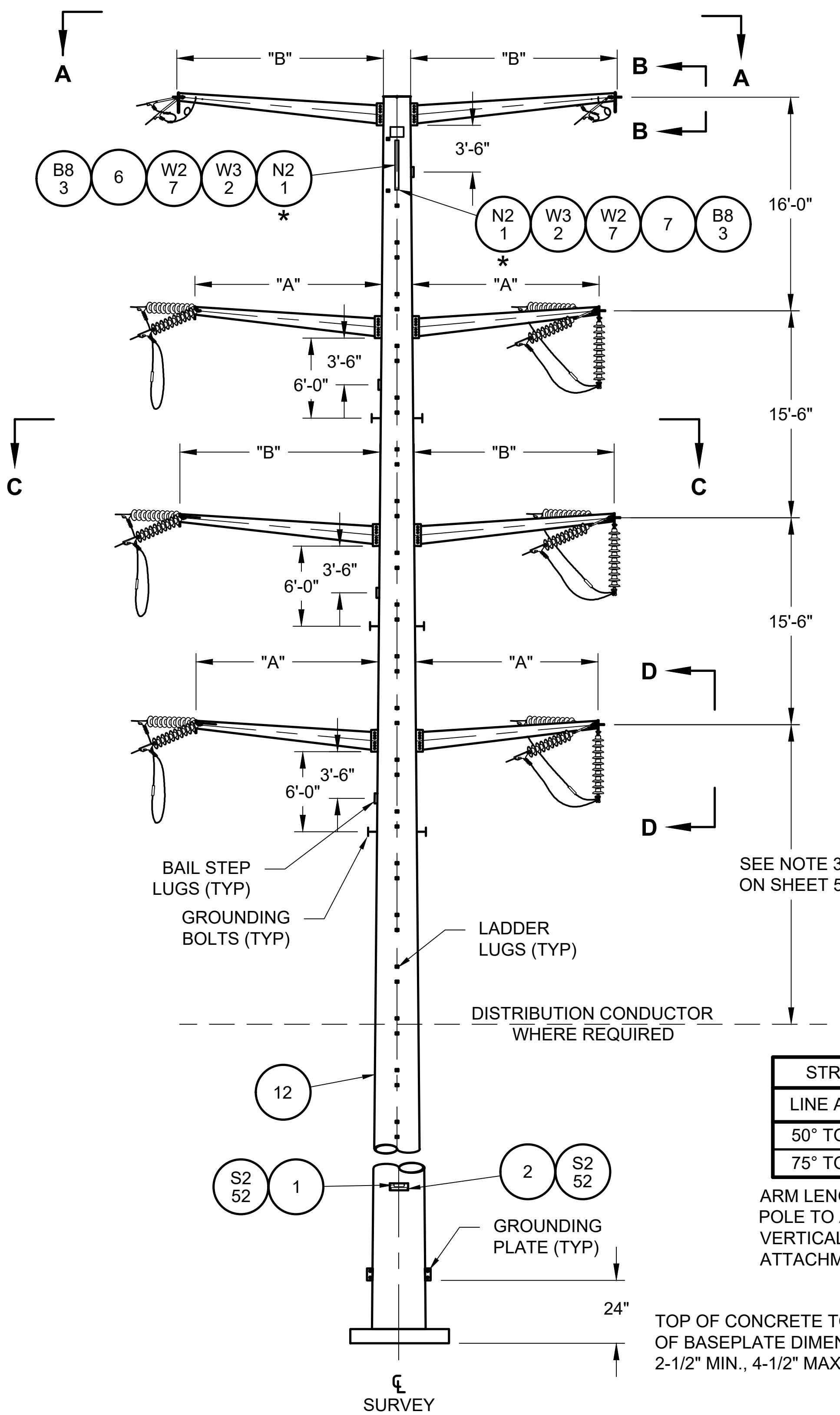
REV.	DATE	BY	APP.	DESCRIPTION

PAPER SIZE: 17X11

DR. IMC	11/21	C.E. CE18-01-TE
CHK. TLH	11/21	ORDER NO. 17127033 / 15372904
INS. TLH	12/21	WBS TW-001440 R/W
APP. BSH	01/22	SCALE N.T.S.

BOWLING GREEN BELLARD–BRIM 138KV/
BRIM–MIDWAY 138KV, NEW 138KV TIE LINE TO AMPT
FIELD REPORT

FirstEnergy Transmission Design	OPERATING CO.	DWG NO.	SHEET	REV.
	ATSI/TE	TZ–7521–B	1	0



STRUCTURE ARM LENGTHS		
LINE ANGLE	DIM. "A"	DIM. "B"
50° TO 75°	13' 0"	14' 0"
75° TO 90°	14'-6"	15'-0"

ARM LENGTHS MEASURE FROM FACE OF POLE TO ATTACHMENT VANG HOLE, AND VERTICAL LENGTHS MEASURE TO ATTACHMENT VANG HOLES.

TOP OF CONCRETE TO BOTTOM OF BASEPLATE DIMENSION: 2-1/2" MIN., 4-1/2" MAX.

* ONE NUT IS INCLUDED WITH BOLT

REASON FOR REVISION: REVISED DESCRIPTION FOR ITEM J3/21.

138KV DOUBLE CIRCUIT
TUBULAR STEEL STRUCTURE
DEADEND SINGLE POLE
ANGLES 50° TO 90°

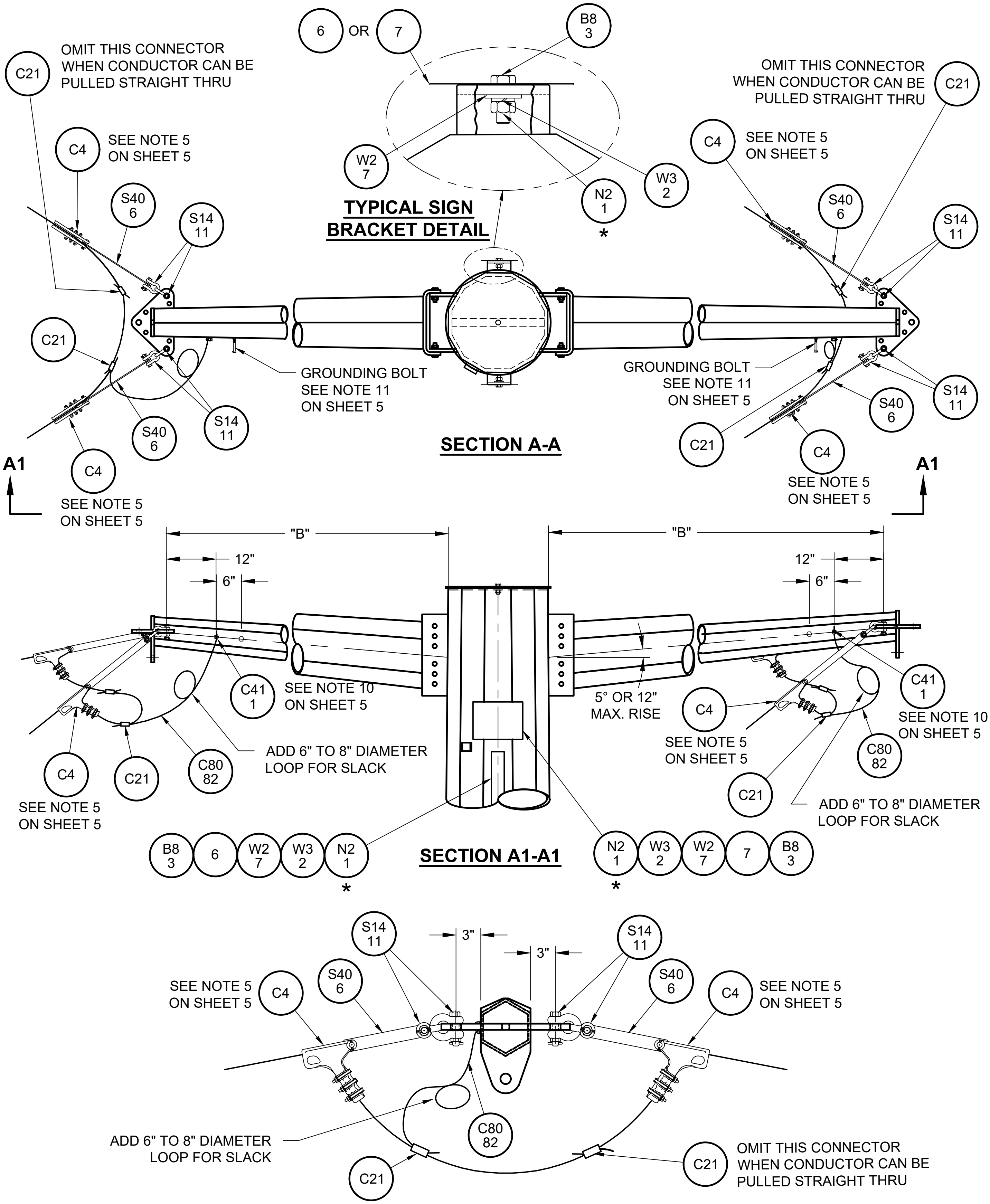
FirstEnergy.
Transmission Std.

DATE ISSUED: 04/07/2021

DWG NO. TR-138375

SHEET 1 / 5

REV. 1.4



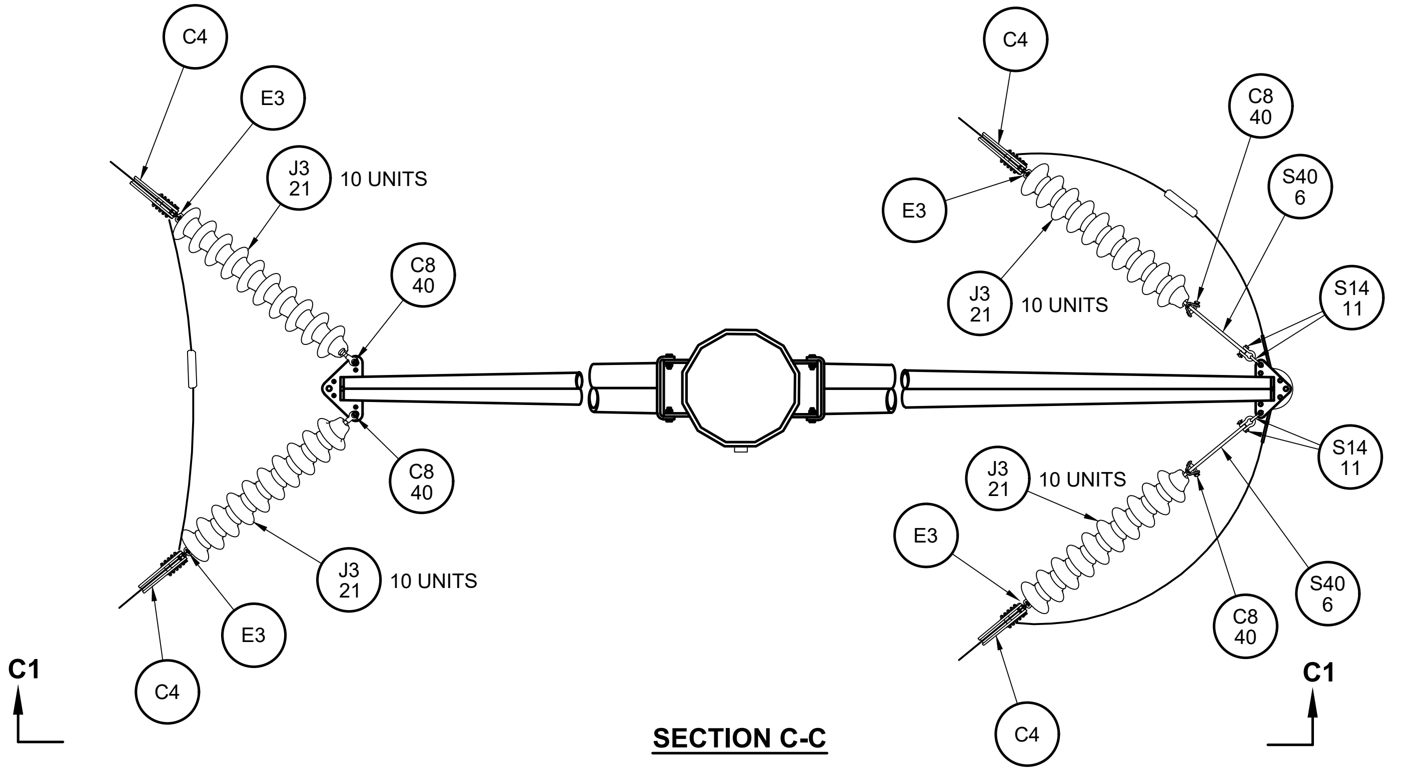
* ONE NUT IS INCLUDED WITH BOLT

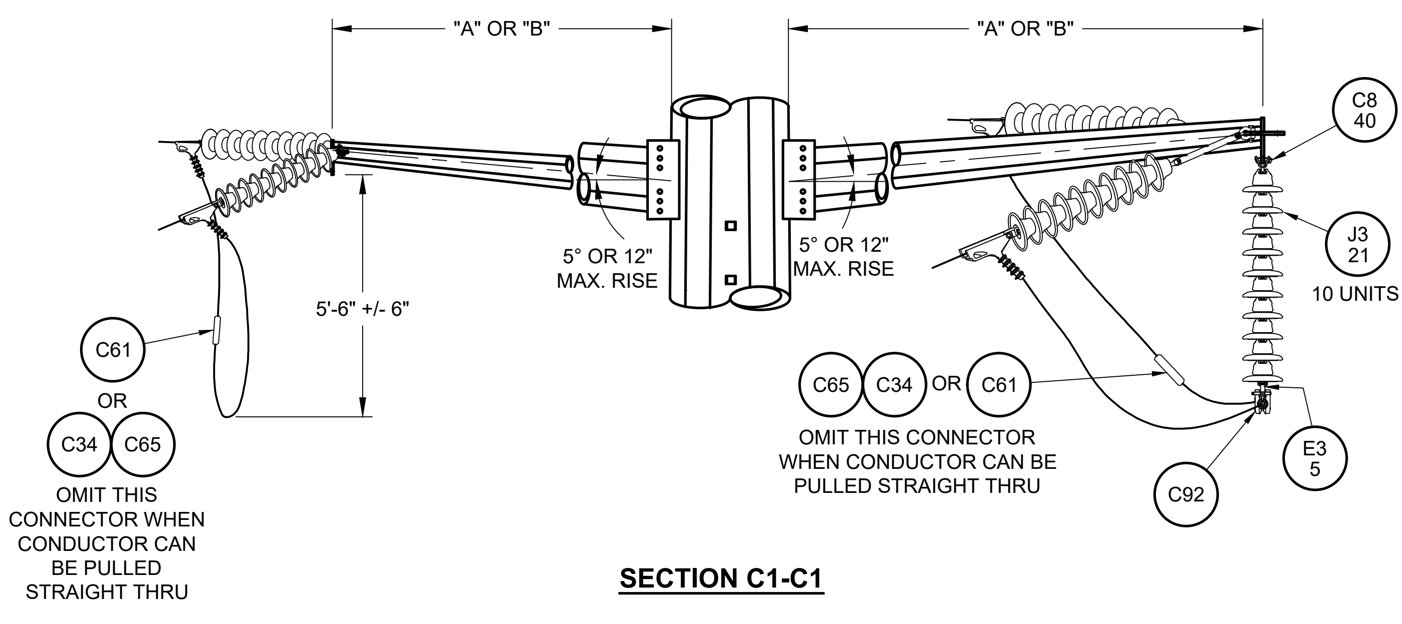
REASON FOR REVISION: REVISED DESCRIPTION FOR ITEM J3/21.

138KV DOUBLE CIRCUIT
TUBULAR STEEL STRUCTURE
DEADEND SINGLE POLE
ANGLES 50° TO 90°

FirstEnergy
Transmission Std.

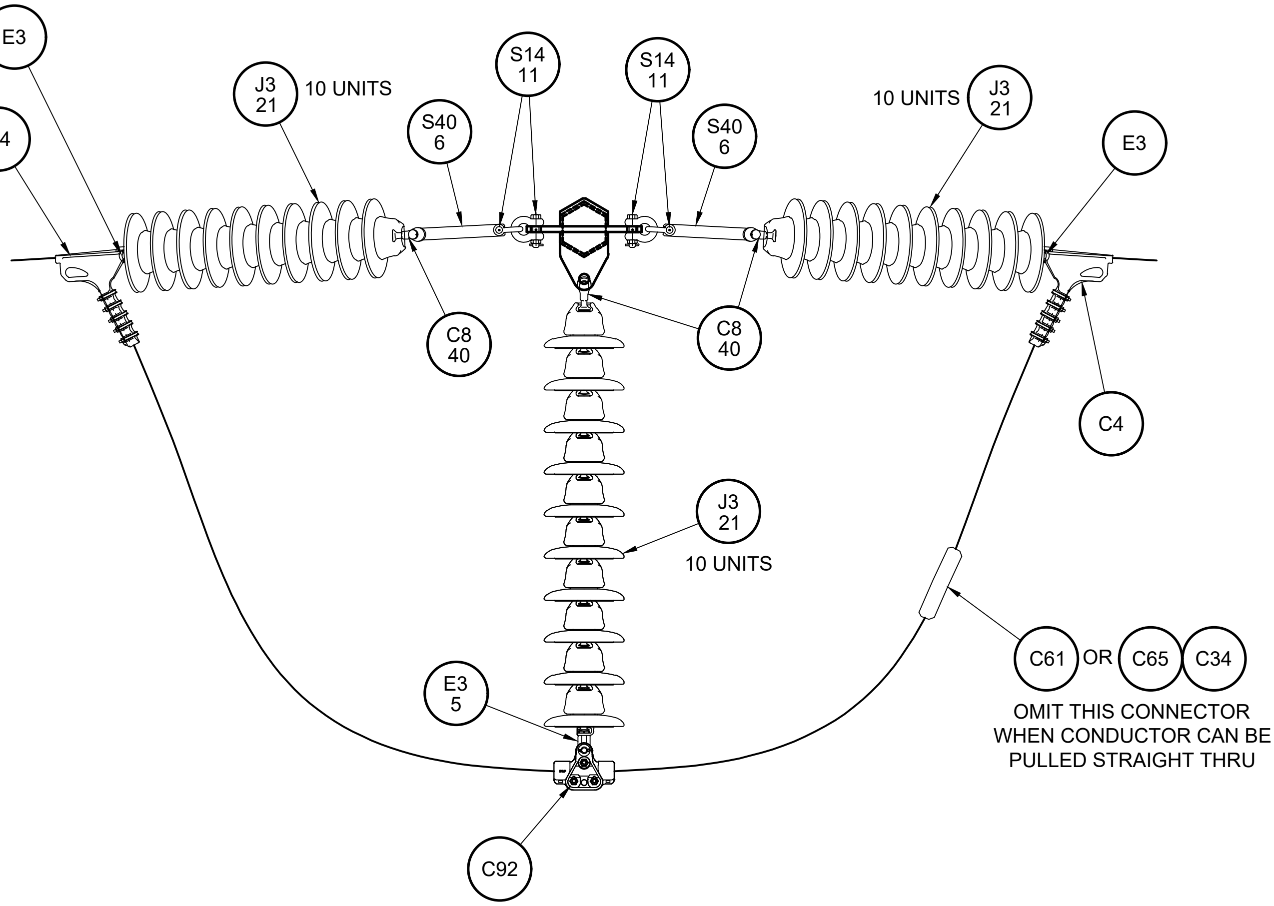
DATE ISSUED:	04/07/2021
DWG NO.	TR-138375
SHEET	2 / 5
REV.	1.4





REASON FOR REVISION: REVISED DESCRIPTION FOR ITEM J3/21.

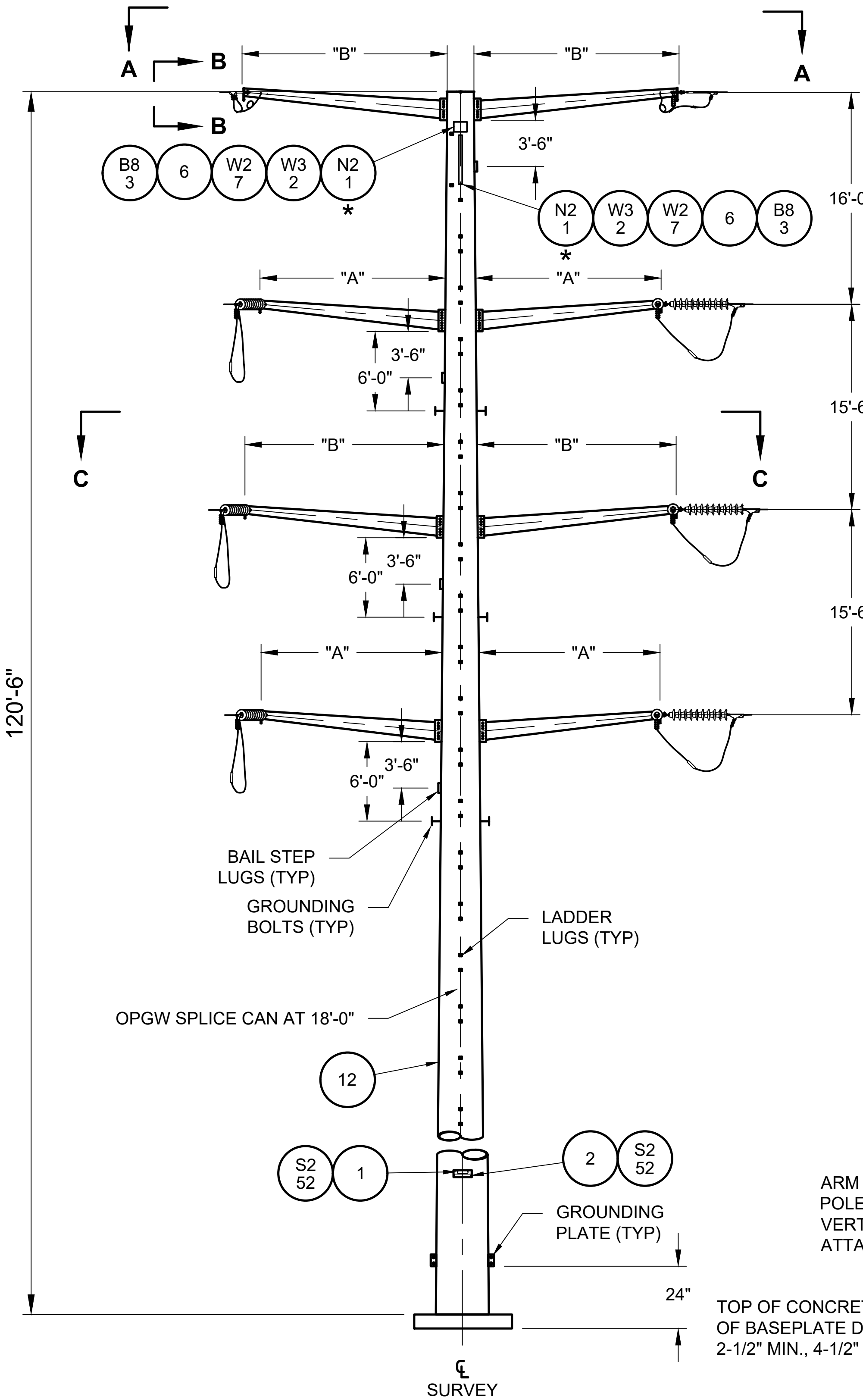
138KV DOUBLE CIRCUIT TUBULAR STEEL STRUCTURE DEADEND SINGLE POLE ANGLES 50° TO 90°	FirstEnergy. Transmission Std.		
	DATE ISSUED: 04/07/2021		
	DWG NO. TR-138375	SHEET 3 / 5	REV. 1.4



SECTION D-D

REASON FOR REVISION: REVISED DESCRIPTION FOR ITEM J3/21.

138KV DOUBLE CIRCUIT TUBULAR STEEL STRUCTURE DEADEND SINGLE POLE ANGLES 50° TO 90°	FirstEnergy Transmission Std.
	DATE ISSUED: 04/07/2021
	DWG NO. TR-138375 | SHEET 4 / 5 | REV. 1.4



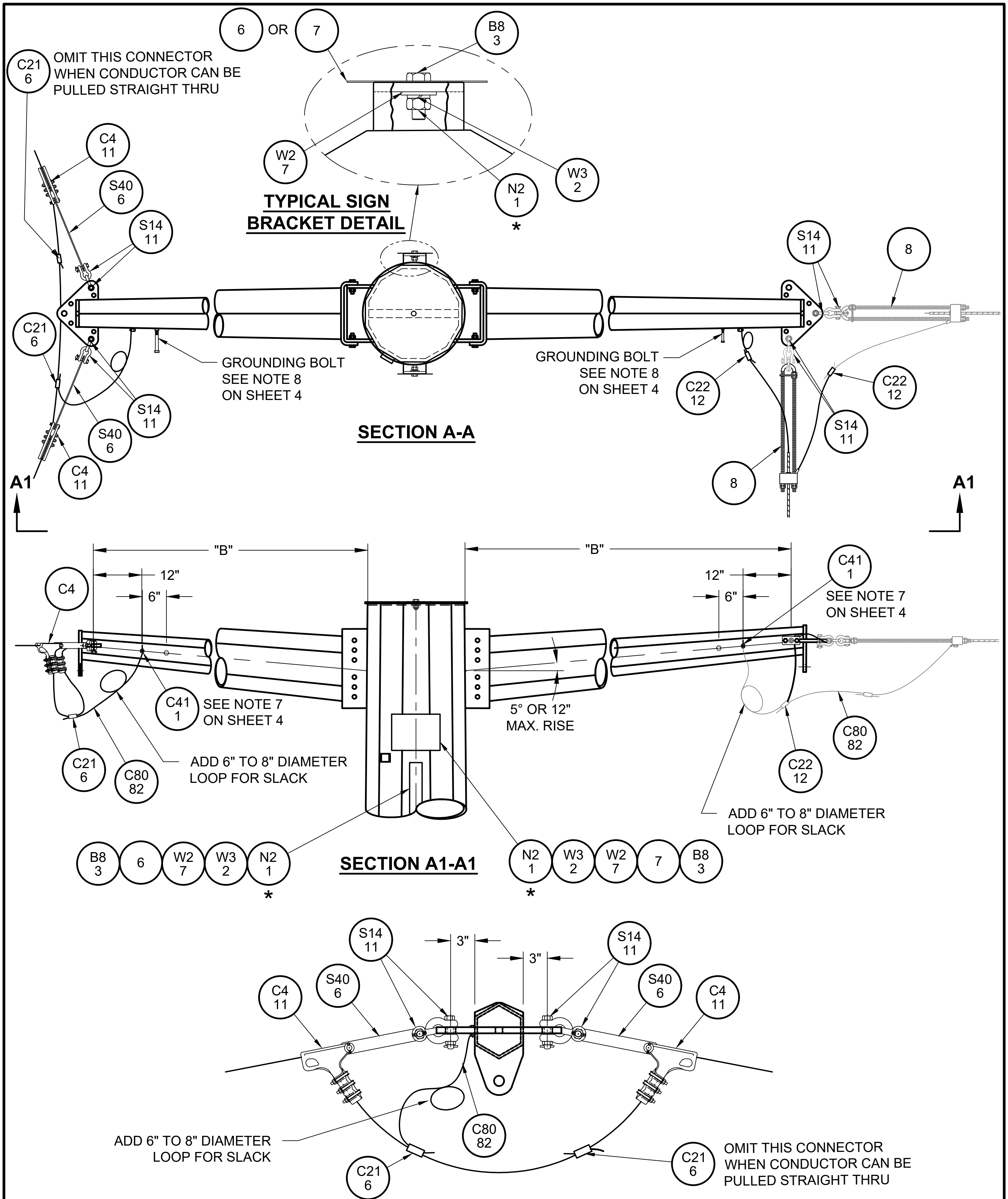
STR ARM LENGTHS	
DIM. "A"	DIM. "B"
14'-6"	15'-0"

ARM LENGTHS MEASURE FROM FACE OF POLE TO ATTACHMENT VANG HOLE, AND VERTICAL LENGTHS MEASURE TO ATTACHMENT VANG HOLES.

PAPER SIZE: 8.5X11

* ONE NUT IS INCLUDED WITH BOLT

DR. JDB 11/29/21	C.E. 18-01-TE	BRIM-MIDWAY 138kV LINE BOWLING GREEN BELLARD-BRIM 138kV LINE STRUCTURE #2 DETAILS	
CHK. TLH 11/29/21	ORDER NO. 15372904 17127033		
INS. TLH 1/18/22	WBS R/W	FirstEnergy Transmission Design	ASSET/OP. CO. ATSI/TE
APP. BSH 2/2/22	SCALE N.T.S.	DWG NO. TZ-7262-A	SHEET 1/4 REV.



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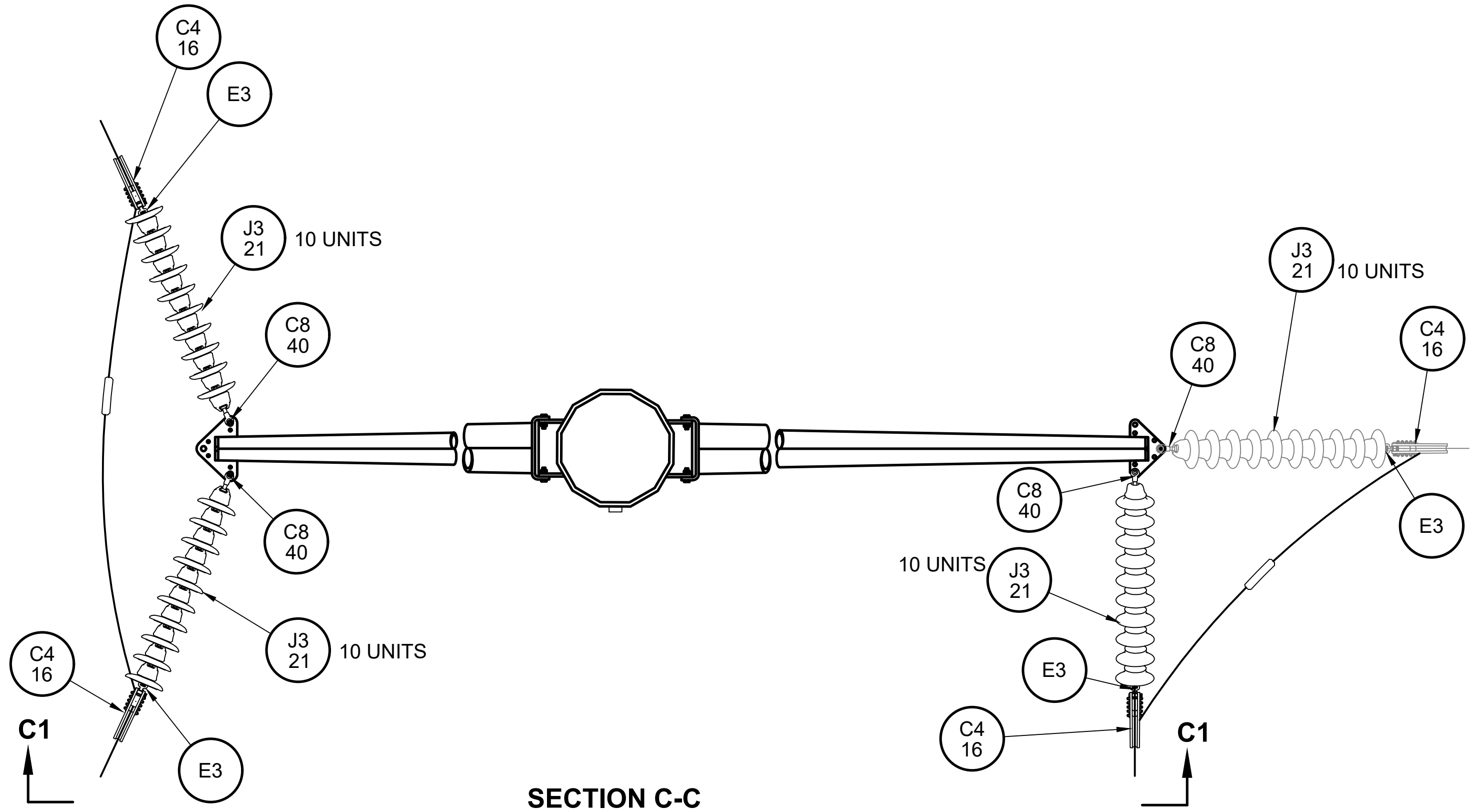
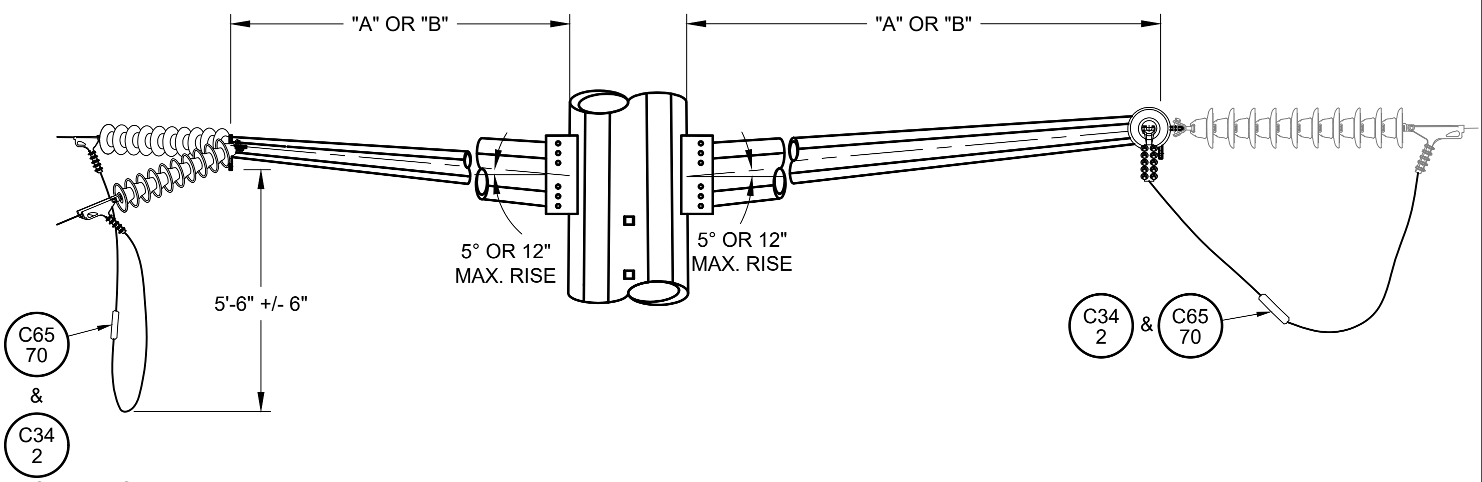


SECTION C-C



OMIT THIS
CONNECTOR WHEN
CONDUCTOR CAN
BE PULLED
STRAIGHT THRU

SECTION C1-C1

PAPER SIZE: 8.5X11

DR. JDB	11/29/21	C.E. 18-01-TE	BRIM-MIDWAY 138kV LINE BOWLING GREEN BELLARD-BRIM 138kV LINE STRUCTURE #2 DETAILS			
CHK. TLH	11/29/21	ORDER NO. 15372904 17127033				
INS. TLH	1/18/22	WBS R/W	FirstEnergy. Transmission Design	ASSET/OP. CO. ATSI/TE	DWG NO. TZ-7262-A	SHEET 3/4 / REV.
APP. BSH	2/2/22	SCALE N.T.S.				

WOOD COUNTY 138 KV REINFORCEMENT PROJECT

COMPLAINT RESOLUTION PROCESS

OPSB CASE NUMBER: 18-1335-EL-BTX

Prepared for:

American Transmission Systems, Incorporated
76 South Main Street
Akron, Ohio 44308

ATSI

Prepared by:

FirstEnergy Service Company
76 South Main Street
Akron, Ohio 44308

February 2022

1.0 Introduction

The following Public Information Program provides details of American Transmission System, Incorporated's ("ATSI") plans to contact property owners regarding construction activities on the Wood County 138 kV Reinforcement Project ("Project"). This plan addresses applicable requirements of Condition 8 of the January 16, 2020 Ohio Power Siting Board ("OPSB") Opinion, Order and Certificate. Condition 8 states:

(8) At least 30 days before the preconstruction conference, Applicant shall provide Staff with a copy of a complaint resolution process to address potential public complaints resulting from facility construction and operation. The resolution process must describe how the public can contact the facility and how the facility would respond to anyone issuing a complaint.

2.0 Complaint Resolution Procedure:

As a part of the property owner notification process, communications to affected property owners will take place no less than 7 days prior to construction. The communication to affected property owners will also contain the information describing the project with applicable construction dates. The communication will also contain the following Complaint Resolution Procedure:

> Should you have any questions, concerns or grievances regarding the Project, please contact the ATSI's Project Hotline at (888) 311-4737 or transmissionprojects@firstenergycorp.com.

ATSI will promptly review and provide a response to received questions, concerns or grievances. If ATSI determines that the concern or grievance is a result of Project construction, ATSI will seek to repair, resolve or negotiate applicable mitigation as soon as practicable.

GPD GROUP
Glaus, Pyle, Schomer, Burns & DeHaven, Inc.

GEOTECHNICAL ENGINEERING REPORT

BRIM-BELLARD 138KV LINE TIE-IN
BOWLING GREEN, OHIO

Prepared For:
FirstEnergy Service Company

GPD Project No. 2021821.54
October 15, 2021

10/15/2021

STATE OF OHIO
Delbert
James
Channels
E-57295
REGISTERED
PROFESSIONAL ENGINEER

Delbert J. Channels

Delbert J. Channels, PE
Director of Geotechnical Services

Contents

SECTION 1

1.0 Introduction

GPD Group is pleased to submit this Geotechnical Report for the aforementioned project. The purpose of this study was to obtain information on the subsurface conditions at the proposed project site and, based on this information, to provide geotechnical recommendations regarding the design and construction of foundations, for the FirstEnergy Brim-Bellard 138kv Line. A total of Four (4) borings extending to depths of 30 to 35 feet below the existing ground surface were drilled at the site. Individual boring logs and a Boring Location Plan are attached.

1.1 Project Description

It is our understanding that the project will consist of building a tie-line between Brim Substation and Bellard substation. The tie-line will require four steel monopoles with drilled shaft concrete foundations. The geotechnical borings were requested at the proposed locations of the steel poles.

1.2 Purpose and Scope

The purposes of this report were to investigate subsurface conditions at nine requested locations and to provide geotechnical engineering recommendations for earthwork and foundation design. Specifically, the scope of work included the following:

- Conducting a field exploration program consisting of site reconnaissance and drilling sample borings at selected locations to explore subsurface conditions and collect soil samples.
- Conducting geotechnical engineering laboratory test on sampled soils to assist with soil classifications and estimation of engineering properties.
- Develop geotechnical engineering recommendations for the design and construction of foundations and provided design parameters to be used within the EPRI MFAD program.

SECTION 2

2.0 Site Conditions

The new structures will be around the existing Brim Substation located at the northwest corner of the intersection of Brim Road and Bishop Road near Bowling Green, Ohio. The ground surface elevations ranged from about 674 to 676 feet above sea level according to google earth. Also, at the time of our exploration the proposed project locations were found to consist of mowed grass, a gravel drive, and an agricultural field.

2.1 Subsurface Exploration Program

The subsurface exploration consisted of drilling and sampling four (4) borings at the site to depths 30 to 35 feet below existing grade. Test boring B-4 was offset due to overhead lines at the proposed test location. The offset distance can be seen on the boring log and location plan. The locations of the borings should be considered accurate only to the degree implied by the means and methods used to define them.

The borings were drilled with a track mounted rotary drill rig using hollow stem augers and a automatic SPT hammer to advance the boreholes. Representative soil samples were obtained by both the split- sampling procedure in general accordance with the appropriate ASTM standards. In the split-barrel sampling procedure, the number of blows required to advance a standard 2-inch O.D. split-barrel sampler the last 12 inches of the typical total 18-inch penetration by means of a 140-pound hammer with a free fall of 30 inches, is the standard penetration resistance value (N-Value). This value is used to estimate the in-situ relative density of cohesion-less soils and the consistency of cohesive soils. In the thin-walled tube sampling procedure, a thin-walled, seamless steel tube with a sharp cutting edge is pushed hydraulically into the soil to obtain a relatively undisturbed sample of cohesive or moderately cohesive soil. The sampling depths and penetration distance, plus the standard penetration resistance values, are shown on the boring logs. The samples were sealed and returned to the laboratory for testing and classification.

An automatic SPT hammer was used to advance the split-barrel sampler in the borings performed for this site. A significantly greater efficiency is achieved with the automatic hammer compared to the conventional safety hammer operated with a cathead and rope. This higher efficiency has an appreciable effect on the standard penetration resistance blow count (N) values. The effect of the automatic hammer's efficiency has been considered in the interpretation and analysis of the subsurface information for this report and is illustrated as the N_{60} value located on the boring logs. The energy transfer ratio of the automatic hammer used is 80.9%.

All of the borings were extended into the refusal materials using coring procedures in general accordance with the appropriate ASTM standard. This procedure consisted of casing the overburden soils in order to prevent the borehole from collapsing. The underlying rock was then cored with a diamond bit attached to the outer barrel of a double core barrel. The inner barrel collected the cored material as the outer barrel was rotated at high speeds to cut the rock. The barrel was retrieved to the surface upon completion of each drill run. Once the core samples were retrieved, they were placed in a box and logged. The rock was later classified by an engineer and the "percent recovery" and rock quality designation (RQD) were determined.

The "percent recovery" is the ratio of the sample length retrieved to the drilled length, expressed as a percent. An indication of the actual in-situ rock quality is provided by calculating the sample's RQD. The RQD is the percentage of the length of broken cores retrieved which have core segments at least 4 inches in length compared to each drilled length. The percent recovery and RQD are related to rock soundness and quality as illustrated in Table 1.

Table 1: Rock Quality Designation (RQD)

Relation of RQD and In-situ Rock Quality	
RQD (%)	**Rock Quality**
90 – 100	Excellent
75 – 90	Good
50 – 75	Fair
25 – 50	Poor
0 –25	Very Poor

Field logs of each boring were prepared by a GPD Geologist. These logs included visual classifications of the materials encountered during drilling as well as the geologist's interpretation of the subsurface conditions between samples. Final boring logs included with this report represent an interpretation of the field logs and include modifications based on observations made by a senior Geotechnical Engineer and the results of laboratory testing.

2.2 Laboratory Testing

The samples were classified in the laboratory based on visual observation, texture and plasticity. The descriptions of the soils indicated on the boring logs are in accordance with the enclosed General Notes and the Unified Soil Classification System. A brief description of this classification system is attached to this report.

The laboratory testing program consisted of performing the following tests:

- Natural water content tests (ASTM D-2216)
- Atterberg Limit test (ASTM D-4318)
- Rock Unconfined compressive strength (ASTM D-2938)
- Unit Weight (ASTM D-7263)

Information from these tests was used in conjunction with field penetration test data to evaluate soil strength in-situ, volume change potential, and soil classification. Results of these tests are attached and provided on the boring logs.

Per the technical guidelines three (3) samples were obtained from each boring for environmental testing. The samples were sent to the FirstEnergy Beta lab for testing of polychlorinated biphenyls and total petroleum hydrocarbons.

2.3 Subsurface Conditions

Test boring data collected at the site indicate the presence of silt, sand, and clay over dolomite bedrock. These can generally be described for engineering purposes as presented below. For specific profiles and descriptions at each test location, refer to the Test Boring Logs.

Underlying 12 to 18 inches of topsoil and continuing to depths of 20 to 28.5 feet was brown and gray silt, sand, and clay soils. Where sampled, the soils were damp to wet, and medium stiff to hard where cohesive and medium dense to very dense where granular. A cobble or boulder was encountered at 9 feet below the ground surface at test location B-4 resulting in auger refusal.

Beginning below the soil and continuing to boring termination at depths of 30 to 35 feet was gray Dolomite bedrock. The bedrock was typically slightly weathered to weathered, slight fractured to highly fractured, and moderately strong.

2.3.1 Groundwater Conditions

The borings were monitored while drilling and after completion for the presence and level of groundwater. Water levels observed in the borings are noted on the boring logs. At these times, groundwater was initially observed in Borings B-1, B-2 and B-4 at 13 feet below existing grade. The addition of water during rock coring may mask the groundwater elevation upon completion. It should be noted that moderate groundwater pressure was encountered in the sand layer above the bedrock which should be considered during construction procedures.

It should be recognized that fluctuations of the groundwater table may occur due to seasonal variations in the amount of rainfall, runoff and other factors not evident at the time the borings were performed. Therefore, groundwater levels during construction or at other times in the life of the structure may be higher or lower than the levels indicated on the boring logs. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

SECTION 3

3.0 Engineering Recommendations

The following engineering recommendations are based on information provided to GPD Group regarding the design of the proposed transmission line, the field and laboratory testing performed on the soil encountered at this site, and other information discussed in this report. This report does not reflect variations that may occur between borings, across the site, or due to the modifying effects of weather. The nature and extent of such variations may not become evident until during or after construction. If variations appear, GPD should be immediately notified so that further evaluation and supplemental recommendations can be provided.

3.1 Excavations

Excavations of the site soils can be made with a large excavator. Temporary excavation side-walls should be sloped per O.S.H.A. guidelines for type "C" soil, thus requiring a 1.5:1 (horizontal:vertical) slope. The soil type should be confirmed by a competent person at the time of construction, who would determine if steeper slopes associated with type B soils could be considered. Excavations that extend greater than 20 feet shall be designed and approved by a professional engineer.

It should be noted that a boulder or cobble was encountered at test boring B-4 resulting in auger refusal at a depth of 9 feet, with the borehole then offset so that drilling could continue. **Cobbles or boulders could be encountered during excavation of the drilled shaft foundations.**

3.2 Earthwork

All surfaces cut to subgrade elevation or subgrades to receive fill should be proof-rolled under the direction of an on-site geotechnical engineer or their representative. Proof-rolling should be performed with a minimum 20 ton dump truck. Two (2) passes, (1 forward and 1 backward) should be made at normal walking speed. Any soft, loose, yielding, or obviously contaminated zones should be undercut as directed by the engineer.

All backfill placed adjacent to foundations should be select material, as approved by a qualified geotechnical engineer. For all filling operations, the following should be observed:

1) Prior to use, the approved fill material should be tested as outlined in ASTM D-698 to determine the maximum dry density and optimum moisture content for silty or cohesive soils, or ASTM D-4253 and D-4254 for clean granular soils. For each change in borrow material, additional tests will be required.

2) For all fill or backfill used, the fill material should be placed on the approved subgrade in controlled lifts, with each lift compacted to a stable condition, and to a minimum of 98% maximum dry density per ASTM D-698 at a moisture content within 1.5% of optimum for cohesive or silty borrow. Controlled lifts of granular material should be compacted to 80% relative density per ASTM D-4254.

3) All filling operations should be observed by a qualified soils technician with field density tests made, to assure compaction to specification.

Backfill may consist of mixes of natural soil or crushed aggregate meeting one of the following USCS Classifications: GW, GP, GM, GC, SW, SP, SM, SC, CL, ML, any dual symbol combinations of the proceeding.

3.3 Foundations

Straight shaft drilled piers may be used to support the planned structures. The foundations should bear at any depth, which provides the required resistance, and can be sized to support compression and resist uplift using the following estimated properties.

B-1 MFAD Parameters								
Layer Number	Layer Type (RMR)	Depth to Bottom of Layer (ft)	Total Unit Weight (pcf)	Deformation Modulus (ksi)	Friction Angle (deg)	Undrained Shear Strength or Rock Cohesion (ksf)	Rock / Concrete Bond Strength (ksf)	Ult. End Bearing Strength of Bottom Layer (ksf)
1[1]	TS/CL	3.5	105	---	---	---	---	---
2	CL	5	125	0.80	---	1.50	---	7.50
3	CL-ML	8	130	2.50	---	4.00	---	20.00
4	CL-ML	12	125	2.20	---	3.50	---	17.50
5	SWG	17	130	4.50	35	---	---	24.00
6	SWG	22	135	7.00	37	---	---	30.00
7	MLG	25	140	5.00	38	---	---	30.00
8	LS (39)	35	169	735.50	34.75	2.95	15.00	60.00

B-2 MFAD Parameters								
Layer Number	Layer Type (RMR)	Depth to Bottom of Layer (ft)	Total Unit Weight (pcf)	Deformation Modulus (ksi)	Friction Angle (deg)	Undrained Shear Strength or Rock Cohesion (ksf)	Rock / Concrete Bond Strength (ksf)	Ult. End Bearing Strength of Bottom Layer (ksf)
1[1]	TS/CL	3.5	105	---	---	---	---	---
2	CL-ML	6	125	2.00	---	3.25	---	16.25
3	CL-ML	12	130	2.50	---	4.00	---	20.00
4	ML	17	130	1.30	34	---	---	21.00
5	SW	23	125	0.60	29	---	---	9.00
6	LS (44)	33	168	772.88	35	3.00	15.00	60.00

B-3 MFAD Parameters								
Layer Number	Layer Type (RMR)	Depth to Bottom of Layer (ft)	Total Unit Weight (pcf)	Deformation Modulus (ksi)	Friction Angle (deg)	Undrained Shear Strength or Rock Cohesion (ksf)	Rock / Concrete Bond Strength (ksf)	Ult. End Bearing Strength of Bottom Layer (ksf)
1[1]	TS/CL	3.5	105	---	---	---	---	---
2	CL-ML	8	120	0.80	---	1.50	---	7.50
3	CL-ML	12	130	2.50	---	4.00	---	20.00
4	CL-ML	17	130	1.60	---	2.50	---	12.50
5	MLS	20	140	5.00	38	---	---	30.00
6	LS (56)	30	162	772.88	35	3.00	15.00	60.00

B-4 MFAD Parameters								
Layer Number	Layer Type (RMR)	Depth to Bottom of Layer (ft)	Total Unit Weight (pcf)	Deformation Modulus (ksi)	Friction Angle (deg)	Undrained Shear Strength or Rock Cohesion (ksf)	Rock / Concrete Bond Strength (ksf)	Ult. End Bearing Strength of Bottom Layer (ksf)
1[1]	TS/CL	3.5	105	---	---	---	---	---
2	CL	5	125	2.00	---	3.25	---	16.25
3	CL-ML	8	130	2.50	---	4.00	---	20.00
4	CL-ML	12	130	1.80	---	3.00	---	15.00
5	SW	17	135	7.00	37	---	---	30.00
6	SW	22	135	5.00	36	---	---	30.00
7	SW	28.5	140	8.00	38	---	---	30.00
8	LS (23)	33	168	261.54	30.75	2.15	15.00	60.00

[1] The upper 42 inches of soil should be ignored due to potential effects of frost action as well as construction disturbance.

We recommend that a factor of safety of 3 be applied to the ultimate bearing capacity. The pressure meter modulus and certain other parameters were based on correlations with standard penetration test N-count, laboratory test results, and soil/rock type as shown in the User Guide of MFAD version 5.0. A strength factor of 0.63 is recommended for use with MFAD 5.0. Where lower capacity zones exist below and within 1 pier diameter of higher capacity zones, the lower bearing pressure should be used.

During construction, the pier bottom should be clean and inspected by a qualified geotechnical engineer prior to placing concrete. Concrete should be placed as soon after drilling as possible, with the exposed bearing surface kept as dry as practical. If any delay occurs, the bottom of the pier excavation should be re-augered to remove any softened soil. Any water accumulating in the shaft should be removed before placing concrete. Alternately, the concrete may be placed by a tremie method to preclude segregation of the mix. Casing and/or drilling mud will be necessary for water control and/or sidewall stability.

If temporary casing is used, while withdrawing casing, care should be exercised to maintain concrete inside the casing at a sufficient level to resist earth and hydrostatic pressures acting on the casing exterior. Arching of the concrete, loss of seal and other problem can occur during casing removal and result in contamination of the drilled shaft. These conditions should be considered during the design and construction phases. Placement of soil backfill should not be permitted around the casing prior to removal.

If permanent casing is used, the casing must be advanced ahead of the excavation via driving, vibro-hammer, or twisting. The casing must be installed in such a way to provide good load transfer through side resistance, under no circumstances should the hole be over drilled, and casing placed into the excavation.

SECTION 4

4.0 Seismic Considerations

Based on the subsurface profile found in the test boring, a Seismic Site Classification “C” should be used for design of all the structures according to the “International Building Code and Related Codes, Section 1613.5.2 Site Class Definitions.

4.1 Special Conditions

The clay soils have low swell potential, and collapsing conditions would not be expected. No mines are identified at the test locations on the Ohio Department of Natural Resources mine map.

Dolomite bedrock was encountered at all the boring locations and this rock type can develop solution voids. This area is also identified as a possible Karst area but no karst features have been identified by the Ohio Department of Natural Resources. Although no obvious karst formations were noted, and no voids were identified at the test boring locations, karst conditions cannot be ruled out and our office should be contacted immediately if voids are encountered.

4.2 General Comments

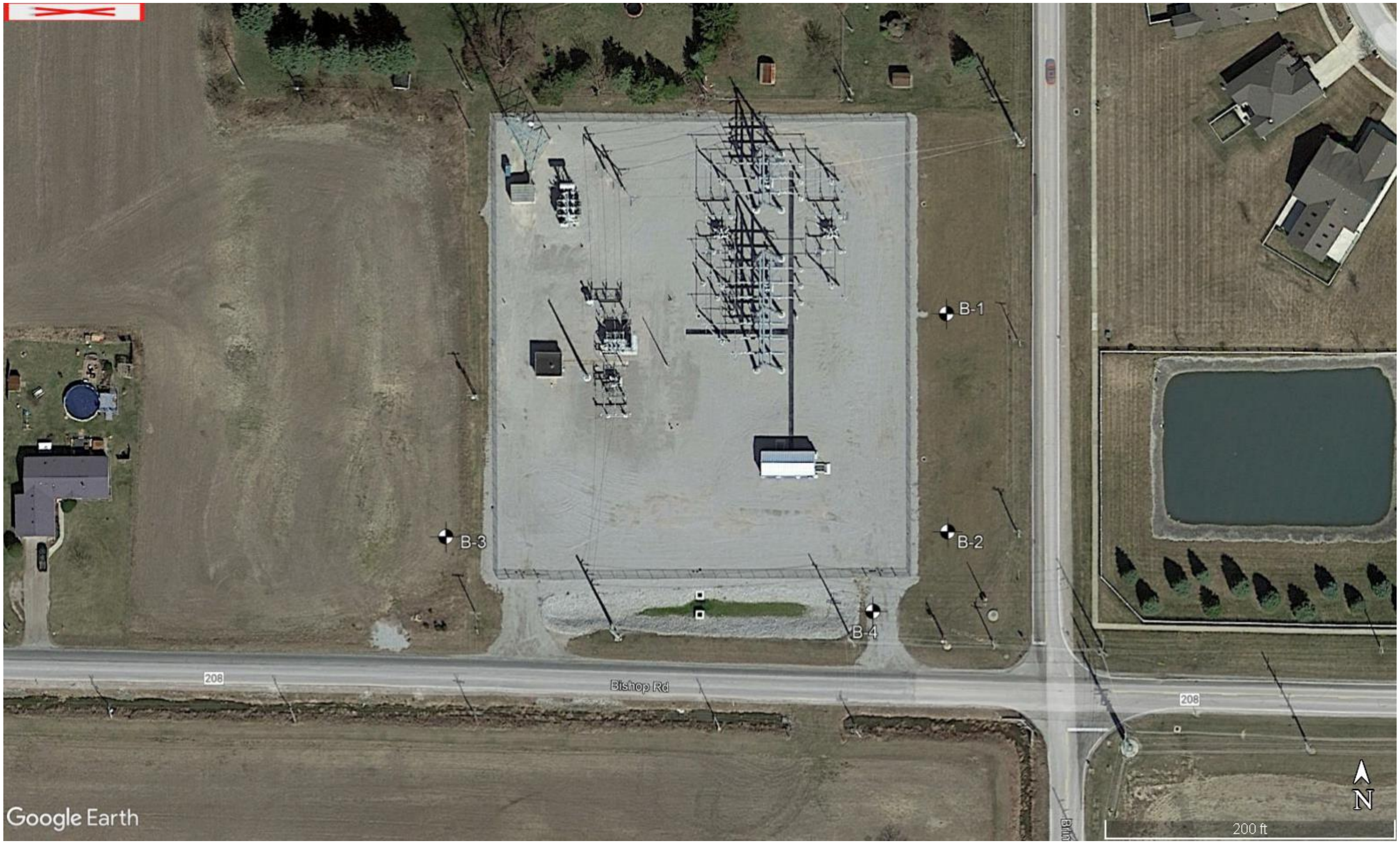
GPD Group should be retained to review the final design plans and specifications so comments can be made regarding interpretation and implementation of our geotechnical recommendations in the design and specifications. GPD or another qualified engineer should also be retained to provide testing and observation during site preparation and fill placement operations as well as during the foundation construction phases of the project.

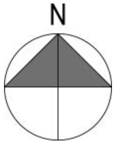
The analysis and recommendations presented in this report are based upon the data obtained from the boring performed at the indicated location and from other information discussed in this report. This report does not reflect variations that may occur across the site, or due to the modifying effects of weather. The nature and extent of such variations may not become evident until during or after construction. If variations appear, GPD should be immediately notified so that further evaluation and supplemental recommendations can be provided.

The scope of services for this project does not include either specifically or by implication any environmental assessment of the site or identification of contaminated or hazardous materials or conditions outside the collection of samples for testing as outlined previously. If the owner is concerned about the potential for such contamination, other studies should be undertaken.

This report has been prepared for the exclusive use of **FirstEnergy Corporation** for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, either express or implied, are intended or made. Site safety, excavation support, and dewatering requirements are the responsibility of others. In the event that changes in the nature, design, or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless GPD Group reviews the changes and either verifies or modifies the conclusions of this report in writing.

LOCATION PLAN





Legend

Soil Boring:

PROJECT: FE-Brim-Bellard 138kV Line Tie-in	
PROJECT NUMBER: 2021821.54	**DATE**: 10-13-2021
LOCATION: Bishop Rd., Bowling Green, Ohio	

520 S Main St, Suite 2531 Akron, Ohio 44311

Boring Number: B-1 (Str. 1 Brim-Bellard 138kV)

CLIENT FirstEnergy
PROJECT NAME Brim-Bellard Tie
PROJECT NUMBER 2021821.54
PROJECT LOCATION Bishop Road, Bowling Green, Ohio
DATE STARTED September 29, 2021 **COMPLETED** September 29, 2021
GROUND ELEVATION **HOLE SIZE**
DRILLING CONTRACTOR GPD Geotechnical Services, Inc.
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger & Rock Coring
AT TIME OF DRILLING 13.00 ft
LOGGED BY Nick Burgess **CHECKED BY** Jason Arney
AT END OF DRILLING 3.00 ftWater added during Rock Coring
NOTES Mobile B-54

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		14" Topsoil									
		Moist, stiff, brown & gray, silty CLAY, little sand, trace of roots.	SS 1	89	2-3-4 N_{60}=9		18	37	17	20	
5			SS 2	100	2-3-5 N_{60}=11		17				
		Moist to damp, hard to very stiff, gray, clayey SILT, little sand, trace of gravel.	SS 3	100	7-14-18 N_{60}=43						
10			SS 4	100	6-7-14 N_{60}=28		10				
		Wet, gray, medium dense, fine to coarse SAND & GRAVEL, little silt.									
15			SS 5	67	5-6-14 N_{60}=27						
20			SS 6	94	8-12-20 N_{60}=43						
		Wet, very dense, gray, SILT & ROCK FRAGMENTS. (Completely weathered Dolomite)									
25			SS 7	75	50/4"						
		Gray, moderately strong, weathered, moderately fractured, vuggy DOLOMITE. Unconfined Compressive Strength=15,470 psi & unit weight=171 pcf at 26.0'	RC 1	93 (35)							
			RC 2	87 (13)							
30											
			RC 3	95 (50)							
35		Unconfined Compressive Strength=14,560 psi & unit weight=167 pcf at 33.25'									

Boring terminated at 35.0 feet

B-1 Core Photo

9-29-2021
Run 1: 25′ TO 27.5′
Run 2: 27.5′ TO 30′
Run 3: 30′ TO 35′

PROJECT: FE Brim-Bellard 138kV Line Tie-in
PROJECT NUMBER: 2021821.54 **DATE**: 10/13/2021
LOCATION: Bishop Rd, Bowling Green, Ohio

520 S Main St, Suite 2531 Akron, Ohio 44311

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Akron, Ohio 44311
Phone 330.572.2100
www.gpdgroup.com

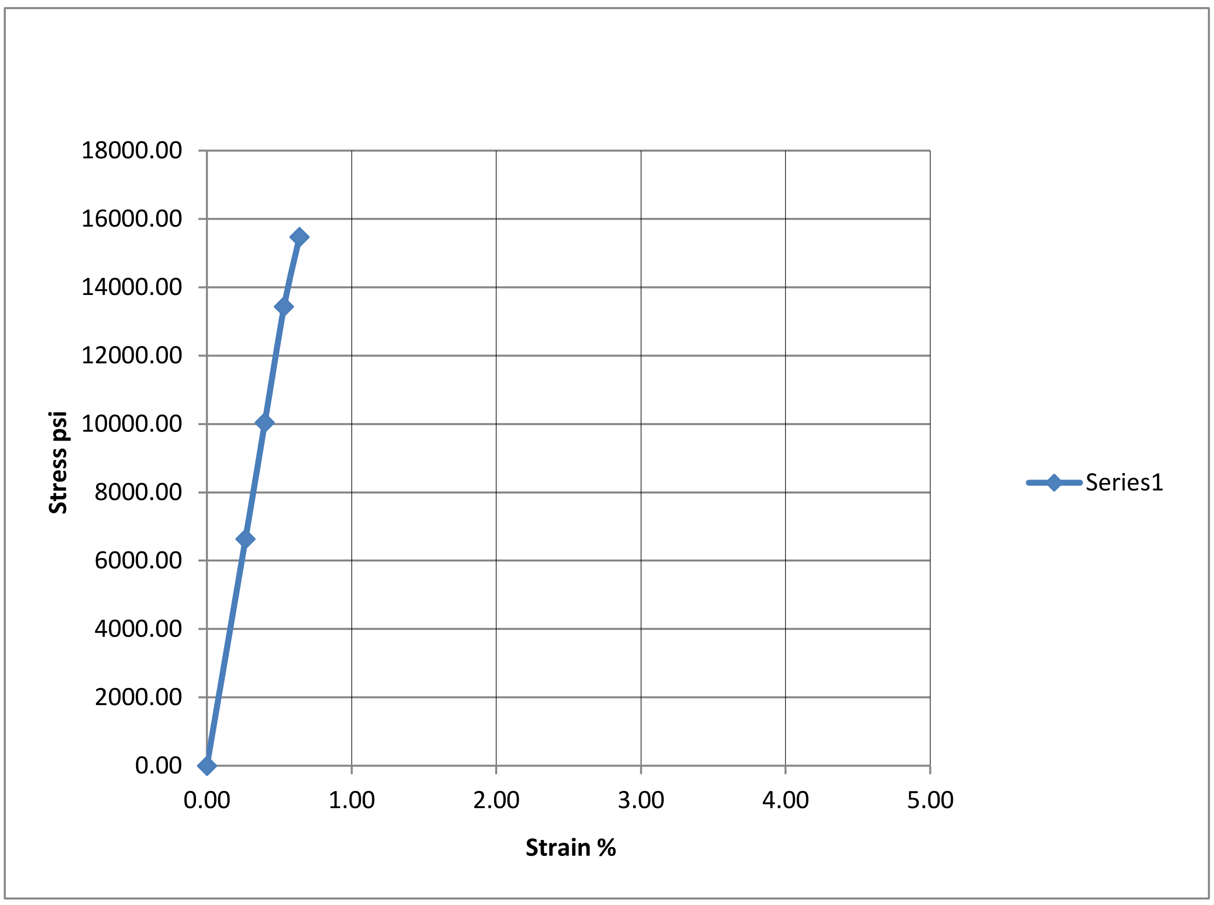
Unconfined Rock Compression Test (ASTM D-2938)

Job Name:	FirstEnergy Brim-Bellard Tie
Boring #:	B-1 (Str. 1 Brim-Bellard 138 kV)
Sample #:	RC-1
Depth:	26.0'
Project #:	2021821.54
Sample Description:	Gray, moderately strong, weathered, moderately fractured, vuggy DOLOMITE.

Unconfined Compressive Strength:	15,470 psi
Strain at Failure:	0.64%
Strain at 50% of Maximum Strength:	0.31%
Modulus of Elasticity:	2,416,800 psi
Average Length:	3.749
Average Diameter:	1.973
Height to Diameter. Ratio:	1.90
Unit Weight (pcf):	171.19

Remarks:

Strain (%)	Stress (psi)
0.00	0.00
0.27	6636.47
0.40	10038.11
0.53	13429.93
0.64	15467.65



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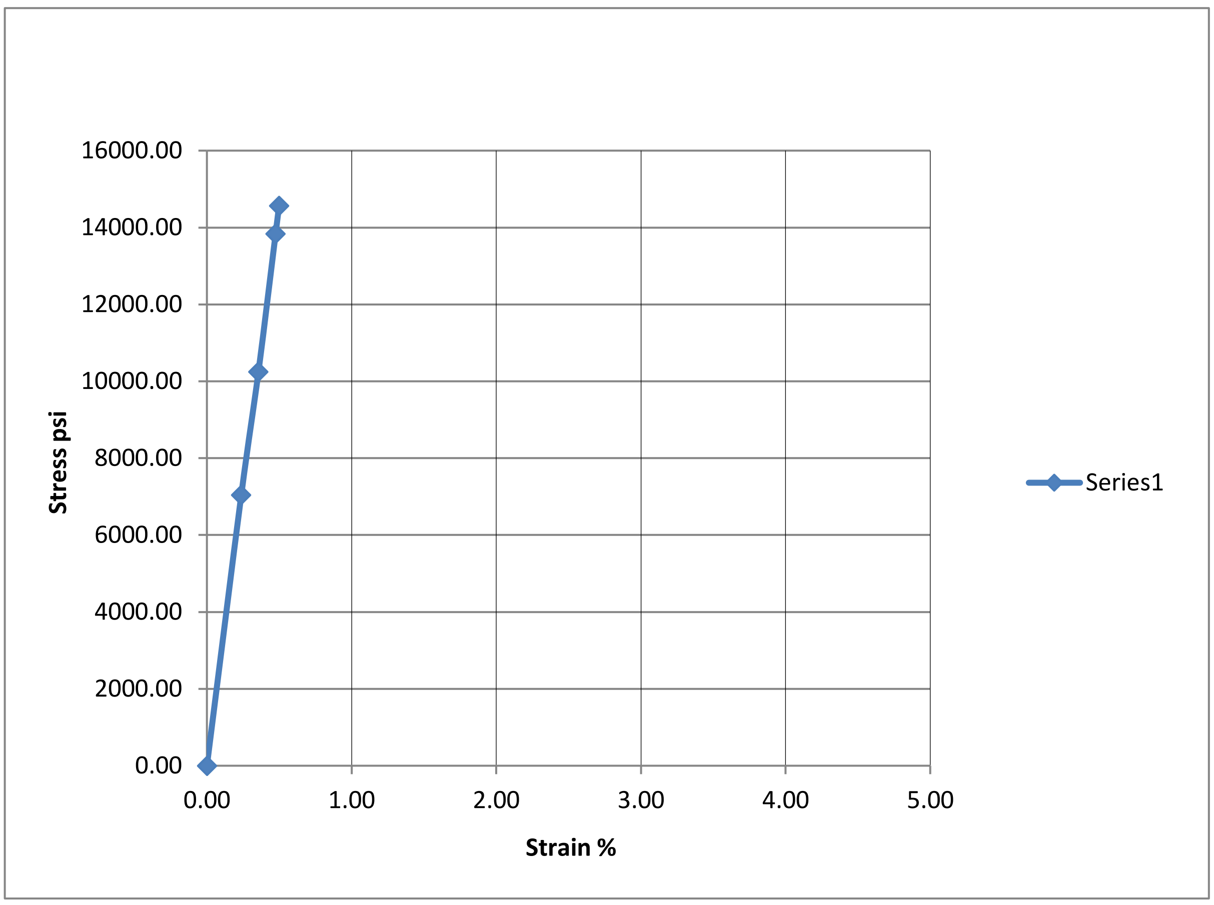
Unconfined Rock Compression Test (ASTM D-2938)

Job Name:	FirstEnergy Brim-Bellard Tie	Unconfined Compressive Strength:	14,560 psi
Boring #:	B-1 (Str. 1 Brim-Bellard 138kV)	Strain at Failure:	0.50%
Sample #:	RC-3	Strain at 50% of Maximum Strength:	0.25%
Depth:	33.25'	Modulus of Elasticity:	2,912,600 psi
Project #:	2021821.54	Average Length:	4.211
Sample Description:	Gray, moderately strong, weathered, moderately fractured, vuggy DOLOMITE.	Average Diameter:	1.98
		Height to Diameter. Ratio:	2.13
		Unit Weight (pcf):	166.59

Remarks:

Strain (%)	Stress (psi)
0.00	0.00
0.24	7034.56
0.36	10240.06
0.47	13835.29
0.50	14562.78



Boring Number: B-2 (Str. 2 Brim-Bellard 138kV)

CLIENT FirstEnergy **PROJECT NAME** Brim-Bellard Tie

PROJECT NUMBER 2021821.54 **PROJECT LOCATION** Bishop Road, Bowling Green, Ohio

DATE STARTED September 28, 2021 **COMPLETED** September 28, 2021 **GROUND ELEVATION** **HOLE SIZE**

DRILLING CONTRACTOR GPD Geotechnical Services, Inc. **GROUND WATER LEVELS:**

DRILLING METHOD Hollow Stem Auger & Rock Coring ▽ **AT TIME OF DRILLING** 14.00 ft

LOGGED BY Nick Burgess **CHECKED BY** Jason Arney ▼ **AT END OF DRILLING** 1.00 ftWater added during coring

NOTES Mobile B-54

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	ATTERBERG LIMITS: PLASTIC LIMIT	ATTERBERG LIMITS: PLASTICITY INDEX	FINES CONTENT (%)
0		13" Topsoil ▼									
		Damp, stiff to hard, gray, clayey SILT, some to little sand, trace of gravel.	SS 1	83	3-4-5 N_{60}=12		20				
5			SS 2	100	4-7-12 N_{60}=26		13	29	15	14	
			SS 3	100	6-13-20 N_{60}=44		13				
10			SS 4	94	6-12-18 N_{60}=40		12				
		Moist to wet, medium dense, gray SILT, little sand. ▽									
15			SS 5	100	5-7-11 N_{60}=24						
		Wet, loose, gray, fine to coarse SAND, little silt & gravel.									
20			SS 6	100	2-3-2 N_{60}=7						
25		Gray, moderately strong, slightly weathered to weathered, slightly fractured to highly fractured DOLOMITE. Unconfined Compressive Strength=22,630 psi & unit weight=176 pcf at 23.5'	RC 1	98 (64)							
30		Unconfined Compressive Strength=20,050 psi & unit weight=161 pcf at 29.75'	RC 2	93 (51)							

Boring terminated at 33.0 feet

B-2 Core Photo

9-28-2021
Run 1: 23' TO 28'
Run 2: 28' TO 33'

PROJECT: FE Brim-Bellard 138kV Line Tie-in
PROJECT NUMBER: 2021821.54 **DATE**: 10/13/2021
LOCATION: Bishop Rd, Bowling Green, Ohio

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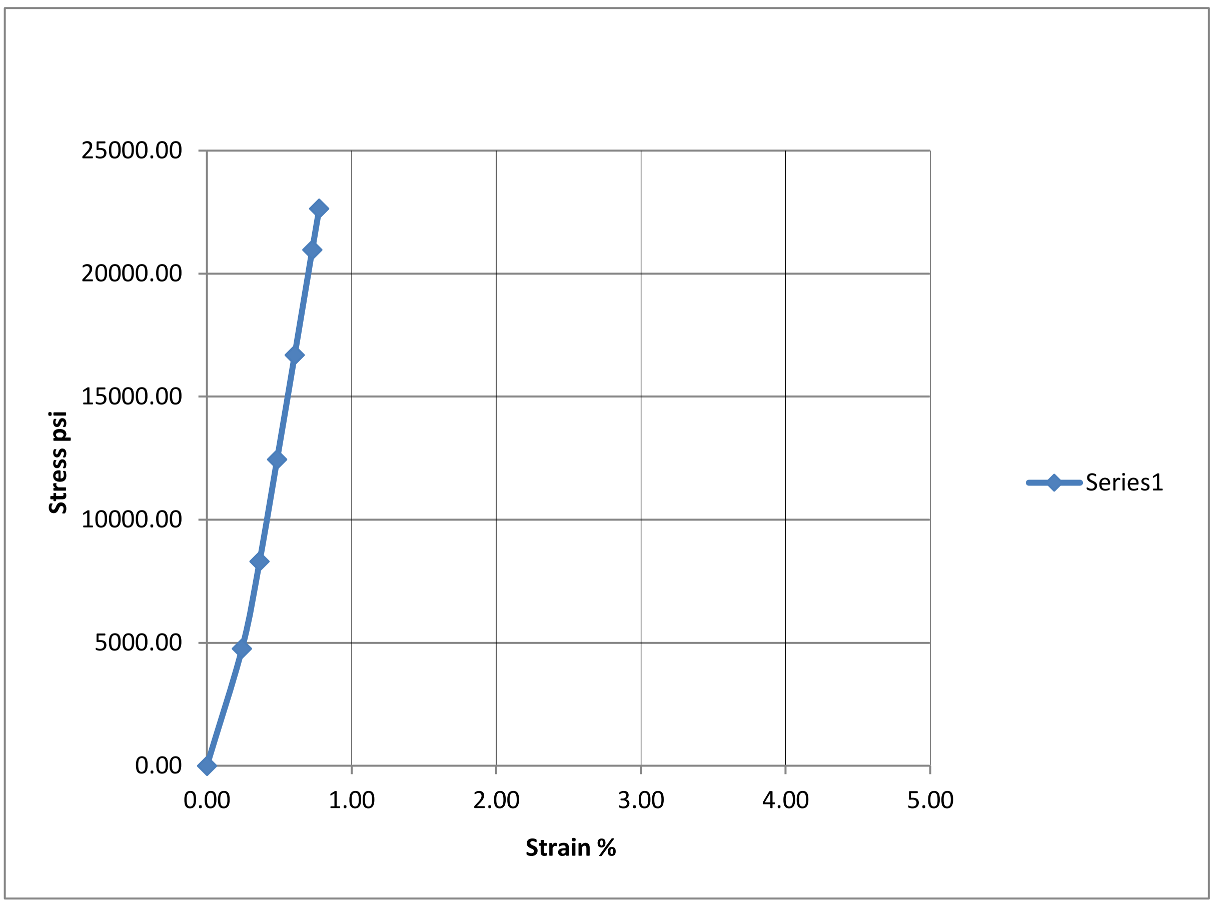
Unconfined Rock Compression Test (ASTM D-2938)

Job Name:	FirstEnergy Brim-Bellard Tie	Unconfined Compressive Strength:	22,630 psi
Boring #:	B-2 (Str. 2 Brim-Bellard 138kV)	Strain at Failure:	0.78%
Sample #:	RC-1	Strain at 50% of Maximum Strength:	0.45%
Depth:	23.5'	Modulus of Elasticity:	2,901,800 psi
Project #:	2021821.54	Average Length:	4.12
Sample Description:	Gray, moderately strong, slightly weathered to weathered, slightly fractured to highly fractured DOLOMITE.	Average Diameter:	1.974
		Height to Diameter. Ratio:	2.09
		Unit Weight (pcf):	175.77

Remarks:

Strain (%)	Stress (psi)
0.00	0.00
0.24	4750.94
0.36	8296.17
0.49	12452.42
0.61	16687.09
0.73	20967.51
0.78	22633.93



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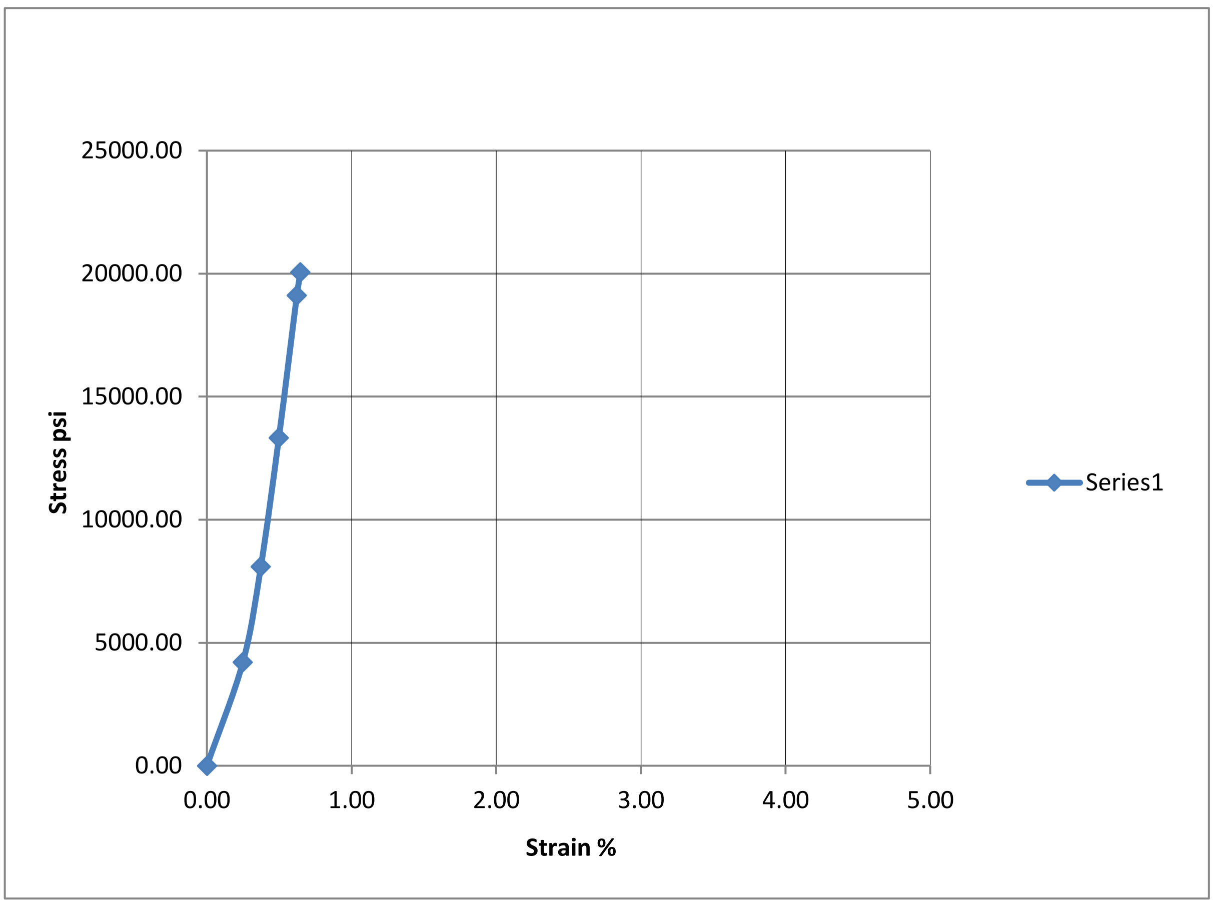
Unconfined Rock Compression Test (ASTM D-2938)

Job Name:	FirstEnergy Brim-Bellard Tie	Unconfined Compressive Strength:	20,050 psi
Boring #:	B-2 (Str. 2 Brim-Bellard 138kV)	Strain at Failure:	0.65%
Sample #:	RC-2	Strain at 50% of Maximum Strength:	0.42%
Depth:	29.75'	Modulus of Elasticity:	3,960,500 psi
Project #:	2021821.54	Average Length:	4.02
Sample Description:	Gray, moderately strong, slightly weathered to weathered, slightly fractured to highly fractured DOLOMITE.	Average Diameter:	1.979
		Height to Diameter. Ratio:	2.03
		Unit Weight (pcf):	160.60

Remarks:

Strain (%)	Stress (psi)
0.00	0.00
0.25	4206.80
0.37	8095.00
0.50	13322.61
0.62	19112.65
0.65	20048.94



Boring Number: B-3 (Str. 3 Brim-Midway 138kV)

CLIENT FirstEnergy
PROJECT NAME Brim-Bellard Tie
PROJECT NUMBER 2021821.54
PROJECT LOCATION Bishop Road, Bowling Green, Ohio
DATE STARTED September 27, 2021 **COMPLETED** September 27, 2021
GROUND ELEVATION **HOLE SIZE**
DRILLING CONTRACTOR GPD Geotechnical Services, Inc.
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger & Rock Coring
AT TIME OF DRILLING ---
LOGGED BY Nick Burgess **CHECKED BY** Jason Arney
AT END OF DRILLING ---
NOTES Mobile B-54

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	FINES CONTENT (%)
0		18" Topsoil									
		Moist, stiff, gray, silty CLAY, trace of sand & gravel.	SS 1	89	3-4-5 N_{60}=12		21				
		Damp to moist, stiff to hard, gray, clayey SILT, little sand & gravel.									
5			SS 2	100	3-4-5 N_{60}=12		16				
		Thin wet seam at 7'	SS 3	100	2-3-6 N_{60}=12		17				
10			SS 4	100	5-15-24 N_{60}=53		14				
15			SS 5	94	11-6-9 N_{60}=20						
		Moist, very dense, gray SILT, fine SAND, & ROCK FRAGMENTS, little clay.									
20			SS 6	47	30-9-50/3"						
		Gray, moderately strong, slightly weathered, unfractured, vuggy DOLOMITE.									
		Unconfined Compressive Strength=17,630 psi & unit weight=165 pcf at 23.25'									
25			RC 1	99 (99)							
		Unconfined Compressive Strength=12,410 psi & unit weight=160 pcf at 26.25'									
30											

Boring terminated at 30.0 feet

B-3 Core Photo

9-27-2021
Run 1: 20’ TO 30’

PROJECT: FE Brim-Bellard 138kV Line Tie-in
PROJECT NUMBER: 2021821.54 **DATE**: 10/13/2021
LOCATION: Bishop Rd, Bowling Green, Ohio

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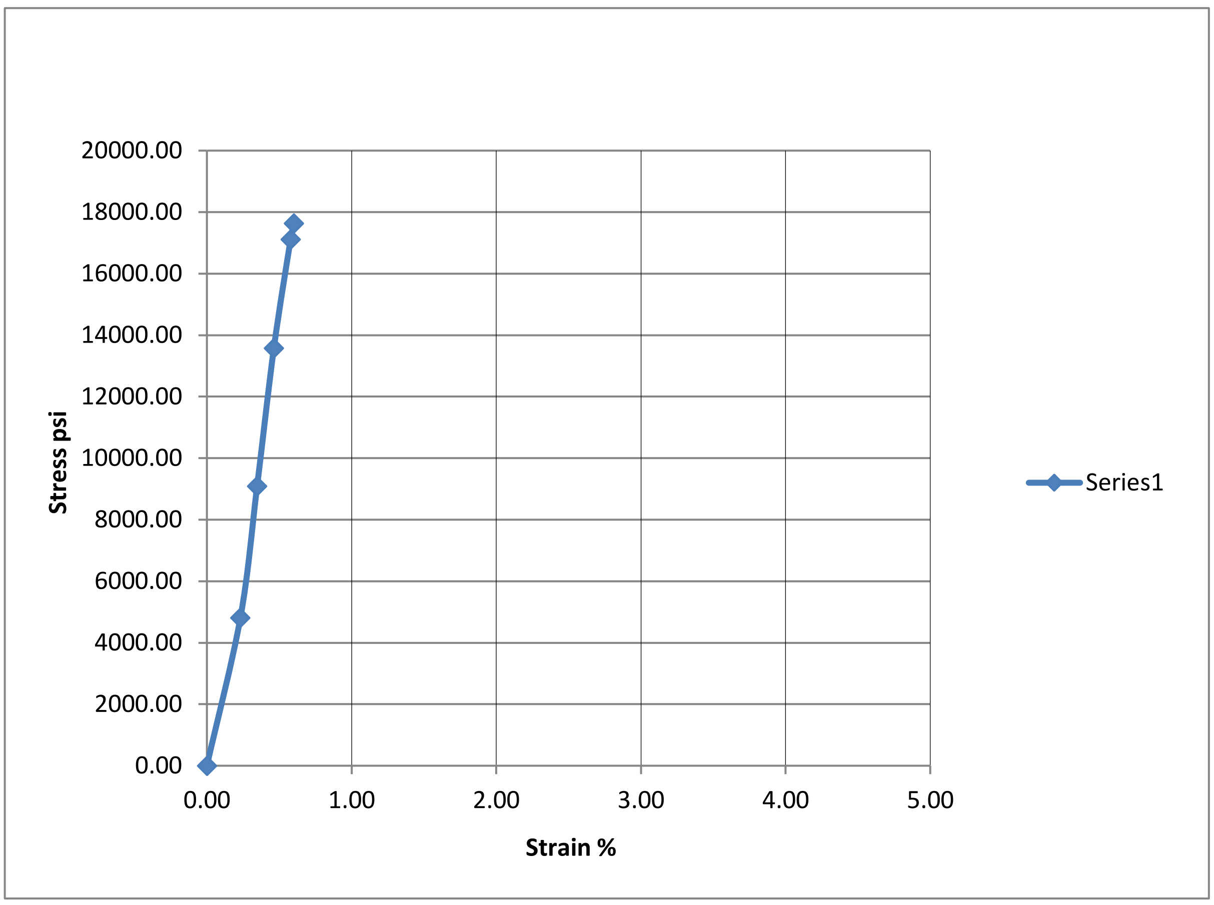
Unconfined Rock Compression Test (ASTM D-2938)

Job Name:	FirstEnergy Brim-Bellard Tie
Boring #:	B-3 (Str. Brim-Midway 138kV)
Sample #:	RC-1
Depth:	23.25'
Project #:	2021821.54
Sample Description:	Gray, moderately strong, slightly weathered, unfractured, vuggy DOLOMITE.

Unconfined Compressive Strength:	17,630 psi
Strain at Failure:	0.60%
Strain at 50% of Maximum Strength:	0.34%
Modulus of Elasticity:	2,938,900 psi
Average Length:	4.321
Average Diameter:	1.975
Height to Diameter. Ratio:	2.19
Unit Weight (pcf):	164.92

Remarks:

Strain (%)	Stress (psi)
0.00	0.00
0.23	4808.15
0.35	9087.49
0.46	13579.01
0.58	17107.60
0.60	17633.13



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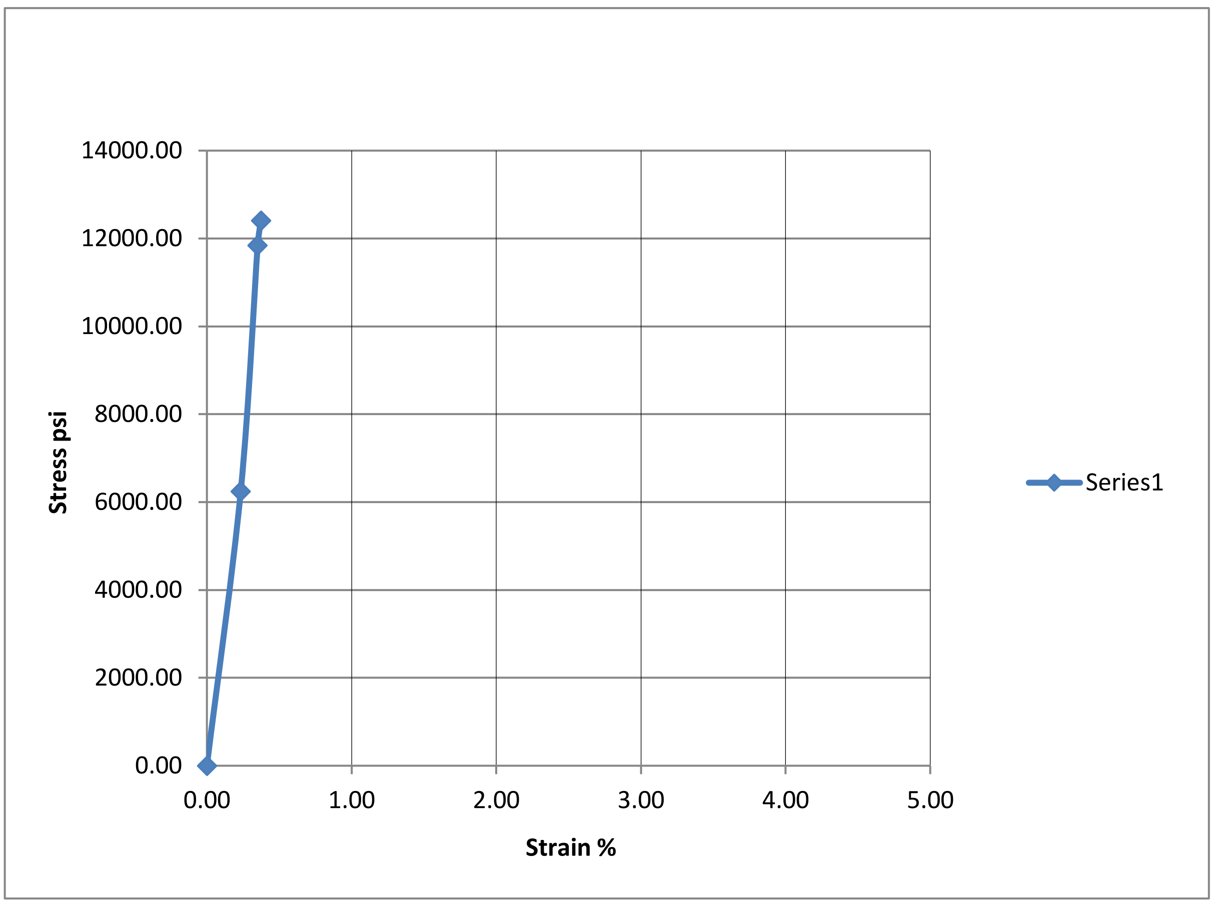
Unconfined Rock Compression Test (ASTM D-2938)

Job Name:	FirstEnergy Brim-Bellard Tie
Boring #:	B-3 (Str. 3 Brim-Midway 138kV)
Sample #:	RC-1
Depth:	26.25'
Project #:	2021821.54
Sample Description:	Gray, moderately strong, slightly weathered, unfractured, vuggy DOLOMITE.

Unconfined Compressive Strength:	12,410 psi
Strain at Failure:	0.37%
Strain at 50% of Maximum Strength:	0.23%
Modulus of Elasticity:	3,353,300 psi
Average Length:	4.274
Average Diameter:	1.975
Height to Diameter. Ratio:	2.16
Unit Weight (pcf):	160.26

Remarks:

Strain (%)	Stress (psi)
0.00	0.00
0.23	6244.39
0.35	11842.47
0.37	12407.17



Boring Number: B-4 (Str. 2 BG5-Brim 69kV)

CLIENT FirstEnergy
PROJECT NAME Brim-Bellard Tie
PROJECT NUMBER 2021821.54
PROJECT LOCATION Bishop Road, Bowling Green, Ohio
DATE STARTED September 28, 2021 **COMPLETED** September 28, 2021
GROUND ELEVATION **HOLE SIZE**
DRILLING CONTRACTOR GPD Geotechnical Services, Inc.
GROUND WATER LEVELS:
DRILLING METHOD Hollow Stem Auger & Rock Coring
▽ **AT TIME OF DRILLING** 13.00 ft
LOGGED BY Nick Burgess **CHECKED BY** Jason Arney
AT END OF DRILLING ---
NOTES Mobile B-54; Boring offset ±20' Northeast due to overhead lines

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	POCKET PEN. (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS: LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX	FINES CONTENT (%)
0		12" Gravel									
		Moist, loose, brown, SILT & fine SAND. (FIll)									
		Damp, medium stiff to very stiff, brown, silty CLAY. little sand.	SS 1	78	2-3-3 N_{60}=8						
5			SS 2	89	6-8-11 N_{60}=26		16				
		Damp, hard, brown to gray, clayey SILT, little sand & rock fragments.	SS 3	100	8-14-19 N_{60}=44		12				
10		Auger refusal on cobble/boulder at 9' - Cored from 9' to 19' - 8" recovery - underlain by fine to coarse sand & gravel. 13.5' and 18.5' samples were collected at offset location	SS 4	89	23-50/3"		13				
15		▽ Wet, dense to very dense, gray, fine to coarse SAND, little gravel/rock fragments, trace of silt.	SS 5	100	12-14-15 N_{60}=39						
20			SS 6	89	6-12-13 N_{60}=34						
25		Significant sand heave into augers at 23.5' sample	SS 7	89	9-13-27 N_{60}=54						
30		Gray, moderately strong, weathered, fractured, DOLOMITE. Unconfined Compressive Strength=8,700 psi & unit weight=168 pcf at 29.25'	RC 1	72 (36)							
			RC 2	92 (0)							

Boring terminated at 33.0 feet

CENTER TERMINATION NOTE - GINT STD US LAB.GDT - 10/14/21 08:47 - F:\GPD GILCHRIST\JOBS\2021\2021821.54 - FIRSTENERGY - BRIM - BELLARD TIE LINE\B-1 BLANK.GPJ

B-4 Core Photo

9-28-2021
Run 1: 28.5' TO 30'
Run 2: 30' TO 33'

PROJECT: FE Brim-Bellard 138kV Line Tie-in
PROJECT NUMBER: 2021821.54 **DATE**: 10/13/2021
LOCATION: Bishop Rd, Bowling Green, Ohio

520 S Main St, Suite 2531 Akron, Ohio 44311

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Akron, Ohio 44311
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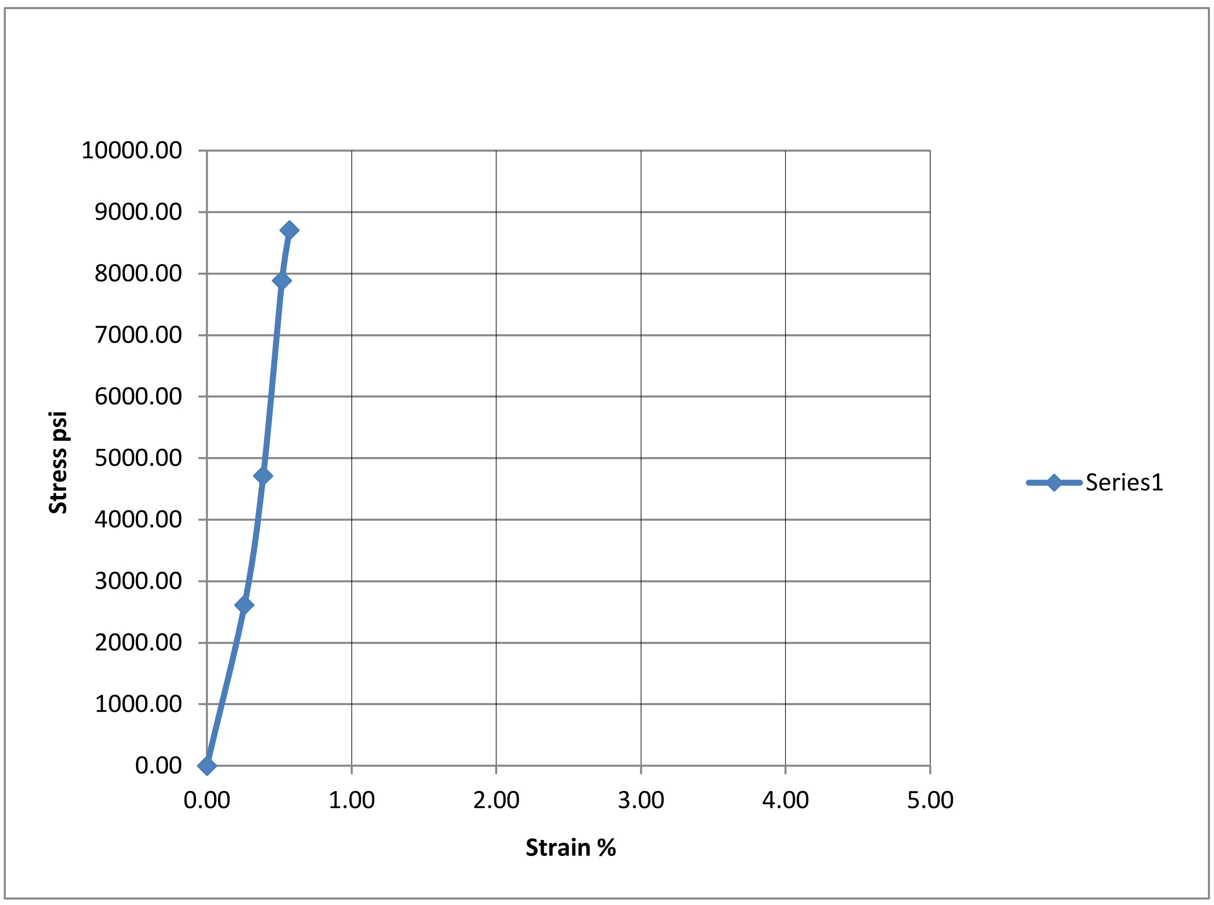
Unconfined Rock Compression Test (ASTM D-2938)

Job Name:	FirstEnergy Brim-Bellard Tie
Boring #:	B-4 (Str. 2 BG5-Brim 69kV)
Sample #:	RC-1
Depth:	29.25'
Project #:	2021821.54
Sample Description:	Gray, moderately strong, weathered, fractured, DOLOMITE.

Unconfined Compressive Strength:	8,700 psi
Strain at Failure:	0.57%
Strain at 50% of Maximum Strength:	0.37%
Modulus of Elasticity:	1,526,900 psi
Average Length:	3.852
Average Diameter:	1.976
Height to Diameter. Ratio:	1.95
Unit Weight (pcf):	168.25

Remarks:

Strain (%)	Stress (psi)
0.00	0.00
0.26	2608.71
0.39	4711.98
0.52	7888.08
0.57	8703.30



GENERAL NOTES

SAMPLE IDENTIFICATION

The Unified Soil Classification System (USCS), AASHTO 1988 and ASTM designations D2487 and D-2488 are used to identify the encountered materials unless otherwise noted. Coarse-grained soils are defined as having more than 50% of their dry weight retained on a #200 sieve (0.075mm); they are described as: boulders, cobbles, gravel or sand. Fine-grained soils have less than 50% of their dry weight retained on a #200 sieve; they are defined as silts or clay depending on their Atterberg Limit attributes. Major constituents may be added as modifiers and minor constituents may be added according to the relative proportions based on grain size.

DRILLING AND SAMPLING SYMBOLS

SFA: Solid Flight Auger - typically 4" diameter flights, except where noted.
HSA: Hollow Stem Auger - typically 3¼" or 4¼ I.D. openings, except where noted.
M.R.: Mud Rotary - Uses a rotary head with Bentonite or Polymer Slurry
R.C.: Diamond Bit Core Sampler
H.A.: Hand Auger
P.A.: Power Auger - Handheld motorized auger

SS: Split-Spoon - 1 3/8" I.D., 2" O.D., except where noted.
ST: Shelby Tube - 3" O.D., except where noted.
BS: Bulk Sample
PM: Pressuremeter
CPT-U: Cone Penetrometer Testing with Pore-Pressure Readings

SOIL PROPERTY SYMBOLS

N: Standard "N" penetration: Blows per foot of a 140 pound hammer falling 30 inches on a 2-inch O.D. Split-Spoon.
N_{60}: A "N" penetration value corrected to an equivalent 60% hammer energy transfer efficiency (ETR)
Q_u: Unconfined compressive strength, TSF
Q_p: Pocket penetrometer value, unconfined compressive strength, TSF
w%: Moisture/water content, %
LL: Liquid Limit, %
PL: Plastic Limit, %
PI: Plasticity Index = (LL-PL),%
DD: Dry unit weight, pcf
▼,▽,▼: Apparent groundwater level at time noted

RELATIVE DENSITY OF COARSE-GRAINED SOILS

Relative Density	N - Blows/foot
Very Loose	0 - 4
Loose	4 - 10
Medium Dense	10 - 30
Dense	30 - 50
Very Dense	50 - 80
Extremely Dense	80+

ANGULARITY OF COARSE-GRAINED PARTICLES

Description	Criteria
Angular:	Particles have sharp edges and relatively plane sides with unpolished surfaces
Subangular:	Particles are similar to angular description, but have rounded edges
Subrounded:	Particles have nearly plane sides, but have well-rounded corners and edges
Rounded:	Particles have smoothly curved sides and no edges

GRAIN-SIZE TERMINOLOGY

Component	Size Range
Boulders:	Over 300 mm (>12 in.)
Cobbles:	75 mm to 300 mm (3 in. to 12 in.)
Coarse-Grained Gravel:	19 mm to 75 mm (¾ in. to 3 in.)
Fine-Grained Gravel:	4.75 mm to 19 mm (No.4 to ¾ in.)
Coarse-Grained Sand:	2 mm to 4.75 mm (No.10 to No.4)
Medium-Grained Sand:	0.42 mm to 2 mm (No.40 to No.10)
Fine-Grained Sand:	0.075 mm to 0.42 mm (No. 200 to No.40)
Silt:	0.005 mm to 0.075 mm
Clay:	<0.005 mm

PARTICLE SHAPE

Description	Criteria
Flat:	Particles with width/thickness ratio > 3
Elongated:	Particles with length/width ratio > 3
Flat & Elongated:	Particles meet criteria for both flat and elongated

RELATIVE PROPORTIONS OF FINES

Descriptive Term	% Dry Weight
Trace:	< 5%
With:	5% to 12%
Modifier:	>12%

GENERAL NOTES

(Continued)

CONSISTENCY OF FINE-GRAINED SOILS

Q_U - TSF	N - Blows/foot	Consistency
0 - 0.25	0 - 2	Very Soft
0.25 - 0.50	2 - 4	Soft
0.50 - 1.00	4 - 8	Firm (Medium Stiff)
1.00 - 2.00	8 - 15	Stiff
2.00 - 4.00	15 - 30	Very Stiff
4.00 - 8.00	30 - 50	Hard
8.00+	50+	Very Hard

MOISTURE CONDITION DESCRIPTION

Description	Criteria
Dry:	Absence of moisture, dusty, dry to the touch
Moist:	Damp but no visible water
Wet:	Visible free water, usually soil is below water table

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Term	% Dry Weight
Trace:	< 15%
With:	15% to 30%
Modifier:	>30%

STRUCTURE DESCRIPTION

Description	Criteria
Stratified:	Alternating layers of varying material or color with layers at least ¼-inch (6 mm) thick
Laminated:	Alternating layers of varying material or color with layers less than ¼-inch (6 mm) thick
Fissured:	Breaks along definite planes of fracture with little resistance to fracturing
Slickensided:	Fracture planes appear polished or glossy, sometimes striated

Description	Criteria
Blocky:	Cohesive soil that can be broken down into small angular lumps which resist further breakdown
Lensed:	Inclusion of small pockets of different soils
Layer:	Inclusion greater than 3 inches thick (75 mm)
Seam:	Inclusion 1/8-inch to 3 inches (3 to 75 mm) thick extending through the sample
Parting:	Inclusion less than 1/8-inch (3 mm) thick

SCALE OF RELATIVE ROCK HARDNESS

Q_U - TSF	Consistency
2.5 - 10	Extremely Soft
10 - 50	Very Soft
50 - 250	Soft
250 - 525	Medium Hard
525 - 1,050	Moderately Hard
1,050 - 2,600	Hard
>2,600	Very Hard

ROCK BEDDING THICKNESSES

Description	Criteria
Very Thick Bedded	Greater than 3-foot (>1.0 m)
Thick Bedded	1-foot to 3-foot (0.3 m to 1.0 m)
Medium Bedded	4-inch to 1-foot (0.1 m to 0.3 m)
Thin Bedded	1¼-inch to 4-inch (30 mm to 100 mm)
Very Thin Bedded	½-inch to 1¼-inch (10 mm to 30 mm)
Thickly Laminated	1/8-inch to ½-inch (3 mm to 10 mm)
Thinly Laminated	1/8-inch or less "paper thin" (<3 mm)

ROCK VOIDS

Voids	Void Diameter
Pit	<6 mm (<0.25 in)
Vug	6 mm to 50 mm (0.25 in to 2 in)
Cavity	50 mm to 600 mm (2 in to 24 in)
Cave	>600 mm (>24 in)

GRAIN-SIZED TERMINOLOGY

(Typically Sedimentary Rock)

Component	Size Range
Very Coarse Grained	>4.76 mm
Coarse Grained	2.0 mm - 4.76 mm
Medium Grained	0.42 mm - 2.0 mm
Fine Grained	0.075 mm - 0.42 mm
Very Fine Grained	<0.075 mm

ROCK QUALITY DESCRIPTION

Rock Mass Description	RQD Value
Excellent	90 -100
Good	75 - 90
Fair	50 - 75
Poor	25 -50
Very Poor	Less than 25

DEGREE OF WEATHERING

Slightly Weathered:	Rock generally fresh, joints stained and discoloration extends into rock up to 25 mm (1 in), open joints may contain clay, core rings under hammer impact.
Weathered:	Rock mass is decomposed 50% or less, significant portions of the rock show discoloration and weathering effects, cores cannot be broken by hand or scraped by knife.
Highly Weathered:	Rock mass is more than 50% decomposed, complete discoloration of rock fabric, core may be extremely broken and gives clunk sound when struck by hammer, may be shaved with a knife.

Unified Soil Classification System

Major Divisions			Letter	Symbol	Description
Coarse-grained Soils More than ½ retained on the No. 200 Sieve	**Gravels** More than ½ coarse fraction retained on the No. 4 sieve	Clean Gravels	GW		Well-graded gravels and gravel-sand mixtures, little or no fines.
			GP		Poorly-graded gravels and gravel-sand mixtures, little or no fines.
		Gravels With Fines	GM		Silty gravels, gravel-sand-silt mixtures.
			GC		Clayey gravels, gravel-sand-clay mixtures.
	Sands More than ½ passing through the No. 200 sieve	Clean Sands	SW		Well-graded sands and gravelly sands, little or no fines.
			SP		Poorly-graded sands and gravelly sands, little or no fines.
		Sands With Fines	SM		Silty sands, sand-silt mixtures
			SC		Clayey sands, sandy-clay mixtures.
Fine-grained Soils More than ½ passing through the No. 200 Sieve	**Silts and Clays** Liquid Limit less than 50%		ML		Inorganic silts, very fine sands, rock flour, silty or clayey fine sands.
			CL		Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays.
			OL		Organic clays of medium to high plasticity.
	Silts and Clays Liquid Limit greater than 50%		MH		Inorganic silts, micaceous or diatomaceous fines sands or silts, elastic silts.
			CH		Inorganic clays of high plasticity, fat clays.
			OH		Organic clays of medium to high plasticity.
Highly Organic Soils			PT		Peat, muck, and other highly organic soils.

Consistency Classification

Granular Soils			*Cohesive Soils*		
Description - Blows Per Foot (Corrected)			Description - Blows Per Foot (Corrected)		
	MCS	SPT		MCS	SPT
Very loose	<5	<4	Very soft	<3	<2
Loose	5 – 15	4 – 10	Soft	3 – 5	2 – 4
Medium dense	16 – 40	11 – 30	Firm	6 – 10	5 – 8
Dense	41 – 65	31 – 50	Stiff	11 – 20	9 – 15
Very dense	>65	>50	Very Stiff	21 – 40	16 – 30
			Hard	>40	>30

MCS = Modified California Sampler   SPT = Standard Penetration Test Sampler

Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
10101 Hillwood Parkway
Fort Worth, TX 76177

Aeronautical Study No.
2021-AGL-34106-OE
Prior Study No.
2019-AGL-9992-OE

Issued Date: 12/30/2021

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FirstEnergy
76 S Main S
Akron, OH 44308

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Monopole Str. #1
Location:	Bowling Green, OH
Latitude:	41-24-31.11N NAD 83
Longitude:	83-39-54.18W
Heights:	673 feet site elevation (SE)
	80 feet above ground level (AGL)
	753 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be e-filed any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part 1)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking/ lighting are accomplished on a voluntary basis, we recommend it be installed in accordance with FAA Advisory circular 70/7460-1 M.

This determination expires on 06/30/2023 unless:

(a) the construction is started (not necessarily completed) and FAA Form 7460-2, Notice of Actual Construction or Alteration, is received by this office.
(b) extended, revised, or terminated by the issuing office.
(c) the construction is subject to the licensing authority of the Federal Communications Commission (FCC) and an application for a construction permit has been filed, as required by the FCC, within 6 months of the date of this determination. In such case, the determination expires on the date prescribed by the FCC for completion of construction, or the date the FCC denies the application.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

This determination is based, in part, on the foregoing description which includes specific coordinates, heights, frequency(ies) and power. Any changes in coordinates, heights, and frequencies or use of greater power, except those frequencies specified in the Colo Void Clause Coalition; Antenna System Co-Location; Voluntary Best Practices, effective 21 Nov 2007, will void this determination. Any future construction or alteration, including increase to heights, power, or the addition of other transmitters, requires separate notice to the FAA.This determination includes all previously filed frequencies and power for this structure.

If construction or alteration is dismantled or destroyed, you must submit notice to the FAA within 5 days after the construction or alteration is dismantled or destroyed.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

If we can be of further assistance, please contact our office at (817) 222-5933, or andrew.hollie@faa.gov. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2021-AGL-34106-OE.

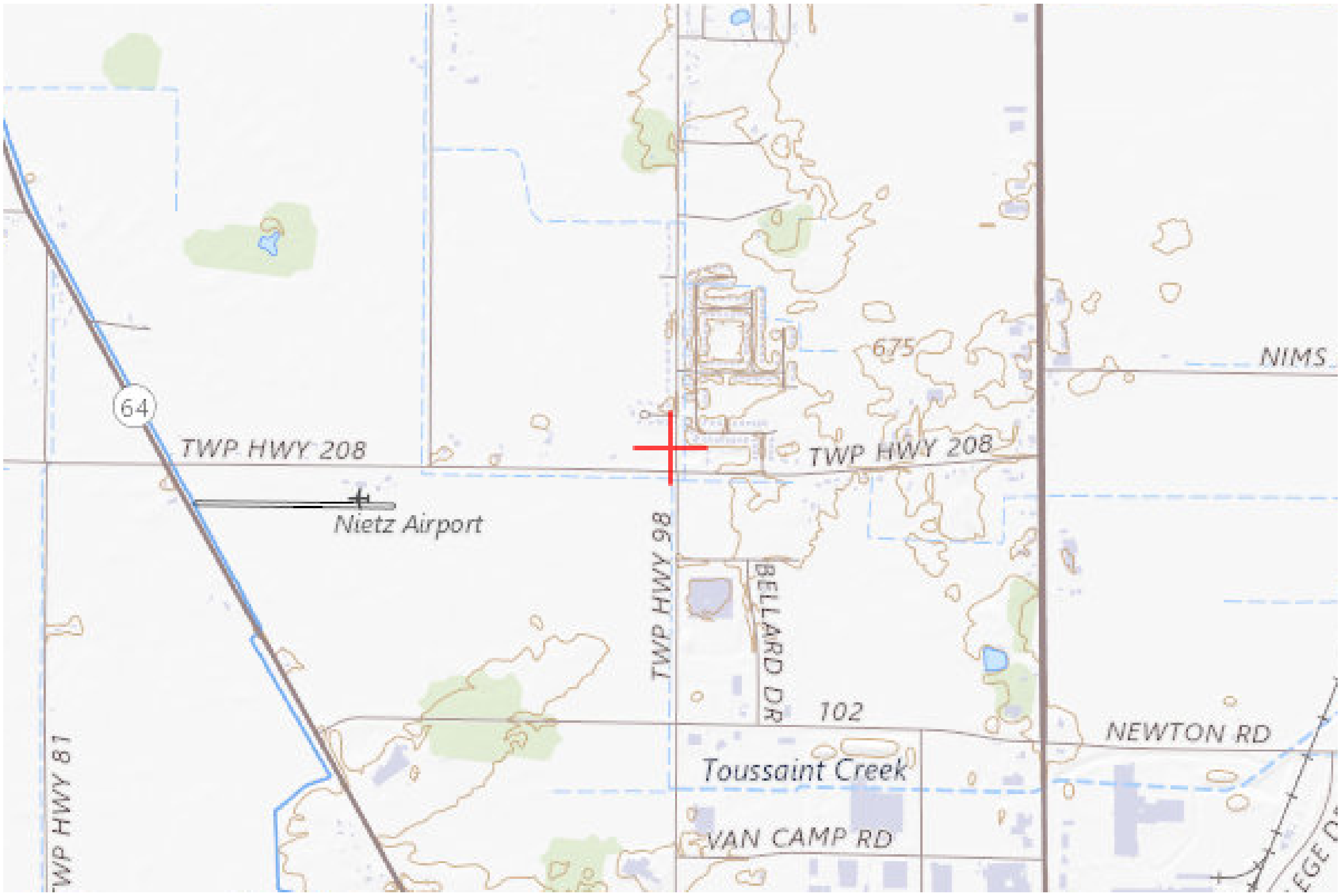
Signature Control No: 503915557-506215488 (DNE)
Andrew Hollie
Specialist

Attachment(s)
Case Description
Map(s)

Case Description for ASN 2021-AGL-34106-OE

CE 18-01-TE: Bellard-Brim 138kV DC Steel Pole Str. #1

TOPO Map for ASN 2021-AGL-34106-OE



Sectional Map for ASN 2021-AGL-34106-OE

Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
10101 Hillwood Parkway
Fort Worth, TX 76177

Aeronautical Study No.
2021-AGL-34107-OE
Prior Study No.
2019-AGL-9993-OE

Issued Date: 12/30/2021

Tyrone Heinmiller
FirstEnergy
76 S Main S
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**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure:	Monopole Str. #2
Location:	Bowling Green, OH
Latitude:	41-24-29.64N NAD 83
Longitude:	83-39-54.18W
Heights:	674 feet site elevation (SE)
	120 feet above ground level (AGL)
	794 feet above mean sea level (AMSL)

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be e-filed any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part 1)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking/ lighting are accomplished on a voluntary basis, we recommend it be installed in accordance with FAA Advisory circular 70/7460-1 M.

This determination expires on 06/30/2023 unless:

(a) the construction is started (not necessarily completed) and FAA Form 7460-2, Notice of Actual Construction or Alteration, is received by this office.
(b) extended, revised, or terminated by the issuing office.
(c) the construction is subject to the licensing authority of the Federal Communications Commission (FCC) and an application for a construction permit has been filed, as required by the FCC, within 6 months of the date of this determination. In such case, the determination expires on the date prescribed by the FCC for completion of construction, or the date the FCC denies the application.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

This determination is based, in part, on the foregoing description which includes specific coordinates, heights, frequency(ies) and power. Any changes in coordinates, heights, and frequencies or use of greater power, except those frequencies specified in the Colo Void Clause Coalition; Antenna System Co-Location; Voluntary Best Practices, effective 21 Nov 2007, will void this determination. Any future construction or alteration, including increase to heights, power, or the addition of other transmitters, requires separate notice to the FAA.This determination includes all previously filed frequencies and power for this structure.

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This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

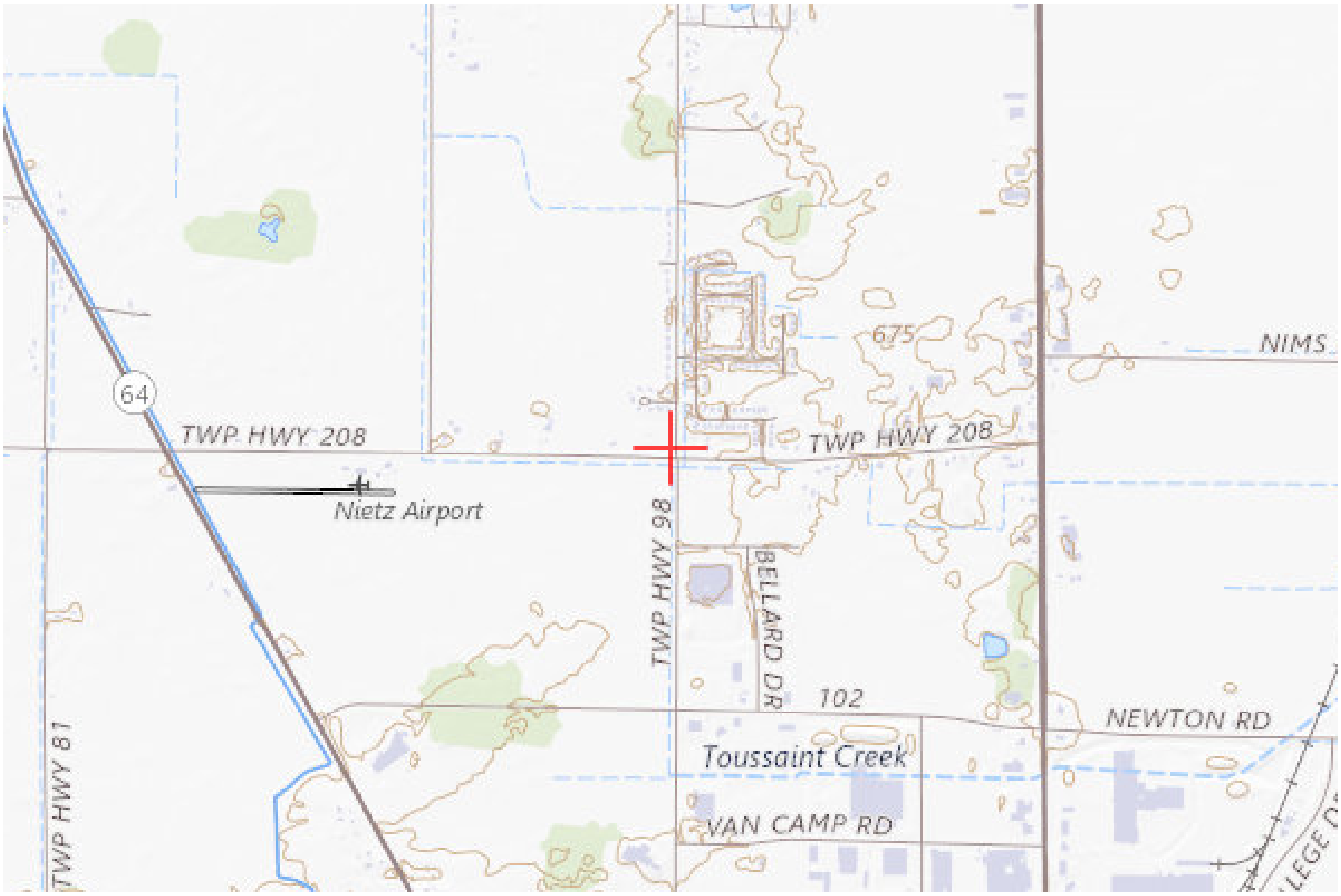
If we can be of further assistance, please contact our office at (817) 222-5933, or andrew.hollie@faa.gov. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2021-AGL-34107-OE.

Signature Control No: 503915558-506215489 (DNE)
Andrew Hollie
Specialist

Attachment(s)
Case Description
Map(s)

CE 18-01-TE - Bellard-Brim 138kV DC Steel Pole Str. #2

TOPO Map for ASN 2021-AGL-34107-OE



Sectional Map for ASN 2021-AGL-34107-OE