PLANNING AND ZONING
Cerro Gordo County Courthouse

220 N Washington Ave Mason City, IA 50401-3254 (641) 421-3075
Tom Drzycimski, AICP, Administrative Officer FAX (641) 421-3088
John Robbins, Assistant Administrative Officer
Michelle Rush, Executive Assistant

APPEAL INSTRUCTIONS AND PROCEDURES

Zoning Board of Adjustment ~ Cerro Gordo County

Read the attached **Rules of Procedure** for the Cerro Gordo County Board of Adjustment. These rules will be complied with in all applications or appeals before the Board of Adjustment. Please do not ask for a variance in these rules as none will be given.

Ordinance sections referred to in this document may be found at www.co.cerro-gordo.ia.us under the Planning and Zoning Department. Click on Zoning Ordinance.

All forms must be typewritten or written in black ink and returned to the address listed above.

FORMS OF APPEAL (choose one):

☒ **Variance to a Zoning District requirement where there are unusual conditions or circumstances which cause a hardship when the provisions of Zoning are strictly applied.**

Required items for review:

- Fully completed application/appeal form (pp. 3 & 4) with necessary site plans
- Fully completed Variance Criteria Supplemental information (pp. 5 & 6)
- Six (6) copies of the property plat if the original plat filed with the Application for Zoning Certificate was drawn larger than 8½" x 14"
- $100.00 non-refundable filing fee made payable to *Cerro Gordo County Treasurer*

☐ **Special Uses listed in Article 20.2 of the Zoning Ordinance and upon which the Board is required to act under the Ordinance.**

Required items for review:

- Fully completed application/appeal form (pp. 3 & 4) with necessary site plans
- If the area to be considered is located within a flood plain, attach copy of Iowa Department of Natural Resources approval
- Written letter:
  - ✓ Describing the special use and how such building or use will affect the character of the neighborhood, traffic conditions, public utility facilities and

other matters pertaining to the public safety, public health and general welfare
  - ✓ Addressing the provisions of Section 24.4(A)(2)(a-g) in the Zoning Ordinance, and
  - ✓ Addressing the performance standards in the applicable subsection of Article 20.2
- Seven (7) copies of the schematic drawing
- $175.00 non-refundable filing fee made payable to *Cerro Gordo County Treasurer*

Site plans are required for the following special uses and an additional fee of $100.00 made payable to *Cerro Gordo County Treasurer* is required for an area of one acre or less, and $200.00 for an area of more than one acre. Site plans shall comply with the provisions of Section 18.12(D) of the Zoning Ordinance. This fee is for site plan review only.

- Go-Kart Tracks, Racetracks, Drag strips
- Sewage Treatment Plants and Waste Stabilization Lagoons
- Public or Private Utility service
- Anhydrous Ammonia Pumping and Storage Facilities
- Wholesale Storage of Gasoline, Fuels, Oils, Flammable or Toxic Substances
- Commercial Feedlots and Confinement Operations
- Salvage Yards and/or Junk Yards
- Extraction and Primary Material Processing
- Permanent Asphalt Plants
- Mobile Home Park
- Travel Trailer Park

☐ **Appeal an error in any order, requirement, decision or determination made by the Zoning Administrator in the enforcement of the Zoning Ordinance.**

Required items for review:

- Fully completed application/appeal form (pp. 3 & 4) with necessary site plans
- Written letter describing the reasons or facts you feel the order, requirement, decision or determination was in error.
- $175.00 non-refundable filing fee made payable to *Cerro Gordo County Treasurer*

The Applicant shall, immediately after filing the appeal paperwork, mark all corners of the lot with lath and colored flags. The Applicant shall also mark with a different colored flag the location of the addition/structure being proposed.

APPLICATION/APPEAL FORM

[For Completion by All Applicants]

Date 8.9.19

TO: ZONING BOARD OF ADJUSTMENT
CERRO GORDO COUNTY, IOWA

I (WE), HAWKEYE POWER PARTNERS, LLC
(NAME)

OF 700 UNIVERSE BLVD JUNO BEACH, FL 33408
(MAILING ADDRESS)

respectfully request that a determination be made by the Board of Adjustment on this Application/Appeal based on the letter written by the Zoning Administrator dated _____ for the reason that it was a matter which, in his/her opinion, should come before the Board of Adjustment.

This Application/Appeal is: (Please Check One)

☒ A Variance to a Zoning District requirement where there are unusual conditions or circumstances which cause a hardship when the provisions of Zoning are strictly applied.

☐ A Special Use listed in Article 20.2 of the Zoning Ordinance upon which the Board is required to act under the Ordinance.

☐ An Appeal where it is alleged there is error in any order, requirement, decision or determination made by the Zoning Administrator in the enforcement of the Zoning Ordinance.

The property affected is located in Section 8, 15 and 17 of Union Township.

The property affected is zoned A-1 according to the Cerro Gordo County Zoning District Maps. Legal description of the property is:

See Variance Summary for legal descriptions of participating properties.

.

I am the ☐ Owner ☐ Contract Purchaser ☒ Other (Explain) Lessee

_____ of the property affected.

Describe what you are proposing to do on the property affected.

Hawkeye Power Partners, LLC proposes to decommission the current 42-megawatt wind farm and construct, own and operate a new 41.3 megawatt wind farm to generate clean electrical power which will be sold to Interstate Power and Light ("IPL") a subsidiary of Alliant Energy under a new 25-year power purchase agreement. With respect to this application for variance, two proposed turbines and one permanant MET tower require the Cerro Gordo Board of Adjustment to grant relief with respect to its property line setback requirement that a turbine be located at a distance equal to the height of the tower measured from its base to the height of the blade at its apex from any property line, per 6.27E, Structures Permitted Above Height Limitations within Article VI General Regulations for Agricultural Zoning Districts.

I (We) grant permission to the Planning & Zoning staff and Board of Adjustment members to enter onto the above described property for purposes of review.

I (We) further state that if this request is granted, I (We) will proceed with the actual construction in accordance with the purposes herein stated and any conditions and/or requirements the Board of Adjustment may stipulate.

Signature of Applicant _____

OFFICE USE ONLY

Date Filed _____ Case Number _____

Date Set for Hearing _____ Fee Paid _____

Application/Appeal was ☐ Granted ☐ Denied ☐ Tabled

VARIANCE CRITERIA SUPPLEMENTAL INFORMATION

Cerro Gordo County Zoning Board of Adjustment

[For completion by Variance Applicants Only]

This attachment is intended to supplement the Appeal to the Board of Adjustment Application for requests for variances. This attachment shall be submitted as a part of and attached to the Appeal Application and serve to enable the Board to make fair and equitable decisions. Failure to complete this form in its entirety may result in postponing the request until adequate information is submitted.

The Board of Adjustment shall authorize upon appeal, in specific cases, such variance from the terms of the Ordinance as will not be contrary to the public interest, where owing to special conditions a literal enforcement of the provisions of the Ordinance will result in unnecessary hardship, and so that the spirit of the Ordinance shall be observed and substantial justice done.

The Applicant shall be held responsible to provide adequate evidence that the literal enforcement of the Ordinance will result in unnecessary hardship. "Hardship" as used in connection with the granting of a variance means the property in question cannot be put to a reasonable use if used under the conditions allowed by the provisions of the Ordinance, the plight of the landowner is due to circumstances unique to his property not created by the landowner; and the variance, if granted, will not alter the essential character of the locality.

The Board shall ensure that their decision shall not be contrary to the public interest, that the spirit of the Ordinance shall be observed, and substantial justice done.

Applicant(s) HAWKEYE POWER PARTNERS, LLC

Type of Variance Requested Variance to the Agricultural Zoning District: Setback From Property Line Requirement in Section 6.27(E) Structures Permitted Above Height Limits

1. The land in question cannot yield a reasonable use for the following reasons:

Turbine 4: parcel in question is partcipating and land use is A-1. No future plans for land use other than current land use which includes compatible uses of agriculture and lease to wind energy conversion project. Proposed siting meets compliance with Road ROW, Dwelling, and all other property line setback requirements. Adjacent property owner is not opposed and no future land use is planned other than current land use.

Turbine 6: parcel in question is partcipating and land use is A-1. No future plan for land use other than current land use which includes compatible uses of agriculture and lease to wind energy conversion project. Adjacent parcel shares common property line.

MET tower: parcel in question is partcipating and land use is A-1. No future plan for land use other than current land use which includes compatible uses of agriculture and lease to wind energy conversion project. Adjacent property owner is not opposed.

2. What is unique about this property compared to other properties in the vicinity?

With respect to all three parcel locations applicable to this request for property line variance, the locations are unique in their individual contributions to overall optimization of the wind energy conversion facility. Each turbine location is specifically selected due to the value it brings to the modeled net capacity to generate wind energy for the specific wind turbine as well as its contribution to the overall array. Also unique is the willingness and interest on behalf of the land owner to participate in the proposed project.

With respect to the parcel location for the MET tower and this request for property line variance, the location is unique it its location to capture relevant and necessary performance data to maintain wind energy center optimization. Also unique is the willingness and interest on behalf of the land owner to participate in the proposed project.

3. Explain how the variance will fit in with the character of the area (i.e., size, height, scale, etc.):

The proposed Project clearly demonstrates compatibility with other agricultural uses in rural Cerro Gordo County. The placement of turbines in this area has not impeded the use of adjacent property for agricultural purposes nor will the new facility. Crops can be grown and livestock can graze right up to the base of the wind turbines and access roads. The land can still be used for the purpose for which it is currently zoned, and the presence of wind turbines will not impede the development of other uses permitted in the agricultural district. Wind turbines will continue to blend with the landscape.

4. The need for the variance cannot be attributed to the present or past property owner for the following reasons:

This request of the Cerro Gordo Board of Adjustment to grant relief is solely with respect to its property line setback requirement that a turbine be located at a distance equal to the height of the tower measured from its base to the height of the blade at its apex from any property line, per 6.27E, Structures Permitted Above Height Limitations within Article VI General Regulations for Agricultural Zoning Districts. This request cannot be attributed to the present or past property owner's land uses/use of property.

5. The Zoning Ordinance requirements have resulted in a need for a variance for the following reasons:

Due to the property line setback requirement that a turbine be located at a distance equal to the height of the tower measured from its base to the height of the blade at its apex from any property line, (per 6.27E, Structures Permitted Above Height Limitations within Article VI General Regulations for Agricultural Zoning District) the exact locations of Turbines 4 and 6, and the project MET tower (SM-01) are selected for purposes of optimizing the net generating capacity of each turbine, and the project dedicated meteorological performance instrumentation. As modeled and designed, these contribute to the optimization of the overall array during site operations. While seeking variance in these limited instances, proposed siting of Turbines 4 and 6, and the MET tower are in compliance with all other applicable siting and performance criteria of the Cerro Gordo County Ordinance.

6. The variance is in accord with the purposes and intent of the Zoning Ordinance and Comprehensive Plan for the following reasons:

Wind Energy Systems are permitted by Special Use within A-1 zoning districts under Section 6.27E, Structures Permitted Above Height Limitations within Article VI General Regulations for Agricultural Zoning District) and as permitted are in general conformance with the Comprehensive Plan to promote renewable energy development in Cerro Gordo County, Iowa.

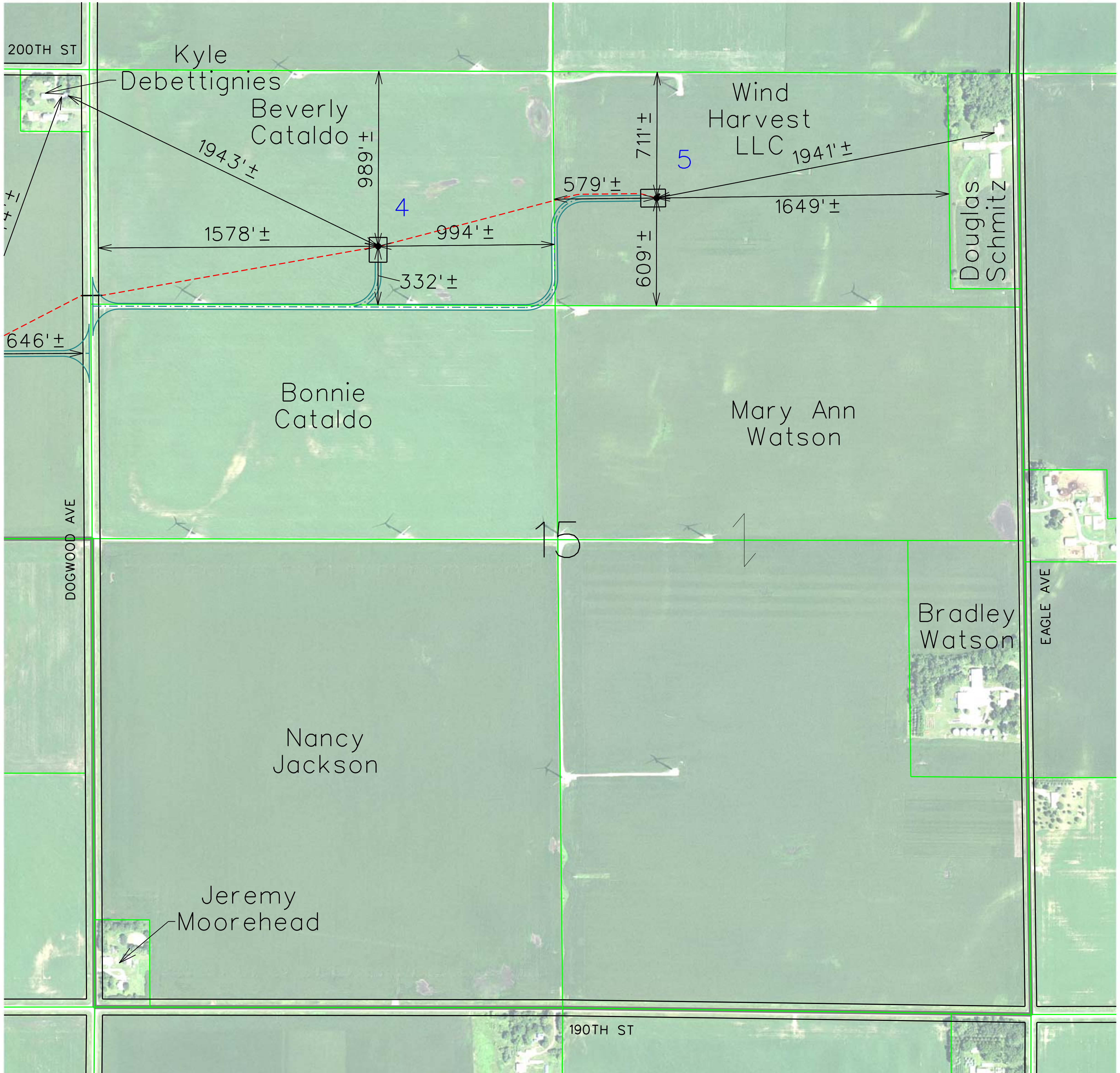
7. The variance will not impair the public health, safety and general welfare of the residents of the County for the following reasons:

Hawkeye Power Partners, LLC has been monitoring environmental and visual resources at its exiting wind energy facility for twenty years. Initial turbine locations were carefully selected and designed to ensure compatibility with other area property users, wildlife, wetlands, floodplains, cultural resources and the facility is by design a tribute to the environment, harvesting steady, clean, local wind energy for conversion into clean power for communities in Iowa. Optimized for energy efficiency, the rebuilt facility will not generate excessive vibration. No dust, smoke, fumes, glare, ground water pollution or other undesirable nuisances or odors are emitted from the proposed facility. The proposed Project will comply with applicable noise standards and meet the noise maximum limit of 60 dB for the project.

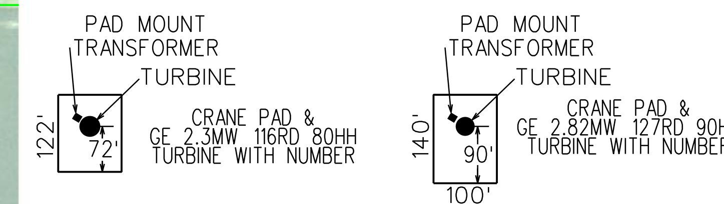
I, Mike Ann ***certify that***

all of the above statements are true to the best of my knowledge and belief.

WTG				SETBACK VIOLATION			VARIANCE REQUEST		SHORTFALL
	Mapbook Sheet #	Turbine Number	Technology	DWELLING	PROPERTY LINE	ROW	CURRENT DISTANCE PROPERTY LINE	REQUIRED DISTANCE PROPERTY LINE	
V1	Sheet 9	4	GE2.82 127RD 89HH	No	Yes	No	**332'**	**550'**	**168'**
V2	Sheet 4	6	GE2.82 127RD 89HH	No	Yes	No	**420'**	**550'**	**130'**
V3	Sheet 7	SM-01	SCADA MET	No	Yes	No	**302'**	**342'**	**40'**



LEGEND



15 GE 2.82 MW TURBINE WITH NUMBER (127 Meter Rotor Diameter & 90 Meter Hub Height 07-22-19 Array)

11 GE 2.3 MW TURBINE WITH NUMBER (116 Meter Rotor Diameter & 80 Meter Hub Height 07-22-19 Array = 10 & 11)

PROPOSED ACCESS ROAD

PROPOSED UNDERGROUND COLLECTION

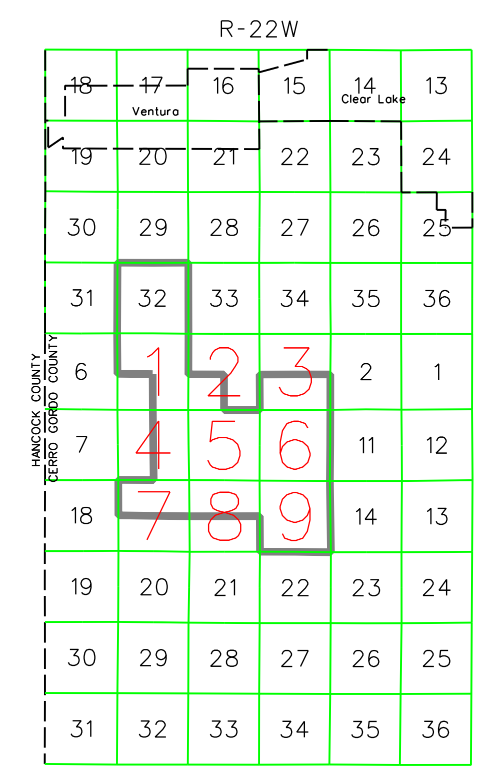
PROPERTY BOUNDARY

EXISTING ROAD RIGHT-OF-WAY

NONPARTICIPATING PARCEL

PROJECT BOUNDARY

SHEET INDEX



0 300

SCALE (FEET)

ISSUE DATE: 08-09-2019

MARK	REVISION	DATE	BY

Engineer: BJF Checked By: MGG Scale: 1"= 300'

Technician: DW Date: 03/13/19 Field Bk: Pg:

Project No: 1180779 Sheet 9 of 9

NEXTERA ENERGY - CERRO GORDO

SUP MAPBOOK - SEC 15, TWP 95N, RNG 22W

CERRO GORDO COUNTY, IOWA

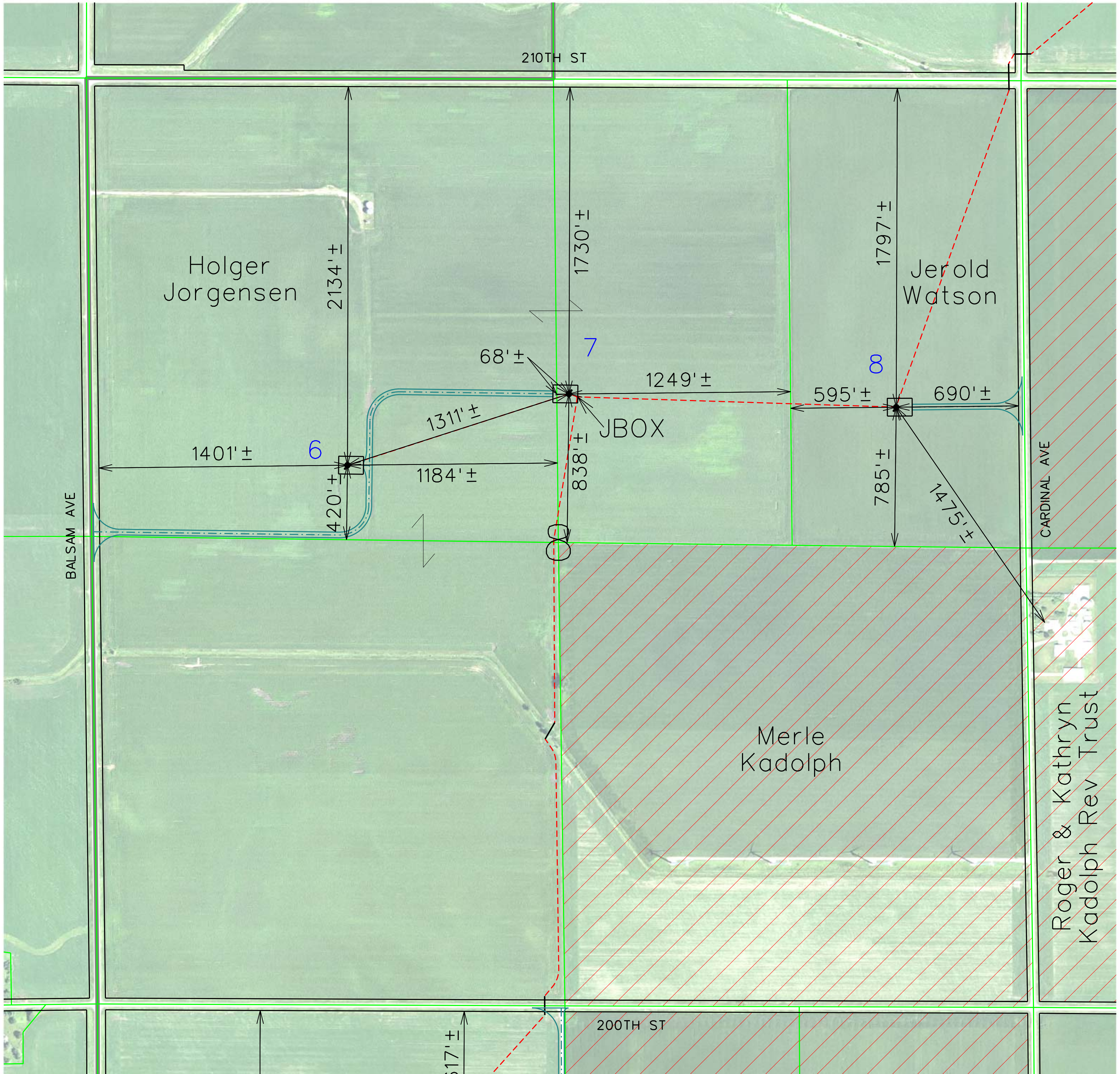
SNYDER & ASSOCIATES, INC.

1751 MADISON AVENUE
COUNCIL BLUFFS, IA 51503
712-322-3202 | www.snyder-associates.com

SNYDER & ASSOCIATES

Project No: 1180779

Sheet 9 of 9



LEGEND

PAD MOUNT TRANSFORMER
TURBINE
CRANE PAD & GE 2.3MW 116RD 80HH TURBINE WITH NUMBER
122'
72'

PAD MOUNT TRANSFORMER
TURBINE
CRANE PAD & GE 2.82MW 127RD 90HH TURBINE WITH NUMBER
140'
90'
100'

15 — GE 2.82 MW TURBINE WITH NUMBER (127 Meter Rotor Diameter & 90 Meter Hub Height 07-22-19 Array)

11 — GE 2.3 MW TURBINE WITH NUMBER (116 Meter Rotor Diameter & 80 Meter Hub Height 07-22-19 Array = 10 & 11)

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PROPOSED UNDERGROUND COLLECTION
PROPERTY BOUNDARY
EXISTING ROAD RIGHT-OF-WAY
NONPARTICIPATING PARCEL
PROJECT BOUNDARY

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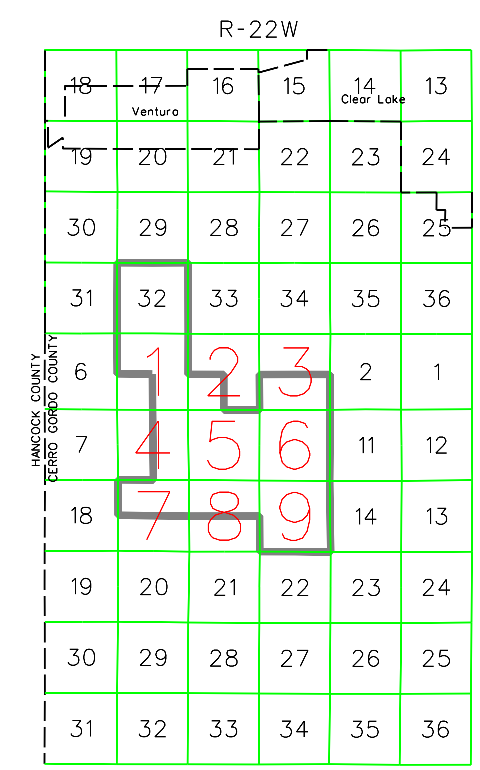


0 300
SCALE (FEET)

ISSUE DATE: 08-09-2019

NEXTERA ENERGY - CERRO GORDO
SUP MAPBOOK - SEC 08, TWP 95N, RNG 22W
CERRO GORDO COUNTY, IOWA

SNYDER & ASSOCIATES, INC.
1751 MADISON AVENUE
COUNCIL BLUFFS, IA 51503
712-322-3202 | www.snyder-associates.com

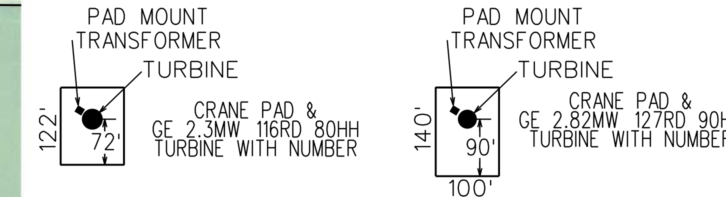
SNYDER & ASSOCIATES

MARK	REVISION	DATE	BY

Engineer: BJF | Checked By: MGG | Scale: 1"= 300'
Technician: DW | Date: 03/13/19 | Field Bk: | Pg:
Project No: 1180779
Sheet 4 of 9

Project No: 1180779

LEGEND



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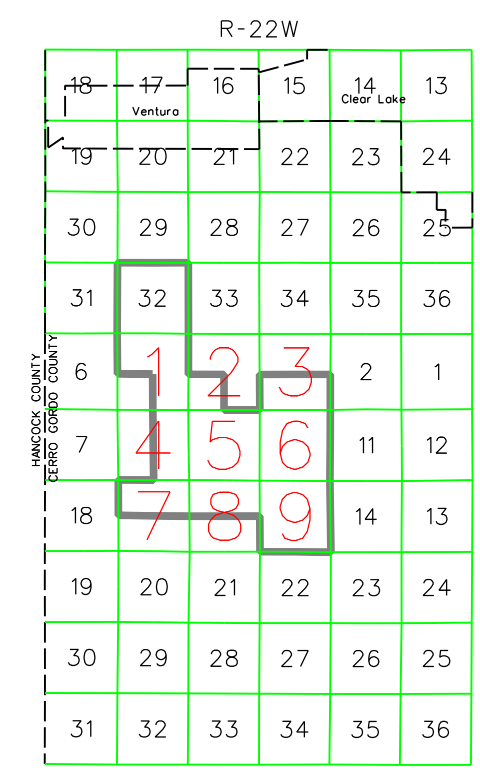

ISSUE DATE: 08-09-2019

MARK	REVISION	DATE	BY

Engineer: BJF | Checked By: MGG | Scale: 1"= 300'

Technician: DW | Date: 03/13/19 | Field Bk: | Pg:

Project No: 1180779 | Sheet 7 of 9

NEXTERA ENERGY - CERRO GORDO

SUP MAPBOOK - SEC 17, TWP 95N, RNG 22W

CERRO GORDO COUNTY, IOWA

SNYDER & ASSOCIATES, INC.

1751 MADISON AVENUE
COUNCIL BLUFFS, IA 51503
712-322-3202 | www.snyder-associates.com

SNYDER & ASSOCIATES

Project No: 1180779

Sheet 7 of 9

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- Written letter:
  - ✓ Describing the special use and how such building or use will affect the character of the neighborhood, traffic conditions, public utility facilities and

other matters pertaining to the public safety, public health and general welfare
  - ✓ Addressing the provisions of Section 24.4(A)(2)(a-g) in the Zoning Ordinance, and
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The Applicant shall, immediately after filing the appeal paperwork, mark all corners of the lot with lath and colored flags. The Applicant shall also mark with a different colored flag the location of the addition/structure being proposed.

APPLICATION/APPEAL FORM

[For Completion by All Applicants]

Date 8.9.19

TO: ZONING BOARD OF ADJUSTMENT
CERRO GORDO COUNTY, IOWA

I (WE), HAWKEYE POWER PARTNERS, LLC
(NAME)

OF 700 UNIVERSE BLVD JUNO BEACH, FL 33408
(MAILING ADDRESS)

respectfully request that a determination be made by the Board of Adjustment on this Application/Appeal based on the letter written by the Zoning Administrator dated _____ for the reason that it was a matter which, in his/her opinion, should come before the Board of Adjustment.

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☐ A Variance to a Zoning District requirement where there are unusual conditions or circumstances which cause a hardship when the provisions of Zoning are strictly applied.

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Sections 3, 4, ,8, 9, 10, 15-17 of Union Township
Setion 32 of Clear Lake Township

The property affected is located in Section _____ of _____ Township.

The property affected is zoned A-1 according to the Cerro Gordo County Zoning District Maps. Legal description of the property is: _____

See Appendix A and C of this application for parcel list and legal descriptions of participating properties.

I am the ☐ Owner ☐ Contract Purchaser ☒ Other (Explain) Lessee

of the property affected.

Describe what you are proposing to do on the property affected.

Hawkeye Power Partners, LLC ("Hawkeye" or the "Applicant")"), a Delaware limited liability company, which is indirectly wholly owned by NextEra Energy Resources, LLC ("NextEra Energy Resources"), a Delaware limited liability company, proposes to decommission the current 42-megawatt wind farm and construct, own and operate a new 41.3 megawatt wind farm to generate clean electrical power which will be sold to Interstate Power and Light ("IPL") a subsidiary of Alliant Energy under a new 25-year power purchase agreement.

I (We) grant permission to the Planning & Zoning staff and Board of Adjustment members to enter onto the above described property for purposes of review.

I (We) further state that if this request is granted, I (We) will proceed with the actual construction in accordance with the purposes herein stated and any conditions and/or requirements the Board of Adjustment may stipulate.

Signature of Applicant

OFFICE USE ONLY

Date Filed _____ Case Number _____

Date Set for Hearing _____ Fee Paid _____

Application/Appeal was ☐ Granted ☐ Denied ☐ Tabled

SUMMARY TABLE						
Turbine #	Height	Agreement	Closest Setback	Closest Dwelling	FAA DNH	Acoustic Analysis (dBA)
1	500.3'	Ford	864'	1486'	499'	50
2	500.3'	Ford	573'	>1486'	499'	50
3	500.3'	Watson	646'	1544'	499'	50-55
4	500.3'	Cataldo	332'	1943'	499'	50-55
5	500.3'	Wind Harvest, LLC	609'	1941'	499'	46
6	500.3'	Jorgensen	420'	>2000'	499'	>45
7	500.3'	Jorgensen	838'	>2000'	499'	>45
8	500.3'	Watson	690'	1475'	499'	51
9	500.3'	Cerro Gordo County Property, LLC	901'	1486'	499'	50
10	450'	Lund	612'	~1650'	499'	~50
11	450'	Lund	569'	~1400'	499'	50-55
12	500.3'	Broers	828'	2080'	499'	45-50
13	500.3'	Graham	878'	2329'	499'	~50
14	500.3'	Shaffer	1409'	1860'	499'	50
15	500.3'	Shaffer	596'	1872'	499'	50
Alt 1	500.3'	Cerro Gordo County Property, LLC	961'	1491'	499'	51
Alt 2	500.3'	Cerro Gordo County Property, LLC	1353'	>2000'	499'	>50
Alt 3	500.3'	Cerro Gordo County Property, LLC	592'	>2000'	499'	51
Met	292'	Ford	302'	>1486'	292'	n/a

TABLE OF CONTENTS

APPENDICES

I. PROJECT INTRODUCTION | CERRO GORDO COUNTY, IOWA

Application for Special Exception Permit & Application for Variance

Hawkeye Power Partners, LLC ("Hawkeye" or the "Applicant")**"), a Delaware limited liability company, which is indirectly wholly owned by NextEra Energy Resources, LLC ("*NextEra Energy Resources*"), a Delaware limited liability company, proposes to** decommission the current 42-megawatt wind farm and construct, own and operate a new 41.3 megawatt wind farm to generate clean electrical power which will be sold to Interstate Power and Light ("IPL") a subsidiary of Alliant Energy under a new 25-year power purchase agreement.

As illustrated throughout this application, Hawkeye Power Partners, LLC has been diligent in intent to decommission and rebuild the existing facility in a manner which meets the requirements of the Cerro Gordo County Wind Ordinance. Hawkeye Power Partners, LLC seeks to decommission in accordance with stated guidelines and industry best practices, and seeks a new Special Use Permit and Variance within these applications. Hawkeye Power Partners, LLC will comply in good faith with the general and specific standards and requirements for special uses as described in the *Cerro Gordo County, Iowa Ordinance #15, 5/16/2012 Revision, BY North Iowa Area Council of Governments, Consulting Planners, Mason City, Iowa*.

Further, Hawkeye Power Partners, LLC has submitted electronic copies and 10 Project Binders (copies) of all required documentation for its Application for Special Use Permit and Application for Variance.

Hawkeye Power Partners, LLC respectfully requests the Cerro Gordo County Board of Adjustment issue both its request for Special Use as well as Variance after consideration of the information provided herein and, after making affirmative findings of fact on each and all of the requirements for issuance of a Variance.

Project Developer Contact:
MIKE WEICH
Hawkeye Power Partners, LLC
NextEra Energy Resources, LLC
561-694-3987
Mike.weich@nexteraenergy.com

II. PROPOSED WIND ENERGY SYSTEM | Special Use Permit Requirements

Hawkeye Power Partners, LLC's proposed wind energy conversion facility will adhere to Special Use Permit requirements per *Section 6.27E, Structures Permitted Above Height Limitations within Article VI General Regulations for Agricultural Zoning Districts*, and requirements for Application for Variance as outlined per *Section 6.4, Nonconforming Uses or Buildings within Article VI General Regulations for Agricultural Zoning Districts, and Article 24 Board of Adjustment.*

1) APPLICANT IDENTIFICATION

Project Developer:
Hawkeye Power Partners, LLC
700 Universe Boulevard
Juno Beach, Florida 33408

Cerro Gordo Wind Energy Center Location:
Cerro Gordo County, Iowa
Parcel Lists and Tables located in **Appendix A**

On behalf of the listed participating landowners, the application is submitted by Hawkeye Power Partners, LLC a limited liability company organized under the laws of Delaware to own and operate the proposed wind farm. Hawkeye Power Partners, LLC is a wholly-owned subsidiary of NextEra Energy Resources, LLC ("*NextEra Energy Resources*") that in turn is a wholly-owned subsidiary of NextEra Energy, Inc. *NextEra Energy Resources* is North America's largest producer of wind energy with 120 wind facilities in operation throughout the United States and Canada, totaling more than 13,528 net MW of wind power.

2) PROJECT STATEMENT

Overall Project Scope
Hawkeye Power Partners, LLC (700 Universe Blvd. Juno Beach, FL 33408) is proposing to decommission its existing wind energy conversion facilities and project collection substation in Cerro Gordo County (IA) and replace it with a proposed modernized wind energy conversion facility as detailed below.*

Name	County	# Turbines	Net MW
Existing Wind Farm	Cerro Gordo	55	42
Proposed Wind Farm	Cerro Gordo	15	42

*All existing collection substation equipment will be replaced (including security fencing, gravel and the foundation) except for the existing dead-end structure. No alterations or improvements are planned for existing transmission.

History

In 1983 the Iowa General Assembly adopted the Alternative Energy Production ("AEP") law. The AEP law was enacted to "actively encourage development of alternative energy production facilities utilizing local renewable energy resources in order to conserve our finite and expensive (fossil-fuel) energy resources". The AEP law required IPL to purchase 13.7 megawatts (MW) of renewable energy.

IPL issued a Request for Proposal (RFP) for renewable energy production facilities on May 02, 1997. On May 30, 1997, FPL Energy, Inc., Foras Energy, Inc. and NEG Micon submitted a proposal to supply IPL with 13.35 MW of wind power from the Cerro Gordo Wind Farm to be located near Clear Lake, Iowa. The bid was site-specific and was based on the wind resource in the Clear Lake area and assumed interconnection with IPC's 161 kV transmission line.

On October 9, 1997, IPC selected the Cerro Gordo Wind Farm project to supply its alternative energy needs. IPC selected the Cerro Gordo Wind Farm because of its close proximity to local load centers, namely the Clear Lake and Mason City areas, and the price of its output.

On January 8, 1998, FPL Energy, Inc. formed Hawkeye Power Partners, LLC ("Hawkeye") for the sole purpose of developing, constructing, owning and operating the Wind Farm. On February 27, 1998, IPL signed a 25-year power purchase agreement ("PPA") with Hawkeye. On April 9, 1998 the Iowa Utilities Board approved the PPA.

On May 26, 1998 Cerro Gordo County approved Hawkeye's application for Special Use which included 29 height and setback variances. On August 21, 1998, Hawkeye Power Partners, LLC submitted an application to amend its Special Use Permit once locations of two meteorological towers were determined. Additionally, Hawkeye introduced a second power purchase agreement requiring permitting for additional wind turbines while eight (8) previously sited turbine locations had been adjusted more than 500' from initial permitted locations in the original application for variance. Following review of Hawkeye's requests to amend, on October 06, 1998 Cerro Gordo County issued Zoning Permits for construction of the Hawkeye Power Partners, LLC wind farm and the wind farm was commercially operational on June 30, 1999.

In June 2018 Hawkeye Power Partners, LLC contacted Cerro Gordo County to begin decommissioning discussions and plans for a new wind farm. December 03, 2018 Cerro Gordo County provided Hawkeye with Special Use application materials. Hawkeye has submitted its application for Special Use for the proposed new wind farm on August 13, 2019. The purpose for the power generation today is very similar as to its past purpose: Hawkeye Power partners, LLC will rebuild its existing plant within nearly the same footprint because of close proximity to local load centers, namely the Clear Lake and Mason City areas, and the price of its output remains attractive to the power purchaser. Additionally, IPC remains committed to supplying local load centers with safe, clean, renewable, home-grown Iowa energy.

The Project

Wind turbine generators convert the energy in wind into electricity. Commercial wind turbines feature a rotor assembly comprised of three blades rotating in the vertical plane, perpendicular to the ground and facing into the wind. The pivot point of the rotor is a hub, which is attached to a shaft oriented in the horizontal plane. Airflow acting on the blades causes the rotor and shaft to turn. The gearbox increases the shaft speed, which turns the shaft of an electrical generator. The gearbox, generator, brake systems and certain electronic components are mounted in the nacelle atop the turbine tower. The nacelle provides a fully enclosed workspace for maintenance operations.

The Project requires a nameplate capacity of 42 MW. To meet the need of producing 42 MW in the most cost-effective manner at the proposed site, Hawkeye has selected two machines consisting of 2 GE2.3 116RD and 13 GE2.82 127RD wind turbine generators. Wind sensors mounted on each turbine sense the direction and speed of the wind and the turbine automatically rotates the nacelle to orient the rotor into the wind. A combination of 15 of these turbines will be required to achieve the 42 MW nameplate capacity of the project.

The GE2.3 machine features blades 58 meters (approximately 190 feet) in length and the GE2.82 machine features blades 63.5 meters (approximately 208 feet) in length. The turbines will be mounted on white tubular steel towers. Access to the turbine nacelle will be via a ladder system located inside the tower.

The height of the rotor hub of the two (2) GE 2.3 machines will be 80 m (262 feet). The highest point of the area swept by the blades will be approximately 137.2m (450 feet) above the ground;

the lowest point swept will be approximately 30.9m (101.7 feet) above the ground.
The height of the rotor hub of the thirteen (13) GE 2.82 machines will be 89 m (292 feet). The highest point of the area swept by the blades will be approximately 152.5m (500.3 feet) above the ground; the lowest point swept will be approximately 25.2m (83.7 feet) above the ground. The proposed SCADA MET height will be 89m (292 feet) above the ground.

Unlike the existing Hawkeye Power Partners, LLC wind farm where turbines were installed in rows, or strings, oriented in an east-west direction, the proposed wind farm will be installed in such a manner as to comply with established siting criteria while minimizing losses in generating capacity from turbulence and waking. Turbine access roads will be constructed as required, with turnouts constructed at each turbine site, with landowner consent, and in compliance with Cerro Gordo Temporary and Permanent Road Improvements Permitting Guidelines per its Road Use Agreement with Hawkeye Power Partners, LLC.

The individual wind turbines have a rated maximum power output between 2000-2820 kW. Adjacent to each turbine is a transformer (turbine transformer), which will boost the voltage to 34.5 kilovolts (kV). Underground power collection lines will collect power from all of the turbine transformers in a string and convey it to public (county road) rights-of-way. At that point, risers will be installed and a network of above ground lines will collect the power from all of the turbine strings and convey it along public rights-of-way to the project substation. One substation will serve the project. It will boost the project output from 34.5 kV to the 161 kV level of the transmission line with which the project is interconnected. That transmission line transects the project site. The project substation will be constructed immediately adjacent to the transmission line, and the interconnection will be accomplished at that point.

Communication lines will be installed with the power collection lines. These lines will connect each turbine to the central project control system located in the project Operations and Maintenance Facility (O&M Facility). The performance of each turbine will be monitored via this system, as well as the implementation of many operational actions.

One meteorological tower, a SCADA MET, will be installed at one strategic location at the site. This will be utilized over the life of the project for recording wind, weather, and facility performance data.

Site Selection Process

Communities in Northwest Iowa have uniquely benefitted from natural and abundant wind resources for over 20 years, and these communities continue to plan for wind farms in partnership with public and private utilities. Due to industry obsolescence, the NEG Micon 750/48 turbine technology has proven more and more difficult to maintain optimum operations and perform upgrades. Hawkeye chose to improve on the process to harness this abundant wind resource using proposed modern GE wind turbine technology and controls. The established and known proximity to a large utility grid line with capacity that can be interchanged is equally ideal.

Landowners in the proposed site area have been contacted and asked if they would be interested in participating or continuing to participate in the rebuild Project. Information on the proposed wind farm was provided through individual land owner consultations as well as during a community Open House on September 10, 2019 from 6-8:00 pm at Historic Park Inn Ballroom located at 7 West State Street, Mason City, IA 50401.

Landowners have been offered the opportunity to participate in the following ways: through the leasing of small portions of their properties for the placement of turbines or collection; through the

granting of easements for access roads; through the granting of easements for the overhanging of turbines placed on adjacent properties; for preventing the addition of any objects which might obstruct the wind resource for nearby turbines; or a combination of the above.

Interested landowners have signed new easement agreements, which gave Hawkeye the opportunity to inspect the property, discuss terms of their arrangements, and share preliminary exhibits for owner consent. Landowners participating in the existing wind farm will continue to receive lease payments for turbines or collection, etc. until Hawkeye achieves its commercial operation date (COD) for the proposed rebuild project. Once Hawkeye is COD, all new options agreements will be exercised.

Hawkeye proposed possible new wind turbine locations to landowners based on preliminary review of topographic maps, county plat maps and current land use. Through feedback from landowners, a general layout was agreed upon, which places turbines and access roads to minimize disruption to current agricultural use.

Certain siting criteria have been imposed. County minimum setbacks are as follows and in Table 1 below: tower tip height plus minimum front/side/rear yard setbacks from all property lines; tower tip height setbacks from county road right of ways; minimum setbacks of from occupied dwellings; minimum spacing between turbines; and noise and shadow flicker studies which have largely demonstrated compliance with county and industry standards. When and where Hawkeye was unable to meet setback requirement, exhibits and narratives have been submitted to Cerro Gordo County and can be reviewed in Section III Application for Variance.

CERRO GORDO COUNTY TOWER SITING SUMMARY	
PROPERTY LINES	TOWER TIP HEIGHT + LAND USE DISTRICT SETBACK SEE BELOW
ROAD ROW	TOWER TIP HEIGHT
NOISE	60 Dba FROM CLOSEST INHABITED DWELLING
AG-1 LAND USE DISTRICT SETBACK	A. Front yard depth, fifty (50) feet. B. Each side yard width, twenty-five (25) feet. C. Rear yard depth, thirty (30) feet.

At the time of its application, Hawkeye has identified 18 possible wind turbine sites (15 WTGs and 3 Alternate WTGs). Elimination of possible alternate sites will take place between the time of the permit application and during construction, set for spring 2020. Turbine sites will be eliminated due to environmental, design, and economic constraints such as low-lying areas, wind breaks, wetland areas and individual landowner constraints. Zoning permits for each WTG have been separately submitted to the Cerro Gordo County Planning and Zoning Department.

Wind Turbine Structures, Color and Finish

Structures for wind turbines shall be self-supporting tubular towers, and shall be of a non-reflective neutral white color. No lattice structure shall be used for wind turbines. No logos or advertisements will be affixed on these structures. Each turbine shall be marked with a visible identification number located no higher than fifteen (15) feet above ground level. The white color and surface treatment of the wind turbine generators and supporting structures shall, to the greatest extent possible, minimize disruption of the natural characteristics of the site.

Road Use Agreement

Hawkeye Power Partners, LLC will negotiate a Roads Use Agreement with Cerro Gordo County to include all terms acceptable to both parties as they relate to preparation, use, maintenance, and restoration of agreed upon roads and structures during decommissioning and construction activities, including dust control measures. All required highway permits including; work in right of way permits, driveway access permits, 911-EMS address permits, crane crossing, and radius improvement permits will be submitted for approval by the Cerro Gordo County Roads Engineer along with a final copy of the Roads Use Agreement, Delivery Flow Plan (haul route), Crane Path Map, and Construction Safety Signage samples for approval by the Cerro Gordo County Commission.

Project Construction

The Hawkeye Power Partners, LLC team consists of about 200 professionals with expertise covering all phases of wind farm development: from site selection and land acquisition to assessing the specific wind yield for a project, technical wind farm design, planning and environmental impact assessment, bank financing and wind farm construction. We employ an EPC (Engineering, Procurement, Construction) Contractor for all of our projects who in turn subcontracts work with local smaller firms as much as possible.

Project construction begins with the construction of access roads, the excavation and construction of foundations, and the construction of the electrical infrastructure (the power collection and communication lines) and then the project substation.

Access Roads and Installation of the Foundation

Local small and medium sized construction firms are used as much as possible to do the construction work. The first steps in wind farm construction are to build access roads, widen turning radii, establish crane hardstandings and paths, and to install the foundations. To minimize disruption, existing access roads are used whenever possible, and improved as required.

Cable installation

Electrical cable to connect each turbine to an on-site electrical control building is usually laid underground parallel to the access roads. By using a cable plough, up to 1,000 meters of cable can be laid daily.

Wind Turbine Construction

The actual erection of a wind turbine takes place within a few days and involves three steps. First, the tower segments are delivered and are assembled using two cranes, one used to lift and the other to steady. Then the nacelle, which houses the electrical generator, is mounted on top of the tower. Finally, the three rotor blades are connected to the hub, which is then lifted by cranes and attached to the nacelle. In some cases, each rotor blade is lifted and connected seperately.

The lowest of 3 sections of the turbine towers are installed first. Large cranes are brought on site to lift into place the upper 2 tower sections, the turbine nacelles, and the rotors. Once the substation is installed and energized, turbines can be brought into service as soon as they are installed, interconnected with the power collection system and the substation and finally commissioned.

Equipment

Equipment involved in construction will include trenching and excavation equipment, graders, cement and gravel haul trucks, heavy and intermediate-sized cranes, semi-trailer trucks delivering wind turbine generator and tower components, transformers, and assorted other lighter vehicles.

Construction Schedule

Our team's experience in the development and construction management of over 120 wind farms throughout North America has resulted in some of the best-in-class project management in the industry. Assuming all permits are issued, the below table depicts an anticipated schedule outlining major Hawkeye Wind Energy Center milestones.

Hawkeye Wind Energy Center Milestones	
Site Preparation	TBD
EPC Mobilize/Turbine Delivery Commencement	FEBRUARY 2020
Commercial Operation Date	JULY 2020

Impacts to Community, Health, and General Welfare

When properly sited, wind turbines are a safe and effective means of generating electricity. The first wind turbines came online in the U.S. in the 1980's. People have been safely living and working around wind turbines for generations. The weight of scientific evidence, more than 80 peer-reviewed studies, shows properly sited wind turbines are not related to adverse health effects. This includes concerns around: audible noise, low frequency noise, infrasound and shadow flicker. It is our policy to site turbines in compliance with manufacturer's safety specifications, local, state, and Federal standards, codes and ordinances, and in accordance with industry best practices. We have included examples of safety signage which will be found on site at the Hawkeye Wind Energy Facility in **Appendix J.**

Studies have found the "nocebo" effect (the opposite of the "placebo" effect) can lead individuals who are subject to misinformation about wind energy to report negative health effects, despite no evidence for such health effects. Wind energy actually provides significant public health benefits by improving air quality which helps to reduce asthma and breathing related illnesses.

With the evolution of modern wind turbine technology, most of the time the mechanical sound from the turbine is virtually indistinguishable from the natural environment. Turbines only run when the wind is blowing. When ground level winds are high, the sound of the wind masks most of the turbine sound. The sound from the rotating blades may be audible depending on one's distance from the turbine, weather conditions, and time of day.

Infrasound, which is sound below 20 Hz and often described as inaudible, is generated by a wide range of sources, including cars, severe weather and wind. The measured level of infrasound within wind farms is well below the audibility threshold and far below those that would pose a risk to health. Developers work to site wind turbines at a safe distance from homes and businesses so that sound levels meet or exceed all industry best practices and guidelines.

Corporate Safety

Our vision for NextEra Energy, Inc. corporate safety is to establish and promote a safety culture based on the principle that ZERO injuries is the only acceptable target. We will provide support for business unit activities that clearly identify expectations for all levels of NextEra Energy, Inc. employees, and establish agreed upon consequences for exceeding, meeting or failing to meet those expectations. We expect each employee to work safely in order to return home at the end of the day, injury free.

3) PROCEDURE

Hawkeye Power Partners, LLC acknowledges and understands the process administered by the Cerro Gordo County Board of Adjustment when reviewing an application for a Special Use permit. In reviewing an application for a Special Use, the Board of Adjustment may consider the following:

Requirement A
Whether the proposed use is harmonious with and in accordance with the general principles and proposals of zoning ordinance for Cerro Gordo County.

Applicant Comment
The existing WECS have been located in the Cerro Gordo County area for twenty years. The predominant land use is agricultural row crop. Given this history, it is clear the proposed Special Use is compatible with the predominant land use and both are in accordance with the general principles and proposals of Cerro Gordo County's zoning ordinance. Hawkeye Power Partners, LLC has lease agreements with all of the land owners addressing plans for decommissioning and rebuilding of the proposed wind farm.

The proposed Special Use will result in decommissioning of an aging commercial wind energy facility and introduce a modernized wind energy facility within approximately the same project footprint. In doing so, it will predominantly be in conformance with minimum siting requirements in order to reduce or eliminate risk or harm to people, property, and the well-being of the community at-large. This includes compliance with minimum setbacks from structures, property lines, public rights away, communication and electrical lines, and noise limits. Shadow flicker was also considered in design of the new facility although not regulated by Cerro Gordo County.

Requirement B
That the use be designed, constructed, operated and maintained so as to be harmonious and appropriate in appearance with the existing or intended character of the general vicinity and that such a use will not change the essential character of the area in which it is proposed.

Applicant Comment
The proposed Project clearly demonstrates compatibility with other agricultural uses in rural Cerro Gordo County. The placement of turbines in this area has not impeded the use of adjacent property for agricultural purposes nor will the new facility. Crops can be grown and livestock can graze right up to the base of the wind turbines and access roads. The land can still be used for the purpose for which it is currently zoned, and the presence of wind turbines will not impede the development of other uses permitted in the agricultural district. Wind turbines will continue to blend with the landscape.

Requirement C

That the use will not be hazardous or disturbing to existing or future uses in the same general vicinity and will be a substantial improvement to the property in the immediate vicinity and to the community as a whole.

Applicant Comment

Hawkeye Power Partners, LLC has been monitoring environmental and visual resources at its exiting wind energy facility for twenty years. Initial turbine locations were carefully selected and designed to ensure compatibility with other area property users, wildlife, wetlands, floodplains, cultural resources and the facility is by design a tribute to the environment, harvesting steady, clean, local wind energy for conversion into clean power for communities in Iowa. Optimized for energy efficiency, the rebuilt facility will not generate excessive vibration. No dust, smoke, fumes, glare, ground water pollution or other undesirable nuisances or odors are emitted from the proposed facility. The proposed Project will comply with applicable noise standards and meet the noise maximum limit of 60 dB for the project.

Requirement D

That the proposed use will be served adequately by essential public facilities and services such as highways, streets, policy, fire protection, drainage structures, refuse disposal, water and sewage facilities or schools.

Applicant Comment

The Story County Roads Engineer and Board of Supervisors will approve the Project Roads Use Agreement which identifies approved use of roads into and throughout the Project area, including delivery routes, bridges, culverts, existing and new ingress and egress. The approved Roads Use Agreement takes local essential public facilities and services into consideration. The Project Storm Water Pollution Prevention Plan and Spill Prevention Control and Countermeasure Plan and septic permitting will comply with state and federal requirements for pollution control during the construction phase. Once operational, the site will comply with all local refuse disposal, water and septic regulations. The Project Emergency Action Plan (EAP) will identify local Key Contacts for emergency purposes and will be a 'living and breathing' document housed at the Job Site (Laydown Yard) during construction and within the Operations and Maintenance Facility during operations. During construction and operation phases, all Site Personnel will be trained in deployment of safety and security measures outlined in the EAP. The on-site Construction Management Team will post traffic control signage and accompany each delivery in and out of the project area, monitoring vehicular and pedestrian safety

Requirement E

That the proposed use will not create an excessive additional requirement at public cost for public facilities and services.

Applicant Comment

All costs of pre-construction, construction of the Project, and maintenance and restoration of public roads post construction are paid by Hawkeye Power Partners, LLC. To ensure roads are maintained and restored post construction to meet or exceed pre-construction standards, Hawkeye Power Partners, LLC will work with the Cerro Gordo County Roads Engineer.

Requirement F

That the proposed use will not involve uses, activities, processes, materials, and equipment or conditions of operations that will be detrimental to any person, property or general welfare by reasons of excessive production of traffic, noise, smoke, fumes, glare, or odors.

Applicant Comment

Optimized for energy efficiency, the rebuilt facility will not generate excessive vibration. No dust, smoke, fumes, glare, ground water pollution or other undesirable nuisances or odors are emitted from the proposed facility. The proposed Project will comply with applicable noise standards and meet the noise maximum limit of 60 dB for the project.

Requirement G

That the proposed use is consistent with the intent and the purpose of the zoning district in which it is proposed to locate such use.

Applicant Comment

The proposed Project clearly demonstrates compatibility with other agricultural uses in rural Cerro Gordo County. The placement of turbines in this area over a span of twenty years has not impeded the use of adjacent property for agricultural purposes nor will the new facility. Crops can be grown and livestock can graze right up to the base of the wind turbines and access roads. The land can still be used for the purpose for which it is currently zoned, and the presence of wind turbines will not impede the development of other uses

4) PROJECT MAP AND SITE PLANS

The Hawkeye Power Partners, LLC project map and site plan ("site plans") can be found in **Appendix B**. The project map shows wind turbine generators in relation to the general area including the physical features and land uses of the project area. The site plans is organized by wind turbine generator location ID and details setbacks to property lines, rights-of-way, occupied dwellings and safety fall zones; FEMA 1% Annual Chance Flood Area Overlay; proposed wind turbine generator access roads; underground collection; tip height; area of each access easement; SCADA MET; and each request for variance in relation to each proposed non-conforming wind turbine generator.

5) CONSENT DOCUMENTS

Copies of original and new redacted landowner consent easements and agreements can be found in **Appendix C.**

6) OTHER AGENCY DETERMINATIONS AND APPROVALS

Hawkeye Power Partners, LLC will comply with all applicable federal, state, and local laws and regulations and will obtain all required federal, state, and local approvals, licenses, permits or variances for the proposed wind project prior to or in tandem with mobilization of proposed/associated construction activities. *NextEra Energy Resources* performs a systematic evaluation of its wind projects to ensure they are sited in an environmentally responsible manner and in compliance with all applicable local, state and federal laws and regulations. The following list represents determinations and approvals associated with proposed upgrade activities documentation of which can be found in **Appendix D**:

ENTITY / APPLICATION	DESCRIPTION	STATUS
Iowa Department of Natural Resources (IDNR)	SWPPP	In process
Federal Aviation Administration (FAA)	Determinations of No Hazard Light and Marking Plan	Complete

National Telecommunications and Information Administration	Federal Beam Path Study	Complete
Cerro Gordo County Road Department	ROW Permits & Road Use Agreement	In process
Cerro Gordo County Drain Commission	As required	In process
Iowa Department of Transportation (IADOT)	ROW Permits & Agreements	In process
Gas Lines	Permits & Agreements	In process
Transmission Owner (list)	Permits & Agreements	In process

7) SOUND SOURCES AND ACOUSTIC ASSESSMENT

There are two principal sound sources from an operating wind turbine: mechanical and aerodynamic sound. Mechanical sound is generated at the gearbox, generator, and cooling fan and is radiated from the surfaces of the nacelle and machinery enclosure and by openings in the nacelle casing. Aside from upset conditions that may result in abnormal mechanical noise emissions, the dominant noise generating component of utility scale wind turbines is aerodynamic.

Aerodynamic sound is related to air flow and the interaction with the tower structure and rotor blades when in motion and is the largest component of acoustic emissions for modern wind turbines. Sound originates from the flow of air around the air foils which is very strongly influenced by the tip speed of the blades. Tip speed is the speed of the tip of a rotor blade as it travels along the circumference of the rotor-swept area. The tip speed is directly related to the rotor size, which is fixed, and to the rotor rotational speed. The tip speed ratio is defined as the ratio of the speed of the tip of a rotating blade to the speed of the wind. Aerodynamic noise will vary primarily as a function of rotor rotational speed.

Air flow occurring across the blade produces turbulence at the surface boundary layer, which results in trailing edge boundary sound. Trailing edge sound is considered the principal aerodynamic noise source component of wind turbines. In addition to trailing edge, tip sound is created by vortex shedding as the blade tips pass through the air when in motion. Wind turbine manufacturers have instituted several measures to both reduce aerodynamic sound and increase power generation efficiency by reducing trailing edge and tip sound generation.

Efforts to reduce aerodynamic sounds have included the use of upwind rotor designs, noise-reduced nacelle, variable speed operation resulting in lower tip speed ratios, and the use of specially modified rotor blades designed and fabricated to reduce trailing edge noise. Earlier wind turbine designs had the blades located downwind of the support structure. As the blades passed through the vortex shed behind the support tower, the blade would be momentarily displaced, resulting in a pressure pulse. This becomes the mechanism for the generation of excessive acoustic modulation and low frequency sound. The downwind rotor design is rarely used in modern utility-scale wind turbines that employ the now-standard upwind rotor design with blades upstream of the tower structure. This change in rotor location has greatly reduced many issues associated with the downwind design and resulted in a decrease of 10 dB or greater, which corresponds to a perceived decrease in loudness by a factor of two.

Project operational sound was modeled per ISO 9613-2 within two separate layout scenarios, each containing 39 noise sensitive receptors. Project operational sound was then calculated for maximum rotational conditions. Acoustic modeling analyses per ISO 9613-2 were inclusive of a number of conservative

assumptions. Since no modeled NSRs resulted in > 60 dBA, it is expected that received sound levels at noise-sensitive receptors will be compliant with the 60 dBA prescribed in the Cerro Gordo Zoning Ordinance. A copy of the Acoustic Assessment Report can be found in **Appendix E**.

8) SHADOW FLICKER STUDY

Due to the significant growth of the wind energy industry in recent years, some states have published model bylaws regulating shadow flicker for local governments to adopt or modify at their own discretion which may include guidance and recommendations for shadow flicker levels and mitigation; no bylaw or ordinance has been adopted by Cerro Gordo County.

The Cerro Gordo County *Special Use Permit for Wind Farm Applicant Checklist* provided to Hawkeye Power Partners, LLC prior to its application indicates the applicant should consider Shadow Flicker prior to Special Use Application. In considering Shadow Flicker, an analysis of potential shadow flicker from the Project was conducted using the WindPro software package. The WindPro analysis was conducted to determine shadow flicker under realistic conditions (actual expected shadow). This analysis calculated the total amount of time (hours and minutes per year) that shadow flicker could occur at receptors located within 2,000 meters of the Project turbines.

The analysis of potential shadow flicker from the Project on nearby receptors shows that shadow flicker within the area of study are expected to be minor and well within acceptable ranges for avoiding nuisance and/or health hazards. Potential screening from trees, shrubs, barns, or other obstacles was conservatively not assumed to block shadows in the initial shadow flicker analysis. In reality, such factors can block shadows from falling on to windows of receptors. A second shadow flicker analysis was conducted for the three worst case impact receptors that consider potential screening obstacles.

For both Layout Scenario 1 and 2, the analysis demonstrated that existing obstacles would likely reduce shadow flicker for two of the three worst case receptors. A copy of the Shadow Flicker Analysis can be found in **Appendix F**. A shadow flicker mitigation plan with screening options for non-participating land owners can be found in **Appendix G**.

9) SETBACK ANALYSES

Setback analyses exhibits pertaining to zoning non-conformities can be found in **Appendix H**. Current Gordo County setbacks are listed below and elsewhere in the project application.

CERRO GORDO COUNTY TOWER SITING SUMMARY	
PROPERTY LINES	TOWER TIP HEIGHT + LAND USE DISTRICT SETBACK
ROAD ROW	TOWER TIP HEIGHT
NOISE	60 Dba FROM CLOSEST INHABITED DWELLING
AG-1 LAND USE DISTRICT SETBACK	A. Front yard depth, fifty (50) feet. B. Each side yard width, twenty-five (25) feet. C. Rear yard depth, thirty (30) feet.

10) DECOMMISSIONING PLAN

A copy of the Decommissioning Plan can be found in **Appendix I**.

11) DEICING

During winter conditions or other periods of cold, moist weather, it is possible for ice to accumulate on the blades of wind turbines. Certain factors such as blade speed, wind, rotation of the turbine, vibration, or gravity could potentially dislodge the ice, resulting in falling ice projectiles.

Icing conditions require low temperatures and high relative humidity. Ice build-up can occur in many ways such as in-cloud icing, freezing precipitation, frost, and wet snow or sleet. While these conditions are possible in North America, the accumulation of ice is highly dependent on local weather conditions, the height of the turbine, and its operational state.

Modern wind turbines can be equipped with cold-weather packages, including passive and active de-icing systems, allowing them to operate safely in extremely cold temperatures. Passive systems include ice-resistant coatings and sprays. Active systems include forced-air heaters or electro-thermal systems.

In addition to these systems, most modern wind turbines in ice-prone areas are equipped with ice-detection systems that stop turbine operation if ice has built up and nearly all turbines are equipped with vibration sensors to detect any rotor imbalance that could occur due to ice build-up.

Beyond the operational procedures described above, basic setbacks and proper signage further greatly reduce the chance of damage or injury from shedding ice. Wind farms also employ predetermined start-up procedures after icing events, such as remote, manual restarts.[5] Fences and warning signs are also employed to minimize human traffic in areas possibly affected by falling ice.

Fortunately, through a combination of siting guidelines, warning signs, and operational precautions, the risk of injury or death from falling ice from wind turbines is negligible. Not only does icing occur only a few days per year in cold climates, but improvements in ice sensing technology, remote camera monitoring of turbines, and de-icing systems limit the occurrences of turbines operating with accumulated ice.

Once stationary, a wind turbine does not differ substantially from other structures like communications towers, antennas, power lines, or buildings with respect to ice accumulation or ice fall. Risk assessments have shown that the area directly beneath the turbine is most likely to experience falling ice, and some research suggests the risk associated with being struck by a large piece of ice from a wind turbine is about one in ten million. Ice is rarely found farther from the turbine than its maximum vertical extent of the tower height plus the radius.

12) MANUFACTURERS SPECS

The Project will include GE2.3 116RD and 13 GE2.82 127RD machines. GE Turbine Specifications can be found in **Appendix J.**

13) SUBSTATION

Project substation scaled site plan with location, dimensions, setback configurations and fencing descriptions, equipment diagrams and warrantee deed can be found in **Appendix K.**

14) CERTIFICATE OF LIABILITY INSURANCE

A copy of the Project Certificate of Liability Insurance can be found in **Appendix L.**

15) APPLICATION FEES

A copy of the invoice for administrative fees paid to Cerro Gordo County can be found in **Appendix M**. Application fees will be submitted with SEP Review and Application for Variance Submittal.

16) PUBLIC NOTICE

A table listing all adjacent property owners, within a half-mile radius including name and mailing address, location by 1/4-1/4 section legal description and adjacent turbine can be found in **Appendix N.**

III. APPLICATION FOR VARIANCE

1) VARIANCE STANDARDS

Hawkeye Power Partners, LLC acknowledges the fact that Cerro Gordo County's development regulations and zoning standards for Wind Energy Devices (Special Use Permit requirements per *Section 6.27E, Structures Permitted Above Height Limitations within Article VI General Regulations for Agricultural Zoning Districts*, and requirements for Application for Variance as outlined per *Section 6.4, Nonconforming Uses or Buildings within Article VI General Regulations for Agricultural Zoning Districts*) generally apply equally to all properties, yet in this instance Hawkeye Power Partners, LLC is unfairly burdened by *Section 6.27E, Structures Permitted Above Height Limitations within Article VI General Regulations for Agricultural Zoning Districts* (setback requirements) creating hardship on a genuine effort to improve existing wind energy facilities while remaining in compliance with the regulations and continuing to supply local load centers with safe, clean, renewable, home-grown Iowa energy.

Because *Article 24.4 Jurisdiction and Powers of the Board of Adjustment* authorizes the Cerro Gordo County Board of Adjustment to grant a variance from the rules set forth in *Section 6.27E, Structures Permitted Above Height Limitations within Article VI General Regulations for Agricultural Zoning Districts* in limited circumstances, Hawkeye Power Partners, LLC request the Cerro Gordo County Board of Adjustment consider the following in granting a variance after making affirmative findings of fact on each and all of the following criteria:

Requirement A:
The land in question cannot yield a reasonable return if used only for a purpose allowed in that zone.

Applicant Comment:
The principle of reasonable return asks the Board to consider if, without a variance, a property owner cannot establish any beneficial use on their property. The applicant has been operating their WECS on the numerous properties within the agricultural community of Cerro Gordo County for 20 years. Many benefits have been established by the Hawkeye Power Partners, LLC wind farm location and operation in Cerro Gordo County including payments to land owners, property taxes paid, and the production of clean energy used by people in Cerro Gordo County. In desiring to rebuild the proposed wind farm within nearly the same project footprint, it is the desire and intent of Hawkeye Power Partners, LLC to continue to sustain these established community benefits.

Requirement B:
The plight of the owner is due to unique circumstances and not to the general conditions in the neighborhood, which may reflect the unreasonableness of the zoning ordinance itself.

Applicant Comment:
The principle of reasonable return asks the Board to consider if, without a variance, a property owner cannot establish any beneficial use on their property. The goal of the applicant is to continue operation of the WECS. To remain viable and improve operation efficiencies updated equipment with the latest technology is needed to be installed on the existing WECS. It is important that all WECS receive the same upgrades to achieve the overall operation objectives. The existing but obsolete Micon M1500-750/48

(750kw) generators, towers and blades measure at a 48m rotor diameter (157'). Proposed GE blades consistent with modern WTG technology measure at 116m rotor diameter; this increase in blade length create special circumstances peculiar to the structure that impede compliance with *Osceola County, Iowa 2013 Zoning & Subdivision Ordinances, Article XIII Wind Energy Regulations Section 13.3 Wind Energy Requirements (i.e. setback requirements). See Exhibits (WTG 01-WTG 60).*

Requirement C:
The use to be authorized by the variance will not alter the essential character of the locality.

Applicant Comments:
The Project clearly demonstrates the proposed wind farm will continue to be compatible with other agricultural uses in rural Story County. The placement of the turbines within the existing wind farm has not impeded the use of adjacent property for agricultural purposes nor will the more modernized wind energy facility. Crops can be grown and livestock can graze right up to the base of the wind turbines and access roads. The land can still be used for the purpose for which it is currently zoned, and the presence of wind turbines will not impede the development of other uses permitted in the agricultural district. Wind turbines will continue to blend with the landscape.

By fully participating in a thorough and transparent process in which Cerro Gordo County will review the current Special Use Permit (SUP) application and undergo application for consideration for Variance, Hawkeye Power Partners, LLC believes Cerro Gordo County will not have conferred any special privileges by leading this thorough process in order to determine merit in granting the proposed variance.

2) VARIANCE SUMMARY

In providing the following summary as evidence that the literal enforcement of the Ordinance will result in unnecessary hardship, Hawkeye Power Partners, LLC seeks to demonstrate the properties in question cannot be put to a reasonable use if used under the conditions allowed by the provisions of the Ordinance; the plight of the landowner is due to circumstances unique to his property not created by the landowner; and the variance, if granted, will not alter the essential character of the locality.

In granting a variance in this instance, the Cerro Gordo County Board of Adjustment shall ensure that their decision will in no way be contrary to the public interest, that the spirit of the Ordinance shall be observed, and substantial justice done.

Hawkeye Power Partners, LLC proposes to decommission the current 42-megawatt wind farm and construct, own and operate a new 41.3 megawatt wind farm to generate clean electrical power which will be sold to Interstate Power and Light ("IPL") a subsidiary of Alliant Energy under a new 25-year power purchase agreement. With respect to this application for variance, two proposed turbines and one permanent MET tower are subject to this request that the Cerro Gordo Board of Adjustment grant relief with respect to the property line setback requirement that a turbine be located at a distance equal to the height of the tower measured from its base to the height of the blade at its apex from any property line, per 6.27E, Structures Permitted Above Height Limitations within Article VI General Regulations for Agricultural Zoning Districts.

Requirement 1: The land in question cannot yield a reasonable use for the following reasons:

Turbine 4: the parcel in question is a participating parcel in the Project and land use is A-1. The land owner has no future plans for land use other than current land use which includes compatible uses of agriculture and lease to wind energy conversion project. Proposed siting is in compliance with Road ROW, Dwelling,

and all other property line setback requirements. Adjacent property owner is not opposed and no future land use is planned other than current land use. *(See Variance Request Table below)*
Turbine 6: the parcel in question is participating and land use is A-1. No future plan for land use other than current land use which includes compatible uses of agriculture and lease to wind energy conversion project. Adjacent parcel shares common property line. *(See Variance Request Table below)*
MET tower: the parcel in question is participating and land use is A-1. No future plan for land use other than current land use which includes compatible uses of agriculture and lease to wind energy conversion project. Adjacent property owner is not opposed. *(See Variance Request Table below)*

Hawkeye Power Partners, LLC Variance Request Table

WTG				SETBACK VIOLATION			VARIANCE REQUEST		SHORTFALL
	Mapbook Sheet #	Turbine Number	Technology	DWELLING	PROPERTY LINE	ROW	CURRENT DISTANCE PROPERTY LINE	REQUIRED DISTANCE PROPERTY LINE	
V1	Sheet 9	4	GE2.82 127RD 89HH	No	Yes	No	**332'**	**550'**	**168'**
V2	Sheet 4	6	GE2.82 127RD 89HH	No	Yes	No	**420'**	**550'**	**130'**
V3	Sheet 7	SM-01	SCADA MET	No	Yes	No	**302'**	**342'**	**40'**

Requirement 2: What is unique about this property compared to other properties in the vicinity?
With respect to all three parcel locations applicable to this request for property line variance, the locations are unique in their individual contributions to overall optimization of the wind energy conversion facility. Each turbine location is specifically selected due to the value it brings to the modeled net capacity to generate wind energy for the specific wind turbine as well as its contribution to the overall array. Also unique is the willingness and interest on behalf of the land owner to participate in the proposed project. With respect to the parcel location for the MET tower and this request for property line variance, the location is unique in its location to capture relevant and necessary performance data to maintain wind energy center optimization. Also unique is the willingness and interest on behalf of the land owner to participate in the proposed project.

Requirement 3: Explain how the variance will fit in with the character of the area (i.e., size, height, scale, etc.):
The proposed Project clearly demonstrates compatibility with other agricultural uses in rural Cerro Gordo County. The placement of turbines in this area has not impeded the use of adjacent property for agricultural purposes nor will the new facility. Crops can be grown and livestock can graze right up to the base of the wind turbines and access roads. The land can still be used for the purpose for which it is currently zoned, and the presence of wind turbines will not impede the development of other uses permitted in the agricultural district. Wind turbines will continue to blend with the landscape.

Requirement 4: The need for the variance cannot be attributed to the present or past property owner for the following reasons:
This request of the Cerro Gordo Board of Adjustment to grant relief is solely with respect to its property line setback requirement that a turbine be located at a distance equal to the height of the tower measured from its base to the height of the blade at its apex from any property line, per 6.27E, Structures Permitted Above Height Limitations within Article VI General Regulations for Agricultural Zoning Districts. The request cannot be attributed to the present or past property owner's land uses/use of property.

Requirement 5: The Zoning Ordinance requirements have resulted in a need for a variance for the following reasons:
Due to the property line setback requirement that a turbine be located at a distance equal to the height of the tower measured from its base to the height of the blade at its apex from any property line, (*per 6.27E,*

Structures Permitted Above Height Limitations within Article VI General Regulations for Agricultural Zoning District) the exact locations of Turbines 4 and 6, and the project MET tower (SM-01) are selected for purposes of optimizing the net generating capacity of each turbine, and the project dedicated meteorological performance instrumentation. As modeled and designed, these contribute to the optimization of the overall array during site operations. While seeking variance in these limited instances, proposed siting of Turbines 4 and 6, and the MET tower are in compliance with all other applicable siting and performance criteria of the Cerro Gordo County Ordinance.

Requirement 6: The variance is in accord with the purposes and intent of the Zoning Ordinance and Comprehensive Plan for the following reasons:
Wind Energy Systems are permitted by Special Use within A-1 zoning districts under *Section 6.27E, Structures Permitted Above Height Limitations within Article VI General Regulations for Agricultural Zoning District*) and as permitted are in general conformance with the Comprehensive Plan to promote renewable energy development in Cerro Gordo County, Iowa.

Requirement 7: The variance will not impair the public health, safety and general welfare of the residents of the County for the following reasons:
Hawkeye Power Partners, LLC has been monitoring environmental and visual resources at its exiting wind energy facility for twenty years. Initial turbine locations were carefully selected and designed to ensure compatibility with other area property users, wildlife, wetlands, floodplains, cultural resources and the facility is by design a tribute to the environment, harvesting steady, clean, local wind energy for conversion into clean power for communities in Iowa. Optimized for energy efficiency, the rebuilt facility will not generate excessive vibration. No dust, smoke, fumes, glare, ground water pollution or other undesirable nuisances or odors are emitted from the proposed facility. The proposed Project will comply with applicable noise standards and meet the noise maximum limit of 60 dB for the project.

IV. CONCLUSION

This submission and referenced Appendices demonstrate Hawkeye Power Partners, LLC's compliance with the intent of the *Cerro Gordo County, Iowa* Special Use Permit requirements per *Section 6.27E, Structures Permitted Above Height Limitations within Article VI General Regulations for Agricultural Zoning Districts*, and requirements for Application for Variance as outlined per *Section 6.4, Nonconforming Uses or Buildings within Article VI General Regulations for Agricultural Zoning Districts.*

Upon Special Use Permit and Variance approval, Hawkeye Power Partners, LLC s forward to the opportunity to decommission existing facilities and construct a new modern and optimized facility in order to continue bringing economic benefits to project stakeholders and Cerro Gordo County for years to come.

Cerro Gordo County Planning & Zoning
Staff Report
SPECIAL USE

Case No.: Case No. 20-17	**Date of Application:** August 13, 2019
Use Request: 20.2(J) Public Utility Structures & Accessory Equipment	**Owners:** ; See Appendix A of application
Current Zoning: A-1 Agricultural	**Petitioner:** Hawkeye Power Partners, LLC
Address: Unassigned	**Size of Special Use:** As shown on general site plan
	Size of Parcel: Varies
Legal: Locations: Sections 3, 4, 5, 8, 9, 10, 15, 16, & 17 Union Township	**Hearing Date:** September 24, 2019

BACKGROUND INFORMATION:

1) PURPOSE OF SPECIAL USE REQUEST -

NextEra Energy Resources (NextEra) has submitted an Application for a Special Use Permit (SUP) as Hawkeye Power Partners, LLC to construct up to 18 wind turbines, a meteorological tower, a substation, along with associated collection lines and construction sitings including two laydown yards as staging areas. The project is intended to replace the existing Clear Lake Wind Farm south of Ventura. The existing windfarm will be fully decommissioned with the new proposed development taking its place. The proposed project location is in roughly the same area as the existing Clear Lake Wind Farm, located in Section 3, 4, 5, 8, 9, 10, 15, 16, & 17, Union Township, about 2.5 miles south of Ventura. A summary table has been included with your packet to aid in making the application easier to digest.

While 18 turbine locations are being analyzed, NextEra will ultimately construct a total of 15 turbines at a 41.3-megawatt output. This will generate roughly the same amount of power as the existing 42-megawatt windfarm. The project will use GE model turbines with the narrative stating two of the turbines will be 450' tall and 13 of the turbines will be 500.3' tall at the maximum height of the blade rotation in the equipment description. While the height is noted, there is a note acknowledging the intention to construct the turbines as required. I am reviewing all turbines as if it is intended to be as tall as it was reviewed by the Federal Aviation Administration (FAA) at up to 499 feet tall. Zoning Permits submitted in case of potential approval also indicate the intention for a 499' maximum height. A condition of the permit should require the turbines to be no taller than what has been approved by the FAA in its Determinations of No Hazard in Appendix D of the application.

New transmission lines are proposed to be installed underground through private property with some limited locations along county right-of-way. Collection lines will primarily run underground on private property with some limited installation within county right-of-way. Obtaining the necessary utility and driveway entrance permits from the County Engineers Office should be a condition of approval. Floodplain Development Permits may also be required as a result if there is any boring under any waterbodies, though based on the county GIS system this is not likely the case.

The meteorological tower is proposed to be located in the SW¼, Section 17, Union Township. It will be approximately 292' at its maximum height. The purpose of the tower will be testing weather and climate conditions and monitoring performance of the development throughout the life of the project.

The substation will be the point of interconnection to transfer the power generated by the project onto the electrical grid. NextEra has a new 25-year power purchase agreement with Interstate Power and Light (IPL), a subsidiary of Alliant Energy, to supply power for its energy generation needs. The substation is located in Section 10, Union Township at an existing substation site owned by IPL.

The Zoning Ordinance permits commercial wind energy conversion systems (wind turbines), which are regulated similarly to a public utility structure or communication tower, on property zoned A-1 with a Special Use Permit under Section 20.2(J).

NextEra has requested 3 setback variances as a part of the application for Turbines 4, 6, and the meteorological tower. However, only 1 variance is actually necessary, as 2 of the requests meet setback requirements. Article 20.2(J) of the Zoning Ordinance requires a setback from any right-of-way line, principal or accessory structure, or non-participating property line. The setback for Turbine 6 was measured to the south property line of the NW¼, Section 8, Union Township, but the entire SW¼ of Section 8 is owned by the same participating property owner as the parcel in which Turbine 6 is located. This meets the requirement, and no variance is necessary. The meteorological tower location sits 302' from the east non-participating property line, and the tower is 292' at its maximum height. This exceeds the height of the tower and meets the setback requirement. No variance is necessary as a result. A discussion of the variance request for Turbine 4 is included in the "Potential Detriments to Persons, Property, or General Welfare" section below. The setback distances for the variance requests have been highlighted blue for ones not being necessary and red for the request that a variance is needed to build as proposed on the enclosed summary table.

2) EXISTING LAND USE AND ZONING CLASSIFICATION OF PROPERTY –

The parcels on which the turbines are proposed have been used for agricultural production as the primary use for decades. The current zoning of the properties on which the turbines will be erected is A-1 Agricultural. Approximate locations of the 18 turbine sites, meteorological tower, substation, and collection lines are shown in the included general site plan in Appendix B of the application. More detailed site plans are included in the setback analysis in Appendix H of the application.

3) LAND USE AND ZONING CLASSIFICATION OF SURROUNDING PROPERTY -

Agricultural production and rural residences are the predominant uses of land in the surrounding area. All property in the immediate vicinity is zoned A-1 Agricultural or A-2 Agricultural.

GENERAL FINDINGS:

1) HARMONY AND ACCORD WITH GENERAL PRINCIPLES AND PROPOSALS OF ZONING ORDINANCE -

The purpose statement of the Zoning Ordinance says that it was "adopted for the purpose of promoting public health, safety, morals, comfort, and general welfare." The proposed use should not have an impact on public health as there are no emissions from wind generating facilities. The use should not adversely affect public safety, morals, comfort, or general welfare. With appropriate conditions applied to the development, any potential impacts will be mitigated or eliminated.

The ordinance is also intended to "conserve the values of property and encourage the most appropriate use of land." Experience has shown that wind turbines generally do not have an adverse impact on property values. Property values within the area of the existing Clear Lake Wind Farm did not suffer as a result of that project. The ordinance states that it is intended to "provide the social and economic advantages resulting from an orderly planned use of land resources; and facilitate adequate but economical provisions for public improvements." The repowering of wind turbines stands as a public improvement that maintains and enhances the use of renewable energy in North Iowa.

2) COMPATIBILITY OF USE WITH APPEARANCE AND ESSENTIAL CHARACTER OF AREA -

A minimal amount of farmland will be taken out of production for the tower sites and access roads. Typically, around one acre of land is taken out of production to accommodate a wind turbine. A net gain of land in agricultural production is expected, however, after the existing windfarm is fully decommissioned. Agricultural operations will be continued up to the location of the towers and the roads.

The turbines will have significant visual impacts on surrounding residences. A structure of this height will be visible for a significant distance. Using an algebraic formula, and not accounting for visual obstructions such as hills, valleys, and vegetation, a turbine with an overall height of 499 feet may be seen for 27 miles (See Figure 1). There are about 40 dwellings within one mile of the proposed turbine sites. The existing windfarm has been located in the general area for over 20 years, and the redevelopment will continue the use.

3) IMPACT ON EXISTING AND FUTURE USES, VICINITY, AND COMMUNITY AS A WHOLE -

The proposed turbines should be considered permanent improvements. Eventually, the turbines may be considered obsolete and decommissioned. A decommissioning plan was filed with the application and states that a performance bond will be established for the total current estimated cost of removing the structures, which protects landowners from a possible abandonment. The proposed wind turbines should have minimal impact on existing and future agricultural operations on this or surrounding property. The use should not have a detrimental impact on the community as a whole with appropriate conditions applied. A detailed discussion of other potential impacts is included below.

4) ADEQUACY OF PUBLIC SERVICES (i.e., highways, streets, police, fire protection, drainage structures, refuse disposal, water and sewage facilities, or schools) -

Most of the turbines are proposed to be accessed off of gravel roads, though Turbines 1 and 11 will be accessed off of a paved road. The Board of Adjustment should approve accesses as a condition of the SUP subject to the standards of the County Engineer. Likewise, since these are county roads, access and delivery routes to the sites should be coordinated with the County Engineer's office as a condition of approval.

The construction of turbines usually involves the movement of heavy equipment, extra-long trailers carrying blades, and other vehicles that may cause damage to gravel roads. The narrative states that the company will coordinate with the County Engineer on transportation routes. Furthermore, they say that they will document road conditions prior to construction and work with the Engineer to restore the roads to pre-construction conditions after construction. The applicant has already entered into a road use agreement with the County Engineer, which includes requirements for pre and post construction road assessments and repairs of any damaged roads to their original condition. This should still be a condition of the SUP.

Law enforcement protection is provided by the Cerro Gordo County Sheriff's Department. Fire protection for the turbines is split between Ventura Fire Department and the Clear Lake Fire Department. There should be little, if any, additional demand on either agency as a result of approving the proposed special use.

Portions of the project area lie within Drainage Districts 120 and 22. The developer should be made responsible for any and all repairs to any drainage structures that are damaged during construction or as a result of the development. The same is true for private drainage structures. This should be a condition of the permit if approved. None of the turbines, the substation, or the meteorological tower are located within the FEMA-designated 100-year floodplain, and it does not appear that any of the collection lines will cross into the floodplain either. If needed, it is the applicant's responsibility to obtain any permits required by the state or a local Floodplain Development Permit if any grading work during construction will potentially occur in the FEMA-designated 100-year floodplain or if the applicant needs to bore under a waterbody for collection lines.

It is the applicant's responsibility to ensure that all onsite refuse will be disposed of at its expense. The use will not require water or wastewater facilities.

The proposed use should not have an impact on schools.

5) PUBLIC COST FOR ADDITIONAL PUBLIC FACILITIES AND SERVICES -

The proposed use should not create any need for additional public facilities or services. The applicant should be required to repair county roads and drainage district tile or private drainage tile damaged during construction. Otherwise, it is not anticipated that the development will require additional public services or facilities.

6) POTENTIAL DETRIMENTS TO PERSONS, PROPERTY, OR GENERAL WELFARE (i.e., excessive traffic, noise, smoke, fumes, glare, or odors) -

Large developments such as this have a potential for various impacts to the vicinity in which they are located. With appropriate conditions applied within the SUP, any potential impacts can be properly mitigated.

Proximity

Large structures such as the proposed turbines should be a sufficient distance away from nearby residences to mitigate potential impacts. Detailed site plans in Appendix H of the application show that the turbines will be erected at distances that are equal to or greater than the height of the tower (including blades at their highest point of rotation) from existing principal or accessory structures, from road right-of-way lines, or any shared property line with a non-participating landowner. All structures meet required setbacks except the request for variance for Turbine 4 discussed below. Additional acoustical requirements in the Zoning Ordinance ensure the turbines are even further away from nearby residences. None of the proposed turbines are closer than 1,400' from a nearby residence. I have listed all the setback distances to the nearest residence from each turbine location in the enclose summary table.

Noise

The largest potential impact, besides possibly the visual impact discussed above, is the potential for noise generated by each turbine. Sound is produced by the air flow of the wind acting on the rotor blades and causing them to turn. There is also some sound produced by the mechanical components of the turbines. Article 6.27(E) of the Zoning Ordinance requires that no sound produced by a wind energy system may exceed 60 decibels. For comparison, this is roughly about the decibel range of an air conditioning unit.

An acoustical assessment conducted by a third party is included in Appendix E of the application analyzing two scenarios. The assessment assumed that all turbines were operating at maximum rotational speeds and does not factor in other environmental factors that may contribute or impede the sound produced by the turbines. Measurements were recorded for residences within 2,000 meters (6,561.68') from the project area. The loudest measured decibel level was at 53 decibels for the nearest residences and is below the requirement. A summary and map of the results of the analysis are included at the end of the assessment. I have included a summary of the approximate decibel level for the nearest residence from each turbine in the enclosed summary table.

Appropriate setbacks are an efficient means to reduce the impacts of noise produced by wind turbines. Research suggests that a setback of at least 1,250' is necessary to mitigate noise appropriately. Additional separation achieves little additional benefit the further any distance a setback distance is. None of the proposed turbine locations are closer than 1,400' from the nearest respective residence. The loudest levels in the assessment fall around the 50-decibel level. This level is about usual bedroom levels and quieter than usual home noises. Noise levels produced by the turbines will typically be much quieter than the maximum conditions assumed by the analysis and will be at much lower levels. On multiple occasions, I have measured the decibel range from the turbine development south of Mason City from the road in typical weather conditions on a sunny day, approximately 600' from the road. In those conditions and at that distance, measurements were at approximately 40 decibels with contributions from birds in the area.

The summary missed the residences at 12374 Cardinal Avenue and a new house currently under construction. Based on the scenario maps in the analysis, noise from the turbines will be below 50 decibels for both residences.

Mechanical components in need of repair may cause some additional noise at times. Appropriate maintenance will ensure that such additional noise does not contribute to the overall noise of each turbine. NextEra employs locally based maintenance workers to ensure proper maintenance is done.

Shadow Flicker

Wind turbines can create a shadow flicker effect when the shadow from the moving rotor blades is cast through a constrained opening, such as a window. Appendix F of the application includes a shadow flicker analysis assessing the effect on residences within 2,000 meters of the project area. The analysis used a conservative approach in that no existing building or vegetative buffers were considered in expected conditions. The measurements for the analysis are recorded in a hours per year format that the effect may impact a particular

residence in an annual timeframe. If a residence may potentially be affected, the effect would impact the respective residence for a certain number of minutes per day that fluctuate depending on the time of year.

The accepted standard by governing jurisdictions and, as I understand it, the industry is for the effect to not impact a particular residence for more than 30 hours per year. Assuming no vegetation or other mitigating factors, the results of the analysis show that three residences may be impacted more than 30 hours per year by the shadow flicker effect: 10956 Dogwood Avenue, 11393 Cardinal Avenue, and 1887 200th Street. Included in the analysis was an assessment on whether existing vegetation or other mitigating factors would help alleviate the effect. The analysis concluded the first two addresses, which have significant vegetation or buildings between turbine location, would help mitigate the shadow flicker effect. No vegetation exists at 1887 200th Street to help mitigate the effect. Providing a mitigation solution, particularly for these three residences, should be a condition of the permit.

Vegetation or structures located between turbines and a residence can significantly mitigate or eliminate the shadow flicker effect. Below is a summary of the current conditions regarding existing vegetation or structures that may assist in mitigating the effect for residences that may receive over 5 hours per year of the effect:

- 1887 200th Street: limited or no vegetation to the east of the house
- 10586 Balsam Avenue: no vegetation screening
- 2354 220th Street: some vegetation to the north/limited vegetation to the south of the house
- 2177 220th Street: no vegetation screening
- 12558 Cardinal Avenue: significant vegetation on west and north side of property
- 12374 Cardinal Avenue: limited vegetation
- 12024 Dogwood Avenue: some vegetation to the south of the house
- 4284 210th Street: heavy vegetation to the west of the house
- 11273 Dogwood Avenue: significant vegetation to north/some to east/none to south of the house
- 11393 Cardinal Avenue: significant vegetation to west and north of house/building to east and south
- 10493 Cardinal Avenue: some vegetation to the east and and west/significant to north of house/building on west side of house
- 10922 Eagle Avenue: some vegetation to west/significant to north of house
- 10537 Eagle Avenue: limited vegetation on northwest part of property
- 10757 Cedar Avenue: significant vegetation on north side of house/ none elsewhere
- 3477 220th Street: heavy vegetation to the west of house
- New house under construction on 210th Street between Cardinal Avenue and Dogwood Avenue: no vegetation

The summary missed the residences at 12374 Cardinal Avenue and the new house currently under construction. Going by the included maps, the first address may be affected less than 30 hours per year. The house under construction may be affect 30 hours or more per year.

A shadow flicker mitigation plan was included in Appendix G of the application. The narrative states that a mitigation strategy will be taken on a case-by-case basis as is necessary. I have recommended a condition that at a minimum, the applicant provide any residence that may be affected by the shadow flicker effect with automated window blinds for times they may be affected at a minimum. The Board may want to consider a condition of the applicant provide additional vegetation for residences without it at its expense.

Other Potential Impacts

The rotor blades of any of the models of turbines will be 83.7'' from ground level at their lowest point. This should minimize any hazard to persons or livestock. The turbines will be required to be lit by FAA standards. The narrative states that red, synchronized lights will be used. Daytime lighting is not required. The Board may want to consider a condition requiring that the towers be lit with red lights. The visual impacts created by the proposed project vary according to the subjective opinions of any given person.

The proposed use will generate traffic during construction; however, it should generate very few trips once complete. These trips will likely be associated with routine maintenance. The applicant has already entered into

a road use agreement with the County Engineer, specifying construction routes and the requirement that it must repair any damaged road to pre-construction or better conditions. The Board may want to adopt a condition that dust control be applied during construction at the direction of and in such frequencies as the County Engineer may prescribe, at the applicant's expense. The County Engineer has been afforded the opportunity to comment on the application. Any comments received will be shared with the Board at the hearing.

The proposed turbines will not produce smoke, fumes, or odors. Glare is a possibility, though unlikely. The Board may wish to consider a condition that requires the applicant to mitigate any glare within 30 days of receipt of a complaint.

The proposed 499' turbines are approximately 1,250'-1,300' above mean sea level. The proposed site is outside of the Conical Overlay Zone of the Mason City Municipal Airport. The Mason City Municipal Airport has commented that they see no issue with the proposed turbines at the approved heights by the FAA.

Variance Request for Turbine 4

The proposed distance for Turbine 4 from the south, non-participating property line is 332'. This is closer by 167' than the required 499' setback to non-participating property lines. The location of the turbine is in the NW¼ of Section 15, Union Township. The turbine is located in a vast farm field. No structures exist on the neighboring property.

The narrative states that the requested variance is due to independent circumstances of project needs. The request describes a process of careful site selection based on weather conditions unique to the needs of the operation of the windfarm. Earlier in the general SUP application, the applicant states locations are chosen in a staggered configuration to optimize the efficiency of the development.

The proposed location is unlikely to negatively impact the parcel to the south. Agricultural activity on the parcel to the south is also unlikely to be hindered. As a result, I recommend approval of the variance request be granted within the conditions of the SUP.

7) COMPATIBILITY AND CONSISTENCY WITH THE INTENT AND PURPOSE OF THE ZONING DISTRICT -

Variances to the height requirements of the A-1 Agricultural District will be necessary. The towers will be about 499 feet (to the tip of the blade) in height, which far exceeds the 35-foot maximum allowed. All other required A-1 district setbacks will be me, except as described for Turbine 4 above.

The stated intent of the A-1 Agricultural District is to "permit the continued use of such land for agricultural purposes." The proposed wind turbines will cause minimal disruption to continued agricultural production on the property once construction is complete.

8) COMPATIBILITY WITH COUNTY COMPREHENSIVE PLAN -

According to the county's Comprehensive Plan, the future land use of the area to be encompassed by this project is designated for agricultural use. The continued agricultural use of the land in the project area will not be compromised significantly by the special use. Each turbine will take about one acre of farmland out of production, though a net gain of farmable land is anticipated after the existing windfarm is fully decommissioned.

COMPLIANCE WITH ADDITIONAL ARTICLE 20 REQUIREMENTS:

Additional requirements for the special use requested are as follows:

20.2 SPECIAL USES

J. Commercial microwave, radio and television towers, public utility structures and accessory equipment, including their transmitting stations and towers, and wireless telecommunications facilities. Any district except residential, provided the following requirements are met:

1. Application. In making application for a Special Use Permit, the applicant shall file the following in addition to the standard application for Special Use Permit:

    a. A site plan, drawn to scale, identifying the site boundary; tower or facility location; height of structure(s); guy wires and anchors; and existing and proposed structures including accessory structures. **Detailed site plans for the development were filed with the application.**

    b. If the applicant is not the site owner, written authorization from the site owner. **The application package included copies of the Wind Farm Agreements and lease agreements for all turbine locations, meteorological tower, construction area participation, and collection lines signed by the property owners**

    c. The applicant shall provide evidence that available public or private sites are unsuitable for operation of the facility under applicable telecommunications regulations and applicant's technical design requirements. A new tower shall not be permitted if co-location can be found upon an existing or alternative tower structure that meets engineering requirements of an applicant's wireless network within a one (1) mile radius of the proposed new tower site. Cost shall not be used as a reason against co-locating of antennas. **The proposed turbines are not a telecommunications facility. Therefore, this requirement does not apply.**

    d. Evidence that all permits required by any other governmental entity have been obtained, or, if all such permits cannot practicably be obtained prior to the public hearing, the written acknowledgement by the applicant that any special use permit granted will be contingent upon the applicant obtaining all such permits and providing conclusive evidence thereof to the Administrative Officer, as the latter may require. **The applicant filed copies of the Determination of No Hazard to Air Navigation from the FAA for up to 18 turbine sites and the location of the meteorological tower. The determinations are for turbines with overall heights of 499 feet. There is a 1.3' discrepancy in the height (500.3') in the equipment description of the narrative. Zoning Permit Application filed with the Planning and Zoning Office if the SUP is approved list the height at 499', indicating the intention is be compliant with the FAA determinations. A condition of the SUP should only allow a maximum height as approved by the FAA. A results letter from the National Telecommunications and Information Administration was also included with the application that states that "…no agency had issues with wind turbine placement…."**

    Additional approvals may be required by the Iowa DNR (SWPP or NPDES permits), Iowa DOT, the Army Corps of Engineers, or the US Fish and Wildlife Service Copies of such permits are required to be submitted to the Planning and Zoning Office once received.

2. Conditions. Any applicant shall provide documentation that all of the following applicable conditions will be met for all towers:

    a. The tower shall be constructed or easily modifiable, within thirty (30) days, to support the equipment of at least three (3) communications companies. **This requirement is usually applied to communications and telecommunications towers and is not applicable to this project.**

    b. Towers and telecommunications facilities shall be of camouflage design, if possible. Examples of camouflage facilities include, but are not limited to, architecturally screened roof-mounted antennas, antennas integrated into architectural elements, communications and telecommunications towers designed to blend into the surrounding environment or to look like an object other than a tower. Where camouflage design is impossible or impractical, the tower shall be built of materials that make it nearly invisible. Lighting on the tower shall be of the least conspicuous type and exist only to satisfy Federal Aviation Administration (FAA) requirements. **The application states that red, synchronized lighting satisfying FAA requirements will be used. Blades and towers will be painted white to blend into the environment and meet FAA requirements.**

c. The tower owner and the tower operator shall provide proof of adequate liability insurance in writing to the Administrative Officer of Cerro Gordo County for Planning and Zoning, under such further conditions and in such amounts as the Board of Adjustment or the Administrative Officer may direct, but in no event shall such proof be required more often than annually. **This should be a requirement of the SUP, if approved. The applicant submitted a Certificate of Liability Insurance, which shows the applicant has commercial general liability coverage for $1 million for each occurrence and $2 million in the aggregate.**

d. The base of the tower shall be at least the height of the tower from any public right-of-way and any existing principal or accessory structure, other than the base station. Guy wires, guy anchors, and base station structures shall comply with all setbacks for the zoning district in which they are located. No guy anchors, towers, or base station structures shall be located in an easement located on the property except that held by the applicant. **This requirement will be met, except as discussed for the request variance for Turbine 4. The guy wires supporting the meteorological tower appear to meet district setback requirements. A detailed site plan demonstrating the guy wires meet the 25' side yard setback requirement must be submitted prior to the issued of a Zoning Permit for the tower.**

e. Any signal interference complaints associated with the tower or related equipment shall be addressed within thirty (30) days in accordance with Federal Communications Commission (FCC) rules and procedures. **This should be a condition of the SUP, if approved.**

f. The tower and all appurtenances shall be removed upon the end of its useful life and the site restored to its condition prior to tower placement within one hundred eighty (180) days. **A decommissioning plan was filed with the application package. In addition, the narrative states that all physical material will be removed to a depth of 4' and the easement area will be restored to pre-existing conditions. Topsoil will be replaced where necessary.**

g. Access from any public road shall be subject to the standards of the County Engineer. An access permit shall be obtained from the County Engineer prior to construction. Access locations are shown on the site plan. **This requirement should be a condition of the SUP, if approved.**

h. A zoning permit shall be applied for and approved, subject to Article 22 of the Zoning Ordinance, prior to any construction. **This should be a condition of the SUP, if approved. Zoning Permit Applications have already been submitted for if the SUP is approved.**

i. A sign shall be placed on the base station structure or at the base of the tower that identifies a name and phone number of whom to contact in case of emergency. No advertising device is permitted anywhere on the facility except as permitted by this Ordinance. **There will be no other advertising. Emergency information should be placed on a sign at the access road as a condition of the SUP, if approved. Examples of safety signage are included in Appendix J of the application.**

3. Exceptions. The Special Use Permit procedure shall not apply where:

   a. An applicant proposes to add an antenna to an existing tower and the addition of such antenna will not increase the total height of the tower.

      In such cases, the applicant shall file an Application for Zoning Certificate for review by the Zoning Administrator, along with evidence that the required FAA and FCC permits have been obtained. **Since this request is not for a communications or telecommunications tower, this requirement does not apply.**

4. Transmission lines. The routing of transmission lines shall be restricted to locations that minimize the disruption of agricultural activity and developed residential areas. **The map of the collection lines is shown on the general site plan included with the application. Many, if not most, of the collection lines run through fields in agricultural production. Though according to the planned construction**

schedule on page 7 of the application, installation is anticipated for about February or March 2020, which is prior to planning and prior to planting of crops. One of the conditions of the SUP, if approved, should be that the applicant obtains a permit to install any collection/distribution lines within any county right-of-way.

ZONING DISTRICT REQUIREMENTS:

Requirements of the **A-1** zoning district for which the proposed special use is to be located are as follows. Ordinance provisions are in normal type. Staff comments are in **bold**:

- Minimum parcel size is 10 acres.
- 7.5 Height Regulation. No building hereafter erected or structurally erected shall exceed two and one-half (2 ½) stories or thirty-five (35) feet. **Variances will be necessary.**
- 7.6 Yard Requirements. Each lot shall have front, side and rear yards not less than the depths or widths following:
  A. Front yard depth, fifty (50) feet.
  B. Each side yard width, twenty-five (25) feet.
  C. Rear yard depth, thirty (30) feet.

- **Compliance with district regulations:**
  All yard setback requirements will be met since the towers can be no closer than 499 feet from any right-of-way line, principal or accessory structure, or non-participating property line. All yard setbacks will be complied with, including the guy wires on the meteorological tower. There is no detailed site plan showing the proposed setback for the guy wire of the tower, so that will be required to be submitted prior to the issuance of a permit for the tower.

  Height variances are necessary for the turbines and meteorological tower. The Zoning Ordinance permits structures to be no taller than 2½ stories or 35 feet in the A-1 Agricultural District. Due to the height of the turbine with the blade at its apex, a variance from this requirement will be necessary. The turbines will be 499 feet tall from base to the top of the blade when it is at its apex. In a case like this, the SUP creates the need for the height variance.

  The towers are required to be set back a distance equal to the tower's height from road rights-of-way, and structures. In addition, the turbines will be at least 1,400 feet from all residences. I recommend that the height variances be granted by condition.

STATUTORY REQUIREMENTS:

Additional requirements under Iowa Code pertain to the Special Use applied for:

- Archaeological Review by the State Historical Society of Iowa may be required.
- Army Corps of Engineers' approval may be required.
- NPDES Storm Water Discharge Permit for the disturbance of more than 1 acre of land.
- FAA determination of no hazard to air navigation (received).
- County Engineer's route recommendations.
- Access approvals for new maintenance roads through the County Engineer.
- Permit to conduct work in the right-of-way from the County Engineer for collection/distribution line work.
- State review for grading within the floodplain or boring under creeks for the collection/distribution system and a local Floodplain Development Permit will likely be required, as applicable.

STAFF ANALYSIS AND RECOMMENDED ACTION:

The county, and specifically the Board of Adjustment, has consistently supported the use of "green" energy efforts. This dates back to the original proposal for the Cerro Gordo Wind Farm south of Clear Lake back in 1998. Since then, the Board of Adjustment has approved height and yard variances to accommodate private wind turbines and approved

a SUP for the capacitor bank related to the Crystal Lake Wind project, and the supervisors have amended the Zoning Ordinance to streamline the approval process for private wind generation facilities.

These turbines will be very noticeable on the landscape due to their proposed height (499 feet) (See Figure 1). For comparison purposes, the stacks on the south side of the Alliant generating plant to the west are 200 feet in height. The visual impacts of these turbines should not be underestimated. Due to the size and location of the proposed turbines, I have invited the County Engineer to submit comments on the application. Their comments will be shared with you at the meeting, if received. The Mason City Municipal Airport has provided comment that they see no issue with the proposed windfarm at the approved height by the FAA.

While noise and shadow flicker are potential impacts, factors such as distance and existing vegetative buffers should mitigate such potential impacts with appropriate conditions applied. The included auditory analysis in Appendix E of the application shows that noise will be no louder than 53 decibels at the nearest residences, which is equivalent to typical household sound, at maximum rotational speed.

The applicant has done an excellent job of demonstrating compliance with the requirements of the Zoning Ordinance as well as obtaining necessary authorizations from the FAA in advance of submitting the application documents. Though there is a slight discrepancy within the equipment description for height and the FAA determination, I believe the Board of Adjustment would be hard-pressed to find a reason to deny the Special Use Permit so long as the below recommended conditions are included at a minimum. The Board has the option to add additional conditions or to amend the recommended conditions you believe are needed to mitigate potential impacts.

RECOMMENDED CONDITIONS TO BE MET IF POSITIVE VOTE BY BOARD OF ADJUSTMENT:

Note: In granting a Special Use Permit, the Board of Adjustment may attach conditions which it finds are necessary to carry out the purpose of the Zoning Ordinance, in conformance with what is provided in Article 20 of the Zoning Ordinance, and where reasonable and necessary may increase the required lot or yard, control the location and number of vehicular access points to the property, limit the number of signs, limit coverage or height of buildings because of obstruction to view and reduction of light and air to adjacent property, and require screening and landscaping to reduce noise and glare and maintain the property in character in keeping with the surrounding area. Special uses shall ordinarily comply with the standards of the district concerned for principal uses which are permitted therein, except as modified by the Board of Adjustment in granting a Special Use Permit.

The following conditions are recommended:

1. This permit may be reviewed at any time in the future upon the request of the applicants or a majority of the Board of Adjustment members.
2. These provisions and/or regulations as stated shall be minimum requirements and wherever the requirements of any other lawfully adopted rules, regulations, or ordinances are at a variance, the most restrictive shall govern.
3. It is contemplated that from time to time during the operation of a commercial windfarm, that conditions may arise which are not covered by the terms and conditions of this permit and which cannot be anticipated. In the event such conditions do arise, the Board of Adjustment of Cerro Gordo County, Iowa may impose additional regulations to meet any new conditions. In addition, if said facility should, at any time, be operated in any manner which violates the rules and regulations of any federal or state regulatory agency, then the Board of Adjustment may impose such other conditions so as to insure compliance with such rules and regulations.
4. This permit will be subject to revocation for operator's failure to comply with the provisions as herein set forth or such other provisions as may, from time to time, be imposed by the Board of Adjustment of Cerro Gordo County, Iowa, under the terms of this permit.
5. County representatives shall have the right to enter the premises at any time upon notification to the permit holder for the purposes of enforcing the provisions of this Special Use Permit.
6. This Special Use Permit shall be applicable to Hawkeye Power Partners, LLC, its successors, and assigns as well as any future owner of the project.
7. Driveway accesses to the turbine sites are hereby approved. Prior to installation of the driveway, a permit shall be obtained from the County Engineer. Said access shall be constructed to the standards of the County Engineer.
8. The applicant shall be responsible for the cost of any 911 site addresses assigned or requested.

9. Transportation of heavy equipment for construction shall be limited to routes designated by the Cerro Gordo County Engineer. Any road damaged as a result of the construction of the special use shall be restored to its pre-construction condition. Costs of repair of damage to county roads or rights-of-way resulting from the construction phase of this project shall be the responsibility of the applicant.
10. Dust control shall be applied during the construction phase at the discretion of and in such amounts and frequencies prescribed by the County Engineer at the applicant's expense.
11. Necessary permits shall be obtained from the County Engineer to install transmission, collection, or distribution lines in any county rights-of-way.
12. The project shall not adversely impact any duly established drainage district or private drainage facilities. Damage to drainage structures resulting from the construction of the special use shall be repaired at the applicant's expense. The applicant shall conduct a pre-construction assessment documenting the existing condition of all drainage structures within the project area.
13. Tower lighting shall comply with FAA requirements, but be the least-intrusive type possible for nearby residents.
14. The applicant shall take appropriate steps to mitigate glare created by the special use within thirty (30) days of receipt of a complaint.
15. A variance from the A-1 district height limitation of 35 feet is hereby granted. The overall height of the special use shall not exceed 499'.
16. The applicants shall apply for and obtain a Zoning Permit prior to any placement of any structure on the property. A site plan prepared by a licensed surveyor or engineer showing the exact location and all required setbacks of the wind turbine or other associated structures shall be filed along with the application.
17. The tower owner and the tower operator shall provide proof of adequate liability insurance in writing to the Planning and Zoning Administrator of Cerro Gordo County, under such further conditions and in such amounts as the Board of Adjustment or the Planning and Zoning Administrator may direct, but in no event shall such proof be required more often than annually.
18. The base of any tower and the meteorological tower shall be at least the overall height of the wind turbine from any public right-of-way, any shared, non-participating property line, and any existing principal or accessory structure, except that a variance is hereby granted for Turbine 4 to be no closer than 332' at its base from the south non-participating property line.
19. Any signal interference complaints associated with the tower or related equipment shall be addressed within thirty (30) days in accordance with Federal Communications Commission (FCC) rules and procedures.
20. The tower and all appurtenances shall be removed to a depth of 48 inches upon the end of its useful life and the site restored to its condition prior to tower placement within one hundred eighty (180) days. Any installed equipment, including collector/transmission/distribution line, within a county right-of-way shall be removed at the discretion of the County Engineer.
21. A sign shall be placed on the base station structure or at the base of the tower that identifies a name and phone number of whom to contact in case of emergency.
22. The special use shall be constructed and operated in accordance with the application.
23. Copies of all permits and licenses issued by other federal, state, or local governmental entities shall be filed in the office of the Cerro Gordo County Zoning Administrator.
24. Refuse removal during construction shall be the responsibility of the applicant.
25. The owners of all residences that may be affected by the potential for shadow flicker effects, as indicated in the shadow flicker analysis included with the application, shall be contacted by the applicant offering to supply and have installed automated window blinds at the applicant's expense as desired by said property owners for the purpose of mitigating the potential effects of said shadow flicker effects. If at any time, any of the automated blinds need maintenance or replacement, the applicant shall be responsible for said maintenance or replacement at its expense. The applicant shall keep record of all contacts, installations, maintenance, or replacements regarding said blinds. Those records shall be made available to the Zoning Administrator upon request.

QUESTIONS & COMMENTS:

Proposed motion for approval of application: To adopt the staff report as the Board's findings and to grant the application, subject to the conditions recommended by staff and as modified by the Board of Adjustment, for the operation of a commercial wind generator turbine, and further, that the grant of the application be made effective immediately and on the condition that Hawkeye Power Partners, LLC, shall perform all operations under the application under the specific direction of the Cerro Gordo County Zoning Administrator, consistent with the proposed conditions

and recommendations approved by the Board of Adjustment, until such time as a formal resolution is drafted and adopted by the Board of Adjustment, not to exceed 60 days.

Proposed motion for denial of application: To adopt the staff report as the Board's findings and to deny the application for the reasons stated in the staff report as well as for the following reasons: ***[STATE ADDITIONAL REASONS FOR DENIAL, IF ANY]***. Said reasons for denial shall be stated in the official transcript and minutes of the Board of Adjustment, and shall be made in writing to the applicant in letter form by the Board's secretary.

Prepared by:
John Robbins
Planning and Zoning Administrator
Final Draft date – September 12, 2019

Figure 1

Looking east from Thrush Avenue (approximately ½-mile-mile away) toward two existing wind turbines (~450' tall) east of Mason City

May 15, 2019, J. Robbins

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Snyder
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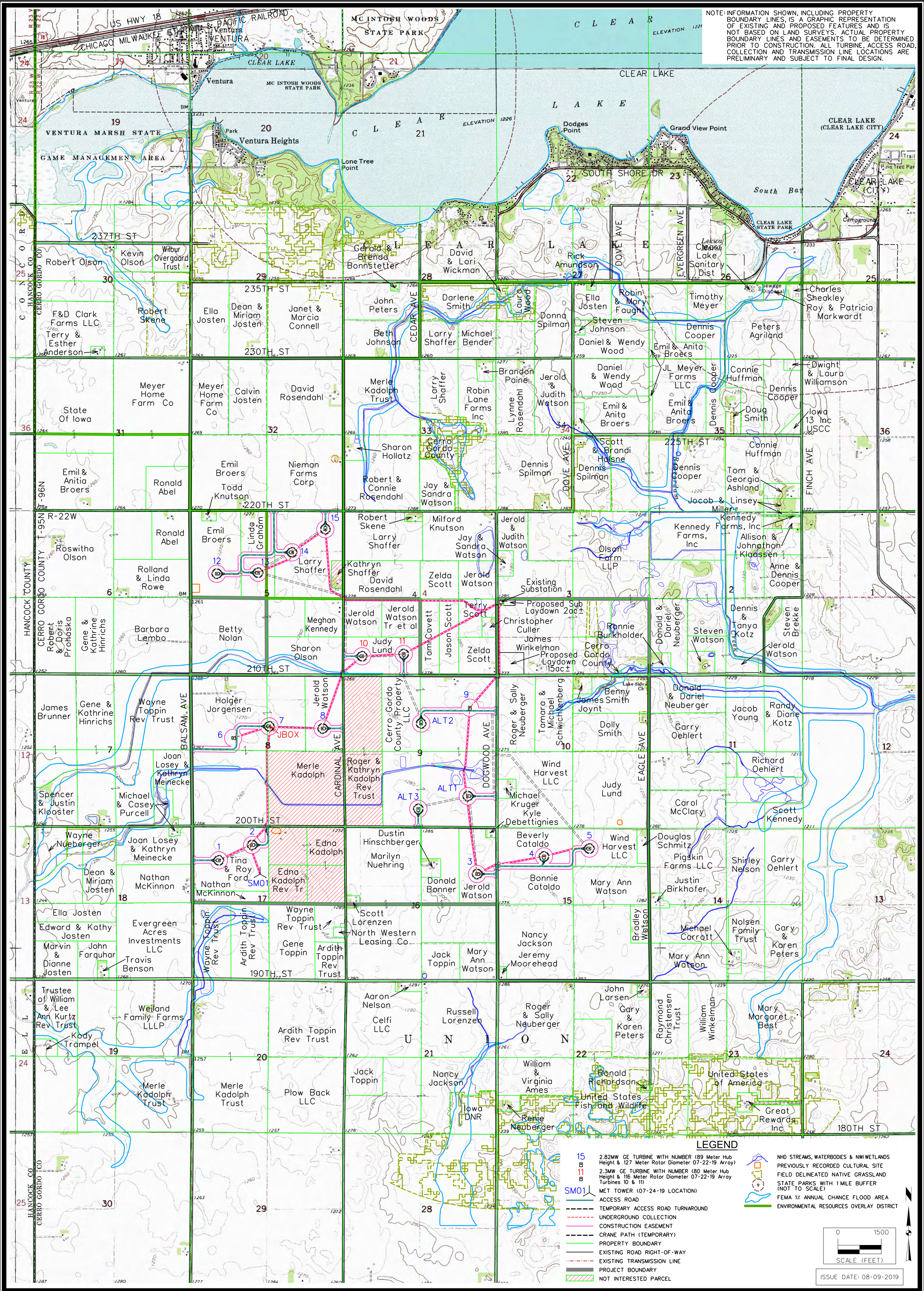
NOTE: INFORMATION SHOWN, INCLUDING PROPERTY BOUNDARY LINES, IS A GRAPHIC REPRESENTATION OF EXISTING AND PROPOSED FEATURES AND IS NOT BASED ON LAND SURVEYS. ACTUAL PROPERTY BOUNDARY LINES AND EASEMENTS TO BE DETERMINED PRIOR TO CONSTRUCTION. ALL TURBINE, ACCESS ROAD, COLLECTION AND TRANSMISSION LINE LOCATIONS ARE PRELIMINARY AND SUBJECT TO FINAL DESIGN.



LEGEND

- 15 — 2.82MW GE TURBINE WITH NUMBER (89 Meter Hub Height & 127 Meter Rotor Diameter 07-22-19 Array)
- 11 — 2.3MW GE TURBINE WITH NUMBER (80 Meter Hub Height & 116 Meter Rotor Diameter 07-22-19 Array Turbines 10 & 11)
- SM01 — MET TOWER (07-24-19 LOCATION)
- ACCESS ROAD
- TEMPORARY ACCESS ROAD TURNAROUND
- UNDERGROUND COLLECTION
- CONSTRUCTION EASEMENT
- CRANE PATH (TEMPORARY)
- PROPERTY BOUNDARY
- EXISTING ROAD RIGHT-OF-WAY
- EXISTING TRANSMISSION LINE
- PROJECT BOUNDARY
- NOT INTERESTED PARCEL
- NHD STREAMS, WATERBODIES & NWI WETLANDS
- PREVIOUSLY RECORDED CULTURAL SITE
- FIELD DELINEATED NATIVE GRASSLAND
- STATE PARKS WITH 1 MILE BUFFER (NOT TO SCALE)
- FEMA 1% ANNUAL CHANCE FLOOD AREA
- ENVIRONMENTAL RESOURCES OVERLAY DISTRICT

0 1500
SCALE (FEET)

ISSUE DATE: 08-09-2019

Sheet 1 of 1

Project No: 1180779

SNYDER & ASSOCIATES

NEXTERA ENERGY - CERRO GORDO

TURBINE SITE PLAN

CERRO GORDO COUNTY, IOWA

MARK	REVISION	DATE	BY

Engineer: BJF	Checked By: MGG	Scale: 1"= 1500'	
Technician: DW	Date: 03/13/19	Field Bk:	Pg:

Project No: 1180779 | Sheet 1 of 1

SNYDER & ASSOCIATES, INC.
1751 MADISON AVENUE
COUNCIL BLUFFS, IA 51503
712-322-3202 | www.snyder-associates.com

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

Aeronautical Study No.
2019-WTE-3740-OE

Issued Date: 06/04/2019

Mike Weich
Cerro Gordo Wind Project
700 Universe Blvd.
Juno Beach, FL 33408

**** 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:	Wind Turbine 1	**OPTIMIZED FINAL SITE PLAN ARRAY**
Location:	Ventura, IA	**WTG 1**
Latitude:	43-02-59.83N NAD 83	
Longitude:	93-28-26.23W	
Heights:	1268 feet site elevation (SE)	
	499 feet above ground level (AGL)	
	1767 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:

As a condition to this Determination, the structure is to be marked/lighted in accordance with FAA Advisory circular 70/7460-1 L Change 2, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

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)

See attachment for additional condition(s) or information.
This determination expires on 12/04/2020 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.

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 and heights. This determination is valid for coordinates within one (1) second latitude/longitude and up to the approved AMSL height listed above (provided the AGL height does not exceed 499 feet). If a certified 1A or 2C accuracy survey was required to mitigate an adverse effect, any change in coordinates or increase in height will require a new certified accuracy survey and may require a new aeronautical study.

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.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. All information from submission of Supplemental Notice (7460-2 Part 2) will be considered the final data (including heights) for this structure. Any future construction or alteration, including but not limited to changes in heights, requires separate notice to the FAA.

Obstruction marking and lighting recommendations for wind turbine farms are based on the scheme for the entire project. ANY change to the height, location or number of turbines within this project will require a reanalysis of the marking and lighting recommendation for the entire project. In particular, the removal of previously planned or built turbines/turbine locations from the project will often result in a change in the marking/lighting recommendation for other turbines within the project. It is the proponent's responsibility to contact the FAA to discuss the process for developing a revised obstruction marking and lighting plan should this occur.

In order to ensure proper conspicuity of turbines at night during construction, all turbines should be lit with temporary lighting once they reach a height of 200 feet or greater until such time the permanent lighting configuration is turned on. As the height of the structure continues to increase, the temporary lighting should be relocated to the uppermost part of the structure. The temporary lighting may be turned off for periods when they would interfere with construction personnel. If practical, permanent obstruction lights should be installed and operated at each level as construction progresses. An FAA Type L-810 steady red light fixture shall be used to light the structure during the construction phase. If power is not available, turbines shall be lit with self-contained, solar powered LED steady red light fixture that meets the photometric requirements of an FAA Type L-810 lighting system. The lights should be positioned to ensure that a pilot has an unobstructed view of at least one light at each level. The use of a NOTAM (D) to not light turbines within a project until the entire project has been completed is prohibited.

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.

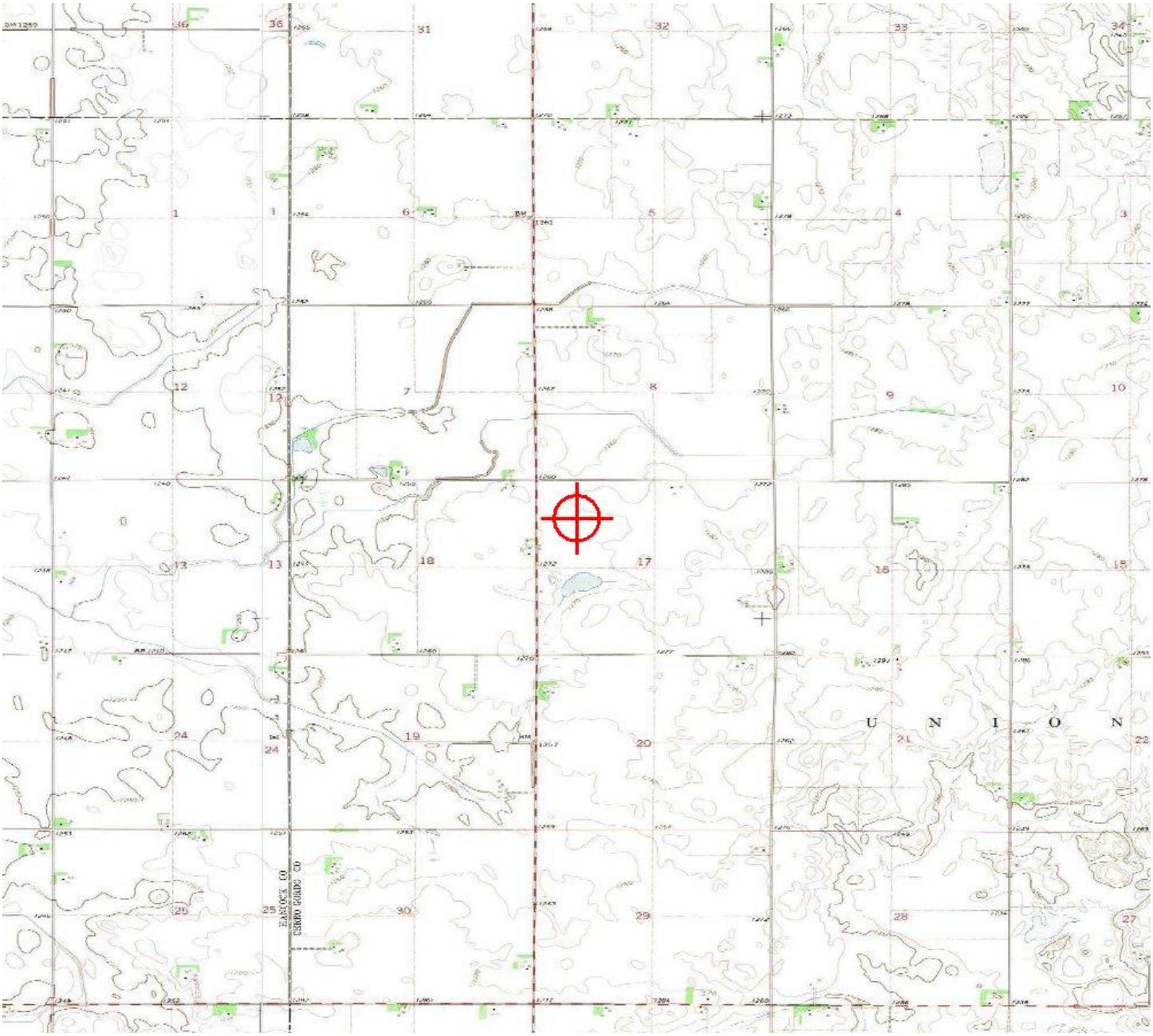
If we can be of further assistance, please contact our office at (816) 329-2528, or cindy.whitten@faa.gov. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2019-WTE-3740-OE.

Signature Control No: 402854014-407551158 (DNE -WT)
Cindy Whitten
Supervisor

Attachment(s)
Additional Information
Map(s)

NOTE: A recommendation for white paint/synchronized red lights will be made for all turbines until such time as the proponent confirms that the layout is final (no changes, no additions, no removals) and all turbines can and will be built at their determined location and height. At that time, the proponent may contact this office and request a re-evaluation of the marking and lighting recommendations for the turbines within this project and a portion of the turbines may qualify for the removal of the lighting recommendation.

TOPO Map for ASN 2019-WTE-3740-OE



Sectional Map for ASN 2019-WTE-3740-OE

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

Aeronautical Study No.
2019-WTE-3741-OE

Issued Date: 06/04/2019

Mike Weich
Cerro Gordo Wind Project
700 Universe Blvd.
Juno Beach, FL 33408

**** 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:	Wind Turbine 2
Location:	Ventura, IA
Latitude:	43-03-05.07N NAD 83
Longitude:	93-28-10.72W
Heights:	1269 feet site elevation (SE)
	499 feet above ground level (AGL)
	1768 feet above mean sea level (AMSL)

OPTIMIZED FINAL SITE PLAN ARRAY
WTG 2

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:

As a condition to this Determination, the structure is to be marked/lighted in accordance with FAA Advisory circular 70/7460-1 L Change 2, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

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)

See attachment for additional condition(s) or information.
This determination expires on 12/04/2020 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.

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 and heights. This determination is valid for coordinates within one (1) second latitude/longitude and up to the approved AMSL height listed above (provided the AGL height does not exceed 499 feet). If a certified 1A or 2C accuracy survey was required to mitigate an adverse effect, any change in coordinates or increase in height will require a new certified accuracy survey and may require a new aeronautical study.

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.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. All information from submission of Supplemental Notice (7460-2 Part 2) will be considered the final data (including heights) for this structure. Any future construction or alteration, including but not limited to changes in heights, requires separate notice to the FAA.

Obstruction marking and lighting recommendations for wind turbine farms are based on the scheme for the entire project. ANY change to the height, location or number of turbines within this project will require a reanalysis of the marking and lighting recommendation for the entire project. In particular, the removal of previously planned or built turbines/turbine locations from the project will often result in a change in the marking/lighting recommendation for other turbines within the project. It is the proponent's responsibility to contact the FAA to discuss the process for developing a revised obstruction marking and lighting plan should this occur.

In order to ensure proper conspicuity of turbines at night during construction, all turbines should be lit with temporary lighting once they reach a height of 200 feet or greater until such time the permanent lighting configuration is turned on. As the height of the structure continues to increase, the temporary lighting should be relocated to the uppermost part of the structure. The temporary lighting may be turned off for periods when they would interfere with construction personnel. If practical, permanent obstruction lights should be installed and operated at each level as construction progresses. An FAA Type L-810 steady red light fixture shall be used to light the structure during the construction phase. If power is not available, turbines shall be lit with self-contained, solar powered LED steady red light fixture that meets the photometric requirements of an FAA Type L-810 lighting system. The lights should be positioned to ensure that a pilot has an unobstructed view of at least one light at each level. The use of a NOTAM (D) to not light turbines within a project until the entire project has been completed is prohibited.

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.

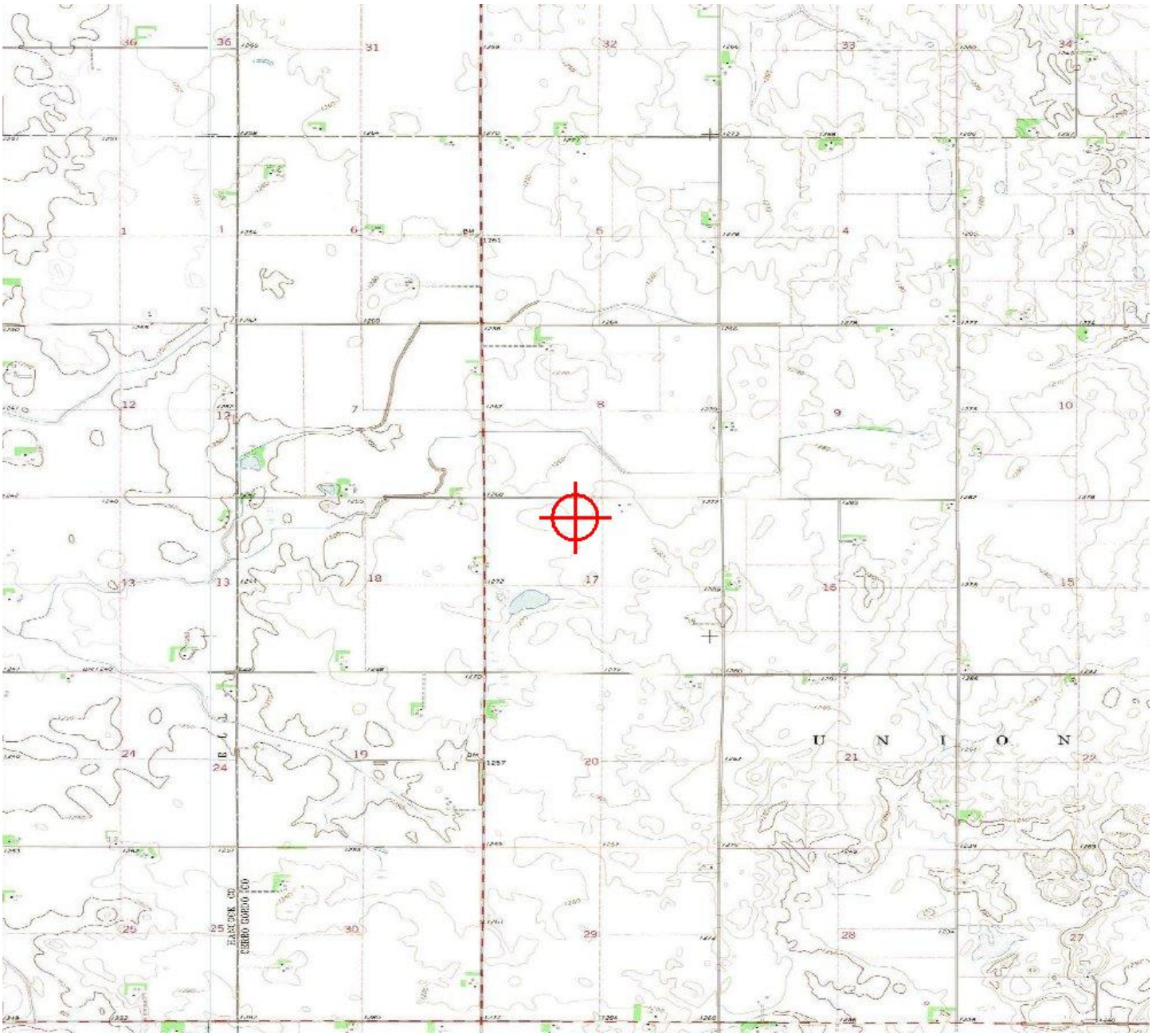
If we can be of further assistance, please contact our office at (816) 329-2528, or cindy.whitten@faa.gov. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2019-WTE-3741-OE.

Signature Control No: 402854015-407551154 (DNE -WT)
Cindy Whitten
Supervisor

Attachment(s)
Additional Information
Map(s)

NOTE: A recommendation for white paint/synchronized red lights will be made for all turbines until such time as the proponent confirms that the layout is final (no changes, no additions, no removals) and all turbines can and will be built at their determined location and height. At that time, the proponent may contact this office and request a re-evaluation of the marking and lighting recommendations for the turbines within this project and a portion of the turbines may qualify for the removal of the lighting recommendation.

TOPO Map for ASN 2019-WTE-3741-OE



Sectional Map for ASN 2019-WTE-3741-OE

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

Aeronautical Study No.
2019-WTE-3743-OE

Issued Date: 06/04/2019

Mike Weich
Cerro Gordo Wind Project
700 Universe Blvd.
Juno Beach, FL 33408

**** 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:	Wind Turbine 4	**OPTIMIZED FINAL SITE PLAN ARRAY**
Location:	Ventura, IA	**WTG 3**
Latitude:	43-02-55.11N NAD 83	
Longitude:	93-26-26.04W	
Heights:	1284 feet site elevation (SE)	
	499 feet above ground level (AGL)	
	1783 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:

As a condition to this Determination, the structure is to be marked/lighted in accordance with FAA Advisory circular 70/7460-1 L Change 2, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

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)

See attachment for additional condition(s) or information.
This determination expires on 12/04/2020 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.

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 and heights. This determination is valid for coordinates within one (1) second latitude/longitude and up to the approved AMSL height listed above (provided the AGL height does not exceed 499 feet). If a certified 1A or 2C accuracy survey was required to mitigate an adverse effect, any change in coordinates or increase in height will require a new certified accuracy survey and may require a new aeronautical study.

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.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. All information from submission of Supplemental Notice (7460-2 Part 2) will be considered the final data (including heights) for this structure. Any future construction or alteration, including but not limited to changes in heights, requires separate notice to the FAA.

Obstruction marking and lighting recommendations for wind turbine farms are based on the scheme for the entire project. ANY change to the height, location or number of turbines within this project will require a reanalysis of the marking and lighting recommendation for the entire project. In particular, the removal of previously planned or built turbines/turbine locations from the project will often result in a change in the marking/lighting recommendation for other turbines within the project. It is the proponent's responsibility to contact the FAA to discuss the process for developing a revised obstruction marking and lighting plan should this occur.

In order to ensure proper conspicuity of turbines at night during construction, all turbines should be lit with temporary lighting once they reach a height of 200 feet or greater until such time the permanent lighting configuration is turned on. As the height of the structure continues to increase, the temporary lighting should be relocated to the uppermost part of the structure. The temporary lighting may be turned off for periods when they would interfere with construction personnel. If practical, permanent obstruction lights should be installed and operated at each level as construction progresses. An FAA Type L-810 steady red light fixture shall be used to light the structure during the construction phase. If power is not available, turbines shall be lit with self-contained, solar powered LED steady red light fixture that meets the photometric requirements of an FAA Type L-810 lighting system. The lights should be positioned to ensure that a pilot has an unobstructed view of at least one light at each level. The use of a NOTAM (D) to not light turbines within a project until the entire project has been completed is prohibited.

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.

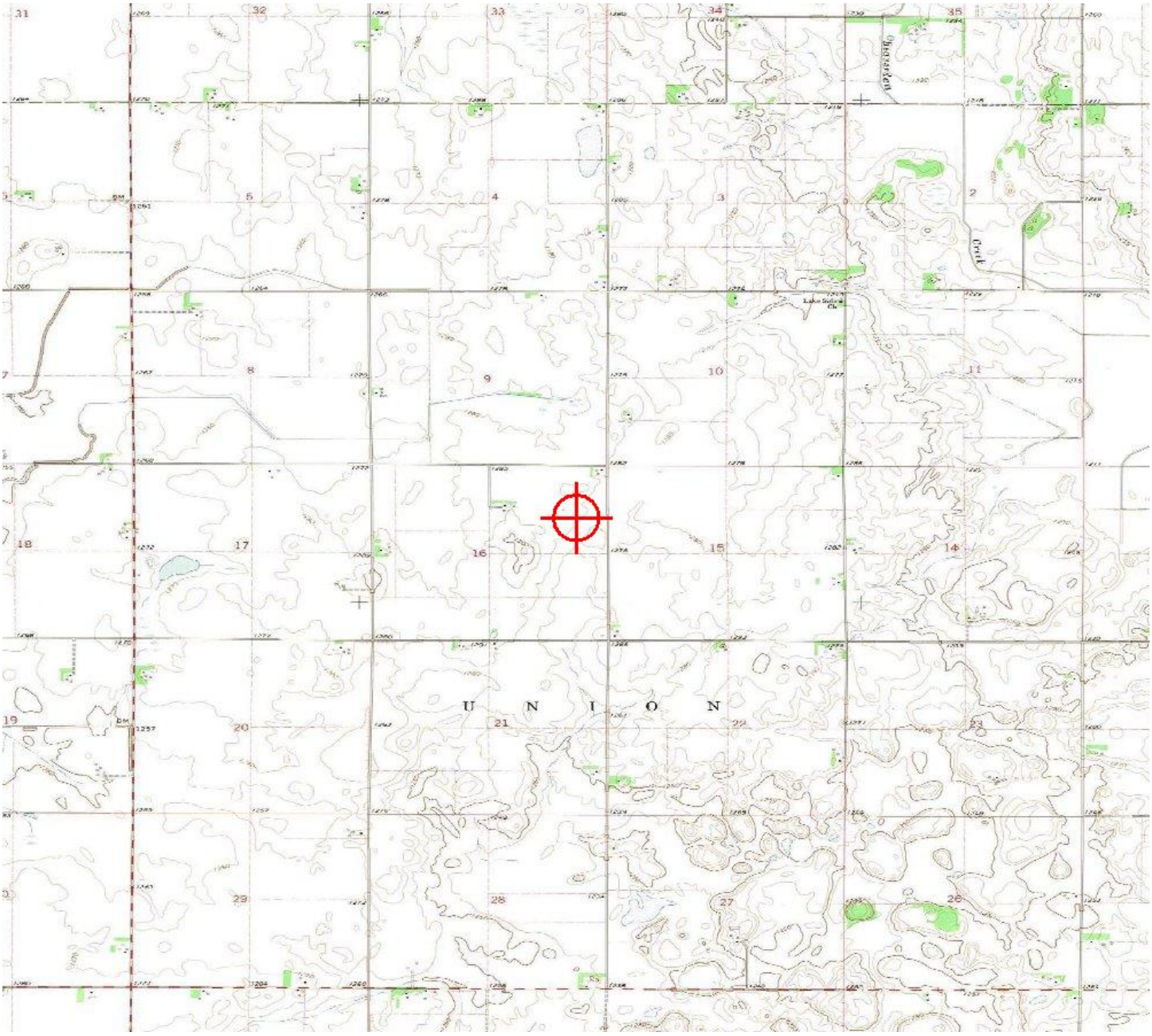
If we can be of further assistance, please contact our office at (816) 329-2528, or cindy.whitten@faa.gov. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2019-WTE-3743-OE.

Signature Control No: 402854017-407551155 (DNE -WT)
Cindy Whitten
Supervisor

Attachment(s)
Additional Information
Map(s)

NOTE: A recommendation for white paint/synchronized red lights will be made for all turbines until such time as the proponent confirms that the layout is final (no changes, no additions, no removals) and all turbines can and will be built at their determined location and height. At that time, the proponent may contact this office and request a re-evaluation of the marking and lighting recommendations for the turbines within this project and a portion of the turbines may qualify for the removal of the lighting recommendation.

TOPO Map for ASN 2019-WTE-3743-OE



Sectional Map for ASN 2019-WTE-3743-OE

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

Aeronautical Study No.
2019-WTE-3762-OE

Issued Date: 06/04/2019

Mike Weich
Cerro Gordo Wind Project
700 Universe Blvd.
Juno Beach, FL 33408

**** 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:	Wind Turbine CG-5B
Location:	Ventura, IA
Latitude:	43-03-01.10N NAD 83
Longitude:	93-25-54.87W
Heights:	1276 feet site elevation (SE)
	499 feet above ground level (AGL)
	1775 feet above mean sea level (AMSL)

OPTIMIZED FINAL SITE PLAN ARRAY
WTG 4

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:

As a condition to this Determination, the structure is to be marked/lighted in accordance with FAA Advisory circular 70/7460-1 L Change 2, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

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)

See attachment for additional condition(s) or information.
This determination expires on 12/04/2020 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.

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 and heights. This determination is valid for coordinates within one (1) second latitude/longitude and up to the approved AMSL height listed above (provided the AGL height does not exceed 499 feet). If a certified 1A or 2C accuracy survey was required to mitigate an adverse effect, any change in coordinates or increase in height will require a new certified accuracy survey and may require a new aeronautical study.

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.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. All information from submission of Supplemental Notice (7460-2 Part 2) will be considered the final data (including heights) for this structure. Any future construction or alteration, including but not limited to changes in heights, requires separate notice to the FAA.

Obstruction marking and lighting recommendations for wind turbine farms are based on the scheme for the entire project. ANY change to the height, location or number of turbines within this project will require a reanalysis of the marking and lighting recommendation for the entire project. In particular, the removal of previously planned or built turbines/turbine locations from the project will often result in a change in the marking/lighting recommendation for other turbines within the project. It is the proponent's responsibility to contact the FAA to discuss the process for developing a revised obstruction marking and lighting plan should this occur.

In order to ensure proper conspicuity of turbines at night during construction, all turbines should be lit with temporary lighting once they reach a height of 200 feet or greater until such time the permanent lighting configuration is turned on. As the height of the structure continues to increase, the temporary lighting should be relocated to the uppermost part of the structure. The temporary lighting may be turned off for periods when they would interfere with construction personnel. If practical, permanent obstruction lights should be installed and operated at each level as construction progresses. An FAA Type L-810 steady red light fixture shall be used to light the structure during the construction phase. If power is not available, turbines shall be lit with self-contained, solar powered LED steady red light fixture that meets the photometric requirements of an FAA Type L-810 lighting system. The lights should be positioned to ensure that a pilot has an unobstructed view of at least one light at each level. The use of a NOTAM (D) to not light turbines within a project until the entire project has been completed is prohibited.

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.

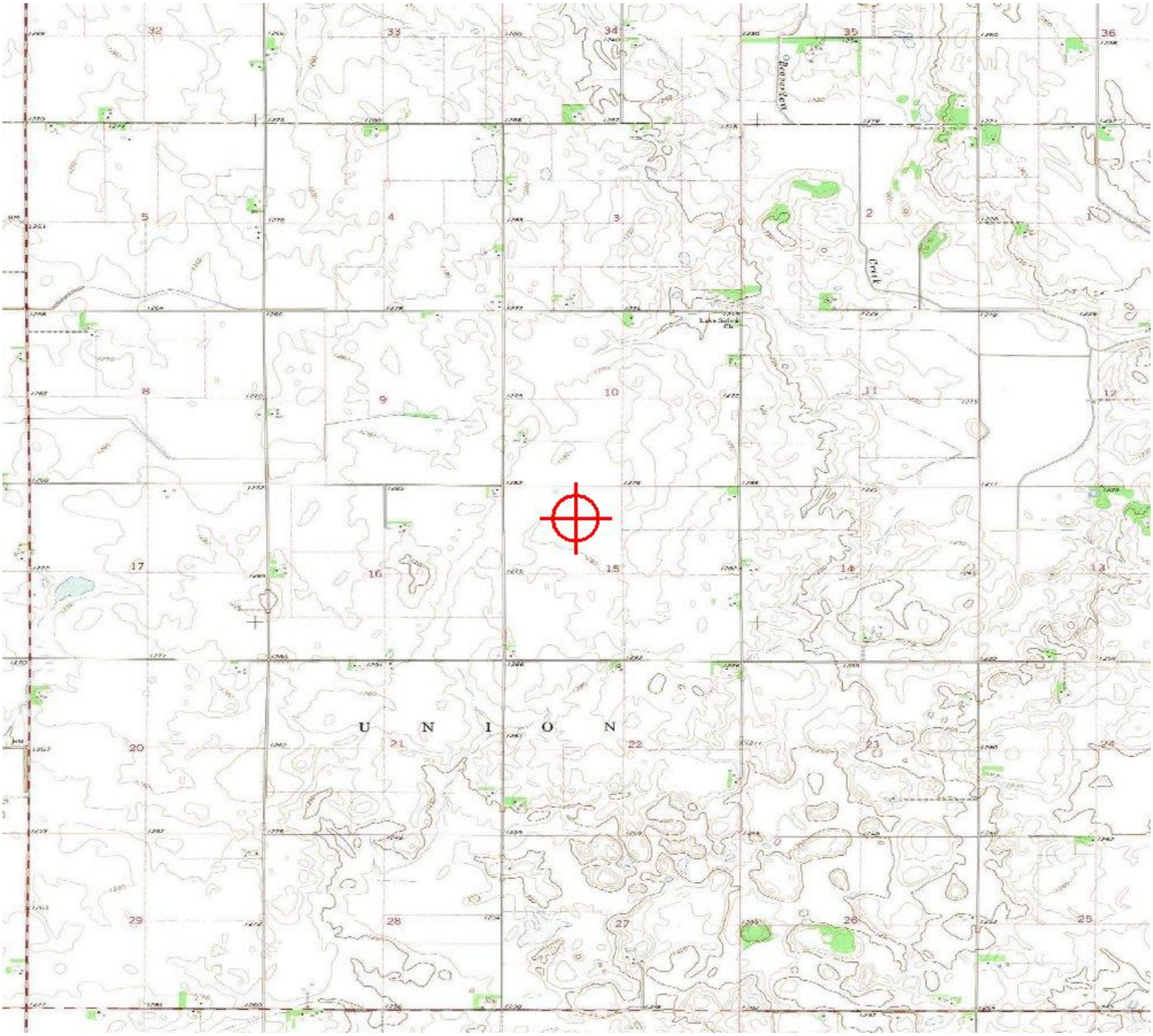
If we can be of further assistance, please contact our office at (816) 329-2528, or cindy.whitten@faa.gov. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2019-WTE-3762-OE.

Signature Control No: 402854037-407551280 (DNE -WT)
Cindy Whitten
Supervisor

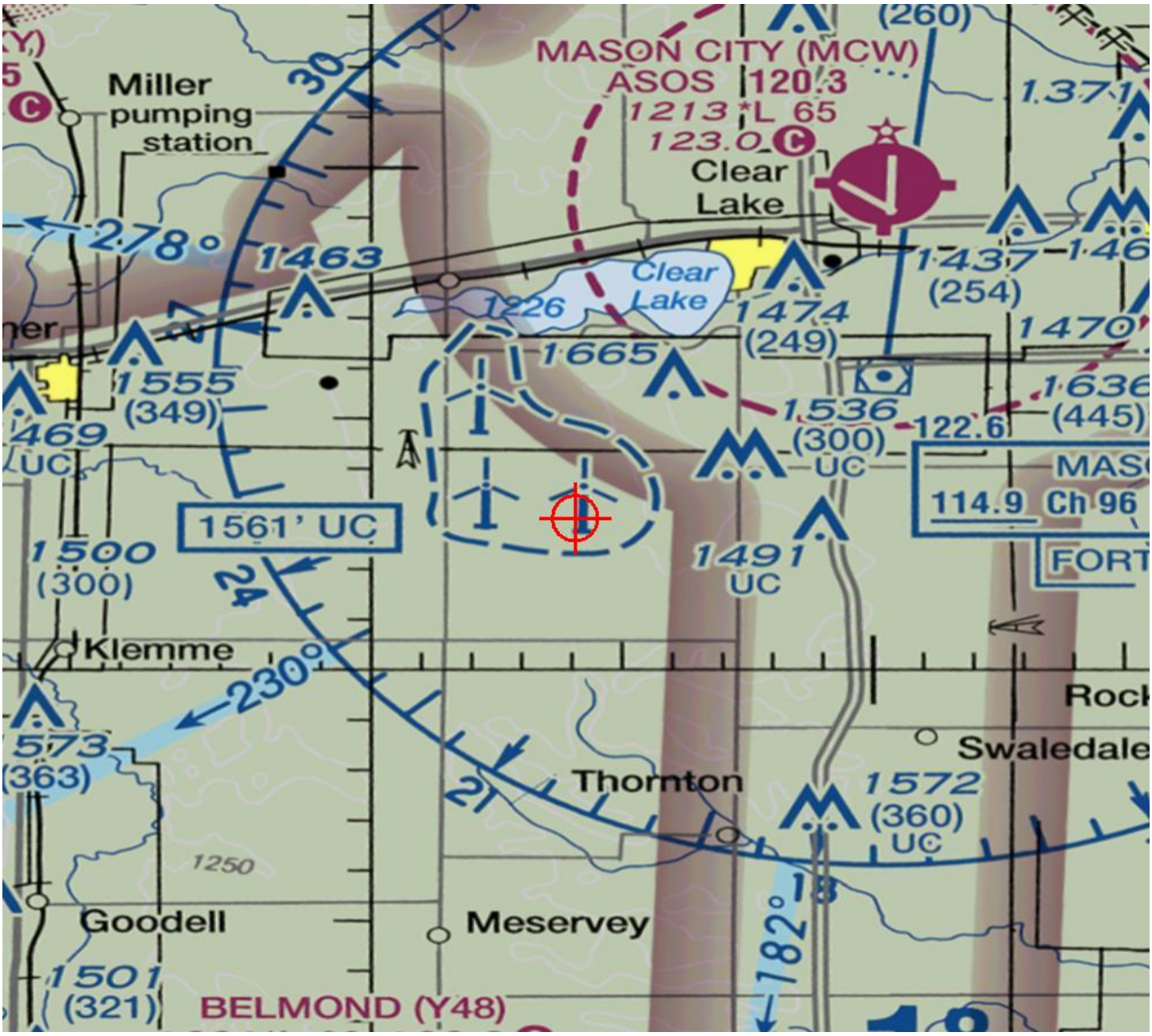
Attachment(s)
Additional Information
Map(s)

NOTE: A recommendation for white paint/synchronized red lights will be made for all turbines until such time as the proponent confirms that the layout is final (no changes, no additions, no removals) and all turbines can and will be built at their determined location and height. At that time, the proponent may contact this office and request a re-evaluation of the marking and lighting recommendations for the turbines within this project and a portion of the turbines may qualify for the removal of the lighting recommendation.

TOPO Map for ASN 2019-WTE-3762-OE



Sectional Map for ASN 2019-WTE-3762-OE



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

Aeronautical Study No.
2019-WTE-3745-OE

Issued Date: 06/04/2019

Mike Weich
Cerro Gordo Wind Project
700 Universe Blvd.
Juno Beach, FL 33408

**** 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:	Wind Turbine 6
Location:	Ventura, IA
Latitude:	43-03-03.77N NAD 83
Longitude:	93-25-33.72W
Heights:	1269 feet site elevation (SE)
	499 feet above ground level (AGL)
	1768 feet above mean sea level (AMSL)

OPTIMIZED FINAL SITE PLAN ARRAY
WTG 5

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:

As a condition to this Determination, the structure is to be marked/lighted in accordance with FAA Advisory circular 70/7460-1 L Change 2, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

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)

See attachment for additional condition(s) or information.
This determination expires on 12/04/2020 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.

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 and heights. This determination is valid for coordinates within one (1) second latitude/longitude and up to the approved AMSL height listed above (provided the AGL height does not exceed 499 feet). If a certified 1A or 2C accuracy survey was required to mitigate an adverse effect, any change in coordinates or increase in height will require a new certified accuracy survey and may require a new aeronautical study.

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.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. All information from submission of Supplemental Notice (7460-2 Part 2) will be considered the final data (including heights) for this structure. Any future construction or alteration, including but not limited to changes in heights, requires separate notice to the FAA.

Obstruction marking and lighting recommendations for wind turbine farms are based on the scheme for the entire project. ANY change to the height, location or number of turbines within this project will require a reanalysis of the marking and lighting recommendation for the entire project. In particular, the removal of previously planned or built turbines/turbine locations from the project will often result in a change in the marking/lighting recommendation for other turbines within the project. It is the proponent's responsibility to contact the FAA to discuss the process for developing a revised obstruction marking and lighting plan should this occur.

In order to ensure proper conspicuity of turbines at night during construction, all turbines should be lit with temporary lighting once they reach a height of 200 feet or greater until such time the permanent lighting configuration is turned on. As the height of the structure continues to increase, the temporary lighting should be relocated to the uppermost part of the structure. The temporary lighting may be turned off for periods when they would interfere with construction personnel. If practical, permanent obstruction lights should be installed and operated at each level as construction progresses. An FAA Type L-810 steady red light fixture shall be used to light the structure during the construction phase. If power is not available, turbines shall be lit with self-contained, solar powered LED steady red light fixture that meets the photometric requirements of an FAA Type L-810 lighting system. The lights should be positioned to ensure that a pilot has an unobstructed view of at least one light at each level. The use of a NOTAM (D) to not light turbines within a project until the entire project has been completed is prohibited.

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.

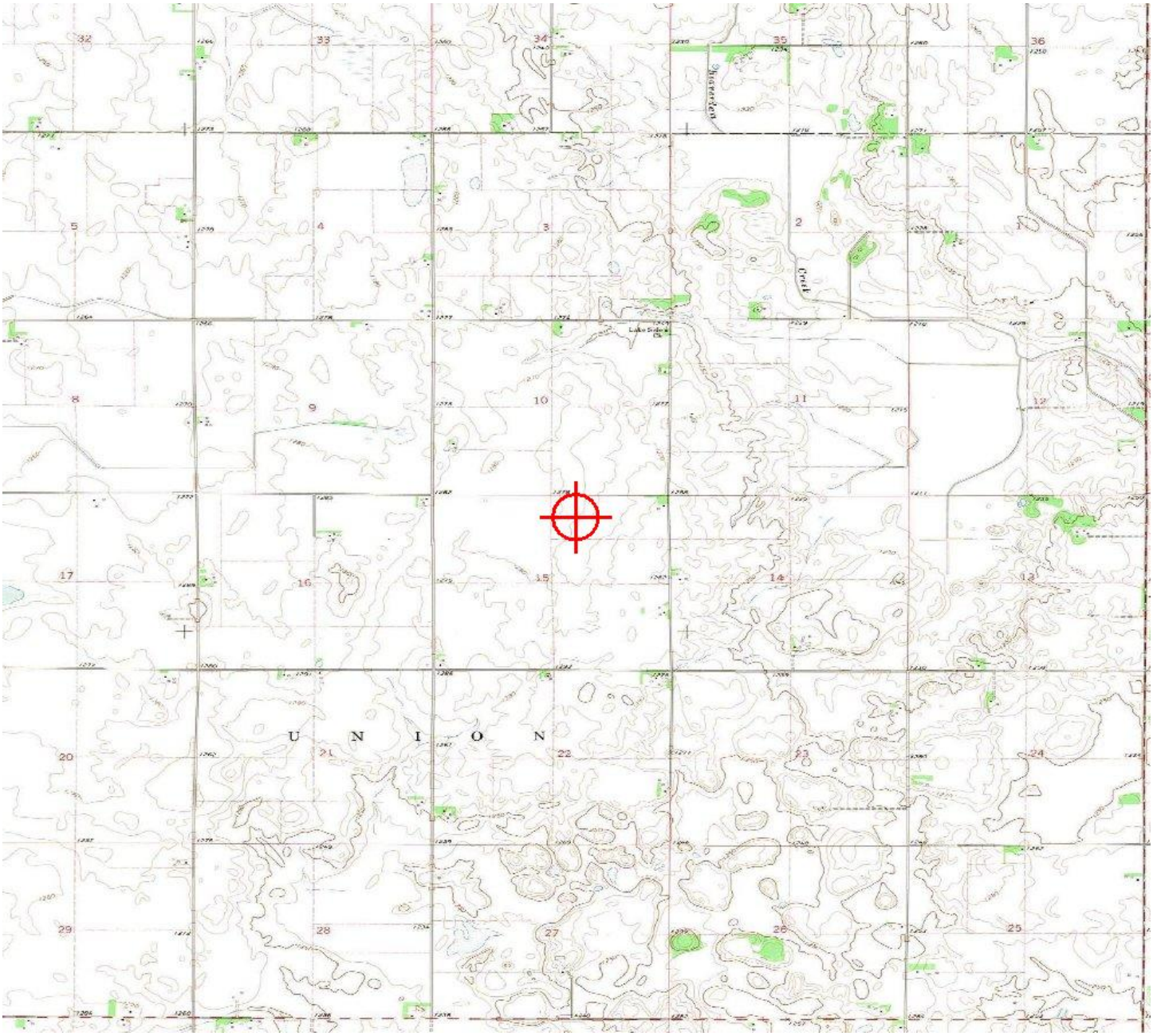
If we can be of further assistance, please contact our office at (816) 329-2528, or cindy.whitten@faa.gov. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2019-WTE-3745-OE.

Signature Control No: 402854019-407551157 (DNE -WT)
Cindy Whitten
Supervisor

Attachment(s)
Additional Information
Map(s)

NOTE: A recommendation for white paint/synchronized red lights will be made for all turbines until such time as the proponent confirms that the layout is final (no changes, no additions, no removals) and all turbines can and will be built at their determined location and height. At that time, the proponent may contact this office and request a re-evaluation of the marking and lighting recommendations for the turbines within this project and a portion of the turbines may qualify for the removal of the lighting recommendation.

TOPO Map for ASN 2019-WTE-3745-OE



Sectional Map for ASN 2019-WTE-3745-OE

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

Aeronautical Study No.
2019-WTE-6439-OE

Issued Date: 07/30/2019

Mike Weich
Cerro Gordo Wind Project
700 Universe Blvd.
Juno Beach, FL 33408

**** 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:	Wind Turbine 6b	OPTIMIZED FINAL SITE PLAN ARRAY
Location:	Ventura, IA	WTG 6
Latitude:	43-03-41.58N NAD 83	
Longitude:	93-28-19.53W	
Heights:	1265 feet site elevation (SE)	
	499 feet above ground level (AGL)	
	1764 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:

As a condition to this Determination, the structure is to be marked/lighted in accordance with FAA Advisory circular 70/7460-1 L Change 2, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

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)

See attachment for additional condition(s) or information.
This determination expires on 01/30/2021 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.

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 and heights. This determination is valid for coordinates within one (1) second latitude/longitude and up to the approved AMSL height listed above (provided the AGL height does not exceed 499 feet). If a certified 1A or 2C accuracy survey was required to mitigate an adverse effect, any change in coordinates or increase in height will require a new certified accuracy survey and may require a new aeronautical study.

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.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. All information from submission of Supplemental Notice (7460-2 Part 2) will be considered the final data (including heights) for this structure. Any future construction or alteration, including but not limited to changes in heights, requires separate notice to the FAA.

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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.

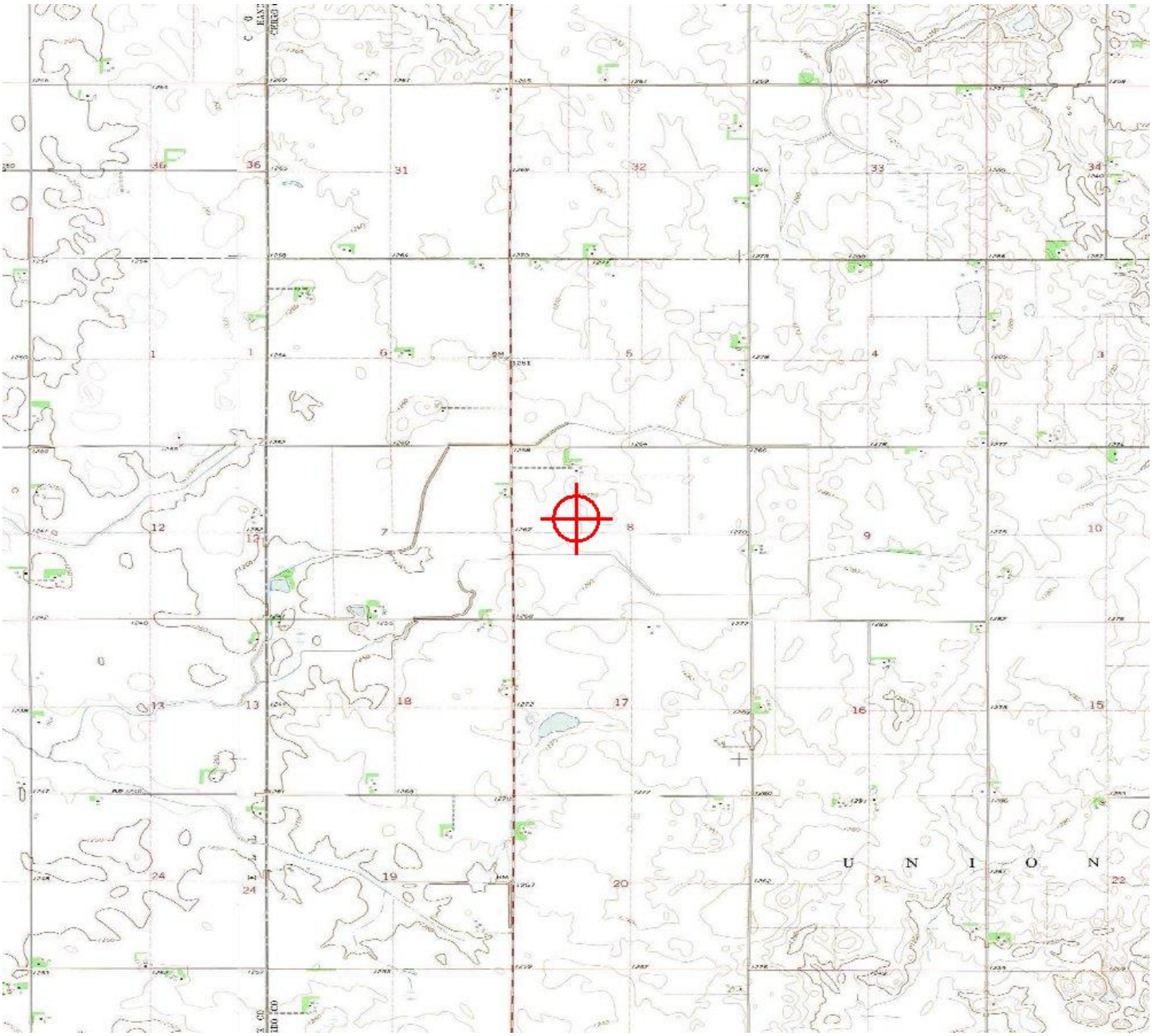
If we can be of further assistance, please contact our office at (816) 329-2524, or brian.a.barnes@faa.gov. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2019-WTE-6439-OE.

Signature Control No: 410710103-412994140 (DNE -WT)
Brian Barnes
Specialist

Attachment(s)
Additional Information
Map(s)

NOTE: A recommendation for white paint/synchronized red lights will be made for all turbines until such time as the proponent confirms that the layout is final (no changes, no additions, no removals) and all turbines can and will be built at their determined location and height. At that time, the proponent may contact this office and request a re-evaluation of the marking and lighting recommendations for the turbines within this project and a portion of the turbines may qualify for the removal of the lighting recommendation.

TOPO Map for ASN 2019-WTE-6439-OE



Sectional Map for ASN 2019-WTE-6439-OE

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

Aeronautical Study No.
2019-WTE-6440-OE

Issued Date: 07/30/2019

Mike Weich
Cerro Gordo Wind Project
700 Universe Blvd.
Juno Beach, FL 33408

**** 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:	Wind Turbine 7b
Location:	Ventura, IA
Latitude:	43-03-45.54N NAD 83
Longitude:	93-28-02.72W
Heights:	1262 feet site elevation (SE)
	499 feet above ground level (AGL)
	1761 feet above mean sea level (AMSL)

OPTIMIZED FINAL SITE PLAN ARRAY
WTG 7

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:

As a condition to this Determination, the structure is to be marked/lighted in accordance with FAA Advisory circular 70/7460-1 L Change 2, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

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)

See attachment for additional condition(s) or information.
This determination expires on 01/30/2021 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.

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 and heights. This determination is valid for coordinates within one (1) second latitude/longitude and up to the approved AMSL height listed above (provided the AGL height does not exceed 499 feet). If a certified 1A or 2C accuracy survey was required to mitigate an adverse effect, any change in coordinates or increase in height will require a new certified accuracy survey and may require a new aeronautical study.

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.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. All information from submission of Supplemental Notice (7460-2 Part 2) will be considered the final data (including heights) for this structure. Any future construction or alteration, including but not limited to changes in heights, requires separate notice to the FAA.

Obstruction marking and lighting recommendations for wind turbine farms are based on the scheme for the entire project. ANY change to the height, location or number of turbines within this project will require a reanalysis of the marking and lighting recommendation for the entire project. In particular, the removal of previously planned or built turbines/turbine locations from the project will often result in a change in the marking/lighting recommendation for other turbines within the project. It is the proponent's responsibility to contact the FAA to discuss the process for developing a revised obstruction marking and lighting plan should this occur.

In order to ensure proper conspicuity of turbines at night during construction, all turbines should be lit with temporary lighting once they reach a height of 200 feet or greater until such time the permanent lighting configuration is turned on. As the height of the structure continues to increase, the temporary lighting should be relocated to the uppermost part of the structure. The temporary lighting may be turned off for periods when they would interfere with construction personnel. If practical, permanent obstruction lights should be installed and operated at each level as construction progresses. An FAA Type L-810 steady red light fixture shall be used to light the structure during the construction phase. If power is not available, turbines shall be lit with self-contained, solar powered LED steady red light fixture that meets the photometric requirements of an FAA Type L-810 lighting system. The lights should be positioned to ensure that a pilot has an unobstructed view of at least one light at each level. The use of a NOTAM (D) to not light turbines within a project until the entire project has been completed is prohibited.

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.

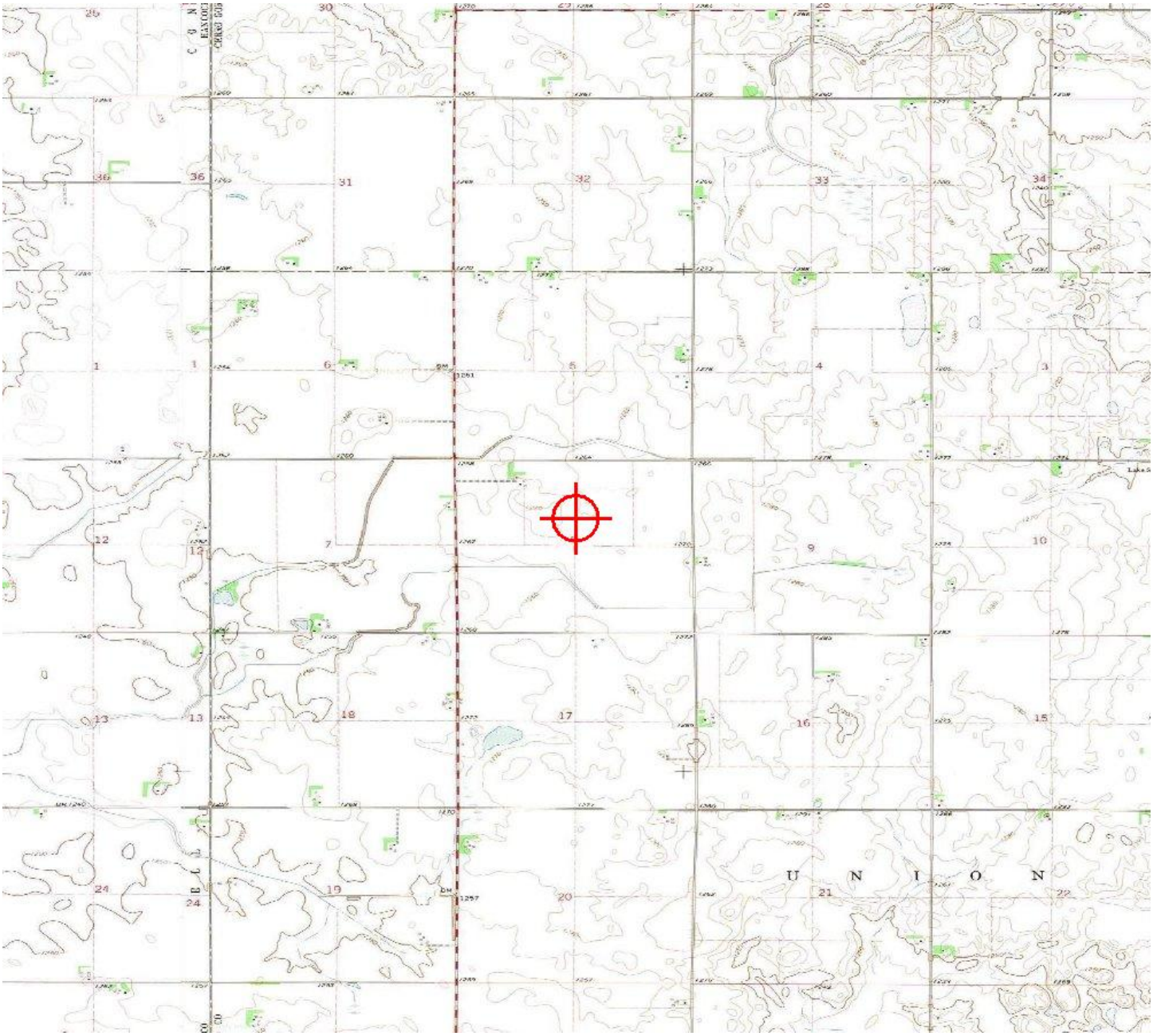
If we can be of further assistance, please contact our office at (816) 329-2524, or brian.a.barnes@faa.gov. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2019-WTE-6440-OE.

Signature Control No: 410710116-412994141 (DNE -WT)
Brian Barnes
Specialist

Attachment(s)
Additional Information
Map(s)

NOTE: A recommendation for white paint/synchronized red lights will be made for all turbines until such time as the proponent confirms that the layout is final (no changes, no additions, no removals) and all turbines can and will be built at their determined location and height. At that time, the proponent may contact this office and request a re-evaluation of the marking and lighting recommendations for the turbines within this project and a portion of the turbines may qualify for the removal of the lighting recommendation.

TOPO Map for ASN 2019-WTE-6440-OE



Sectional Map for ASN 2019-WTE-6440-OE

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

Aeronautical Study No.
2019-WTE-3747-OE

Issued Date: 06/04/2019

Mike Weich
Cerro Gordo Wind Project
700 Universe Blvd.
Juno Beach, FL 33408

**** 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:	Wind Turbine 8	**OPTIMIZED FINAL SITE PLAN ARRAY WTG 8**
Location:	Ventura, IA	
Latitude:	43-03-44.80N NAD 83	
Longitude:	93-27-37.88W	
Heights:	1265 feet site elevation (SE)	
	499 feet above ground level (AGL)	
	1764 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:

As a condition to this Determination, the structure is to be marked/lighted in accordance with FAA Advisory circular 70/7460-1 L Change 2, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

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)

See attachment for additional condition(s) or information.
This determination expires on 12/04/2020 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.

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.

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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.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. All information from submission of Supplemental Notice (7460-2 Part 2) will be considered the final data (including heights) for this structure. Any future construction or alteration, including but not limited to changes in heights, requires separate notice to the FAA.

Obstruction marking and lighting recommendations for wind turbine farms are based on the scheme for the entire project. ANY change to the height, location or number of turbines within this project will require a reanalysis of the marking and lighting recommendation for the entire project. In particular, the removal of previously planned or built turbines/turbine locations from the project will often result in a change in the marking/lighting recommendation for other turbines within the project. It is the proponent's responsibility to contact the FAA to discuss the process for developing a revised obstruction marking and lighting plan should this occur.

In order to ensure proper conspicuity of turbines at night during construction, all turbines should be lit with temporary lighting once they reach a height of 200 feet or greater until such time the permanent lighting configuration is turned on. As the height of the structure continues to increase, the temporary lighting should be relocated to the uppermost part of the structure. The temporary lighting may be turned off for periods when they would interfere with construction personnel. If practical, permanent obstruction lights should be installed and operated at each level as construction progresses. An FAA Type L-810 steady red light fixture shall be used to light the structure during the construction phase. If power is not available, turbines shall be lit with self-contained, solar powered LED steady red light fixture that meets the photometric requirements of an FAA Type L-810 lighting system. The lights should be positioned to ensure that a pilot has an unobstructed view of at least one light at each level. The use of a NOTAM (D) to not light turbines within a project until the entire project has been completed is prohibited.

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.

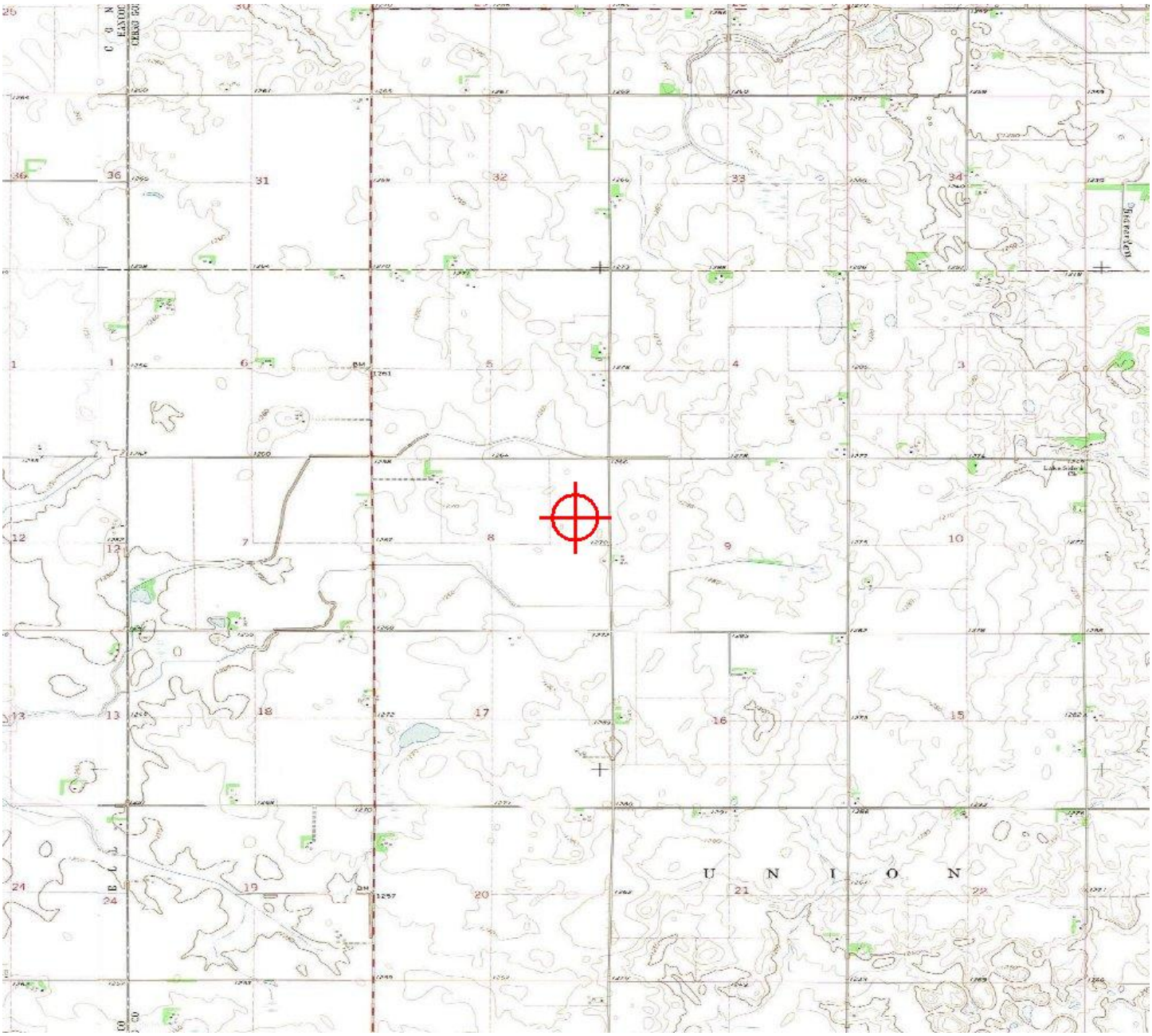
If we can be of further assistance, please contact our office at (816) 329-2528, or cindy.whitten@faa.gov. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2019-WTE-3747-OE.

Signature Control No: 402854021-407551167 (DNE -WT)
Cindy Whitten
Supervisor

Attachment(s)
Additional Information
Map(s)

NOTE: A recommendation for white paint/synchronized red lights will be made for all turbines until such time as the proponent confirms that the layout is final (no changes, no additions, no removals) and all turbines can and will be built at their determined location and height. At that time, the proponent may contact this office and request a re-evaluation of the marking and lighting recommendations for the turbines within this project and a portion of the turbines may qualify for the removal of the lighting recommendation.

TOPO Map for ASN 2019-WTE-3747-OE



Sectional Map for ASN 2019-WTE-3747-OE

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

Aeronautical Study No.
2019-WTE-3749-OE

Issued Date: 06/04/2019

Mike Weich
Cerro Gordo Wind Project
700 Universe Blvd.
Juno Beach, FL 33408

**** 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:	Wind Turbine 10
Location:	Ventura, IA
Latitude:	43-03-51.88N NAD 83
Longitude:	93-26-29.35W
Heights:	1279 feet site elevation (SE)
	499 feet above ground level (AGL)
	1778 feet above mean sea level (AMSL)

OPTIMIZED FINAL SITE PLAN ARRAY
WTG 9

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:

As a condition to this Determination, the structure is to be marked/lighted in accordance with FAA Advisory circular 70/7460-1 L Change 2, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

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)

See attachment for additional condition(s) or information.
This determination expires on 12/04/2020 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.

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 and heights. This determination is valid for coordinates within one (1) second latitude/longitude and up to the approved AMSL height listed above (provided the AGL height does not exceed 499 feet). If a certified 1A or 2C accuracy survey was required to mitigate an adverse effect, any change in coordinates or increase in height will require a new certified accuracy survey and may require a new aeronautical study.

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.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. All information from submission of Supplemental Notice (7460-2 Part 2) will be considered the final data (including heights) for this structure. Any future construction or alteration, including but not limited to changes in heights, requires separate notice to the FAA.

Obstruction marking and lighting recommendations for wind turbine farms are based on the scheme for the entire project. ANY change to the height, location or number of turbines within this project will require a reanalysis of the marking and lighting recommendation for the entire project. In particular, the removal of previously planned or built turbines/turbine locations from the project will often result in a change in the marking/lighting recommendation for other turbines within the project. It is the proponent's responsibility to contact the FAA to discuss the process for developing a revised obstruction marking and lighting plan should this occur.

In order to ensure proper conspicuity of turbines at night during construction, all turbines should be lit with temporary lighting once they reach a height of 200 feet or greater until such time the permanent lighting configuration is turned on. As the height of the structure continues to increase, the temporary lighting should be relocated to the uppermost part of the structure. The temporary lighting may be turned off for periods when they would interfere with construction personnel. If practical, permanent obstruction lights should be installed and operated at each level as construction progresses. An FAA Type L-810 steady red light fixture shall be used to light the structure during the construction phase. If power is not available, turbines shall be lit with self-contained, solar powered LED steady red light fixture that meets the photometric requirements of an FAA Type L-810 lighting system. The lights should be positioned to ensure that a pilot has an unobstructed view of at least one light at each level. The use of a NOTAM (D) to not light turbines within a project until the entire project has been completed is prohibited.

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.

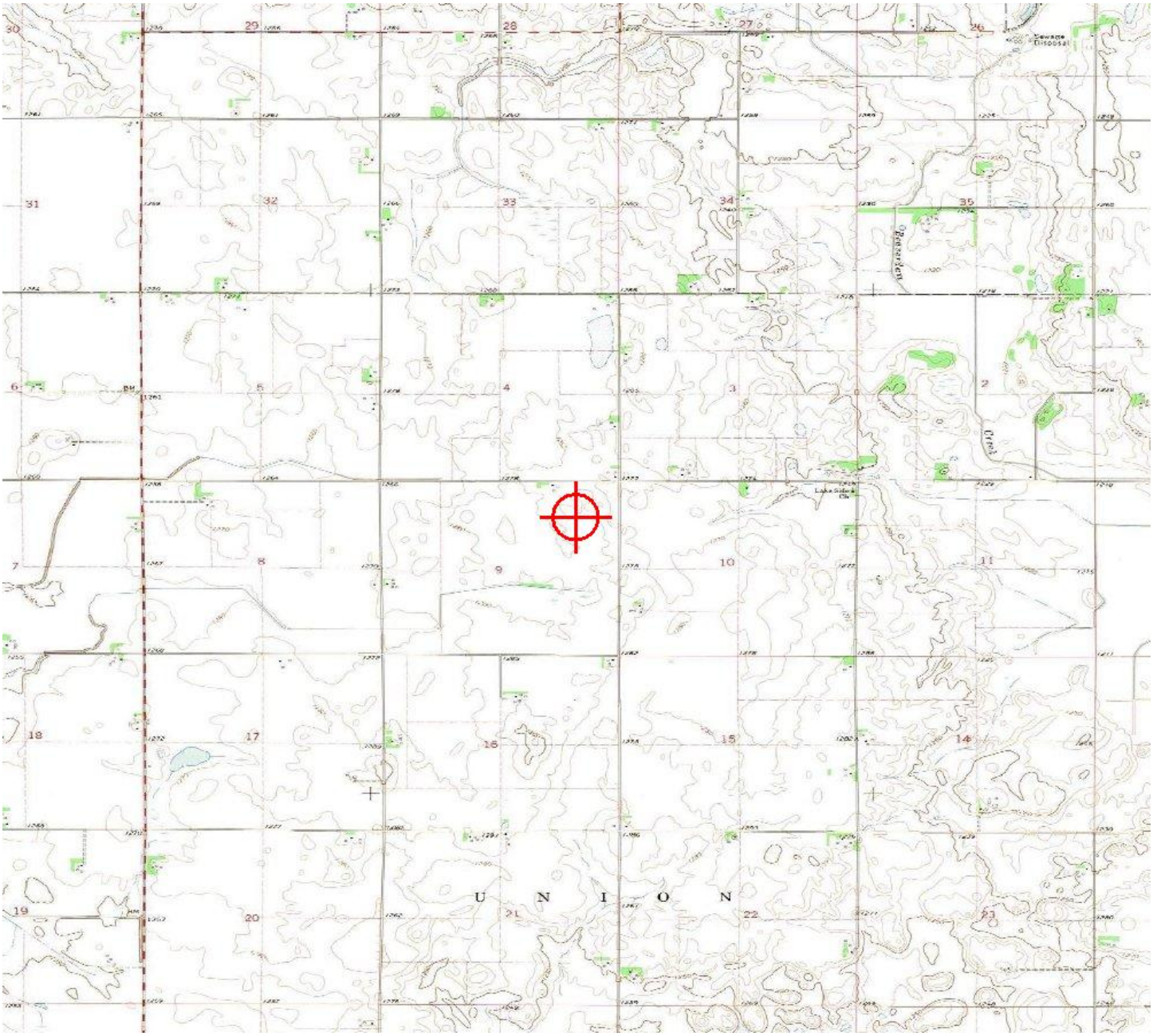
If we can be of further assistance, please contact our office at (816) 329-2528, or cindy.whitten@faa.gov. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2019-WTE-3749-OE.

Signature Control No: 402854023-407551179 (DNE -WT)
Cindy Whitten
Supervisor

Attachment(s)
Additional Information
Map(s)

NOTE: A recommendation for white paint/synchronized red lights will be made for all turbines until such time as the proponent confirms that the layout is final (no changes, no additions, no removals) and all turbines can and will be built at their determined location and height. At that time, the proponent may contact this office and request a re-evaluation of the marking and lighting recommendations for the turbines within this project and a portion of the turbines may qualify for the removal of the lighting recommendation.

TOPO Map for ASN 2019-WTE-3749-OE



Sectional Map for ASN 2019-WTE-3749-OE

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

Aeronautical Study No.
2019-WTE-3755-OE

Issued Date: 06/04/2019

Mike Weich
Cerro Gordo Wind Project
700 Universe Blvd.
Juno Beach, FL 33408

**** 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:	Wind Turbine Alt1
Location:	Ventura, IA
Latitude:	43-04-09.44N NAD 83
Longitude:	93-27-19.50W
Heights:	1262 feet site elevation (SE)
	499 feet above ground level (AGL)
	1761 feet above mean sea level (AMSL)

OPTIMIZED FINAL SITE PLAN ARRAY
WTG 10

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:

As a condition to this Determination, the structure is to be marked/lighted in accordance with FAA Advisory circular 70/7460-1 L Change 2, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

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)

See attachment for additional condition(s) or information.
This determination expires on 12/04/2020 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.
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Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. All information from submission of Supplemental Notice (7460-2 Part 2) will be considered the final data (including heights) for this structure. Any future construction or alteration, including but not limited to changes in heights, requires separate notice to the FAA.

Obstruction marking and lighting recommendations for wind turbine farms are based on the scheme for the entire project. ANY change to the height, location or number of turbines within this project will require a reanalysis of the marking and lighting recommendation for the entire project. In particular, the removal of previously planned or built turbines/turbine locations from the project will often result in a change in the marking/lighting recommendation for other turbines within the project. It is the proponent's responsibility to contact the FAA to discuss the process for developing a revised obstruction marking and lighting plan should this occur.

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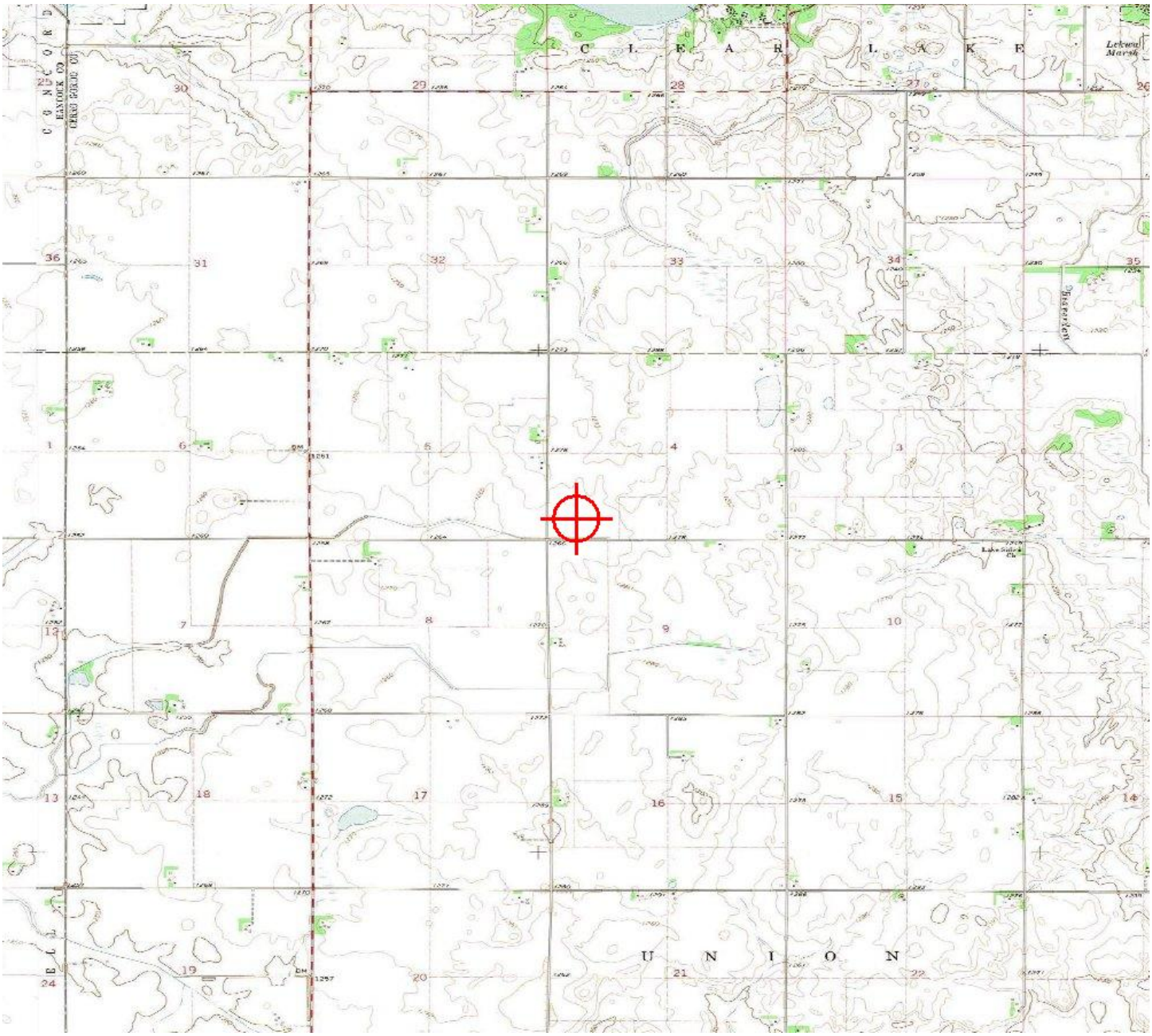
If we can be of further assistance, please contact our office at (816) 329-2528, or cindy.whitten@faa.gov. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2019-WTE-3755-OE.

Signature Control No: 402854029-407551173 (DNE -WT)
Cindy Whitten
Supervisor

Attachment(s)
Additional Information
Map(s)

NOTE: A recommendation for white paint/synchronized red lights will be made for all turbines until such time as the proponent confirms that the layout is final (no changes, no additions, no removals) and all turbines can and will be built at their determined location and height. At that time, the proponent may contact this office and request a re-evaluation of the marking and lighting recommendations for the turbines within this project and a portion of the turbines may qualify for the removal of the lighting recommendation.

TOPO Map for ASN 2019-WTE-3755-OE



Sectional Map for ASN 2019-WTE-3755-OE

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

Aeronautical Study No.
2019-WTE-3757-OE

Issued Date: 06/04/2019

Mike Weich
Cerro Gordo Wind Project
700 Universe Blvd.
Juno Beach, FL 33408

**** 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:	Wind Turbine Alt3	**OPTIMIZED FINAL SITE PLAN ARRAY**
Location:	Ventura, IA	**WTG 11**
Latitude:	43-04-10.22N NAD 83	
Longitude:	93-27-00.10W	
Heights:	1274 feet site elevation (SE)	
	499 feet above ground level (AGL)	
	1773 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:

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(a) the construction is started (not necessarily completed) and FAA Form 7460-2, Notice of Actual Construction or Alteration, is received by this office.
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This determination is based, in part, on the foregoing description which includes specific coordinates and heights. This determination is valid for coordinates within one (1) second latitude/longitude and up to the approved AMSL height listed above (provided the AGL height does not exceed 499 feet). If a certified 1A or 2C accuracy survey was required to mitigate an adverse effect, any change in coordinates or increase in height will require a new certified accuracy survey and may require a new aeronautical study.

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Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. All information from submission of Supplemental Notice (7460-2 Part 2) will be considered the final data (including heights) for this structure. Any future construction or alteration, including but not limited to changes in heights, requires separate notice to the FAA.

Obstruction marking and lighting recommendations for wind turbine farms are based on the scheme for the entire project. ANY change to the height, location or number of turbines within this project will require a reanalysis of the marking and lighting recommendation for the entire project. In particular, the removal of previously planned or built turbines/turbine locations from the project will often result in a change in the marking/lighting recommendation for other turbines within the project. It is the proponent's responsibility to contact the FAA to discuss the process for developing a revised obstruction marking and lighting plan should this occur.

In order to ensure proper conspicuity of turbines at night during construction, all turbines should be lit with temporary lighting once they reach a height of 200 feet or greater until such time the permanent lighting configuration is turned on. As the height of the structure continues to increase, the temporary lighting should be relocated to the uppermost part of the structure. The temporary lighting may be turned off for periods when they would interfere with construction personnel. If practical, permanent obstruction lights should be installed and operated at each level as construction progresses. An FAA Type L-810 steady red light fixture shall be used to light the structure during the construction phase. If power is not available, turbines shall be lit with self-contained, solar powered LED steady red light fixture that meets the photometric requirements of an FAA Type L-810 lighting system. The lights should be positioned to ensure that a pilot has an unobstructed view of at least one light at each level. The use of a NOTAM (D) to not light turbines within a project until the entire project has been completed is prohibited.

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.

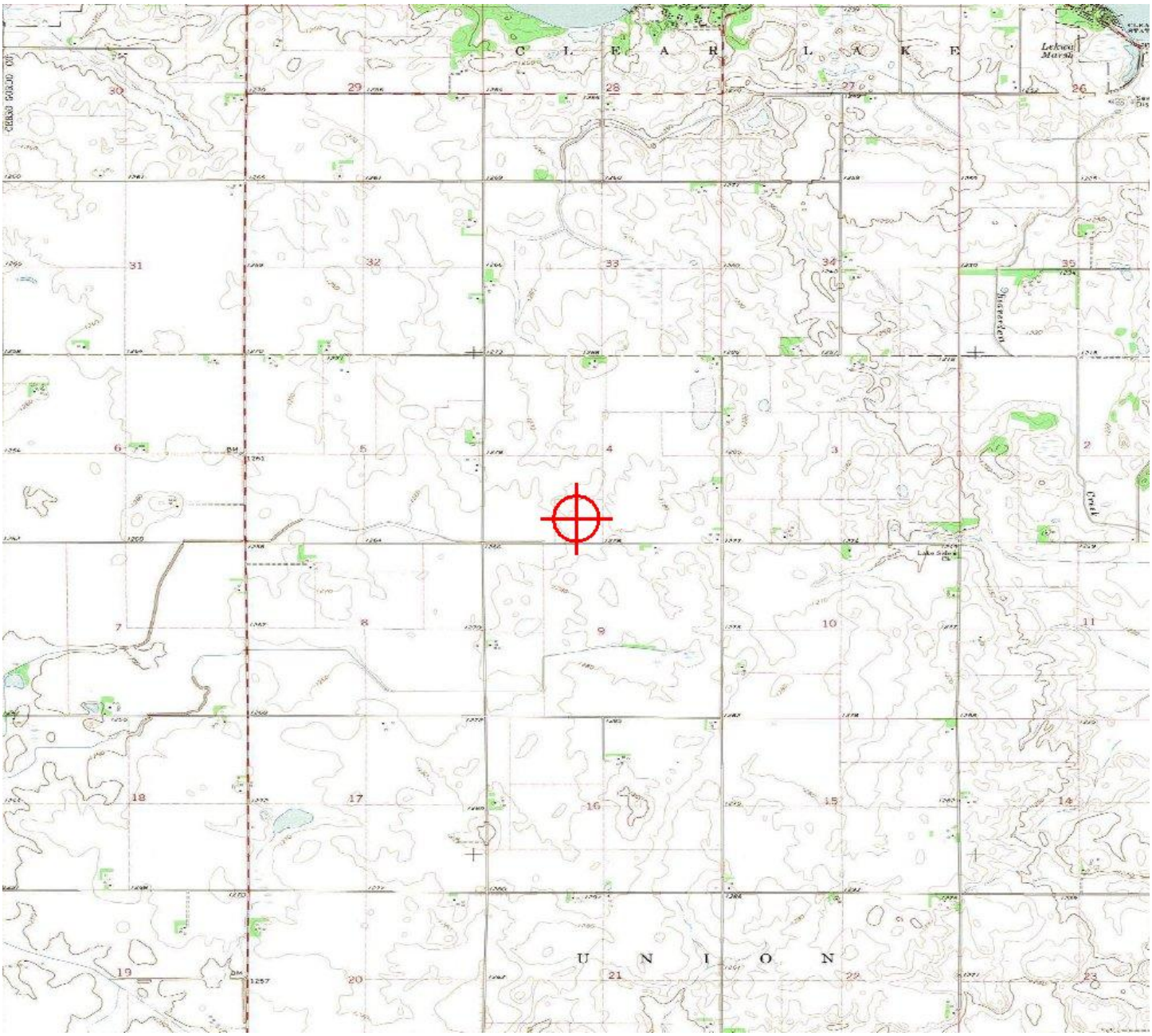
If we can be of further assistance, please contact our office at (816) 329-2528, or cindy.whitten@faa.gov. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2019-WTE-3757-OE.

Signature Control No: 402854032-407551178 (DNE -WT)
Cindy Whitten
Supervisor

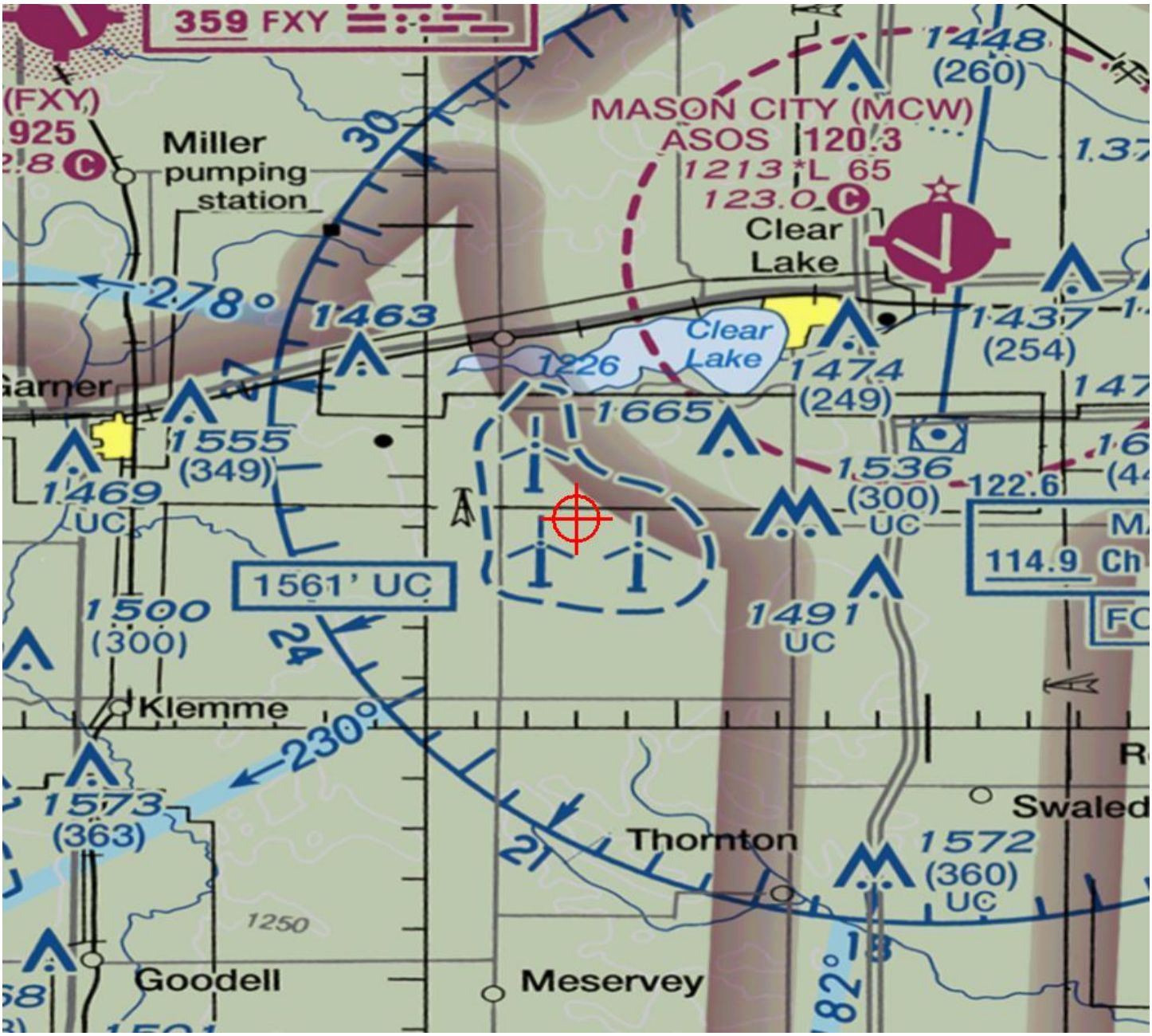
Attachment(s)
Additional Information
Map(s)

NOTE: A recommendation for white paint/synchronized red lights will be made for all turbines until such time as the proponent confirms that the layout is final (no changes, no additions, no removals) and all turbines can and will be built at their determined location and height. At that time, the proponent may contact this office and request a re-evaluation of the marking and lighting recommendations for the turbines within this project and a portion of the turbines may qualify for the removal of the lighting recommendation.

TOPO Map for ASN 2019-WTE-3757-OE



Sectional Map for ASN 2019-WTE-3757-OE



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

Aeronautical Study No.
2019-WTE-3750-OE

Issued Date: 06/04/2019

Mike Weich
Cerro Gordo Wind Project
700 Universe Blvd.
Juno Beach, FL 33408

**** 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:	Wind Turbine 11	**OPTIMIZED FINAL SITE PLAN ARRAY WTG 12**
Location:	Ventura, IA	
Latitude:	43-04-37.62N NAD 83	
Longitude:	93-28-27.14W	
Heights:	1269 feet site elevation (SE)	
	499 feet above ground level (AGL)	
	1768 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:

As a condition to this Determination, the structure is to be marked/lighted in accordance with FAA Advisory circular 70/7460-1 L Change 2, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

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)

See attachment for additional condition(s) or information.
This determination expires on 12/04/2020 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.

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 and heights. This determination is valid for coordinates within one (1) second latitude/longitude and up to the approved AMSL height listed above (provided the AGL height does not exceed 499 feet). If a certified 1A or 2C accuracy survey was required to mitigate an adverse effect, any change in coordinates or increase in height will require a new certified accuracy survey and may require a new aeronautical study.

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.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. All information from submission of Supplemental Notice (7460-2 Part 2) will be considered the final data (including heights) for this structure. Any future construction or alteration, including but not limited to changes in heights, requires separate notice to the FAA.

Obstruction marking and lighting recommendations for wind turbine farms are based on the scheme for the entire project. ANY change to the height, location or number of turbines within this project will require a reanalysis of the marking and lighting recommendation for the entire project. In particular, the removal of previously planned or built turbines/turbine locations from the project will often result in a change in the marking/lighting recommendation for other turbines within the project. It is the proponent's responsibility to contact the FAA to discuss the process for developing a revised obstruction marking and lighting plan should this occur.

In order to ensure proper conspicuity of turbines at night during construction, all turbines should be lit with temporary lighting once they reach a height of 200 feet or greater until such time the permanent lighting configuration is turned on. As the height of the structure continues to increase, the temporary lighting should be relocated to the uppermost part of the structure. The temporary lighting may be turned off for periods when they would interfere with construction personnel. If practical, permanent obstruction lights should be installed and operated at each level as construction progresses. An FAA Type L-810 steady red light fixture shall be used to light the structure during the construction phase. If power is not available, turbines shall be lit with self-contained, solar powered LED steady red light fixture that meets the photometric requirements of an FAA Type L-810 lighting system. The lights should be positioned to ensure that a pilot has an unobstructed view of at least one light at each level. The use of a NOTAM (D) to not light turbines within a project until the entire project has been completed is prohibited.

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.

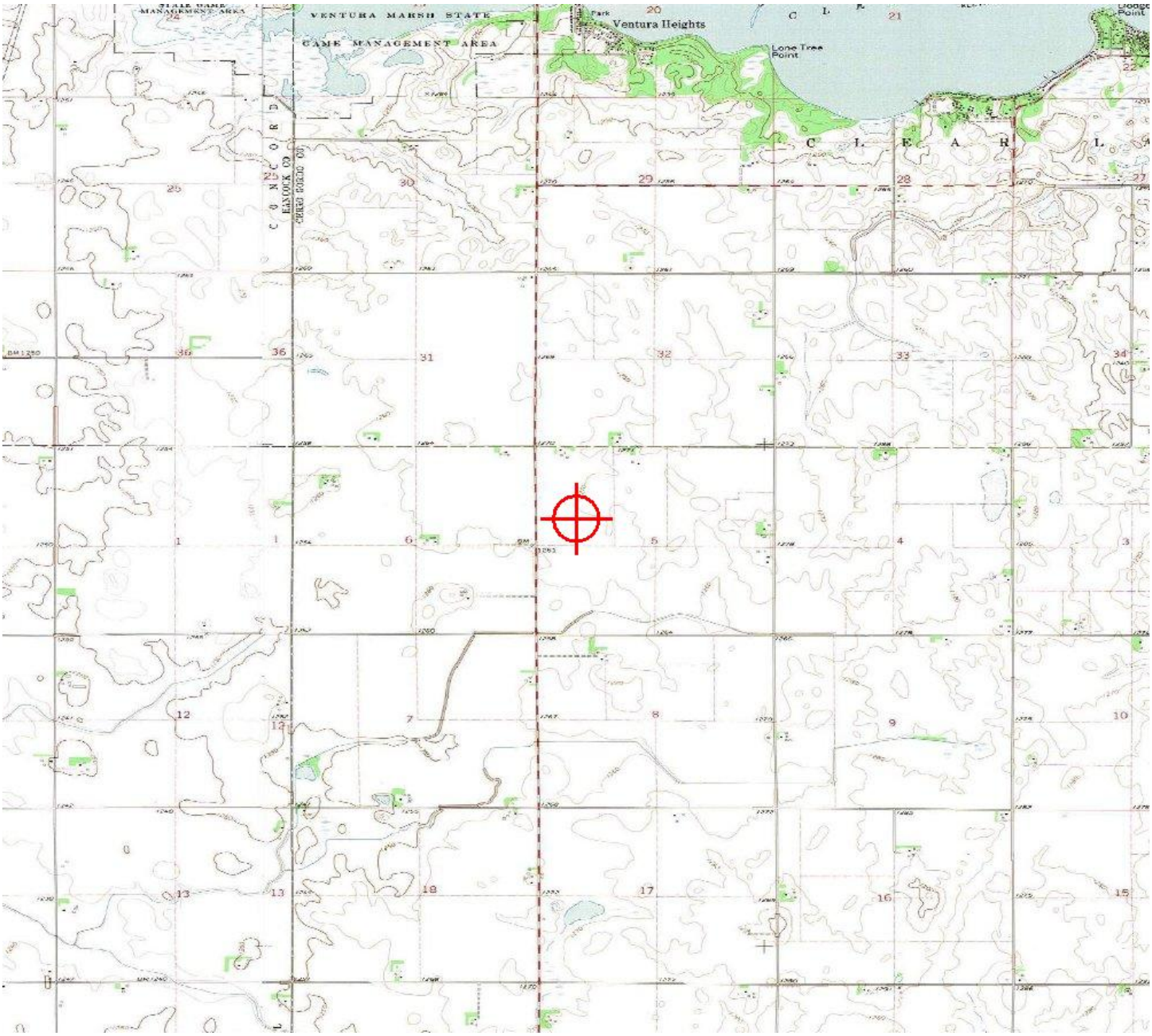
If we can be of further assistance, please contact our office at (816) 329-2528, or cindy.whitten@faa.gov. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2019-WTE-3750-OE.

Signature Control No: 402854024-407551172 (DNE -WT)
Cindy Whitten
Supervisor

Attachment(s)
Additional Information
Map(s)

NOTE: A recommendation for white paint/synchronized red lights will be made for all turbines until such time as the proponent confirms that the layout is final (no changes, no additions, no removals) and all turbines can and will be built at their determined location and height. At that time, the proponent may contact this office and request a re-evaluation of the marking and lighting recommendations for the turbines within this project and a portion of the turbines may qualify for the removal of the lighting recommendation.

TOPO Map for ASN 2019-WTE-3750-OE



Sectional Map for ASN 2019-WTE-3750-OE

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

Aeronautical Study No.
2019-WTE-3751-OE

Issued Date: 06/04/2019

Mike Weich
Cerro Gordo Wind Project
700 Universe Blvd.
Juno Beach, FL 33408

**** 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:	Wind Turbine 12	**OPTIMIZED FINAL SITE PLAN ARRAY**
Location:	Ventura, IA	**WTG 13**
Latitude:	43-04-37.98N NAD 83	
Longitude:	93-28-07.90W	
Heights:	1271 feet site elevation (SE)	
	499 feet above ground level (AGL)	
	1770 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:

As a condition to this Determination, the structure is to be marked/lighted in accordance with FAA Advisory circular 70/7460-1 L Change 2, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

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)

See attachment for additional condition(s) or information.
This determination expires on 12/04/2020 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.

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 and heights. This determination is valid for coordinates within one (1) second latitude/longitude and up to the approved AMSL height listed above (provided the AGL height does not exceed 499 feet). If a certified 1A or 2C accuracy survey was required to mitigate an adverse effect, any change in coordinates or increase in height will require a new certified accuracy survey and may require a new aeronautical study.

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.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. All information from submission of Supplemental Notice (7460-2 Part 2) will be considered the final data (including heights) for this structure. Any future construction or alteration, including but not limited to changes in heights, requires separate notice to the FAA.

Obstruction marking and lighting recommendations for wind turbine farms are based on the scheme for the entire project. ANY change to the height, location or number of turbines within this project will require a reanalysis of the marking and lighting recommendation for the entire project. In particular, the removal of previously planned or built turbines/turbine locations from the project will often result in a change in the marking/lighting recommendation for other turbines within the project. It is the proponent's responsibility to contact the FAA to discuss the process for developing a revised obstruction marking and lighting plan should this occur.

In order to ensure proper conspicuity of turbines at night during construction, all turbines should be lit with temporary lighting once they reach a height of 200 feet or greater until such time the permanent lighting configuration is turned on. As the height of the structure continues to increase, the temporary lighting should be relocated to the uppermost part of the structure. The temporary lighting may be turned off for periods when they would interfere with construction personnel. If practical, permanent obstruction lights should be installed and operated at each level as construction progresses. An FAA Type L-810 steady red light fixture shall be used to light the structure during the construction phase. If power is not available, turbines shall be lit with self-contained, solar powered LED steady red light fixture that meets the photometric requirements of an FAA Type L-810 lighting system. The lights should be positioned to ensure that a pilot has an unobstructed view of at least one light at each level. The use of a NOTAM (D) to not light turbines within a project until the entire project has been completed is prohibited.

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.

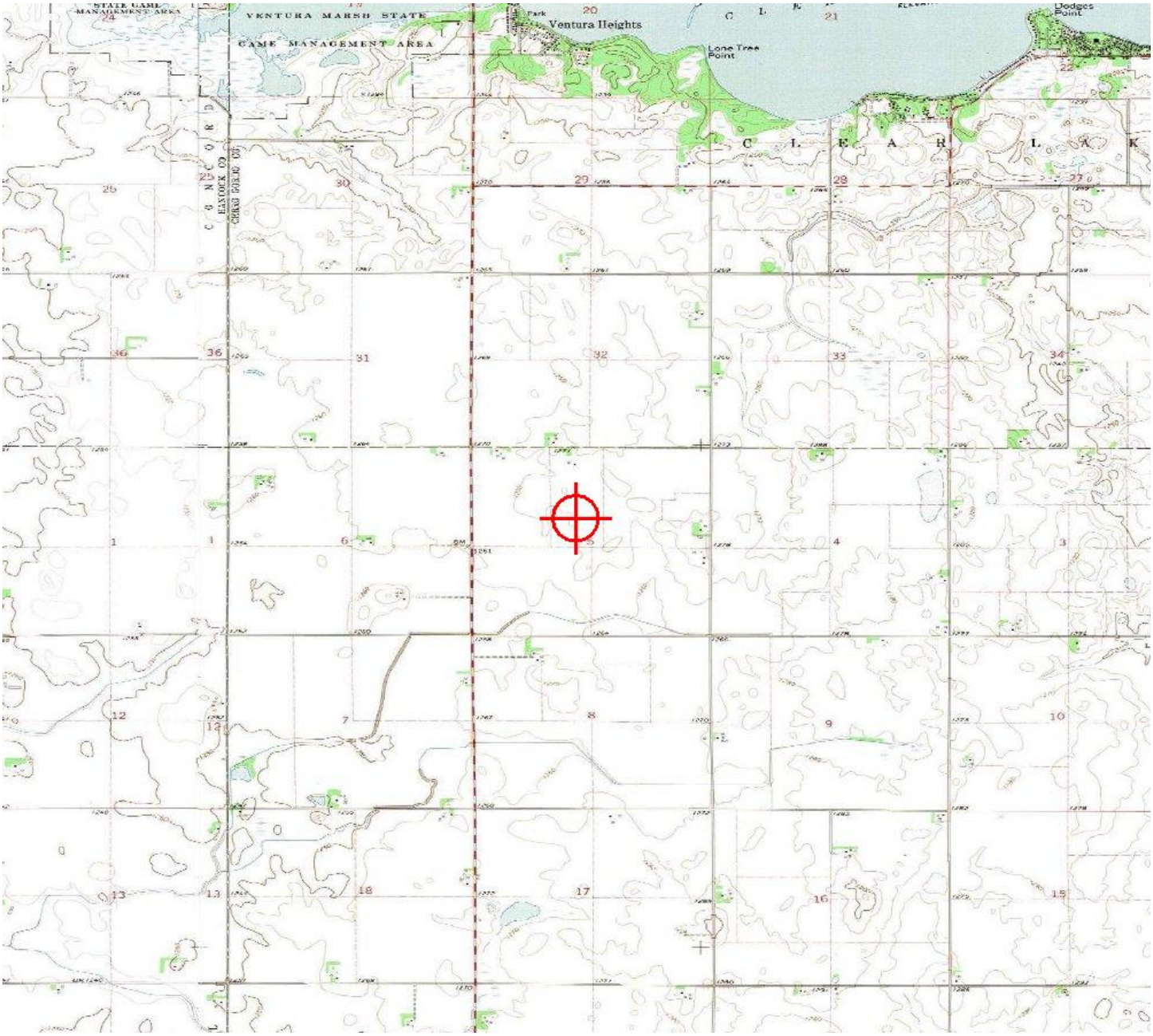
If we can be of further assistance, please contact our office at (816) 329-2528, or cindy.whitten@faa.gov. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2019-WTE-3751-OE.

Signature Control No: 402854025-407551177 (DNE -WT)
Cindy Whitten
Supervisor

Attachment(s)
Additional Information
Map(s)

NOTE: A recommendation for white paint/synchronized red lights will be made for all turbines until such time as the proponent confirms that the layout is final (no changes, no additions, no removals) and all turbines can and will be built at their determined location and height. At that time, the proponent may contact this office and request a re-evaluation of the marking and lighting recommendations for the turbines within this project and a portion of the turbines may qualify for the removal of the lighting recommendation.

TOPO Map for ASN 2019-WTE-3751-OE



Sectional Map for ASN 2019-WTE-3751-OE

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

Aeronautical Study No.
2019-WTE-3752-OE

Issued Date: 06/04/2019

Mike Weich
Cerro Gordo Wind Project
700 Universe Blvd.
Juno Beach, FL 33408

**** 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:	Wind Turbine 13	**OPTIMIZED FINAL SITE PLAN ARRAY**
Location:	Ventura, IA	**WTG 14**
Latitude:	43-04-44.90N NAD 83	
Longitude:	93-27-52.05W	
Heights:	1279 feet site elevation (SE)	
	499 feet above ground level (AGL)	
	1778 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:

As a condition to this Determination, the structure is to be marked/lighted in accordance with FAA Advisory circular 70/7460-1 L Change 2, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

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)

See attachment for additional condition(s) or information.
This determination expires on 12/04/2020 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.

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This determination is based, in part, on the foregoing description which includes specific coordinates and heights. This determination is valid for coordinates within one (1) second latitude/longitude and up to the approved AMSL height listed above (provided the AGL height does not exceed 499 feet). If a certified 1A or 2C accuracy survey was required to mitigate an adverse effect, any change in coordinates or increase in height will require a new certified accuracy survey and may require a new aeronautical study.

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.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. All information from submission of Supplemental Notice (7460-2 Part 2) will be considered the final data (including heights) for this structure. Any future construction or alteration, including but not limited to changes in heights, requires separate notice to the FAA.

Obstruction marking and lighting recommendations for wind turbine farms are based on the scheme for the entire project. ANY change to the height, location or number of turbines within this project will require a reanalysis of the marking and lighting recommendation for the entire project. In particular, the removal of previously planned or built turbines/turbine locations from the project will often result in a change in the marking/lighting recommendation for other turbines within the project. It is the proponent's responsibility to contact the FAA to discuss the process for developing a revised obstruction marking and lighting plan should this occur.

In order to ensure proper conspicuity of turbines at night during construction, all turbines should be lit with temporary lighting once they reach a height of 200 feet or greater until such time the permanent lighting configuration is turned on. As the height of the structure continues to increase, the temporary lighting should be relocated to the uppermost part of the structure. The temporary lighting may be turned off for periods when they would interfere with construction personnel. If practical, permanent obstruction lights should be installed and operated at each level as construction progresses. An FAA Type L-810 steady red light fixture shall be used to light the structure during the construction phase. If power is not available, turbines shall be lit with self-contained, solar powered LED steady red light fixture that meets the photometric requirements of an FAA Type L-810 lighting system. The lights should be positioned to ensure that a pilot has an unobstructed view of at least one light at each level. The use of a NOTAM (D) to not light turbines within a project until the entire project has been completed is prohibited.

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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.

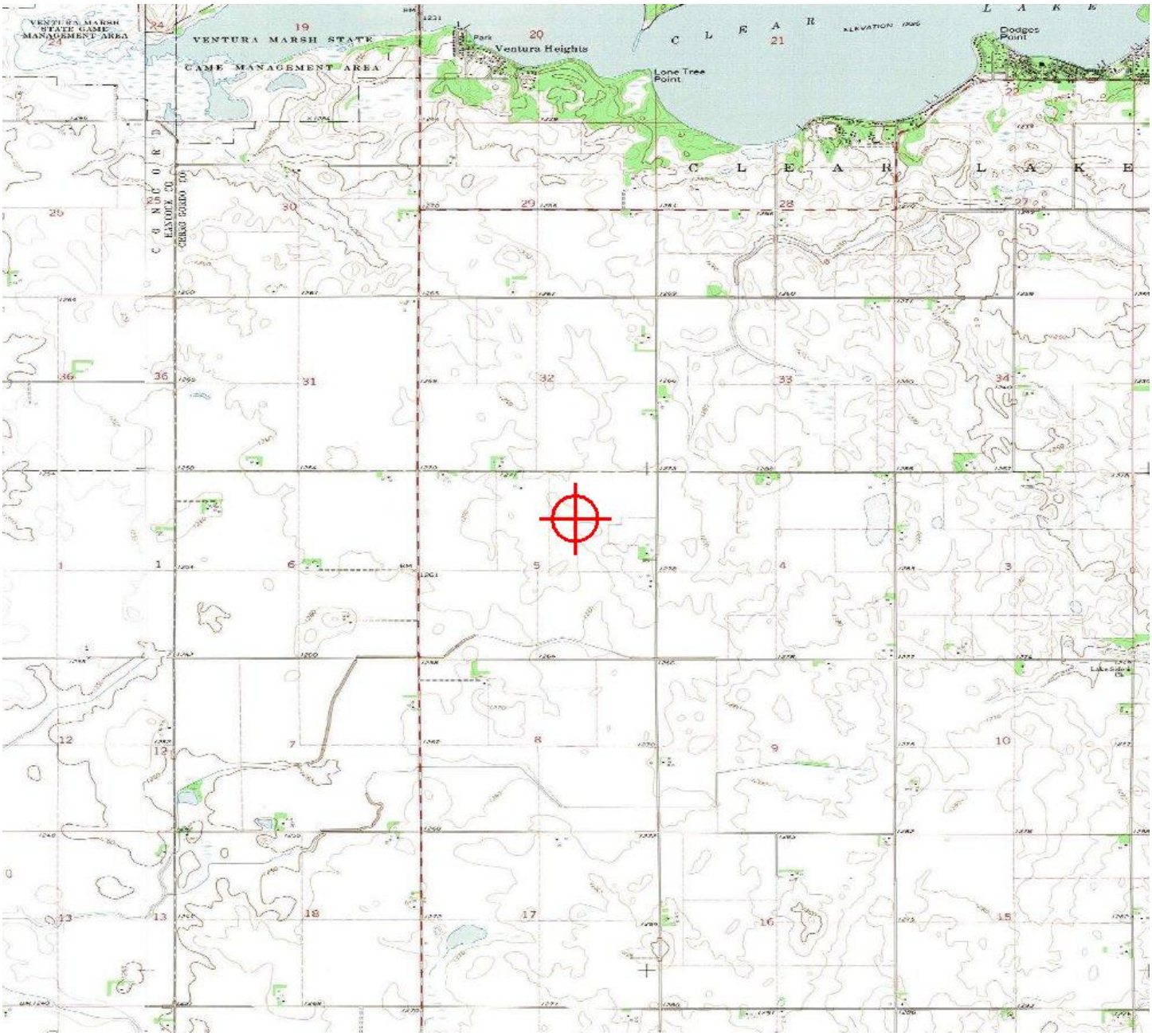
If we can be of further assistance, please contact our office at (816) 329-2528, or cindy.whitten@faa.gov. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2019-WTE-3752-OE.

Signature Control No: 402854026-407551176 (DNE -WT)
Cindy Whitten
Supervisor

Attachment(s)
Additional Information
Map(s)

NOTE: A recommendation for white paint/synchronized red lights will be made for all turbines until such time as the proponent confirms that the layout is final (no changes, no additions, no removals) and all turbines can and will be built at their determined location and height. At that time, the proponent may contact this office and request a re-evaluation of the marking and lighting recommendations for the turbines within this project and a portion of the turbines may qualify for the removal of the lighting recommendation.

TOPO Map for ASN 2019-WTE-3752-OE



Sectional Map for ASN 2019-WTE-3752-OE

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

Aeronautical Study No.
2019-WTE-3753-OE

Issued Date: 06/04/2019

Mike Weich
Cerro Gordo Wind Project
700 Universe Blvd.
Juno Beach, FL 33408

**** 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:	Wind Turbine 14	**OPTIMIZED FINAL SITE PLAN ARRAY WTG 15**
Location:	Ventura, IA	
Latitude:	43-04-52.81N NAD 83	
Longitude:	93-27-36.54W	
Heights:	1275 feet site elevation (SE)	
	499 feet above ground level (AGL)	
	1774 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:

As a condition to this Determination, the structure is to be marked/lighted in accordance with FAA Advisory circular 70/7460-1 L Change 2, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

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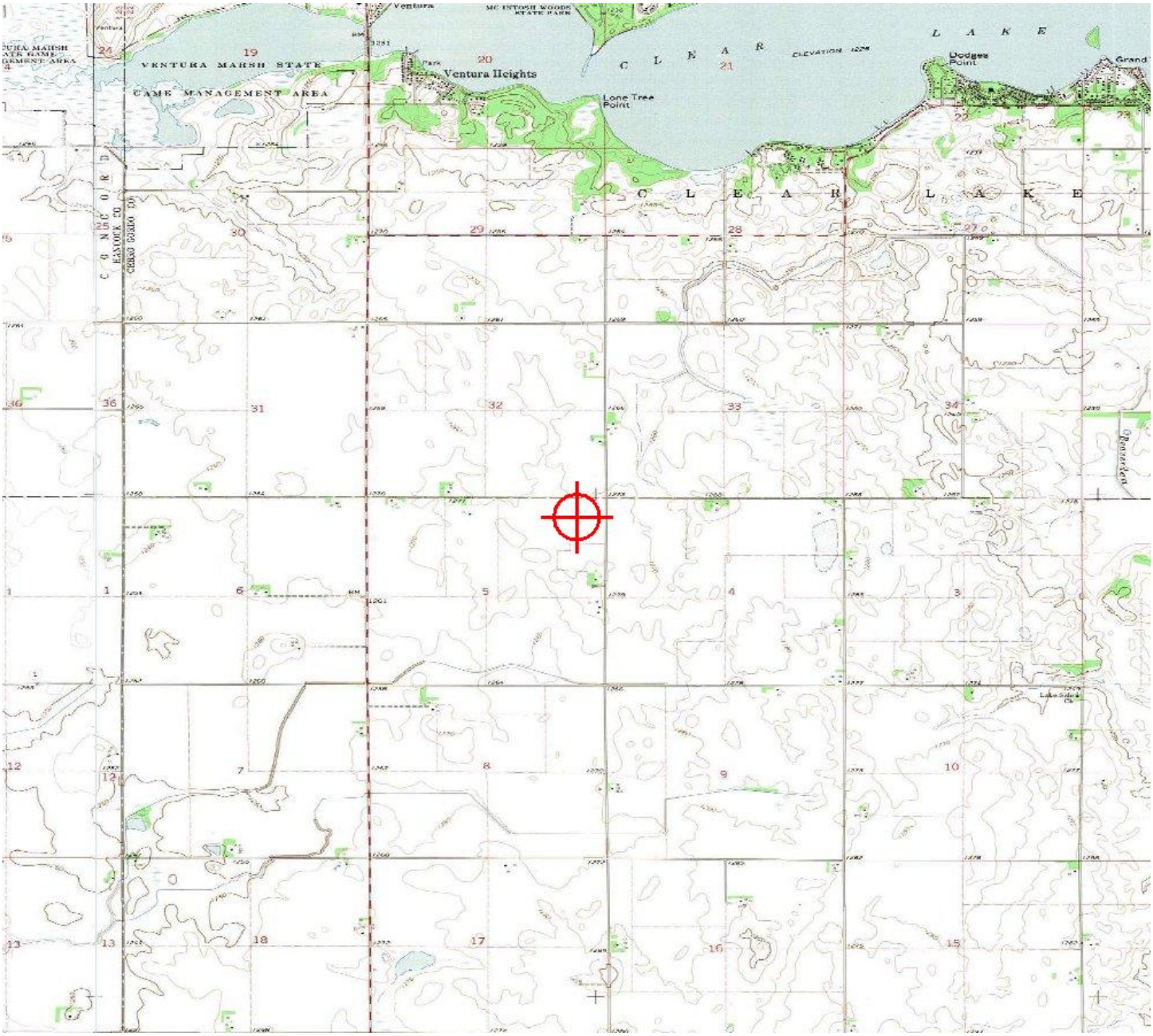
If we can be of further assistance, please contact our office at (816) 329-2528, or cindy.whitten@faa.gov. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2019-WTE-3753-OE.

Signature Control No: 402854027-407551171 (DNE -WT)
Cindy Whitten
Supervisor

Attachment(s)
Additional Information
Map(s)

NOTE: A recommendation for white paint/synchronized red lights will be made for all turbines until such time as the proponent confirms that the layout is final (no changes, no additions, no removals) and all turbines can and will be built at their determined location and height. At that time, the proponent may contact this office and request a re-evaluation of the marking and lighting recommendations for the turbines within this project and a portion of the turbines may qualify for the removal of the lighting recommendation.

TOPO Map for ASN 2019-WTE-3753-OE



Sectional Map for ASN 2019-WTE-3753-OE

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

Aeronautical Study No.
2019-WTE-3758-OE

Issued Date: 06/04/2019

Mike Weich
Cerro Gordo Wind Project
700 Universe Blvd.
Juno Beach, FL 33408

**** 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:	Wind Turbine Alt4
Location:	Ventura, IA
Latitude:	43-03-21.69N NAD 83
Longitude:	93-26-30.31W
Heights:	1279 feet site elevation (SE)
	499 feet above ground level (AGL)
	1778 feet above mean sea level (AMSL)

OPTIMIZED FINAL SITE PLAN ARRAY
WTG ALT 1

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:

As a condition to this Determination, the structure is to be marked/lighted in accordance with FAA Advisory circular 70/7460-1 L Change 2, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

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)

See attachment for additional condition(s) or information.
This determination expires on 12/04/2020 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.

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 and heights. This determination is valid for coordinates within one (1) second latitude/longitude and up to the approved AMSL height listed above (provided the AGL height does not exceed 499 feet). If a certified 1A or 2C accuracy survey was required to mitigate an adverse effect, any change in coordinates or increase in height will require a new certified accuracy survey and may require a new aeronautical study.

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.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. All information from submission of Supplemental Notice (7460-2 Part 2) will be considered the final data (including heights) for this structure. Any future construction or alteration, including but not limited to changes in heights, requires separate notice to the FAA.

Obstruction marking and lighting recommendations for wind turbine farms are based on the scheme for the entire project. ANY change to the height, location or number of turbines within this project will require a reanalysis of the marking and lighting recommendation for the entire project. In particular, the removal of previously planned or built turbines/turbine locations from the project will often result in a change in the marking/lighting recommendation for other turbines within the project. It is the proponent's responsibility to contact the FAA to discuss the process for developing a revised obstruction marking and lighting plan should this occur.

In order to ensure proper conspicuity of turbines at night during construction, all turbines should be lit with temporary lighting once they reach a height of 200 feet or greater until such time the permanent lighting configuration is turned on. As the height of the structure continues to increase, the temporary lighting should be relocated to the uppermost part of the structure. The temporary lighting may be turned off for periods when they would interfere with construction personnel. If practical, permanent obstruction lights should be installed and operated at each level as construction progresses. An FAA Type L-810 steady red light fixture shall be used to light the structure during the construction phase. If power is not available, turbines shall be lit with self-contained, solar powered LED steady red light fixture that meets the photometric requirements of an FAA Type L-810 lighting system. The lights should be positioned to ensure that a pilot has an unobstructed view of at least one light at each level. The use of a NOTAM (D) to not light turbines within a project until the entire project has been completed is prohibited.

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.

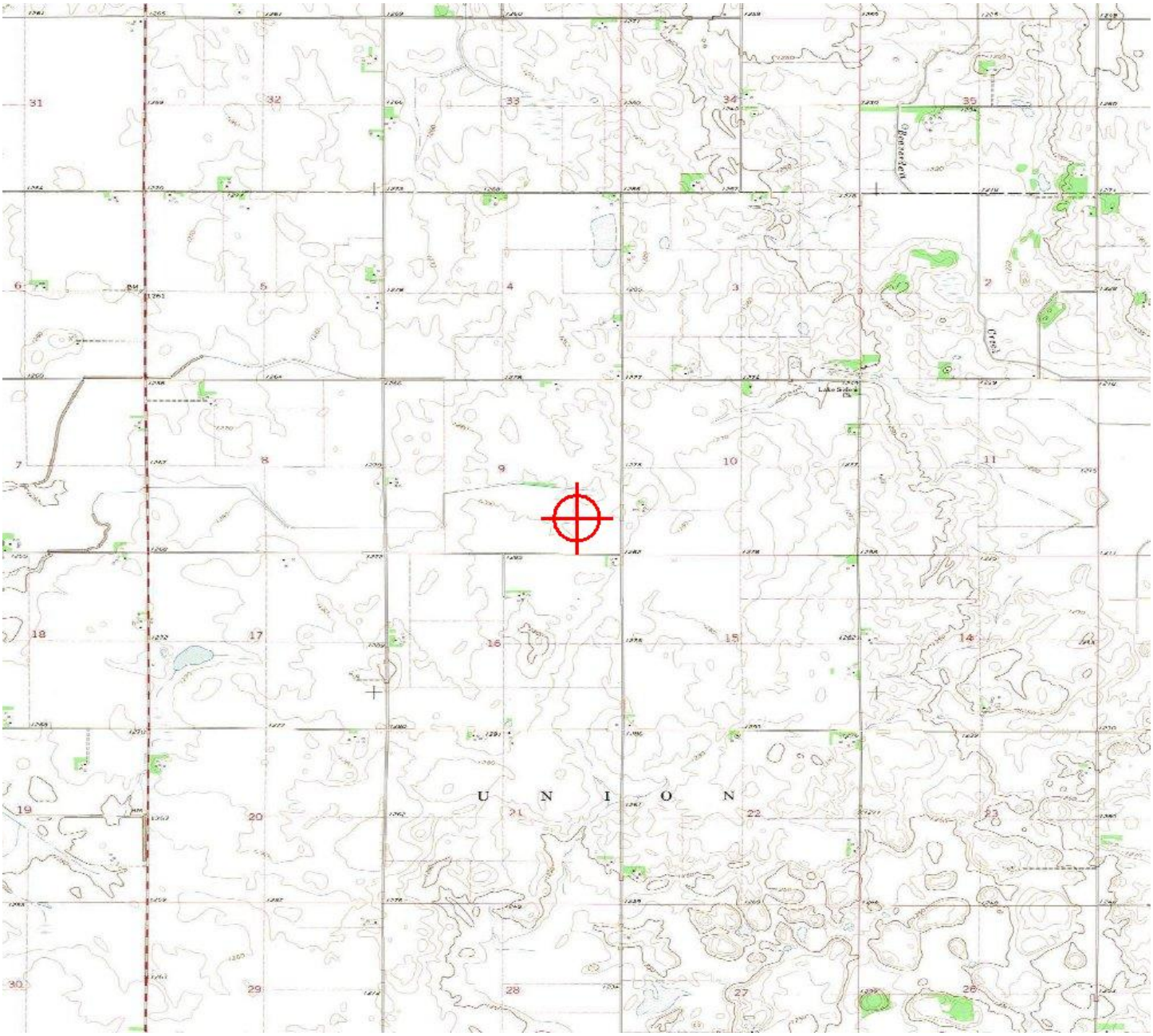
If we can be of further assistance, please contact our office at (816) 329-2528, or cindy.whitten@faa.gov. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2019-WTE-3758-OE.

Signature Control No: 402854033-407551160 (DNE -WT)
Cindy Whitten
Supervisor

Attachment(s)
Additional Information
Map(s)

NOTE: A recommendation for white paint/synchronized red lights will be made for all turbines until such time as the proponent confirms that the layout is final (no changes, no additions, no removals) and all turbines can and will be built at their determined location and height. At that time, the proponent may contact this office and request a re-evaluation of the marking and lighting recommendations for the turbines within this project and a portion of the turbines may qualify for the removal of the lighting recommendation.

TOPO Map for ASN 2019-WTE-3758-OE



Sectional Map for ASN 2019-WTE-3758-OE

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

Aeronautical Study No.
2019-WTE-3748-OE

Issued Date: 06/04/2019

Mike Weich
Cerro Gordo Wind Project
700 Universe Blvd.
Juno Beach, FL 33408

**** 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:	Wind Turbine 9
Location:	Ventura, IA
Latitude:	43-03-46.51N NAD 83
Longitude:	93-26-52.04W
Heights:	1278 feet site elevation (SE)
	499 feet above ground level (AGL)
	1777 feet above mean sea level (AMSL)

OPTIMIZED FINAL SITE PLAN ARRAY ALT 2

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:

As a condition to this Determination, the structure is to be marked/lighted in accordance with FAA Advisory circular 70/7460-1 L Change 2, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

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)

See attachment for additional condition(s) or information.
This determination expires on 12/04/2020 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.

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 and heights. This determination is valid for coordinates within one (1) second latitude/longitude and up to the approved AMSL height listed above (provided the AGL height does not exceed 499 feet). If a certified 1A or 2C accuracy survey was required to mitigate an adverse effect, any change in coordinates or increase in height will require a new certified accuracy survey and may require a new aeronautical study.

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.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. All information from submission of Supplemental Notice (7460-2 Part 2) will be considered the final data (including heights) for this structure. Any future construction or alteration, including but not limited to changes in heights, requires separate notice to the FAA.

Obstruction marking and lighting recommendations for wind turbine farms are based on the scheme for the entire project. ANY change to the height, location or number of turbines within this project will require a reanalysis of the marking and lighting recommendation for the entire project. In particular, the removal of previously planned or built turbines/turbine locations from the project will often result in a change in the marking/lighting recommendation for other turbines within the project. It is the proponent's responsibility to contact the FAA to discuss the process for developing a revised obstruction marking and lighting plan should this occur.

In order to ensure proper conspicuity of turbines at night during construction, all turbines should be lit with temporary lighting once they reach a height of 200 feet or greater until such time the permanent lighting configuration is turned on. As the height of the structure continues to increase, the temporary lighting should be relocated to the uppermost part of the structure. The temporary lighting may be turned off for periods when they would interfere with construction personnel. If practical, permanent obstruction lights should be installed and operated at each level as construction progresses. An FAA Type L-810 steady red light fixture shall be used to light the structure during the construction phase. If power is not available, turbines shall be lit with self-contained, solar powered LED steady red light fixture that meets the photometric requirements of an FAA Type L-810 lighting system. The lights should be positioned to ensure that a pilot has an unobstructed view of at least one light at each level. The use of a NOTAM (D) to not light turbines within a project until the entire project has been completed is prohibited.

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.

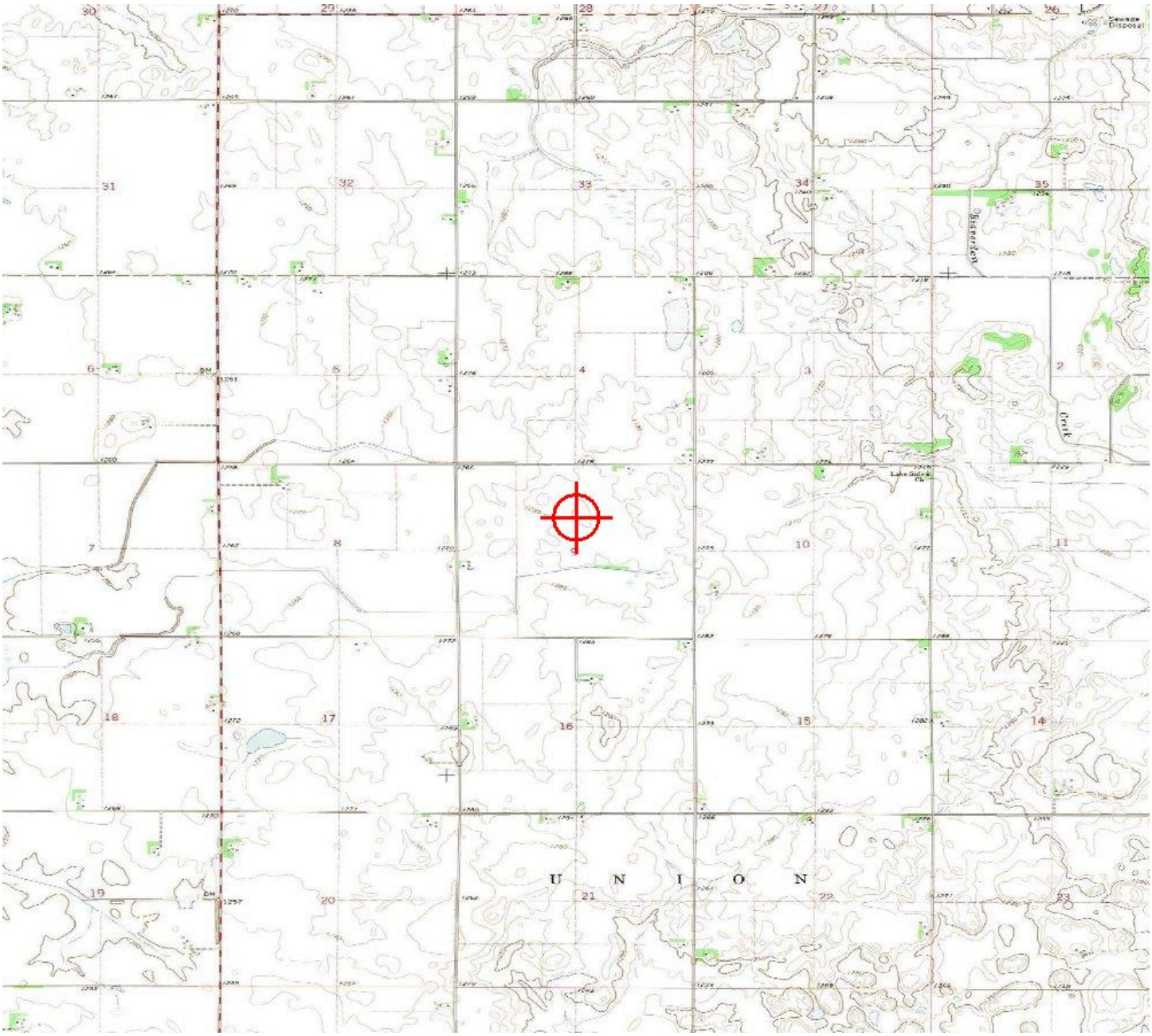
If we can be of further assistance, please contact our office at (816) 329-2528, or cindy.whitten@faa.gov. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2019-WTE-3748-OE.

Signature Control No: 402854022-407551163 (DNE -WT)
Cindy Whitten
Supervisor

Attachment(s)
Additional Information
Map(s)

NOTE: A recommendation for white paint/synchronized red lights will be made for all turbines until such time as the proponent confirms that the layout is final (no changes, no additions, no removals) and all turbines can and will be built at their determined location and height. At that time, the proponent may contact this office and request a re-evaluation of the marking and lighting recommendations for the turbines within this project and a portion of the turbines may qualify for the removal of the lighting recommendation.

TOPO Map for ASN 2019-WTE-3748-OE



Sectional Map for ASN 2019-WTE-3748-OE

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

Aeronautical Study No.
2019-WTE-3746-OE

Issued Date: 06/04/2019

Mike Weich
Cerro Gordo Wind Project
700 Universe Blvd.
Juno Beach, FL 33408

**** 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:	Wind Turbine 7	**OPTIMIZED FINAL SITE PLAN ARRAY**
Location:	Ventura, IA	**WTG ALT 3**
Latitude:	43-03-17.36N NAD 83	
Longitude:	93-26-53.36W	
Heights:	1288 feet site elevation (SE)	
	499 feet above ground level (AGL)	
	1787 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:

As a condition to this Determination, the structure is to be marked/lighted in accordance with FAA Advisory circular 70/7460-1 L Change 2, Obstruction Marking and Lighting, white paint/synchronized red lights - Chapters 4,12&13(Turbines).

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

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)

See attachment for additional condition(s) or information.
This determination expires on 12/04/2020 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.

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 and heights. This determination is valid for coordinates within one (1) second latitude/longitude and up to the approved AMSL height listed above (provided the AGL height does not exceed 499 feet). If a certified 1A or 2C accuracy survey was required to mitigate an adverse effect, any change in coordinates or increase in height will require a new certified accuracy survey and may require a new aeronautical study.

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.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. All information from submission of Supplemental Notice (7460-2 Part 2) will be considered the final data (including heights) for this structure. Any future construction or alteration, including but not limited to changes in heights, requires separate notice to the FAA.

Obstruction marking and lighting recommendations for wind turbine farms are based on the scheme for the entire project. ANY change to the height, location or number of turbines within this project will require a reanalysis of the marking and lighting recommendation for the entire project. In particular, the removal of previously planned or built turbines/turbine locations from the project will often result in a change in the marking/lighting recommendation for other turbines within the project. It is the proponent's responsibility to contact the FAA to discuss the process for developing a revised obstruction marking and lighting plan should this occur.

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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.

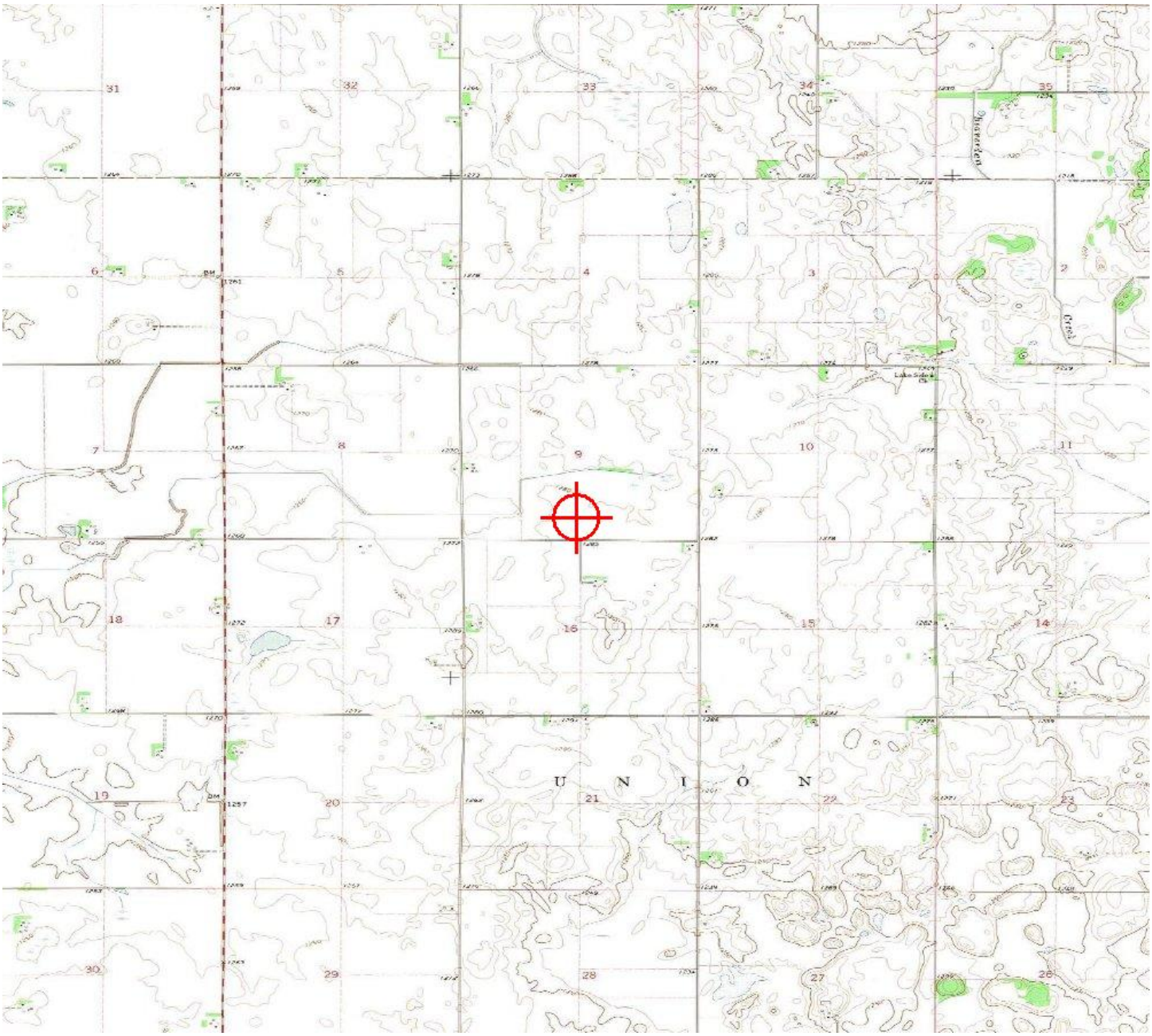
If we can be of further assistance, please contact our office at (816) 329-2528, or cindy.whitten@faa.gov. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2019-WTE-3746-OE.

Signature Control No: 402854020-407551162 (DNE -WT)
Cindy Whitten
Supervisor

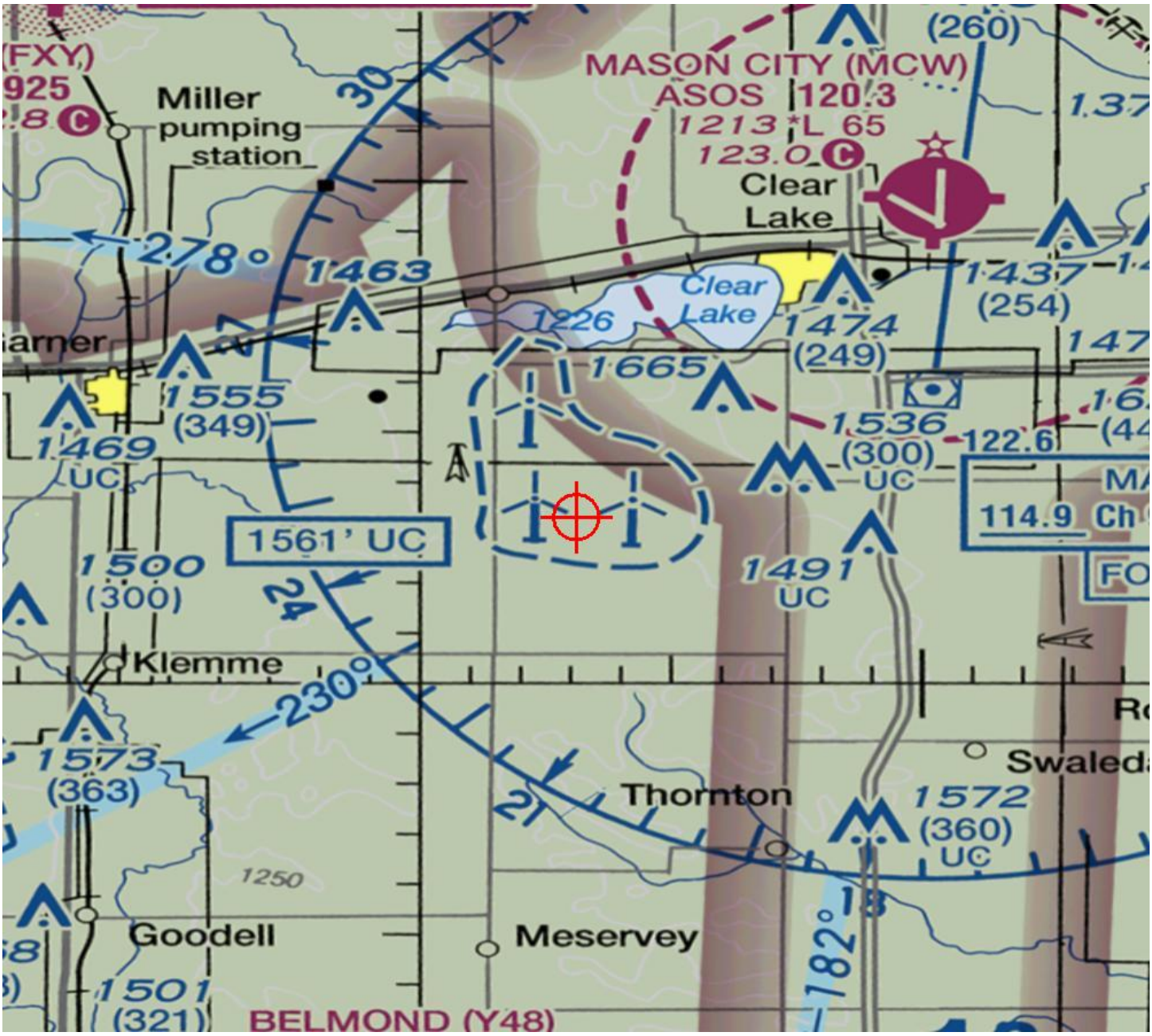
Attachment(s)
Additional Information
Map(s)

NOTE: A recommendation for white paint/synchronized red lights will be made for all turbines until such time as the proponent confirms that the layout is final (no changes, no additions, no removals) and all turbines can and will be built at their determined location and height. At that time, the proponent may contact this office and request a re-evaluation of the marking and lighting recommendations for the turbines within this project and a portion of the turbines may qualify for the removal of the lighting recommendation.

TOPO Map for ASN 2019-WTE-3746-OE



Sectional Map for ASN 2019-WTE-3746-OE



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

Aeronautical Study No.
2019-WTE-3766-OE

Issued Date: 05/07/2019

Mike Weich
Cerro Gordo Wind Project
700 Universe Blvd.
Juno Beach, FL 33408

**** 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:	Met Tower (w/WT Farm) WCG1-SM01
Location:	Ventura, IA
Latitude:	43-05-21.61N NAD 83
Longitude:	93-27-58.08W
Heights:	1267 feet site elevation (SE) 292 feet above ground level (AGL) 1559 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:

As a condition to this Determination, the structure is to be marked/lighted in accordance with FAA Advisory circular 70/7460-1 L Change 2, Obstruction Marking and Lighting, a med-dual system - Chapters 4,8(M-Dual),&12.

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

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)

See attachment for additional condition(s) or information.
This determination expires on 11/07/2020 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.

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 and heights. This determination is valid for coordinates within one (1) second latitude/longitude and up to the approved AMSL height listed above (provided the AGL height does not exceed 499 feet). If a certified 1A or 2C accuracy survey was required to mitigate an adverse effect, any change in coordinates or increase in height will require a new certified accuracy survey and may require a new aeronautical study.

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.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. All information from submission of Supplemental Notice (7460-2 Part 2) will be considered the final data (including heights) for this structure. Any future construction or alteration, including but not limited to changes in heights, requires separate notice to the FAA.

Obstruction marking and lighting recommendations for wind turbine farms are based on the scheme for the entire project. ANY change to the height, location or number of turbines within this project will require a reanalysis of the marking and lighting recommendation for the entire project. In particular, the removal of previously planned or built turbines/turbine locations from the project will often result in a change in the marking/lighting recommendation for other turbines within the project. It is the proponent's responsibility to contact the FAA to discuss the process for developing a revised obstruction marking and lighting plan should this occur.

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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 (424) 405-7644, or tracy.rosgen@faa.gov. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2019-WTE-3766-OE.

Signature Control No: 402854043-405002438 (DNE -WT)
Tracy Rosgen
Technician

Attachment(s)
Additional Information
Frequency Data
Map(s)

As a condition to this Determination, the structure should be lighted with red obstruction lights and marked as noted below:

High-Visibility Sleeves.
It is recommended that several high-visibility sleeves be installed on the MET's outer guy wires. One high-visibility sleeve should be installed on each guy wire, as close to the anchor point as possible, but at a height well above the crop or vegetation canopy. A second sleeve should be installed on the same outer guy wires midway between the location of the lower sleeve and the upper attachment point of the guy wire to the MET. The use of sleeves should not impact the placement of spherical marker balls.

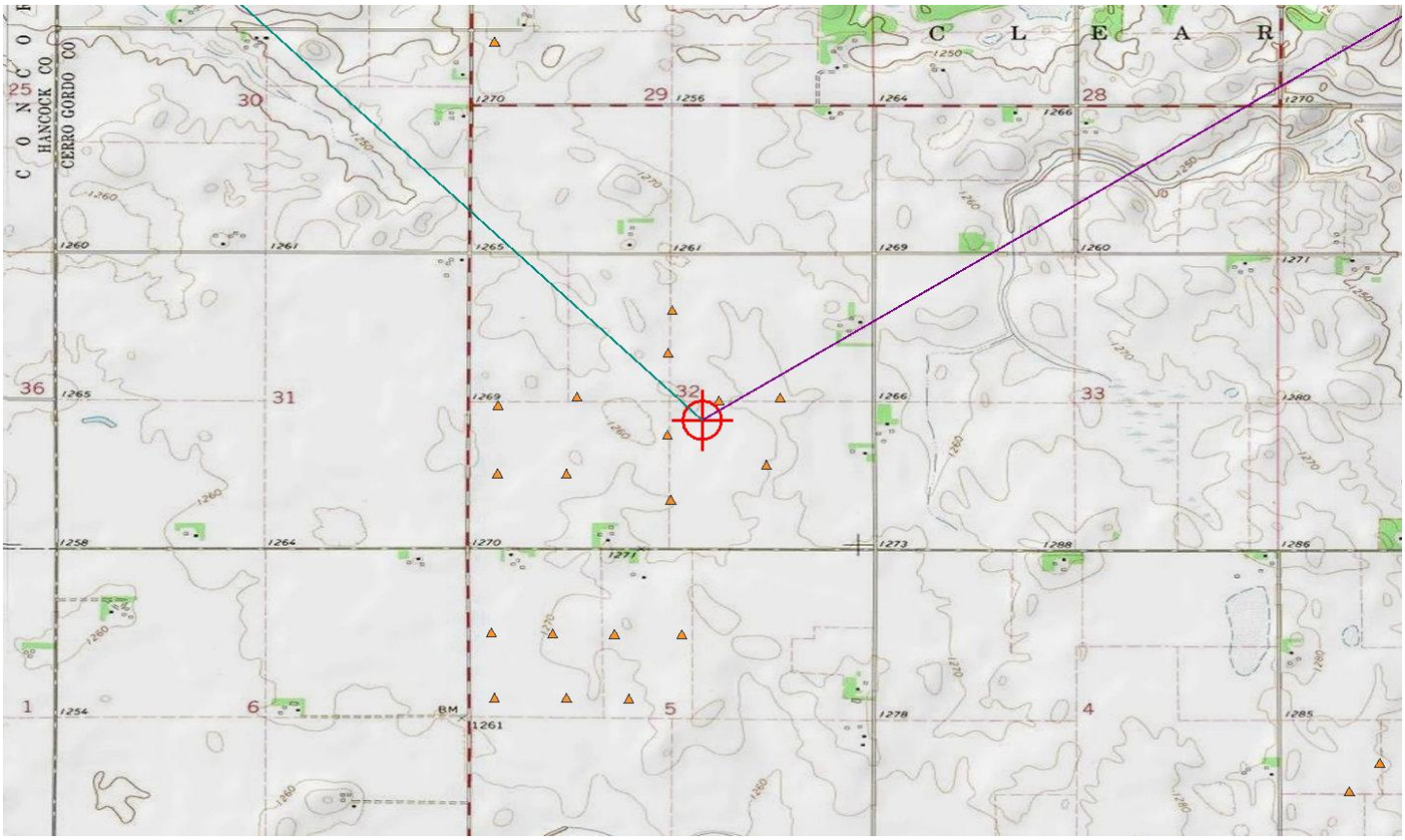
Spherical Markers.
It is also recommended that high-visibility aviation orange spherical marker (or cable) balls be attached to the guy wires. The FAA recommends a total of 8 high visibility spherical marker (or cable balls) of aviation orange color attached to the guy wires; 4 marker balls should be attached to guy wires at the top of the tower no further than 15 feet from the top wire connection to the tower, and 4 marker balls at or below the mid point of the structure on the outer guy wires.

The FAA recognizes that various weather conditions and manufacturing placement standards may affect the placement and use of high-visibility sleeves and/or spherical markers. Thus, some flexibility is allowed when determining sleeve length and marker placement on METs.

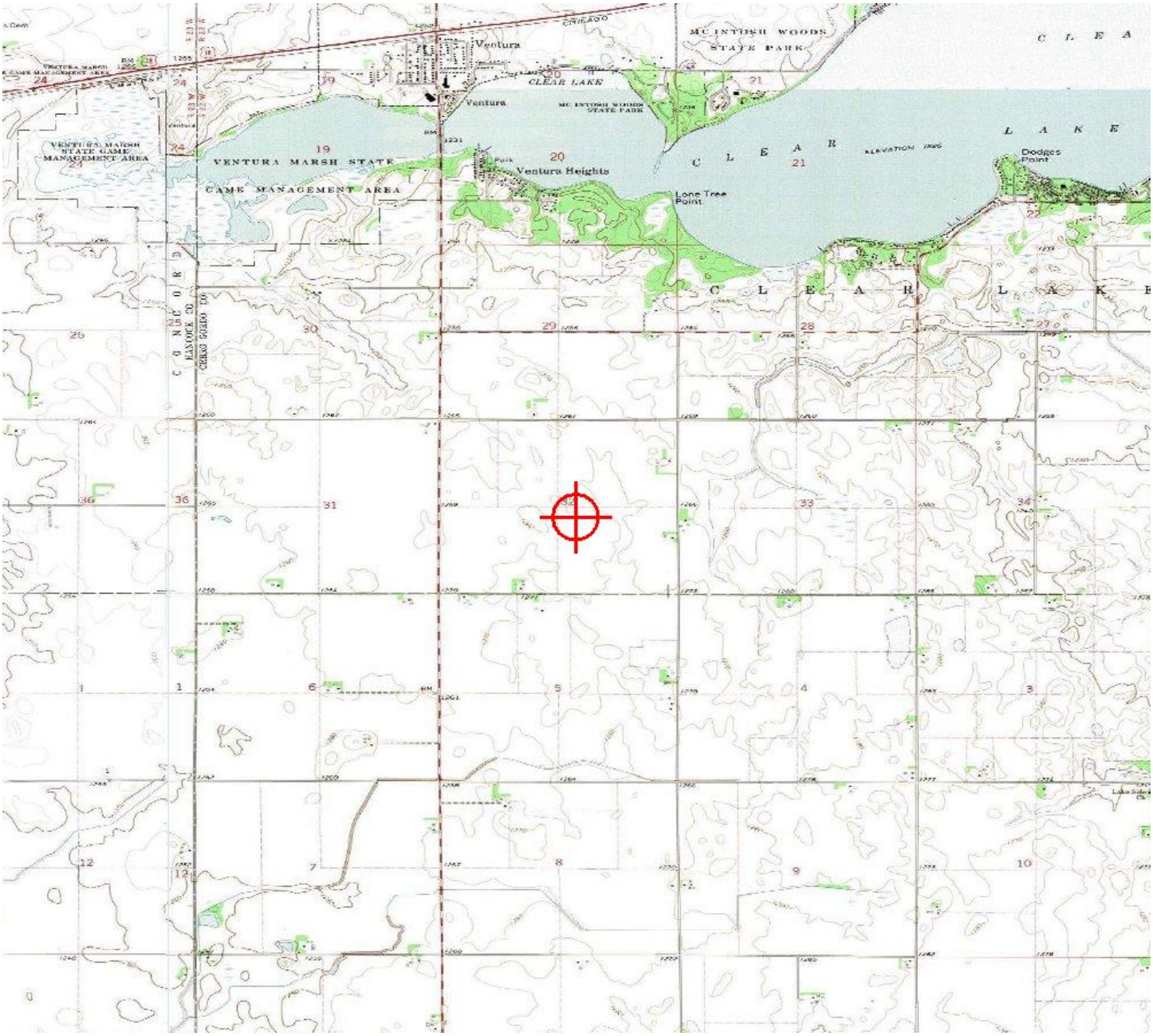
Frequency Data for ASN 2019-WTE-3766-OE

LOW FREQUENCY	HIGH FREQUENCY	FREQUENCY UNIT	ERP	ERP UNIT
450	470	MHz	350	W

Verified Map for ASN 2019-WTE-3766-OE



TOPO Map for ASN 2019-WTE-3766-OE



UNITED STATES DEPARTMENT OF COMMERCE
National Telecommunications and Information Administration
Washington, D.C. 20230

Mr. Daniel C. Labate
Wind Energy Analyst
WindLogics
700 Universe Blvd.
Juno Beach, FL 33408

Re: Cerro Gordo Project: Cerro Gordo County, IA

Dear Mr. Labate:

In response to your request on October 18, 2018, the National Telecommunications and Information Administration provided to the federal agencies represented in the Interdepartment Radio Advisory Committee (IRAC) the plans for the Cerro Gordo Wind Project, located in Cerro Gordo County, Iowa.

After a 45+ day period of review, no agencies had issues with turbine placement in this area.

While the IRAC agencies did not identify any concerns regarding radio frequency blockage, this does not eliminate the need for the wind energy facilities to meet any other requirements specified by law related to these agencies. For example, this review by the IRAC does not eliminate any need that may exist to coordinate with the Federal Aviation Administration concerning flight obstruction.

Thank you for the opportunity to review this proposal.

Sincerely,

John R. McFall

Digitally signed by John R. McFall
Date: 2018.12.11 09:44:48 -05'00'

John R. McFall
Deputy Chief, Spectrum Services Division
Office of Spectrum Management

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

Aeronautical Study No.
2019-WTE-7256-OE
Prior Study No.
2019-WTE-3766-OE

Issued Date: 08/14/2019

Jeffrey Bryce
Cerro Gordo Wind Project
700 Universe Blvd.
Juno Beach, FL 33408

**** 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:	Met Tower (w/WT Farm) WCG1-SM01
Location:	Ventura, IA
Latitude:	43-02-55.15N NAD 83
Longitude:	93-28-07.01W
Heights:	1270 feet site elevation (SE) 292 feet above ground level (AGL) 1562 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:

As a condition to this Determination, the structure is to be marked/lighted in accordance with FAA Advisory circular 70/7460-1 L Change 2, Obstruction Marking and Lighting, a med-dual system - Chapters 4,8(M-Dual),&12.

Any failure or malfunction that lasts more than thirty (30) minutes and affects a top light or flashing obstruction light, regardless of its position, should be reported immediately to (877) 487-6867 so a Notice to Airmen (NOTAM) can be issued. As soon as the normal operation is restored, notify the same number.

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)

See attachment for additional condition(s) or information.
This determination expires on 02/14/2021 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.

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 and heights. This determination is valid for coordinates within one (1) second latitude/longitude and up to the approved AMSL height listed above (provided the AGL height does not exceed 499 feet). If a certified 1A or 2C accuracy survey was required to mitigate an adverse effect, any change in coordinates or increase in height will require a new certified accuracy survey and may require a new aeronautical study.

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.

Additional wind turbines or met towers proposed in the future may cause a cumulative effect on the national airspace system. All information from submission of Supplemental Notice (7460-2 Part 2) will be considered the final data (including heights) for this structure. Any future construction or alteration, including but not limited to changes in heights, requires separate notice to the FAA.

Obstruction marking and lighting recommendations for wind turbine farms are based on the scheme for the entire project. ANY change to the height, location or number of turbines within this project will require a reanalysis of the marking and lighting recommendation for the entire project. In particular, the removal of previously planned or built turbines/turbine locations from the project will often result in a change in the marking/lighting recommendation for other turbines within the project. It is the proponent's responsibility to contact the FAA to discuss the process for developing a revised obstruction marking and lighting plan should this occur.

In order to ensure proper conspicuity of turbines at night during construction, all turbines should be lit with temporary lighting once they reach a height of 200 feet or greater until such time the permanent lighting configuration is turned on. As the height of the structure continues to increase, the temporary lighting should be relocated to the uppermost part of the structure. The temporary lighting may be turned off for periods when they would interfere with construction personnel. If practical, permanent obstruction lights should be installed and operated at each level as construction progresses. An FAA Type L-810 steady red light fixture shall be used to light the structure during the construction phase. If power is not available, turbines shall be lit with self-contained, solar powered LED steady red light fixture that meets the photometric requirements of an FAA Type L-810 lighting system. The lights should be positioned to ensure that a pilot has an unobstructed view of at least one light at each level. The use of a NOTAM (D) to not light turbines within a project until the entire project has been completed is prohibited.

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 (424) 405-7644, or tracy.rosgen@faa.gov. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2019-WTE-7256-OE.

Signature Control No: 413649064-414425127 (DNE -WT)
Tracy Rosgen
Technician

Attachment(s)
Additional Information
Frequency Data
Map(s)

Note: As a condition to this Determination, the structure should be lighted with red obstruction lights and marked as noted below.

High-Visibility Sleeves.

It is recommended that several high-visibility sleeves be installed on the MET's outer guy wires. One high visibility sleeve should be installed on each guy wire, as close to the anchor point as possible, but at a height well above the crop or vegetation canopy. A second sleeve should be installed on the same outer guy wires midway between the location of the lower sleeve and the upper attachment point of the guy wire to the MET. The use of sleeves should not impact the placement of spherical marker balls.

Spherical Markers.

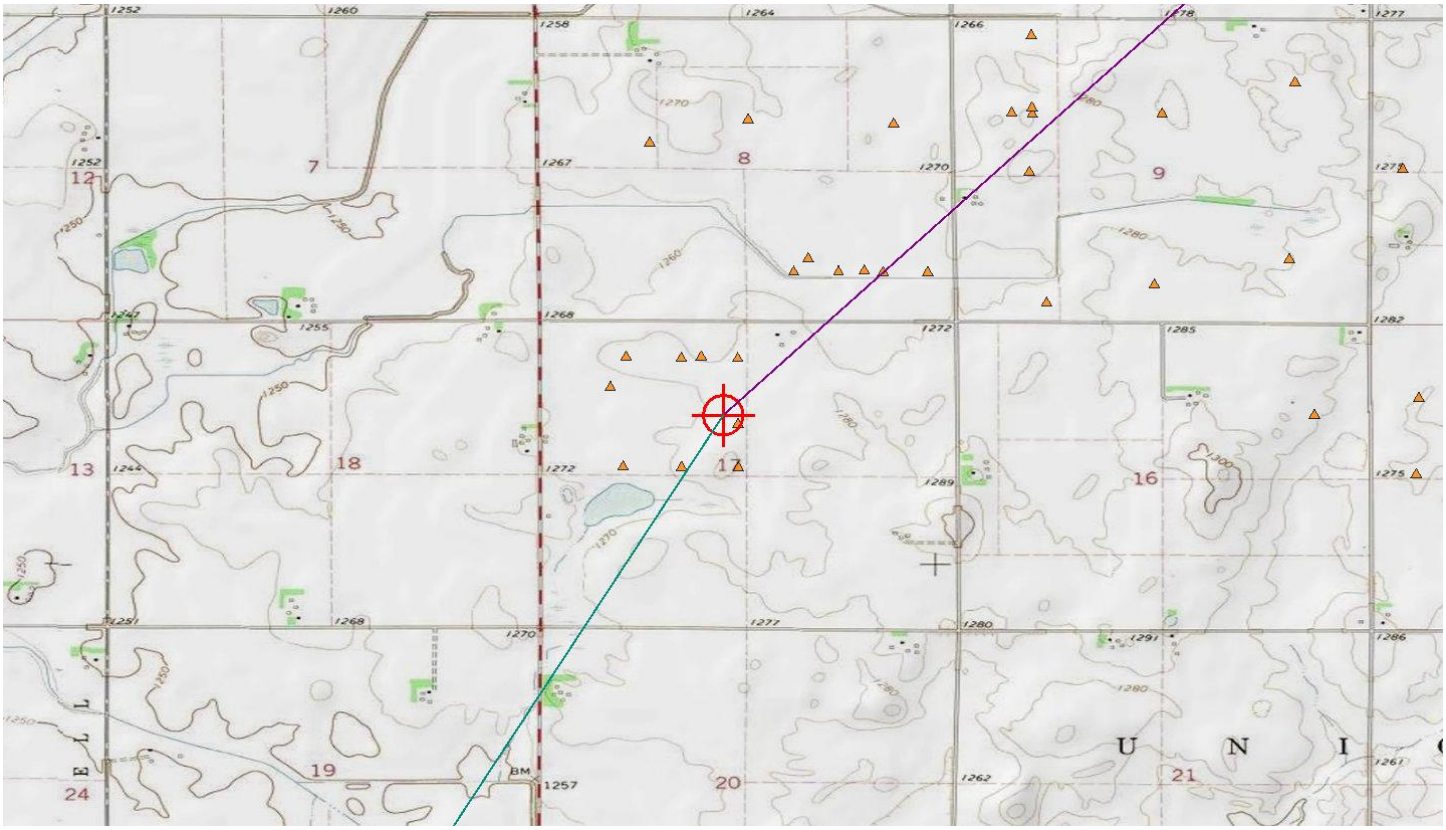
It is also recommended that high-visibility aviation orange spherical marker (or cable) balls be attached to the guy wires. The FAA recommends a total of 8 high visibilities spherical marker (or cable balls) of aviation orange color attached to the guy wires; 4 marker balls should be attached to guy wires at the top of the tower no further than 15 feet from the top wire connection to the tower, and 4 marker balls at or below the mid-point of the structure on the outer guy wires.

The FAA recognizes that various weather conditions and manufacturing placement standards may affect the placement and use of high-visibility sleeves and/or spherical markers. Thus, some flexibility is allowed when determining sleeve length and marker placement on METs.

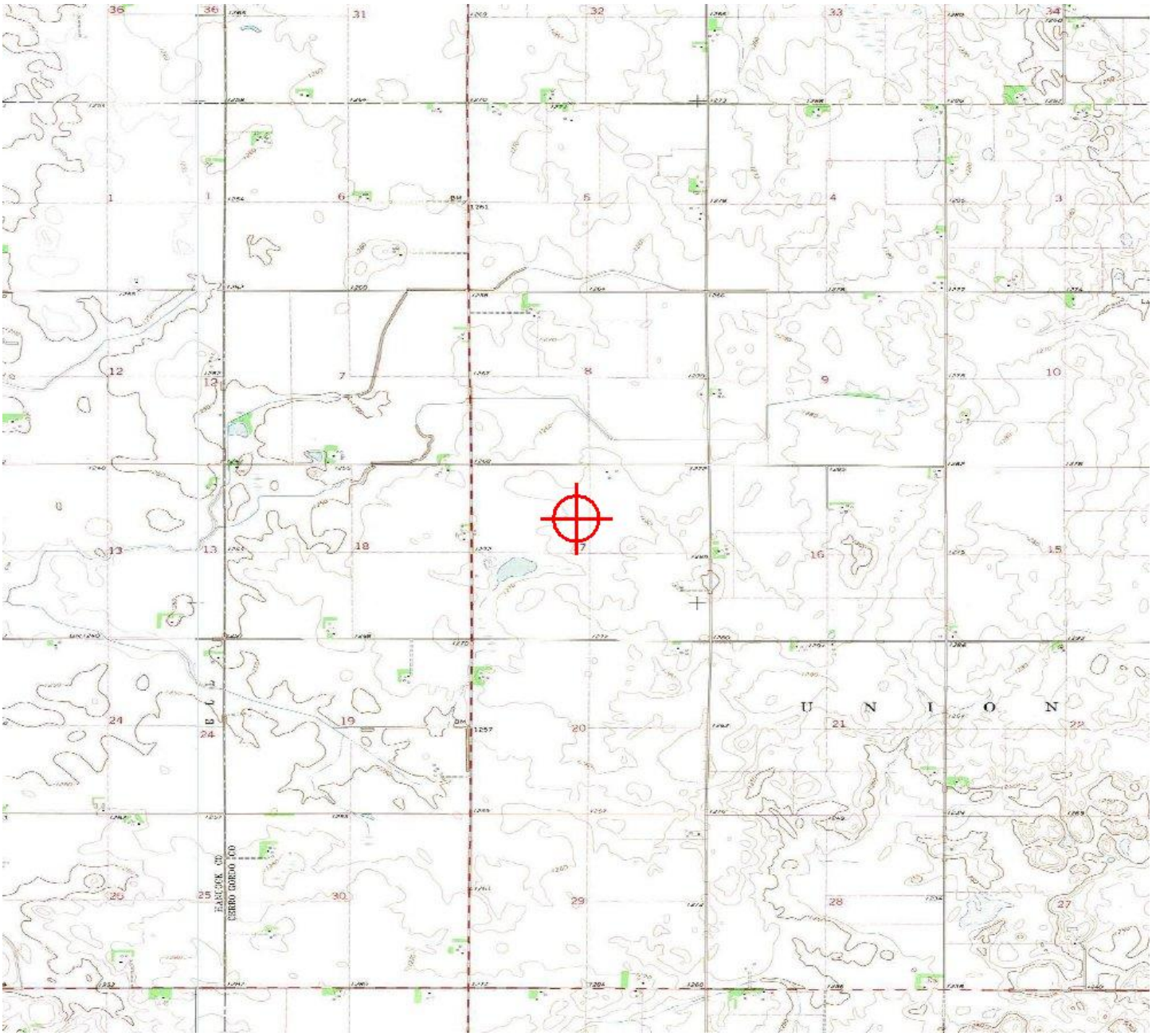
Frequency Data for ASN 2019-WTE-7256-OE

LOW FREQUENCY	HIGH FREQUENCY	FREQUENCY UNIT	ERP	ERP UNIT
450	470	MHz	350	W

Verified Map for ASN 2019-WTE-7256-OE



TOPO Map for ASN 2019-WTE-7256-OE



Acoustic Assessment for the Cerro Gordo Wind Energy Repowering Project

Prepared for

Hawkeye Power Partners, LLC

Prepared by

160 Federal Street, 3rd Floor

Boston MA 02110

July 2019

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Acronyms and Abbreviations

µPa	micropascal
σ_P	standard deviation for product variation
σ_R	standard deviation for test reproducibility
σ_T	total standard deviation
ft	foot
GE	General Electric
Hz	Hertz
IEC	International Electrotechnical Commission
ISO	International Organization for Standardization
kHz	kilohertz
L_{eq}	equivalent sound level
Lp	sound pressure level
Lw	sound power level
m	meter
m/s	meters per second
MW	megawatt
NSR	noise-sensitive receptors
pW	picowatt
the Project	Cerro Gordo Wind Repower Project
USGS	U.S. Geological Survey
UTM	Universal Transverse Mercator

1.0 Introduction

Hawkeye Power Partners, LLC is currently planning to repower an existing wind energy facility in Cerro Gordo County, Iowa. The existing wind energy facility was constructed approximately 20 years ago, and the new Project, referred to as the Cerro Gordo Wind Repower Project, will seek to decommission the old turbines and replace them with 15 new larger turbines to create approximately 40 megawatts of energy. The 15 new wind turbines will consist of a combination of General Electric (GE) 2.82-127 wind turbines with a rotor diameter of 417 feet (127 meters) and a hub height of 292 feet (89 meters) and GE 2.3-116 wind turbines with a rotor diameter of 381 feet (116 meters) and hub height of 262 feet (80 meters).

While only 15 WTGs will be constructed the project includes eight (8) alternate turbine locations. Typically, all 23 turbines would be conservatively included in the analysis. However, four of the eight alternate locations are located adjacent to other turbines and including all of the locations does not present a realistic scenario. Therefore, the project was evaluated as two layout scenarios, each with 19 turbines (15 primary turbines and 4 alternate locations).

The Project will also include modifications to the existing substation. These modifications will include a 50 MVA transformer with a noise guarantee of 75 dBA and a control enclosure that will use 2 air conditioning units that perform at a 70 dBA level at 5 feet. There will also be a 1,000 kVA, 34.5/19/2 kV-480 V grounding transformer that was considered acoustically insignificant.

This acoustic assessment includes a modeling analysis to predict future sound levels when the repowered wind turbines are operational at maximum turbine rotation and simultaneous operations of the substation. Operational sound levels resulting from the Project were analyzed at existing noise-sensitive receptors (NSRs; e.g., residential structures).

1.1 Study Area

The existing Cerro Gordo Wind Energy Project is in Cerro Gordo County, Iowa. County and township (section line) roads characterize the existing roadway system and the Study Area is accessible via Balsam Avenue, 210th Street, and 235th Street as well as other local two-lane paved and gravel county roads. The land within the Study Area is primarily agricultural with scattered residences. The turbines are located on privately-owned land in western Cerro Gordo County. This region of Iowa has topography that can be described as level plains. Gentle slopes and flat areas characterize most of the Study Area. Current land use within the Study Area is primarily agricultural and residential.

1.2 Existing Acoustic Environment

Cerro Gordo County would generally be considered a rural agricultural area. Existing ambient sound levels are expected to be relatively low, although sound levels would be higher near roadways such as Balsam Avenue, 210th Street, and 235th Street. Other human activity such as agricultural operations would seasonally contribute to sound levels in the area associated with crop harvests. Background

sound levels are expected to vary both spatially and temporally depending on natural sounds and proximity to area sound sources such as roadways. Typically, background sound levels are quieter during the night than during the daytime, except during periods when evening and nighttime insect noise may contribute to the soundscape, predominantly in the warmer seasons.

1.3 Acoustic Terminology

Airborne sound is described as the rapid fluctuation or oscillation of air pressure above and below atmospheric pressure, creating a sound wave. Sound is characterized by properties of the sound waves, which are frequency, wavelength, period, amplitude, and velocity. Noise is defined as unwanted sound. A sound source is defined by a sound power level (L_w), which is independent of any external factors. The acoustic sound power is the rate at which acoustical energy is radiated outward and is expressed in units of watts. Sound energy travels in the form of a wave, a rapid fluctuation or oscillation of air pressure above and below atmospheric pressure. A sound pressure level (Lp) is a measure of this fluctuation and can be directly determined with a microphone or calculated from information about the source sound power level and the surrounding environment through predictive acoustic modeling. While the sound power of a source is strictly a function of the total amount of acoustic energy being radiated by the source, the sound pressure levels produced by a source are a function of the distance from the source and the effective radiating area or physical size of the source. In general, the magnitude of a source's sound power level is always considerably higher than the observed sound pressure level near a source since the acoustic energy is being radiated in various directions.

Sound levels are presented on a logarithmic scale to account for the large pressure response range of the human ear and are expressed in units of decibels (dB). A dB is defined as the ratio between a measured value and a reference value usually corresponding to the lower threshold of human hearing defined as 20 micropascals (µPa). Conversely, sound power is commonly referenced to 1 picowatt (pW), which is one trillionth of a watt. Broadband sound includes sound energy summed across the frequency spectrum. In addition to broadband sound pressure levels, analysis of the various frequency components of the sound spectrum is often completed to determine tonal characteristics. The unit of frequency is Hertz (Hz), which corresponds to the rate in cycles per second that sound pressure waves are generated. Typically, a sound frequency analysis examines 11 octave bands (or 33 1/3 octave) ranging from 20 Hz (low) to 20,000 Hz (high). This range encompasses the entire human audible frequency range. Since the human ear does not perceive every frequency with equal loudness, spectrally varying sounds are often adjusted with a weighting filter. The A-weighted filter is applied to compensate for the frequency response of the human auditory system. Sound exposure in acoustic assessments is commonly measured and calculated as A-weighted dB (dBA). Unweighted sound levels are referred to as linear. Linear dB (dBL) are used to determine a sound's tonality and to engineer solutions to reduce or control noise as techniques are different for low and high frequency noise.

Sound can be measured, modeled, and presented in various formats, with the most common metric being the equivalent sound level (L_{eq}). The equivalent sound level has been shown to provide both

an effective and uniform method for comparing time-varying sound levels and is widely used in acoustic assessments. Estimates of noise sources and outdoor acoustic environments, and the comparison of relative loudness are presented in Table 1. Table 2 provides additional reference information on acoustic terminology.

Table 1. Sound Pressure Levels (Lp) and Relative Loudness of Typical Noise Sources and Soundscapes

Noise Source or Activity	Sound Level (dBA)	Subjective Impression	Relative Loudness (perception of different sound levels)
Jet aircraft takeoff from carrier (50 ft.)	140	Threshold of pain	64 times as loud
50-hp siren (100 ft.)	130		32 times as loud
Loud rock concert near stage or Jet takeoff (200 ft.)	120	Uncomfortably loud	16 times as loud
Float plane takeoff (100 ft.)	110		8 times as loud
Jet takeoff (2,000 ft.)	100	Very loud	4 times as loud
Heavy truck or motorcycle (25 ft.)	90		2 times as loud
Garbage disposal, food blender (2 ft.), or Pneumatic drill (50 ft.)	80	Loud	Reference loudness
Vacuum cleaner (10 ft.)	70	Moderate	1/2 as loud
Passenger car at 65 mph (25 ft.)	65		
Large store air-conditioning unit (20 ft.)	60		1/4 as loud
Light auto traffic (100 ft.)	50	Quiet	1/8 as loud
Quiet rural residential area with no activity	45		
Bedroom or quiet living room or Bird calls	40	Faint	1/16 as loud
Typical wilderness area	35		
Quiet library, soft whisper (15 ft.)	30	Very quiet	1/32 as loud
Wilderness with no wind or animal activity	25	Extremely quiet	
High-quality recording studio	20		1/64 as loud
Acoustic test chamber	10	Just audible	
	0	Threshold of hearing	
Note: Adapted from: Beranek 1988; EPA 1971			

Table 2. Acoustic Terms and Definitions

Term	Definition
Noise	Typically defined as unwanted sound. This word adds the subjective response of humans to the physical phenomenon of sound. It is commonly used when negative effects on people are known to occur.

Table 2. Acoustic Terms and Definitions

Term	Definition
Sound Pressure Level (L_P)	Pressure fluctuations in a medium. Sound pressure is measured in decibels referenced to 20 microPascals, the approximate threshold of human perception to sound at 1,000 Hz.
Sound Power Level (L_W)	The total acoustic power of a noise source measured in decibels referenced to picowatts (one trillionth of a watt). Noise specifications are provided by equipment manufacturers as sound power as it is independent of the environment in which it is located. A sound level meter does not directly measure sound power.
A-Weighted Decibel (dBA)	Environmental sound is typically composed of acoustic energy across all frequencies. To compensate for the auditory frequency response of the human ear, an A-weighting filter is commonly used for describing environmental sound levels. Sound levels that are A-weighted are presented as dBA in this report.
Unweighted Decibels (dBL)	Unweighted sound levels are referred to as linear. Linear decibels are used to determine a sound's tonality and to engineer solutions to reduce or control noise as techniques are different for low and high frequency noise. Sound levels that are linear are presented as dBL in this report
Propagation and Attenuation	Propagation is the decrease in amplitude of an acoustic signal due to geometric spreading losses with increased distance from the source. Additional sound attenuation factors include air absorption, terrain effects, sound interaction with the ground, diffraction of sound around objects and topographical features, foliage, and meteorological conditions including wind velocity, temperature, humidity, and atmospheric conditions.
Octave Bands	The audible range of humans spans from 20 to 20,000 Hz and is typically divided into center frequencies ranging from 31 to 8,000 Hz for noise modeling evaluations.
Broadband Sound	Noise which covers a wide range of frequencies within the audible spectrum, i.e., 200 to 2,000 Hz.
Masking	Interference in the perception of one sound by the presence of another sound. At elevated wind speeds, leaf rustle and noise made by the wind itself can mask wind turbine sound levels, which remain relatively constant.
Frequency (Hz)	The rate of oscillation of a sound, measured in units of Hz or kilohertz (kHz). One hundred Hz is a rate of one hundred times (or cycles) per second. The frequency of a sound is the property perceived as pitch: a low-frequency sound (such as a bass note) oscillates at a relatively slow rate, and a high-frequency sound (such as a treble note) oscillates at a relatively high rate. For comparative purposes, the lowest note on a full range piano is approximately 32 Hz and middle C is 261 Hz.
Note: Compiled by Tetra Tech from multiple technical and engineering resources.	

2.0 Noise Regulations and Guidelines

A review was conducted of noise regulations applicable to the Project at the federal, state, county, and local levels. The results of that review showed that there are specific noise regulations to wind energy at a county level, but no federal or state environmental noise requirements with numerical decibel limits specific to this Project.

Cerro Gordo County regulates noise associated with wind energy systems in the Cerro Gordo County Ordinance No. 15, 6.27(E)(4). The ordinance specifies a noise limit of 60 dBA measured at the closest neighboring inhabited dwelling. This level may be exceeded during short-term events such as utility outages and/or periods of high winds.

3.0 Acoustic Modeling Methodology and Results

The primary noise sources during operations of the substation are the transformer and HVAC units. Reference sound power levels input to CadnaA were provided by equipment manufacturers, based on information contained in reference documents, or developed using empirical methods.

There are two principal sound sources from an operating wind turbine: mechanical and aerodynamic sound. Mechanical sound is generated at the gearbox, generator, and cooling fan and is radiated from the surfaces of the nacelle and machinery enclosure and by openings in the nacelle casing. Aside from upset conditions that may result in abnormal mechanical noise emissions, the dominant noise generating component of utility scale wind turbines is aerodynamic.

Aerodynamic sound is related to air flow and the interaction with the tower structure and rotor blades when in motion and is the largest component of acoustic emissions for modern wind turbines. Sound originates from the flow of air around the air foils which is very strongly influenced by the tip speed of the blades. Tip speed is the speed of the tip of a rotor blade as it travels along the circumference of the rotor-swept area. The tip speed is directly related to the rotor size, which is fixed, and to the rotor rotational speed. The tip speed ratio is defined as the ratio of the speed of the tip of a rotating blade to the speed of the wind. Aerodynamic noise will vary primarily as a function of rotor rotational speed.

Air flow occurring across the blade produces turbulence at the surface boundary layer, which results in trailing edge boundary sound. Trailing edge sound is considered the principal aerodynamic noise source component of wind turbines. In addition to trailing edge, tip sound is created by vortex shedding as the blade tips pass through the air when in motion. Wind turbine manufacturers have instituted several measures to both reduce aerodynamic sound and increase power generation efficiency by reducing trailing edge and tip sound generation.

Efforts to reduce aerodynamic sounds have included the use of upwind rotor designs, noise-reduced nacelle, variable speed operation resulting in lower tip speed ratios, and the use of specially modified rotor blades designed and fabricated to reduce trailing edge noise. Earlier wind turbine designs had the blades located downwind of the support structure. As the blades passed through the vortex shed behind the support tower, the blade would be momentarily displaced, resulting in a pressure pulse. This becomes the mechanism for the generation of excessive acoustic modulation and low frequency sound. The downwind rotor design is rarely used in modern utility-scale wind turbines that employ the now-standard upwind rotor design with blades upstream of the tower structure. This change in rotor location has greatly reduced many issues associated with the downwind design and resulted in

a decrease of 10 dB or greater, which corresponds to a perceived decrease in loudness by a factor of two.

It is important to recognize as wind speeds increase, the background ambient sound level will generally increase as well, resulting in acoustic masking effects; however, this trend is also affected by local contributing sound sources. The net result is that during periods of elevated wind speeds when higher wind turbine sound emissions occur, the sound produced from a wind turbine operating at maximum rotational speed may be largely or fully masked due to wind generated sound in foliage or vegetation. In practical terms, this means a nearby receptor would tend to hear leaves or vegetation rustling rather than wind turbine noise. This relationship is expected to further minimize the potential for any adverse noise effects of the Project. Conversely, these acoustic masking effects may be limited during periods of unusually high wind shear or at receiver locations that are sheltered from the prevailing wind direction.

3.1 Acoustic Modeling Software and Calculation Methods

To assess the noise emissions of a wind energy facility, it is necessary to have prediction models with which a noise emission source level measured at a given reference point can be certified. A generally accepted approach for modeling a wind turbine as an idealized point source is described in International Organization for Standardization (ISO) 9613-2, "Attenuation of Sound during Propagation Outdoors". The standard specifies methods to enable noise levels in the community to be predicted from sources of known sound emission and provides a summary of existing knowledge on outdoor sound propagation as published by ISO, a worldwide federation of national standards bodies. The calculation methodologies described are relied on by professionals in the field of acoustics.

Standard acoustic engineering methods that conform to ISO 9613-2 were used in this noise analysis using DataKustic GmbH's CadnaA, the computer-aided noise abatement program (version 2018 MR1). The engineering methods specified in this standard consist of full (1/1) octave band algorithms that incorporate geometric spreading due to wave divergence, reflection from surfaces, atmospheric absorption, screening by topography and obstacles, ground effects, source directivity, heights of both sources and receptors, seasonal foliage effects, and meteorological conditions. For compliance assessment purposes, operational broadband sound pressure levels were calculated assuming that all wind turbines are operating continuously and concurrently at the maximum manufacturer-rated sound level. The sound energy was then summed to determine the equivalent continuous A-weighted downwind sound pressure level at a given point of reception.

The effects of topography were incorporated into the noise prediction model using ground contour data from the official U.S. Geological Survey (USGS) digital elevation dataset to accurately represent terrain in three dimensions. Terrain conditions, vegetation type, ground cover, and the density and height of foliage can also influence the absorption that takes place when sound waves travel over land. The ISO 9613-2 standard accounts for ground absorption rates by assigning a numerical coefficient of G=0 for acoustically hard, reflective surfaces and G=1 for absorptive surfaces and soft ground. If the ground is hard-packed dirt, typically found in industrial complexes, pavement, bare

rock or for sound traveling over water, the absorption coefficient is defined as G=0 to account for reduced sound attenuation and higher reflectivity. In contrast, ground covered in vegetation, including suburban lawns, livestock and agricultural fields (both fallow with bare soil and planted with crops), will be acoustically absorptive and aid in sound attenuation (i.e., G=1.0). For the purposes of this modeling analysis, a semi-reflective ground absorption factor of 0.5 was applied throughout the Project area. In addition to geometrical divergence, attenuation factors include topographical features, terrain coverage, and/or other natural or anthropogenic obstacles that can affect sound attenuation and result in acoustical screening. To be conservative, sound attenuation through foliage and diffraction around and over existing anthropogenic structures such as buildings was not included in the model. Sound attenuation by the atmosphere is not strongly dependent on temperature and humidity; however, a temperature of 10°C (50°F) and 70 percent relative humidity parameters were selected as reasonably representative of conditions favorable to sound propagation.

Since it is not possible to account for all factors that affect sound propagation and attenuation, acoustic modeling followed the methodologies as described in the ISO 9613-2 standard, which have been accepted as reasonably conservative, to serve as regulatory worst case. Inherent to the ISO 9613-2 standard is the assumption of downwind sound propagation conditions. That is, the wind turbine sound power levels and modeling methods are representative of when the wind is blowing from the wind turbine to the receptor. In fact, the ISO 9613-2 modeling method unrealistically assumes that downwind conditions exist in all directions, between each wind turbine and each receptor simultaneously, even though this is physically impossible. Therefore, lower levels are expected in the upwind direction. In addition, the acoustic modeling algorithms essentially assume laminar atmospheric conditions, in which neighboring layers of air do not mix. This conservative assumption does not take into consideration turbulent eddies and micrometeorological variations that may form when winds change speed or direction, which can interfere with the sound wave propagation path and increase attenuation effects.

3.2 Acoustic Modeling Input Parameters

The operational acoustic assessment was performed using the existing layout with 19 potential wind turbine locations and with the addition of the transformer and HVAC units at the substation. The following equipment was evaluated in this analysis:

- **GE 2.82-127 Wind Turbine** – Wind turbine with a rotor diameter of 417 feet (127 meters) and a hub height of 292 feet (89 meters); and
- **GE 2.3-116 Wind Turbine** – Wind turbine a rotor diameter of 381 feet (116 meters) and hub height of 262 feet (80 meters).
- **Hyundai Electric 50 MVA Transformer –** This transformer will be the main transformer at the substation. It has a noise guarantee of 75 dBA.
- **Marvair Outdoor ComPac I/II Air Conditioner –** These units will be used with the control enclosure. They are rated for 70 dBA at 5 feet.

For the purposes of the acoustic modeling analysis all wind turbine positions were conservatively modeled as GE 2.82-127 wind turbine models. The manufacturer sound specification used to characterize the wind turbine sound power characteristics was that provided for the 2.82-127-60 Hz wind turbine model.

To assist project developers and acoustical engineers, wind turbine manufacturers report wind turbine sound power data at integer wind speeds referenced to the effective hub height, ranging from cut-in to full rated power. This accepted International Electrotechnical Commission (IEC) technical specification (TS) standard was developed to ensure consistent and comparable sound emission data of utility-scale wind turbines between manufacturers. The IEC test is an accepted standard providing a uniform methodology for measuring the noise emissions of a wind turbine from cut-in through full rotational wind speeds. The IEC testing standard defines deviation values σ_T, σ_R and σ_P for measured apparent sound power levels as described by IEC/TS 61400-14, where σ_T is the total standard deviation, σ_R is the standard deviation for test reproducibility, and σ_P is the standard deviation for product variation. To account for this inherent deviation associated with the IEC testing methodology, a confidence interval of k = 2 dBA was applied. The combination of the modeling parameters used and the inclusion of the 2-dBA term are expected to result in a reasonable and conservative assessment of Project sound levels since it is unlikely that all wind turbines would be operating concurrently 2 dB above the mean.

Table 3 provides a summary of the sound power data correlated by wind speed at reference rotor hub height assuming a roughness length coefficient of 0.05 meters. The roughness length describes the change in wind speed at increased elevation and may vary based on site specific terrain conditions. It is assumed that the wind turbine models for the Project will have similar sound power profiles as those used in the acoustic modeling analysis; however, it is possible that the final manufacturer warranty values may vary slightly. A summary of sound power data for the GE 2.82-127 – 60 Hz by octave band center frequency during maximum rotational speed is presented in Table 4.

Table 3. GE 2.82-127 – 60 Hz Wind Turbine Broadband Sound Power Levels Correlated with Wind Speed

Hub Height (m)	Sound Power Level (dBA) at Reference Hub Height Wind Speed (m/s)						
	4	5	6	7	8	9	10
89	96.7	96.9	100.4	103.9	106.8	109.2	110.0
Source: General Electric 2018.							

Wind turbines can be somewhat directional, radiating more sound in some directions than others. The IEC test measurement protocol requires that sound measurements are made for the maximum downwind directional location when reporting apparent sound power levels. Thus, it is assumed that wind turbine directivity and sound generating efficiencies are inherently incorporated in the sound source data and used in acoustic model development. A summary of sound power data by octave band center frequency for both wind turbines operating at maximum rotation are presented in Table

4 (1/1 octave band frequency data provided with stated intended use limited for informational purposes only).

Table 4. GE 2.82-127 – 60 Hz Wind Turbine Broadband Sound Power Level by Octave Band Frequency (10 m/s)

K-factor	Octave Band Sound Power Level (dBA) by Frequency (Hz)								Broad band (dBA)
	63	125	250	500	1000	2000	4000	8000	
2	92.6	98.0	100.6	104.2	105.5	102.1	94.1	76.0	110.0
Source: General Electric 2018.									

3.3 Acoustic Modeling Results

Acoustic modeling was completed for simultaneous substation operations with wind turbine operation during maximum rotation for two scenario layouts. Each scenario incorporated a total of 15 turbines and 4 alternatives. A sound contour plot displaying turbine locations, receptor locations, and Project operational sound levels in color-coded isopleths for both scenarios are provided in Figures 1 and 2 in Attachment A. The sound contours are graphical representations of the cumulative noise associated with all Project wind turbines operating concurrently at the given operating condition and show how operational noise would be distributed over the surrounding area. The contour lines presented are analogous to elevation contours on a topographic map, i.e., the sound contours are continuous lines of equal noise level. Figures 1 and 2 displays broadband operational sound levels at wind speeds sufficient to sustain wind turbine operation at maximum rotational speeds during moderate downwind propagation. The resultant sound contour plot is independent of the existing acoustic environment, i.e., the plot and tabulated results represent Project-generated sound levels only.

Table 5 summarizes the predicted sound level impacts statistics across all 39 NSRs. Appendix B presents the results of the Project acoustic modeling analysis and includes the NSR ID, Universal Transverse Mercator (UTM) coordinates, and the received sound levels at each NSR. Received sound levels are rounded to the nearest whole decimal.

Table 5. Acoustic Modeling Results Summary

Received Sound Level Ranges	Number of Modeled NSRs	
	Layout Scenario 1	Layout Scenario 2
Total	**39**	**39**
< 35 dBA	0	0
≥ 35 & < 40 dBA	11	9
≥ 40 & < 45 dBA	15	17
≥ 45 & < 50 dBA	7	8
≥50 & < 55 dBA	6	5
≥ 55 & < 60 dBA	0	0

Table 5. Acoustic Modeling Results Summary

Received Sound Level Ranges	Number of Modeled NSRs	
	Layout Scenario 1	**Layout Scenario 2**
Total	**39**	**39**
≥ 60 dBA	0	0

4.0 Conclusion

Project operational sound has been calculated for maximum rotational conditions. Acoustic modeling analyses per ISO 9613-2 was inclusive of a number of conservative assumptions. It is expected that received sound levels at noise-sensitive receptors will be compliant with the 60 dBA prescribed in the Cerro Gordo Zoning Ordinance.

5.0 References

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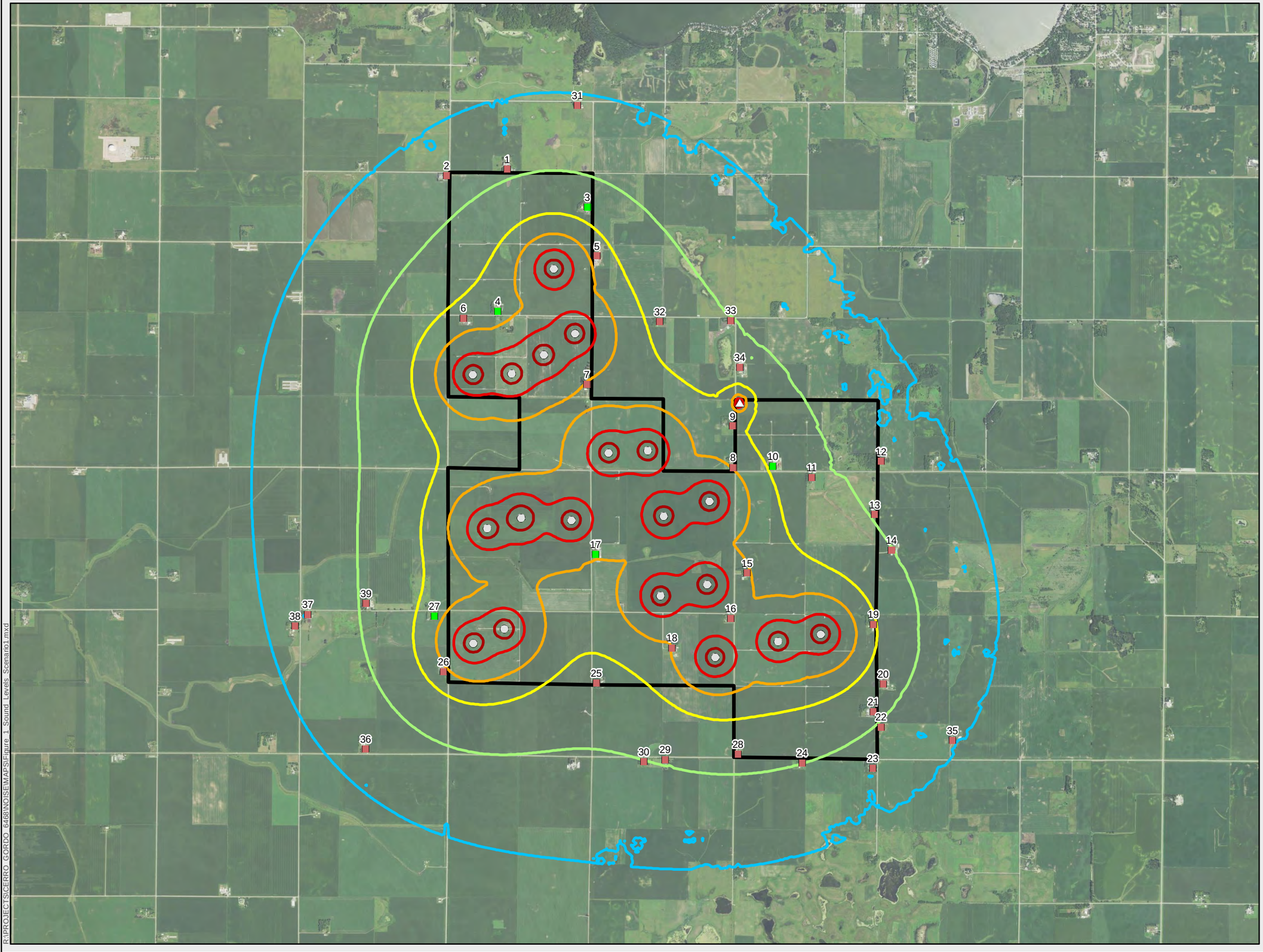
Appendix A. Figures

Cerro Gordo Wind Repower Project

Figure 1
Scenario 1
Received Sound Levels

Cerro Gordo County, Iowa



- Project Area
- Proposed Turbines
- Proposed Substation
- Participating Receptor
- Non-Participating Receptor

Sound Level Contour (dBA):

- 35
- 40
- 45
- 50
- 55
- 60

N

0 0.5 1

Miles

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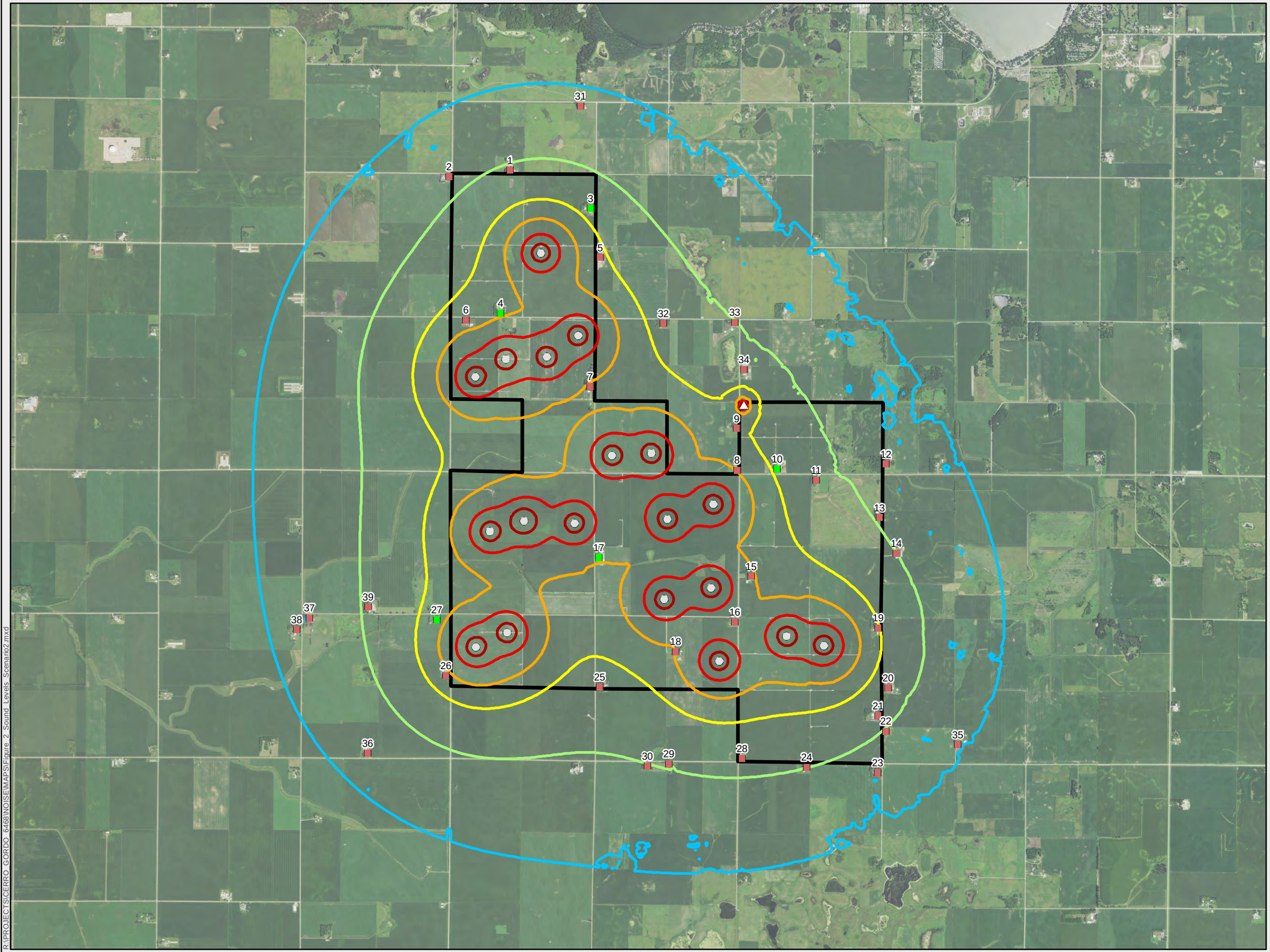
Cerro Gordo
Wind Repower Project

Figure 2
Scenario 2
Received Sound Levels

Cerro Gordo County, Iowa



- Project Area
- Proposed Turbines
- Proposed Substation
- Participating Receptor
- Non-Participating Receptor

Sound Level Contour (dBA):

- 35
- 40
- 45
- 50
- 55
- 60

N

0 0.5 1

Miles

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Appendix B. Detailed Summary of Acoustic Analysis Results

Appendix B. Detailed Summary of Acoustic Analysis Results				
Receptor ID	**UTM Easting (m)**	**UTM Northing (m)**	**Scenario 1 Received Sound at Maximum Rotation (dBA)**	**Scenario 2 Received Sound at Maximum Rotation (dBA)**
1	461781	4771796	39	41
2	461061	4771690	38	39
3	462663	4771360	43	44
4	461662	4770197	49	50
5	462771	4770754	49	47
6	461306	4770065	47	48
7	462675	4769378	50	50
8	464317	4768447	50	50
9	464310	4768911	46	46
10	464765	4768459	45	45
11	465200	4768332	42	42
12	465980	4768514	38	38
13	465910	4767915	40	40
14	466093	4767516	40	40
15	464472	4767260	51	51
16	464291	4766751	53	53
17	462771	4767472	51	51
18	463632	4766421	51	51
19	465890	4766680	46	46
20	466002	4766012	42	43
21	465848	4765738	41	42
22	465980	4765530	40	40
23	465885	4765068	38	38
24	465096	4765130	40	40
25	462784	4766026	44	44
26	461064	4766169	50	50
27	460932	4766761	49	49
28	464387	4765267	42	42
29	463555	4765164	41	41
30	463314	4765143	40	40
31	462567	4772514	36	36
32	463492	4770084	44	44
33	464290	4770098	40	40
34	464395	4769570	43	43
35	466779	4765380	36	36
36	460194	4765284	37	37
37	459540	4766795	37	37
38	459399	4766666	36	36
39	460197	4766920	41	41

Shadow Flicker Mitigation Plan

Hawkeye Power Partners, LLC will offer Shadow Flicker mitigation to homeowners within the project boundary that have a proven claim as a result of the proposed Project. Hawkeye Power Partners, LLC will provide a mitigation liaison as well as a menu of mitigation options to correct affected homeowners. Hawkeye Power Partners, LLC will handle each of these mitigation requests as a one-off basis in order to ensure each land owner individual needs are identified.

Cerro Gordo Wind Energy Repower Project

Shadow Flicker Analysis
Cerro Gordo County, Iowa

August 2019

Prepared for

Hawkeye Power Partners, LLC

Prepared by

160 Federal Street
Boston, MA 02110
617-443-7500

TABLE OF CONTENTS

TABLES

FIGURES

APPENDIX

ACRONYMS AND ABBREVIATIONS

Hz	Hertz
MW	megawatt
the Project	Cerro Gordo Wind Energy Center
UTM	Universal Transverse Mercator

1.0 OVERVIEW

Hawkeye Power Partners, LLC is currently planning to repower an existing wind energy facility in Cerro Gordo County, Iowa. The existing wind energy facility was constructed approximately 20 years ago, and the new Project, referred to as the Cerro Gordo Wind Repower Project, will seek to decommission the old turbines and replace them with 15 new larger wind turbine generators (WTGs) to create approximately 40 megawatts of energy. While only 15 WTGs will be constructed the project includes eight (8) alternate turbine locations. Typically, all 23 turbines would be conservatively included in the analysis. However, four of the eight alternate locations are located adjacent to other turbines and including all of the locations does not present a realistic scenario. Therefore, the project was evaluated as two layout scenarios, each with 19 turbines (15 primary turbines and 4 alternate locations). This shadow flicker assessment includes a modeling analysis to predict future shadow flicker impact when the repowered wind turbines are operational. Shadow flicker impact resulting from the Project were analyzed at existing receptors (e.g., residential structures).

2.0 PROJECT COMPONENTS

The Project will be based on two (2) General Electric (GE)2.3-116 WTGs and thirteen (13) GE2.8-127 WTGs. The GE 2.82-127 WTG model has a generating capacity of 2.82 megawatts (MW), a rotor diameter of 417 feet (127 meters), and a hub height of 292 feet (89 meters). The GE 2.3-116 WTG model has a generating capacity of 2.3 MW, a rotor diameter of 381 feet (116 meters), and a hub height of 262 feet (80 meters). The analysis evaluated each scenario of 19 WTG locations (including alternate locations). However, the Project will only install up to 15 WTGs and will therefore have less overall shadow flicker than what is presented in this analysis.

3.0 SHADOW FLICKER BACKGROUND

Shadow flicker is not regulated in applicable county, state or federal law, and there is no permitting threshold limiting the hours per year of anticipated shadow flicker to a receptor from a wind energy project. Due to the significant growth of the wind energy industry in recent years, some states have published model bylaws for local governments to adopt or modify at their own discretion which may include guidance and recommendations for shadow flicker levels and mitigation; no bylaw or ordinance has been adopted by Cerro Gordo County.

4.0 WINDPRO SHADOW FLICKER ANALYSIS

An analysis of potential shadow flicker from the Project was conducted using the WindPro software package. WindPro is a well-known, commercial software package commonly used in the planning, design, and analysis of wind energy projects. As described above, the Project will install up to 15 wind turbines. For this analysis, the eight alternate WTG locations were included for a total of 23 turbines.

The WindPro analysis was conducted to determine shadow flicker under realistic conditions (actual expected shadow). This analysis calculated the total amount of time (hours and minutes

per year) that shadow flicker could occur at receptors located within 2,000 meters of the Project turbines. The realistic shadow flicker condition scenario is based on the following:

- The elevation and position geometries of the wind turbines and surrounding receptors (potentially occupied residences). Elevations were determined using U.S. Geological Survey digital elevation model data. Positions geometries were determined using geographic information system and referenced to Universal Transverse Mercator (UTM) Zone 15 (NAD83).
- The position of the sun and the incident sunlight relative to the wind turbine and receptors on a minute-by-minute basis over the course of a year.
- Historical sunshine availability (percent of total hours available). Historical sunshine rates for the area (as summarized by the National Climatic Data Center [NOAA 2016] for nearby Des Moines, Iowa) used in this analysis are provided in Table 1. Des Moines, Iowa is approximately 90 miles south of the Project area.
- Estimated wind turbine operations and orientation based on wind data (wind speed and direction) measured at meteorological towers located on the Project site.
- Receptor viewpoints (i.e., house windows) are assumed to always be directly facing turbine-to-sun line of sight ("greenhouse mode") and do not account for trees or other obstructions which may block sunlight.

Table 1. Historical Sunshine Availability in Des Moines, Iowa

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
50%	54%	55%	55%	61%	69%	74%	70%	66%	59%	45%	43%

Source: NOAA 2016

Potential screening from trees, shrubs, barns, or other obstacles was conservatively not assumed to block shadows in the initial shadow flicker analysis. In reality, such factors can block shadows from falling on to windows of receptors. A second shadow flicker analysis was conducted for the worst case impact receptors that considers potential screening obstacles. Existing obstacles were defined by both aerial photos and field verification to define existing obstacle dimensions and properties. Deciduous trees were only assumed to be blocking structures during the leaf-on season (May through October). The obstacle information was input to WindPro to assess the potential mitigating effects the existing obstacles might have in reducing shadow flicker impacts at the worst case receptors.

WindPro incorporates terrain elevation contour information and the analysis accounts for terrain elevation differences. The sun's path with respect to each turbine location is calculated by the software to determine the cast shadow paths every minute over a full year. Sun angles less than 3 degrees above the horizon were excluded for the reasons identified earlier in Section 3. Since shadow flicker is only an issue when at least 20 percent of the sun disc is covered by the

blades, WindPro uses blade dimension data to calculate the maximum distance from the turbine where shadow flicker must be calculated. For the proposed 127-meter rotor diameter, WindPro calculates a shadow flicker distance of less than 1,800 meters. Beyond this distance, the turbine will not contribute to the shadow flicker. It should be noted however, that WindPro provides a conservative estimate of shadow flicker as obstacles such as trees, haze, and visual obstructions (window facing, coverings) are not accounted for despite the likelihood of their reducing or eliminating shadow flicker to receptors.

A total of 39 residential structures were identified within and near the Project Area as occupied or potentially occupied residences. The 39 residential structures are considered potential shadow flicker receptors for the purpose of this analysis. A receptor in the model is defined as a one-meter squared area (approximate size of a typical window), 1 meter (3.28 feet) above ground level. Approximate eye level is set at 1.5 meters (4.94 feet). Figures 1 and 2 show the locations of all 39 identified residential structures, along with the turbine locations for layout scenarios 1 and 2, respectively.

5.0 SHADOW FLICKER ANALYSIS RESULTS

Shadow flicker modeling was conducted using WindPro for two layout scenarios. Each scenario incorporated a total of 15 primary turbines and 4 alternatives. As expected, WindPro predicts that shadow flicker will be greatest at locations closest to the wind turbines. Shadow flicker contours plots displaying turbine locations, receptor locations and shadow flicker impact levels in color-coded isopleths are provided for both Layout Scenario 1 and Layout Scenario 2 in Figures 1 and 2, respectively.

Tables 2 and 3 present the WindPRO predicted top ten highest shadow flicker results at the identified receptors for Layout Scenario 1 and 2, respectively. Both tables also present the expected shadow flicker impact results for the scenario when existing obstacles are considered for the worst case receptors. Table 4 summarizes the predicted shadow flicker impact statistics across all 39 receptors. Appendix A presents the results of the Project shadow flicker modeling analysis and includes Receptor ID, Universal Transverse Mercator (UTM) coordinates, and the predicted shadow flicker for all 39 receptors.

For Layout Scenario 1, the maximum predicted shadow flicker at any occupied residence receptor is 41 hours and 14 minutes per year (Receptor ID 17). This is approximately 0.92 percent of the potential available daylight hours. Potential screening from obstacles was not included in this initial analysis. A second shadow flicker analysis was conducted for the top three worst case impact receptors that considered potential screening obstacles. After incorporating existing obstacles surrounding the three worst case receptors, the analysis showed that the potential screening effects of the existing obstacles could reduce shadow flicker for two of the three receptors (Receptor ID 16 and 17).

Table 2. WindPro Top Ten Expected Shadow Flicker Hours Results – Layout Scenario 1

Receptor ID	Participation Status	Expected Shadow Flicker Hours per Year [hr:min]
		No Obstacles (With Obstacles)
17	Pending	41:14 (34:07)
27	Participant	36:32 (36:32)
16	Non-participant	32:25 (24:24)
15	Non-participant	26:54
8	Non-participant	23:52
18	Non-participant	23:02
4	Participant	18:20
5	Non-participant	17:15
32	Non-participant	13:34
6	Non-participant	13:08

For Layout Scenario 2, the maximum predicted shadow flicker at any occupied residence receptor is 41 hours and 14 minutes per year (Receptor ID 17). This is approximately 0.92 percent of the potential available daylight hours. Potential screening from obstacles was not included in this initial analysis. A second shadow flicker analysis was conducted for the top three worst case impact receptors that considered potential screening obstacles. After incorporating existing obstacles surrounding these three worst case receptors, the analysis showed that the potential screening effects of the existing obstacles reduced shadow flicker impacts for two of the three receptors (Receptor IDs 16 and 17).

Table 3. WindPro Top Ten Expected Shadow Flicker Hours Results – Layout Scenario 2

Receptor ID	Participation Status	Expected Shadow Flicker Hours per Year [hr:min]
		No Obstacles (With Obstacles)
17	Pending	41:14 (32:27)
27	Participant	36:32 (36:32)
16	Non-participant	25:36 (18:31)
6	Non-participant	24:28
8	Non-participant	23:52
18	Non-participant	23:29
15	Non-participant	20:17
4	Participant	18:20
19	Non-participant	14:07
5	Non-participant	12:11

Table 4. Statistical Summary of WindPro Expected Shadow Flicker – Number of Modeled Receptors

Cumulative Shadow Flicker Time (Expected)	Number of Modeled Receptors	
	Layout Scenario 1	Layout Scenario 2
Total	39	39
= 0 hours	20	18
> 0 hours & ≤ 10 hours	8	11
> 10 hours & ≤ 20 hours	5	3 (4)[1]
> 20 hours & ≤ 30 hours	3 (4)[1]	5 (4)[1]
> 30 hours	3 (2)[1]	2

[1]The obstacle analysis conducted for the three worst case receptors demonstrated that existing obstacles surrounding the receptors would likely reduce shadow flicker impact for two of the three receptors, as shown by the values in parentheses.

6.0 CONCLUSION

The analysis of potential shadow flicker from the Project on nearby receptors shows that shadow flicker within the area of study are expected to be minor and well within acceptable ranges for avoiding nuisance and/or health hazards. Potential screening from trees, shrubs, barns, or other obstacles was conservatively not assumed to block shadows in the initial shadow flicker analysis. In reality, such factors can block shadows from falling on to windows of receptors. A second shadow flicker analysis was conducted for the three worst case impact receptors that considers potential screening obstacles. For both Layout Scenario 1 and 2, the analysis demonstrated that existing obstacles would likely reduce shadow flicker for two of the three worst case receptors (Receptor IDs 16 and 17). Existing obstacles surrounding Receptor 27 did not block shadows. However, Receptor 27 is ownded by a landowner that is participating in the Project. Receptor 17 was previously a participating landowner, and participation in the repower project is still pending at this time. The analysis assumes that the receptors all have a direct in-line view of the incoming shadow flicker sunlight. In reality, the windows of many houses will not face the sun directly for the key shadow flicker times.

7.0 REFERENCES

Epilepsy Action. 2018. Information Web Page on Photosensitive Epilepsy. British Epilepsy Association. http://www.epilepsy.org.uk/info/photo_other.html. Accessed July 2018.

National Oceanic and Atmospheric Administration (NOAA). 2016. Comparative Climatic Data for the United States Through 2015.

Appendix A

Figures

Cerro Gordo Wind Repower Project

Figure 1
Scenario 1
Shadow Flicker

Cerro Gordo County, Iowa

- Project Area
- Proposed Turbines
- Participating Receptor
- Non-Participating Receptor

Shadow Flicker (hours per year)

- < 15
- 15
- 30
- 50
- 100
- 200

N

0 0.25 0.5

Miles

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Cerro Gordo Wind Repower Project

Figure 2
Scenario 2
Shadow Flicker

Cerro Gordo County, Iowa

- Project Area
- Proposed Turbines
- Participating Receptor
- Non-Participating Receptor

Shadow Flicker (hours per year)

- < 15
- 15
- 30
- 50
- 100
- 200

N

0 0.25 0.5

Miles

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Appendix B

Detailed Summary of Shadow Flicker Analysis Results

Receptor ID	UTM Coordinates (meters)		Participation Status	Expected Shadow Flicker Hours per year – No Obstacles (With Obstacles) (hh:mm)	
	Easting	Northing		Layout Scenario 1	Layout Scenario 2
1	461781	4771796	Non-participant	0:00	0:00
2	461099	4771722	Non-participant	0:00	3:37
3	462680	4771371	Participant	0:00	9:18
4	461677	4770199	Participant	18:20	18:20
5	462789	4770821	Non-participant	17:15	12:11
6	461290	4770123	Non-participant	13:08	24:28
7	462675	4769378	Non-participant	7:33	9:12
8	464317	4768447	Non-participant	23:52	23:52
9	464310	4768911	Non-participant	3:33	3:33
10	464765	4768459	Participant	9:23	9:23
11	465200	4768332	Non-participant	2:27	2:27
12	465980	4768514	Non-participant	0:00	0:00
13	465910	4767915	Non-participant	0:00	0:00
14	466093	4767516	Non-participant	1:00	2:35
15	464472	4767260	Non-participant	26:54	20:17
16	464291	4766751	Non-participant	32:25 (24:24)	25:36 (18:31)
17	462771	4767472	Pending	41:14 (24:07)	41:14 (32:27)
18	463632	4766421	Non-participant	23:02	23:29
19	465893	4766685	Non-participant	12:10	14:07
20	466002	4766012	Non-participant	4:36	8:43
21	465893	4765704	Non-participant	0:00	0:00
22	465980	4765530	Non-participant	0:00	0:00
23	465885	4765068	Non-participant	0:00	0:00
24	465096	4765130	Non-participant	0:00	0:00
25	462784	4766026	Non-participant	7:37	7:37
26	461068	4766152	Non-participant	0:00	0:00
27	460963	4766776	Participant	36:32 (36:32)	36:32 (36:32)
28	464375	4765226	Non-participant	0:00	0:00
29	463555	4765164	Non-participant	0:00	0:00
30	463314	4765143	Non-participant	0:00	0:00
31	462567	4772514	Non-participant	0:00	0:00
32	463492	4770084	Non-participant	13:34	8:02
33	464290	4770098	Non-participant	0:00	0:00
34	464395	4769570	Non-participant	0:00	0:00
35	466779	4765380	Non-participant	0:00	0:00
36	460194	4765284	Non-participant	0:00	0:00
37	459540	4766795	Non-participant	0:00	0:00
38	459399	4766666	Non-participant	0:00	0:00
39	460197	4766920	Non-participant	3:50	3:50

WTG				SETBACK VIOLATION			VARIANCE REQUEST		SHORTFALL
	Mapbook Sheet #	Turbine Number	Technology	DWELLING	PROPERTY LINE	ROW	CURRENT DISTANCE PROPERTY LINE	REQUIRED DISTANCE PROPERTY LINE	
V1	Sheet 9	4	GE2.82 127RD 89HH	No	Yes	No	**332'**	**550'**	**168'**
V2	Sheet 4	6	GE2.82 127RD 89HH	No	Yes	No	**420'**	**550'**	**130'**
V3	Sheet 7	SM-01	SCADA MET	No	Yes	No	**302'**	**342'**	**40'**

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8/9/2019
7:39:06 AM

Snyder
1:1500

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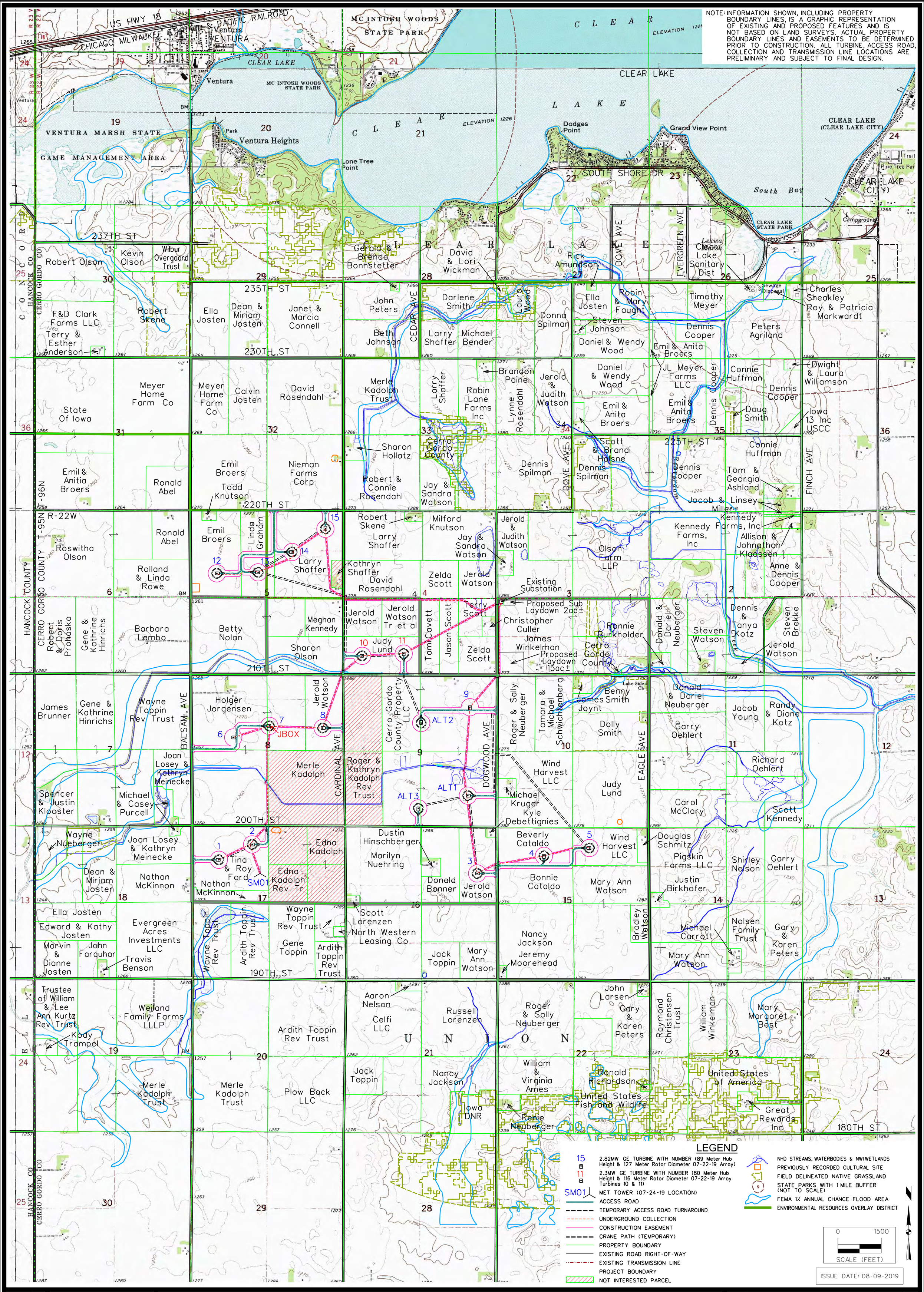
NOTE: INFORMATION SHOWN, INCLUDING PROPERTY BOUNDARY LINES, IS A GRAPHIC REPRESENTATION OF EXISTING AND PROPOSED FEATURES AND IS NOT BASED ON LAND SURVEYS. ACTUAL PROPERTY BOUNDARY LINES AND EASEMENTS TO BE DETERMINED PRIOR TO CONSTRUCTION. ALL TURBINE, ACCESS ROAD, COLLECTION AND TRANSMISSION LINE LOCATIONS ARE PRELIMINARY AND SUBJECT TO FINAL DESIGN.



LEGEND

- 15 — 2.82MW GE TURBINE WITH NUMBER (89 Meter Hub Height & 127 Meter Rotor Diameter 07-22-19 Array)
- 11 — 2.3MW GE TURBINE WITH NUMBER (80 Meter Hub Height & 116 Meter Rotor Diameter 07-22-19 Array Turbines 10 & 11)
- SM01 — MET TOWER (07-24-19 LOCATION)
- ACCESS ROAD
- TEMPORARY ACCESS ROAD TURNAROUND
- UNDERGROUND COLLECTION
- CONSTRUCTION EASEMENT
- CRANE PATH (TEMPORARY)
- PROPERTY BOUNDARY
- EXISTING ROAD RIGHT-OF-WAY
- EXISTING TRANSMISSION LINE
- PROJECT BOUNDARY
- NOT INTERESTED PARCEL
- NHD STREAMS, WATERBODIES & NWI WETLANDS
- PREVIOUSLY RECORDED CULTURAL SITE
- FIELD DELINEATED NATIVE GRASSLAND
- STATE PARKS WITH 1 MILE BUFFER (NOT TO SCALE)
- FEMA 1% ANNUAL CHANCE FLOOD AREA
- ENVIRONMENTAL RESOURCES OVERLAY DISTRICT

0 1500
SCALE (FEET)

ISSUE DATE: 08-09-2019

Sheet 1 of 1

Project No: 1180779

SNYDER & ASSOCIATES

NEXTERA ENERGY - CERRO GORDO

CERRO GORDO COUNTY SUP SITE PLAN

CERRO GORDO COUNTY, IOWA

MARK	REVISION	DATE	BY

Engineer: BJF	Checked By: MGG	Scale: 1"= 1500'	
Technician: DW	Date: 03/13/19	Field Bk:	Pg:

Project No: 1180779

Sheet 1 of 1

SNYDER & ASSOCIATES, INC.
1751 MADISON AVENUE
COUNCIL BLUFFS, IA 51503
712-322-3202 | www.snyder-associates.com

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US HWY 18
CHICAGO MILWAUKEE ST PAUL & PACIFIC RAILROAD
VENTURA
MC INTOSH WOODS STATE PARK
CLEAR LAKE
CLEAR LAKE (CLEAR LAKE CITY)
CLEAR LAKE (CITY)
VENTURA MARSH STATE GAME MANAGEMENT AREA
Ventura Heights
Lone Tree Point
Dodges Point
Grand View Point
SOUTH SHORE DR
CLEAR LAKE STATE PARK
Campground
237TH ST
235TH ST
230TH ST
225TH ST
220TH ST
210TH ST
200TH ST
190TH ST
180TH ST
CEDAR AVE
DOVE AVE
EVERGREEN AVE
FINCH AVE
BALSAM AVE
CARDINAL AVE
DOGWOOD AVE
EAGLE AVE
Clear Lake Sanitary Dist
Robert Olson
Kevin Olson
Wilbur Overgaard Trust
Gerald & Brenda Bonnstetter
David & Lori Wickman
Rick Amundson
F&D Clark Farms LLC
Terry & Esther Anderson
Robert Skene
Ella Josten
Dean & Miriam Josten
Janet & Marcia Connell
John Peters
Darlene Smith
Laura Wood
Donna Spilman
Beth Johnson
Larry Shaffer
Michael Bender
Ella Josten
Robin & Mary Faught
Timothy Meyer
Charles Sheakley
Roy & Patricia Markwardt
Steven Johnson
Dennis Cooper
Peters Agriland
Daniel & Wendy Wood
Emil & Anita Broers
Meyer Home Farm Co
Calvin Josten
David Rosendahl
Merle Kadolph Trust
Brandon Paine
Jerold & Judith Watson
Lynne Rosendahl
Robin Lane Farms Inc
Daniel & Wendy Wood
JL Meyer Farms LLC
Connie Huffman
Dwight & Laura Williamson
Emil & Anita Broers
Doug Smith
Iowa 13 Inc USCC
State Of Iowa
Emil & Anitia Broers
Ronald Abel
Emil Broers
Todd Knutson
Nieman Farms Corp
Sharon Hollatz
Robert & Connie Rosendahl
Jay & Sandra Watson
Dennis Spilman
Scott & Brandi Haisne
Dennis Cooper
Tom & Georgia Ashland
Jocob & Miller Linsey Kennedy
Roswitha Olson
Rolland & Linda Rowe
Linda Graham
Larry Shaffer
Kathryn Shaffer
David Rosendahl
Robert Skene
Milford Knutson
Jay & Sandra Watson
Zelda Scott
Jerold Watson
Kennedy Farms, Inc
Allison & Johnathon Klaassen
Anne & Dennis Cooper
Existing Substation
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Proposed Laydown 15ac±
Christopher Culler
James Winkelman
Terry Scott
Tami Cavett
Jason Scott
Olson Farm LLP
Ronnie Burkholder
Cerro Gordo County
Donald & Dariel Neuberger
Steven Watson
Dennis & Tanya Kotz
Steven Brekke
Jerold Watson
Barbara Lembo
Betty Nolan
Meghan Kennedy
Sharon Olson
Jerold Watson Tr et al
Judy Lund
Robert & Doris Prohaska
Gene & Kathrine Hinrichs
James Brunner
Gene & Kathrine Hinrichs
Wayne Toppin Rev Trust
Holger Jorgensen
Jerold Watson
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Tamara & Michael Schwichtenberg
James Smith Joynt
Benny
Donald & Dariel Neuberger
Jacob Young
Randy & Diane Kotz
Dolly Smith
Garry Oehlert
Richard Oehlert
Joan Losey & Kathryn Meinecke
Merle Kadolph
Roger & Kathryn Kadolph Rev Trust
Wind Harvest LLC
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Scott Kennedy
Spencer & Justin Klooster
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Wayne Nueberger
Joan Losey & Kathryn Meinecke
Dustin Hinschberger
Marilyn Nuehring
Edna Kadolph
Edna Kadolph Rev Tr
Tina & Roy Ford
SM01
Nathan McKinnon
Donald Bonner
Jerold Watson
Beverly Cataldo
Bonnie Cataldo
Wind Harvest LLC
Douglas Schmitz
Pigskin Farms LLC
Justin Birkhofer
Mary Ann Watson
Shirley Nelson
Garry Oehlert
Dean & Miriam Josten
Nathan McKinnon
Ella Josten
Edward & Kathy Josten
Evergreen Acres Investments LLC
Marvin & Dianne Josten
John Farquhar
Travis Benson
Wayne Toppin Rev Trust
Ardith Toppin Rev Trust
Gene Toppin
Scott Lorenzen
North Western Leasing Co
Jack Toppin
Mary Ann Watson
Jeremy Moorehead
Nancy Jackson
Bradley Watson
Michael Carrott
Nolsen Family Trust
Gary & Karen Peters
Trustee of William & Lee Ann Kurtz Rev Trust
Kody Trampel
Weiland Family Farms LLLP
Merle Kadolph Trust
Ardith Toppin Rev Trust
Plow Back LLC
Aaron Nelson
Celfi LLC
Russell Lorenzen
Jack Toppin
Nancy Jackson
Iowa DNR
Roger & Sally Neuberger
Gary & Karen Peters
John Larsen
Raymond Christensen Trust
William Winkelman
Mary Margaret Best
William & Virginia Ames
Ronald Richardson
United States of America
United States Fish and Wildlife
Great Rewards Inc
Renie Neuberger

LEGEND

- 15 — 2.82MW GE TURBINE WITH NUMBER (89 Meter Hub Height & 127 Meter Rotor Diameter 07-22-19 Array)
- 11 — 2.3MW GE TURBINE WITH NUMBER (80 Meter Hub Height & 116 Meter Rotor Diameter 07-22-19 Array Turbines 10 & 11)
- SM01 — MET TOWER (07-24-19 LOCATION)
- ACCESS ROAD
- TEMPORARY ACCESS ROAD TURNAROUND
- UNDERGROUND COLLECTION
- CONSTRUCTION EASEMENT
- CRANE PATH (TEMPORARY)
- PROPERTY BOUNDARY
- EXISTING ROAD RIGHT-OF-WAY
- EXISTING TRANSMISSION LINE
- PROJECT BOUNDARY
- NOT INTERESTED PARCEL
- NHD STREAMS, WATERBODIES & NWI WETLANDS
- PREVIOUSLY RECORDED CULTURAL SITE
- FIELD DELINEATED NATIVE GRASSLAND
- STATE PARKS WITH 1 MILE BUFFER (NOT TO SCALE)
- FEMA 1% ANNUAL CHANCE FLOOD AREA
- ENVIRONMENTAL RESOURCES OVERLAY DISTRICT

0 1500
SCALE (FEET)

ISSUE DATE: 08-09-2019

Sheet 1 of 1
Project No: 1180779

SNYDER & ASSOCIATES

NEXTERA ENERGY - CERRO GORDO

CERRO GORDO COUNTY SUP SITE PLAN

CERRO GORDO COUNTY, IOWA

MARK	REVISION	DATE	BY

Engineer: BJF	Checked By: MGG	Scale: 1"= 1500'	
Technician: DW	Date: 03/13/19	Field Bk:	Pg:
Project No: 1180779		Sheet 1 of 1	

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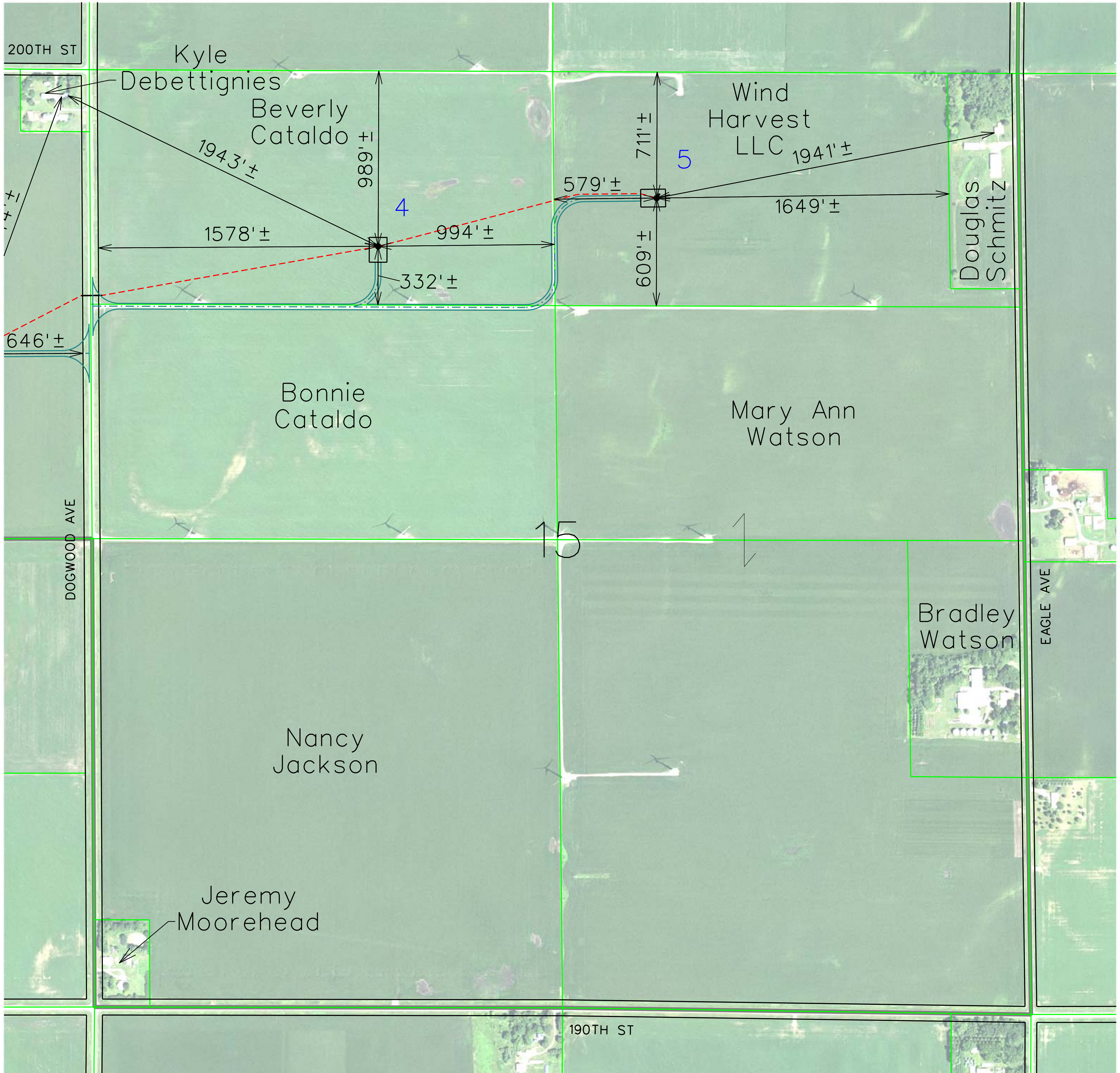


LEGEND

PAD MOUNT TRANSFORMER, TURBINE, CRANE PAD & GE 2.3MW 116RD 80HH TURBINE WITH NUMBER (122' × 72')

PAD MOUNT TRANSFORMER, TURBINE, CRANE PAD & GE 2.82MW 127RD 90HH TURBINE WITH NUMBER (140' × 100', 90')

15 — GE 2.82 MW TURBINE WITH NUMBER (127 Meter Rotor Diameter & 90 Meter Hub Height 07-22-19 Array)

11 — GE 2.3 MW TURBINE WITH NUMBER (116 Meter Rotor Diameter & 80 Meter Hub Height 07-22-19 Array = 10 & 11)

PROPOSED ACCESS ROAD

PROPOSED UNDERGROUND COLLECTION

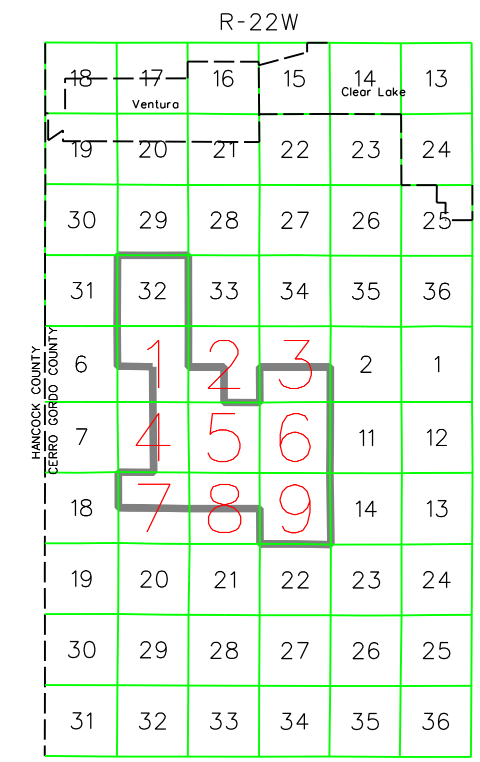
PROPERTY BOUNDARY

EXISTING ROAD RIGHT-OF-WAY

NONPARTICIPATING PARCEL

PROJECT BOUNDARY

SHEET INDEX



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ISSUE DATE: 08-09-2019

NEXTERA ENERGY - CERRO GORDO

SUP MAPBOOK - SEC 15, TWP 95N, RNG 22W

CERRO GORDO COUNTY, IOWA

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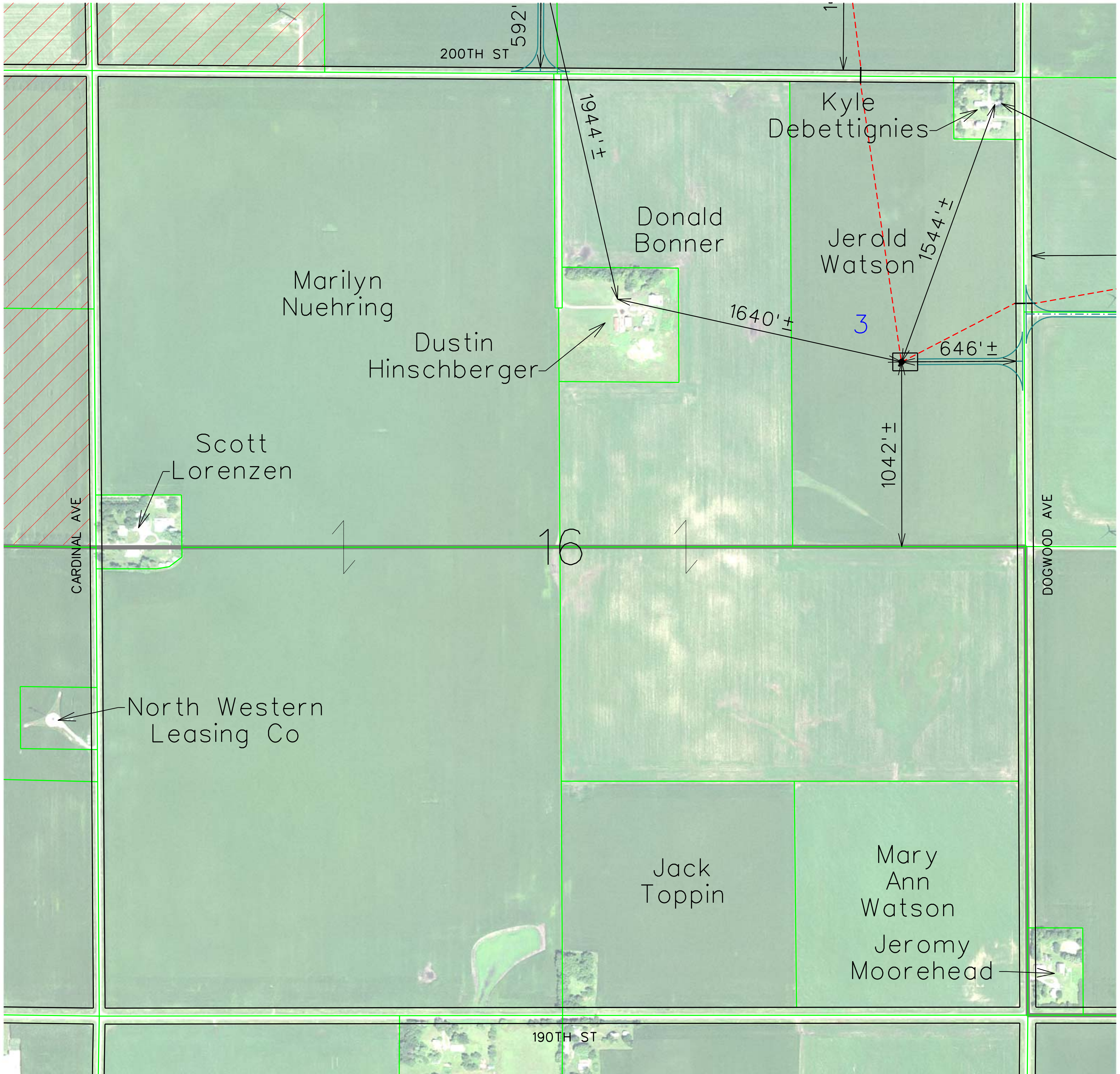
MARK	REVISION	DATE	BY

Engineer: BJF | Checked By: MGG | Scale: 1"= 300'
Technician: DW | Date: 03/13/19 | Field Bk: | Pg:
Project No: 1180779 | Sheet 9 of 9

SNYDER & ASSOCIATES

Project No: 1180779
Sheet 9 of 9



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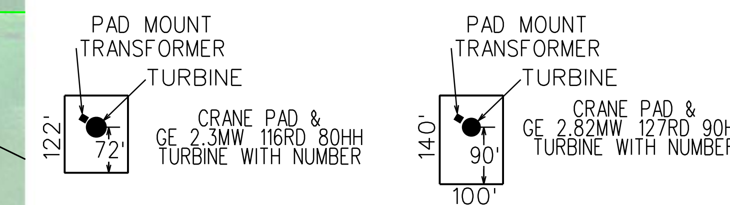


15 — GE 2.82 MW TURBINE WITH NUMBER (127 Meter Rotor Diameter & 90 Meter Hub Height 07-22-19 Array)

11 — GE 2.3 MW TURBINE WITH NUMBER (116 Meter Rotor Diameter & 80 Meter Hub Height 07-22-19 Array = 10 & 11)

PROPOSED ACCESS ROAD

PROPOSED UNDERGROUND COLLECTION

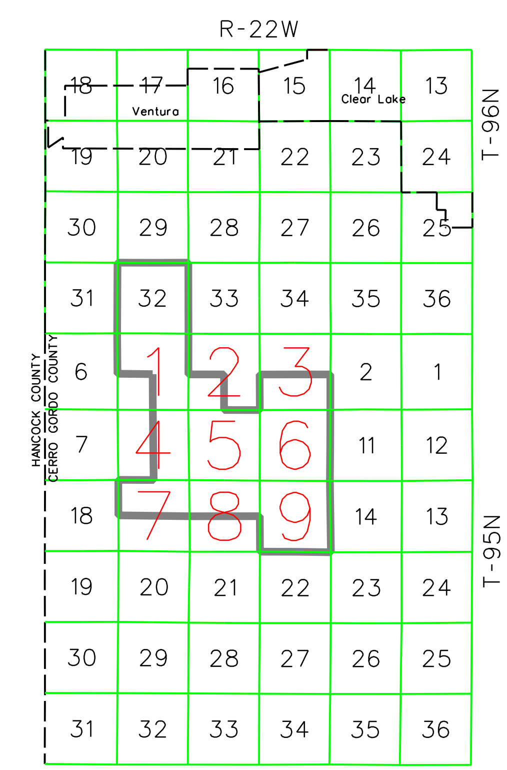
PROPERTY BOUNDARY

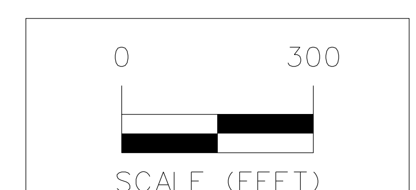
EXISTING ROAD RIGHT-OF-WAY

NONPARTICIPATING PARCEL

PROJECT BOUNDARY

SHEET INDEX





ISSUE DATE: 08-09-2019

NEXTERA ENERGY - CERRO GORDO

SUP MAPBOOK - SEC 16, TWP 95N, RNG 22W

CERRO GORDO COUNTY, IOWA

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MARK	REVISION	DATE	BY

Engineer: BJF | Checked By: MGG | Scale: 1"= 300'

Technician: DW | Date: 03/13/19 | Field Bk: | Pg:

Project No: 1180779 | Sheet 8 of 9

SNYDER & ASSOCIATES

Project No: 1180779

Sheet 8 of 9

LEGEND

PAD MOUNT TRANSFORMER / TURBINE / CRANE PAD & GE 2.3MW 116RD 80HH TURBINE WITH NUMBER (122' × 72')

PAD MOUNT TRANSFORMER / TURBINE / CRANE PAD & GE 2.82MW 127RD 90HH TURBINE WITH NUMBER (140' × 100', 90')

15 — GE 2.82 MW TURBINE WITH NUMBER (127 Meter Rotor Diameter & 90 Meter Hub Height 07-22-19 Array)

11 — GE 2.3 MW TURBINE WITH NUMBER (116 Meter Rotor Diameter & 80 Meter Hub Height 07-22-19 Array = 10 & 11)

PROPOSED ACCESS ROAD

PROPOSED UNDERGROUND COLLECTION

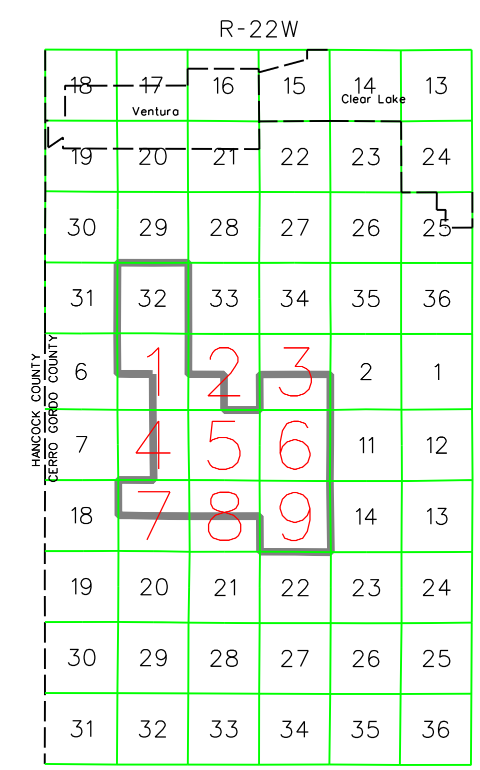
PROPERTY BOUNDARY

EXISTING ROAD RIGHT-OF-WAY

NONPARTICIPATING PARCEL

PROJECT BOUNDARY

SHEET INDEX



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SCALE (FEET)

ISSUE DATE: 08-09-2019

NEXTERA ENERGY - CERRO GORDO

SUP MAPBOOK - SEC 17, TWP 95N, RNG 22W

CERRO GORDO COUNTY, IOWA

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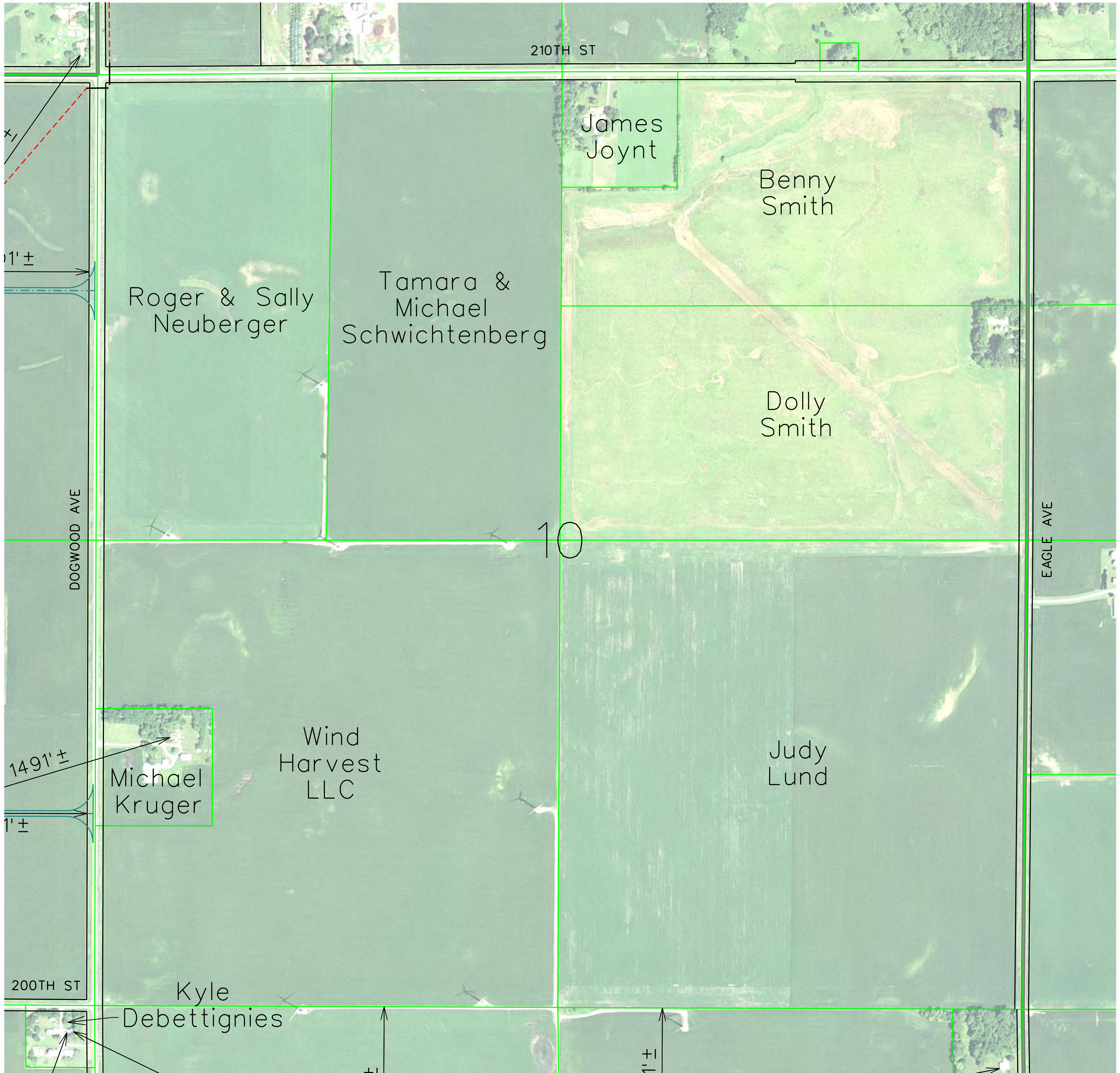
Engineer: BJF | Checked By: MGG | Technician: DW | Date: 03/13/19 | Scale: 1"= 300' | Project No: 1180779 | Sheet 7 of 9

SNYDER & ASSOCIATES

Project No: 1180779

Sheet 7 of 9



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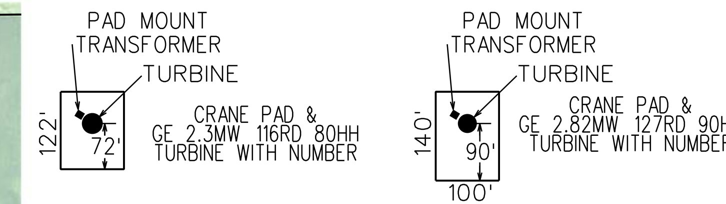


15 GE 2.82 MW TURBINE WITH NUMBER (127 Meter Rotor Diameter & 90 Meter Hub Height 07-22-19 Array)

11 GE 2.3 MW TURBINE WITH NUMBER (116 Meter Rotor Diameter & 80 Meter Hub Height 07-22-19 Array = 10 & 11)

PROPOSED ACCESS ROAD

PROPOSED UNDERGROUND COLLECTION

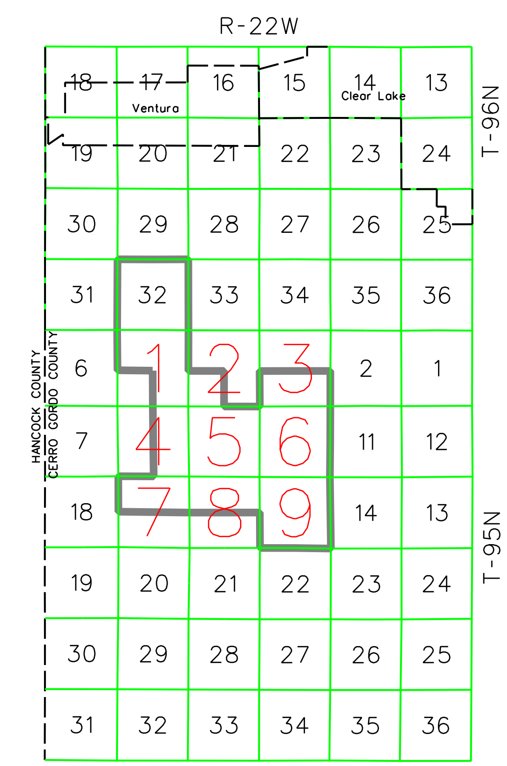
PROPERTY BOUNDARY

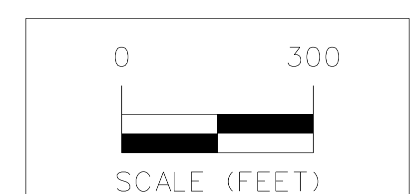
EXISTING ROAD RIGHT-OF-WAY

NONPARTICIPATING PARCEL

PROJECT BOUNDARY

SHEET INDEX





ISSUE DATE: 08-09-2019

NEXTERA ENERGY - CERRO GORDO

SUP MAPBOOK - SEC 10, TWP 95N, RNG 22W

CERRO GORDO COUNTY, IOWA

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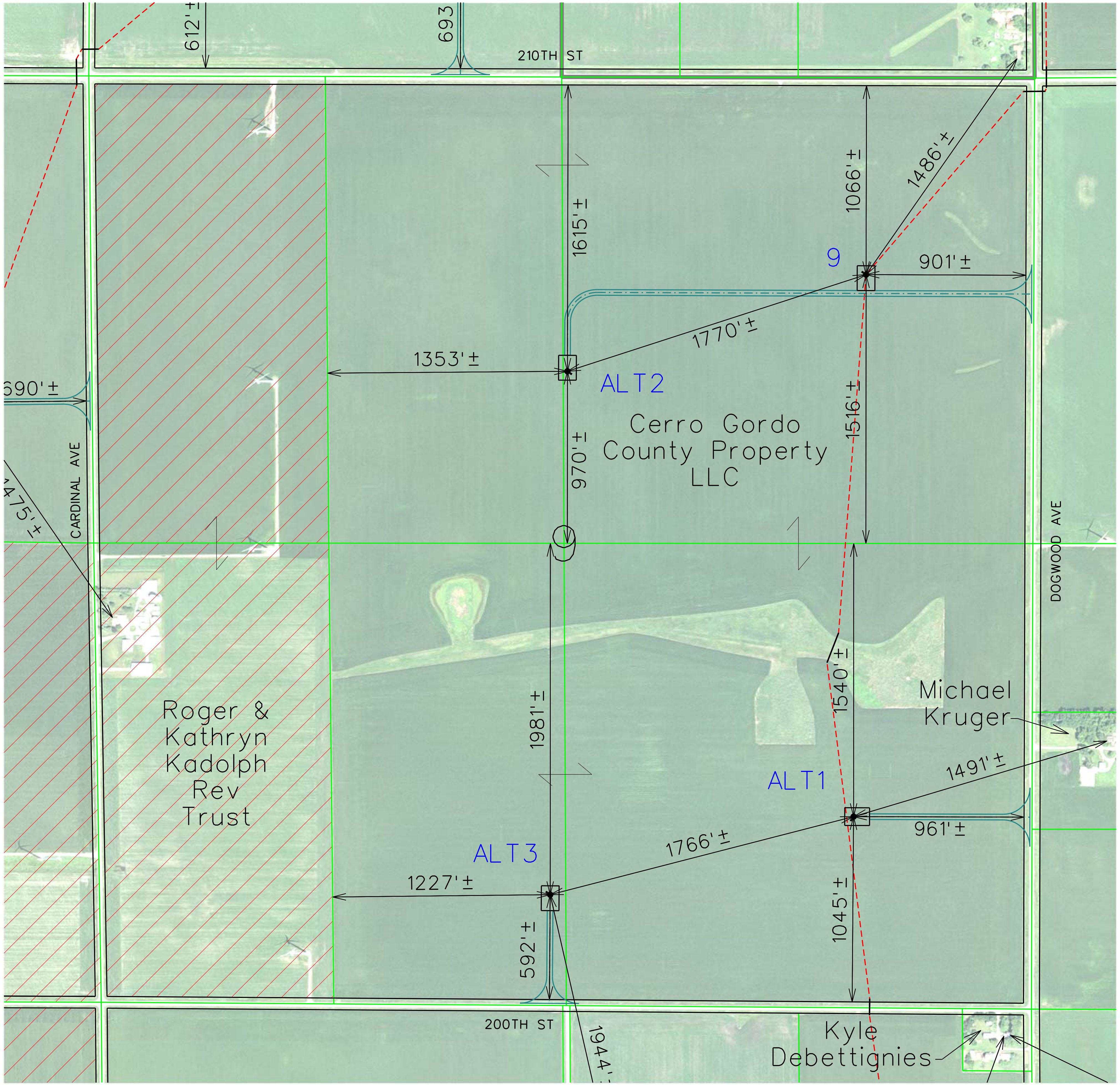
MARK	REVISION	DATE	BY

Engineer: BJF | Checked By: MGG | Scale: 1"= 300'
Technician: DW | Date: 03/13/19 | Field Bk: | Pg:
Project No: 1180779 | Sheet 7 of 9

SNYDER & ASSOCIATES

Project No: 1180779



LEGEND

PAD MOUNT TRANSFORMER / TURBINE / CRANE PAD & GE 2.3MW 116RD 80HH TURBINE WITH NUMBER (122' × 72')

PAD MOUNT TRANSFORMER / TURBINE / CRANE PAD & GE 2.82MW 127RD 90HH TURBINE WITH NUMBER (140' × 100', 90')

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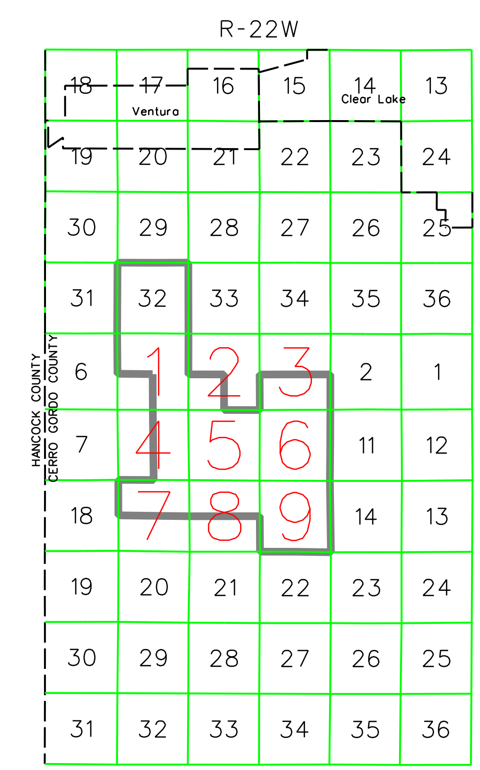
- PROPOSED ACCESS ROAD
- PROPOSED UNDERGROUND COLLECTION
- PROPERTY BOUNDARY
- EXISTING ROAD RIGHT-OF-WAY
- NONPARTICIPATING PARCEL
- PROJECT BOUNDARY

SHEET INDEX



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SCALE (FEET)

ISSUE DATE: 08-09-2019

NEXTERA ENERGY - CERRO GORDO

SUP MAPBOOK - SEC 09, TWP 95N, RNG 22W

CERRO GORDO COUNTY, IOWA

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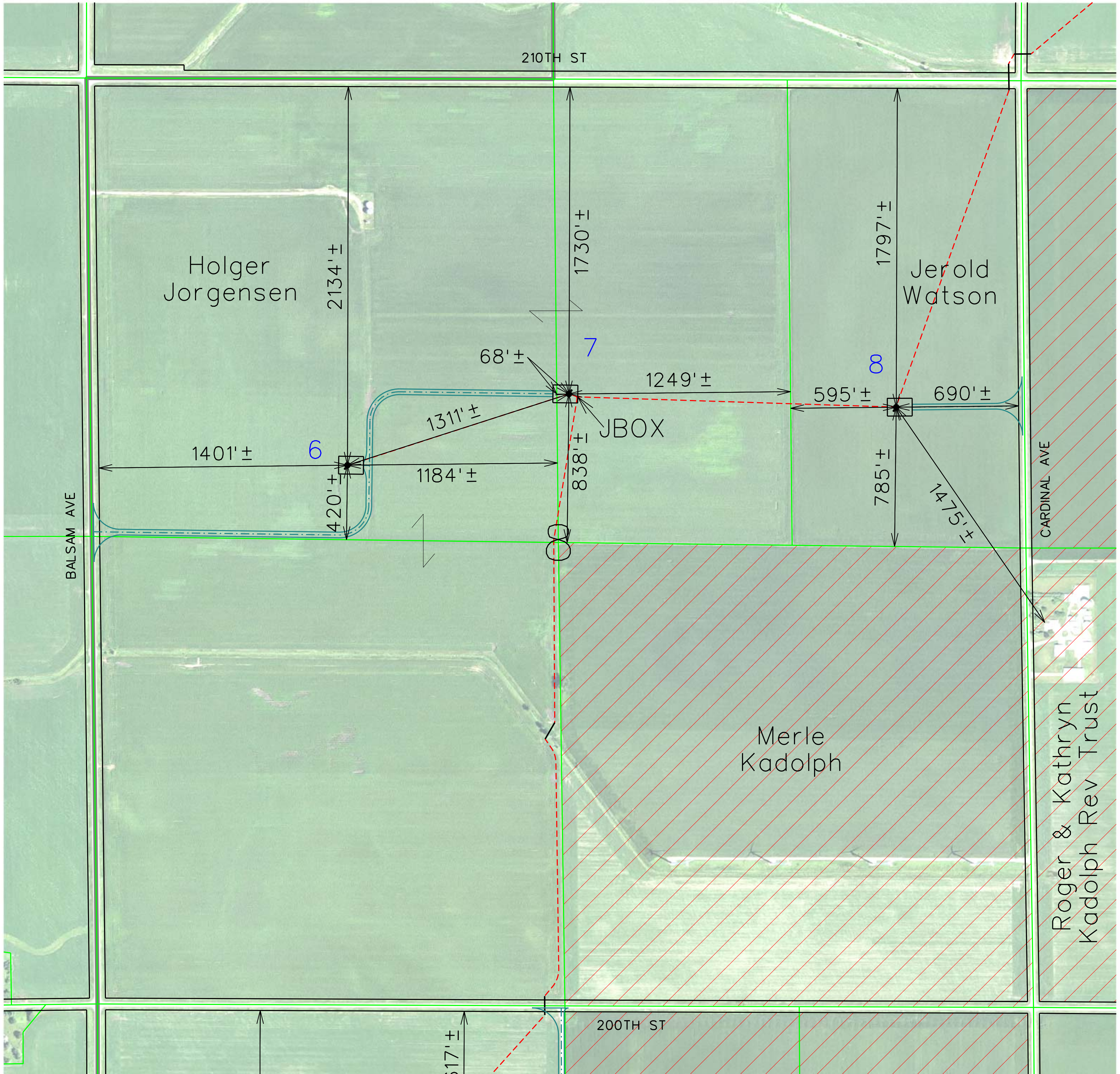
MARK	REVISION	DATE	BY

Engineer: BJF | Checked By: MGG | Scale: 1"= 300' | Technician: DW | Date: 03/13/19 | Field Bk: | Pg: | Project No: 1180779 | Sheet 5 of 9

SNYDER & ASSOCIATES

Project No: 1180779



LEGEND

PAD MOUNT TRANSFORMER / TURBINE / CRANE PAD & GE 2.3MW 116RD 80HH TURBINE WITH NUMBER (122' × 72')

PAD MOUNT TRANSFORMER / TURBINE / CRANE PAD & GE 2.82MW 127RD 90HH TURBINE WITH NUMBER (140' × 100', 90')

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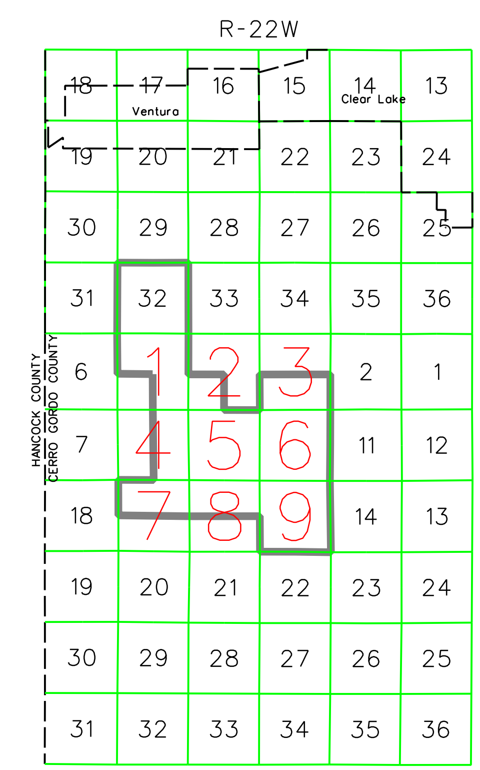
- PROPOSED ACCESS ROAD
- PROPOSED UNDERGROUND COLLECTION
- PROPERTY BOUNDARY
- EXISTING ROAD RIGHT-OF-WAY
- NONPARTICIPATING PARCEL
- PROJECT BOUNDARY

SHEET INDEX



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SCALE (FEET)

ISSUE DATE: 08-09-2019

MARK	REVISION	DATE	BY

Engineer: BJF | Checked By: MGG | Scale: 1"= 300'
Technician: DW | Date: 03/13/19 | Field Bk: | Pg:
Project No: 1180779 | Sheet 4 of 9

NEXTERA ENERGY - CERRO GORDO

SUP MAPBOOK - SEC 08, TWP 95N, RNG 22W

CERRO GORDO COUNTY, IOWA

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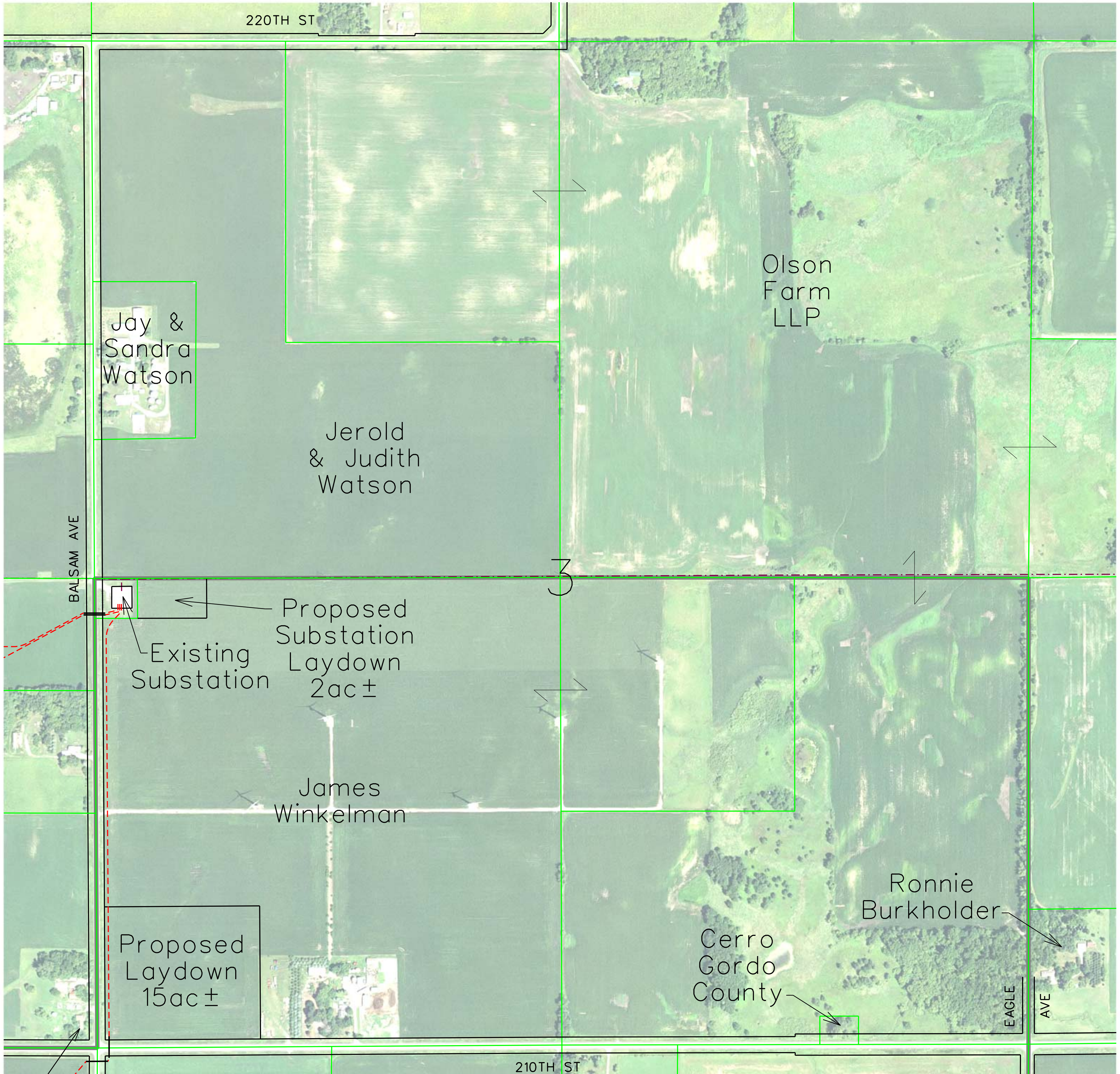
SNYDER & ASSOCIATES

Project No: 1180779



LEGEND

PAD MOUNT TRANSFORMER / TURBINE / CRANE PAD & GE 2.3MW 116RD 80HH TURBINE WITH NUMBER (122' × 72')

PAD MOUNT TRANSFORMER / TURBINE / CRANE PAD & GE 2.82MW 127RD 90HH TURBINE WITH NUMBER (140' × 100', 90')

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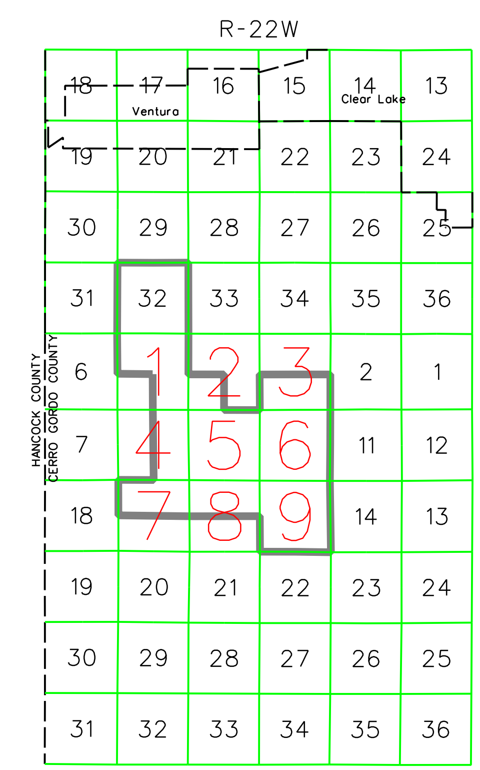
- PROPOSED ACCESS ROAD
- PROPOSED UNDERGROUND COLLECTION
- PROPERTY BOUNDARY
- EXISTING ROAD RIGHT-OF-WAY
- NONPARTICIPATING PARCEL
- PROJECT BOUNDARY

SHEET INDEX



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SCALE (FEET)

ISSUE DATE: 08-09-2019

NEXTERA ENERGY - CERRO GORDO

SUP MAPBOOK - SEC 03, TWP 95N, RNG 22W

CERRO GORDO COUNTY, IOWA

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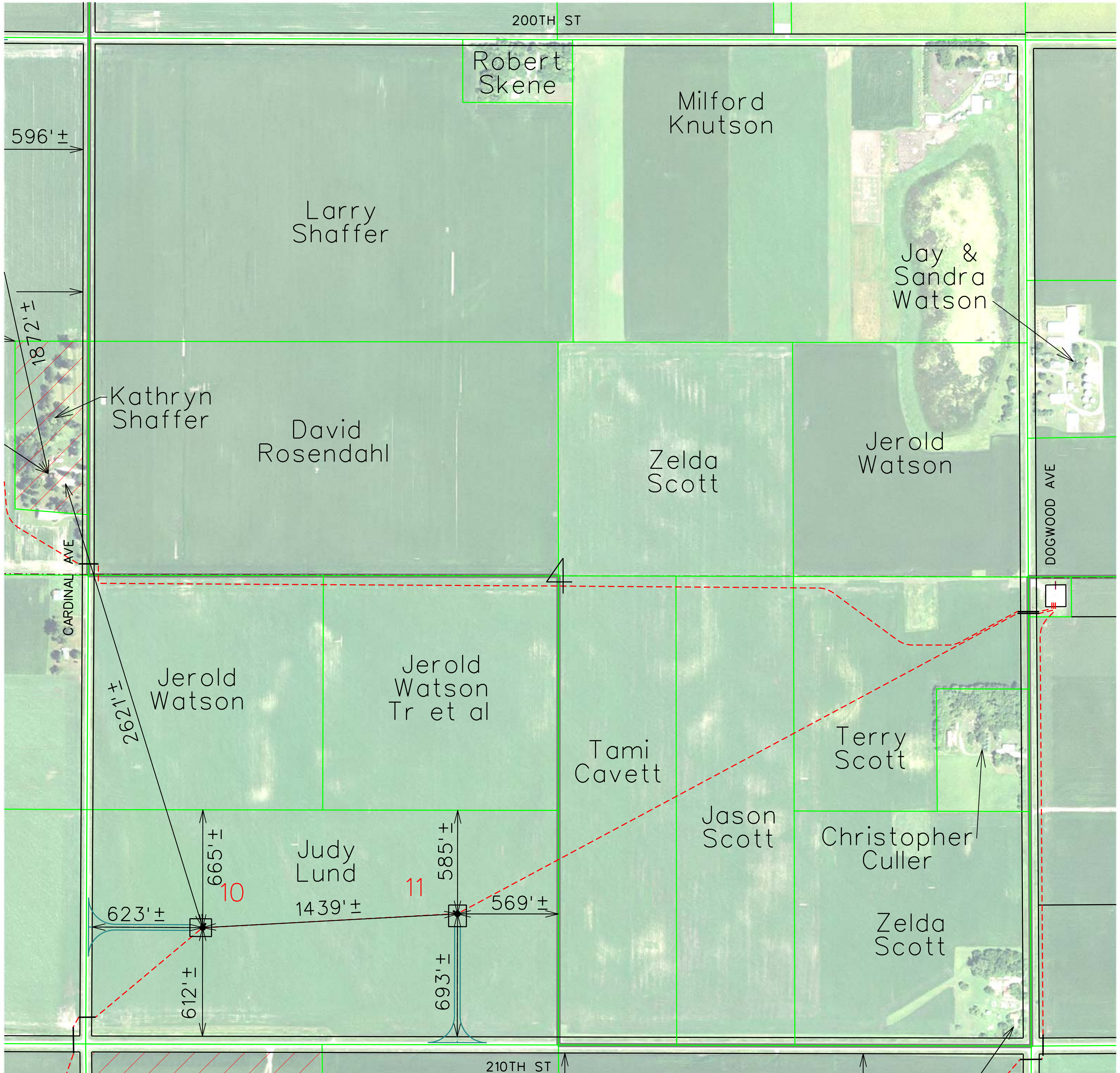
Engineer: BJF | Checked By: MGG | Scale: 1"= 300'
Technician: DW | Date: 03/13/19 | Field Bk: | Pg:
Project No: 1180779 | Sheet 3 of 9

SNYDER & ASSOCIATES

Project No: 1180779
Sheet 3 of 9



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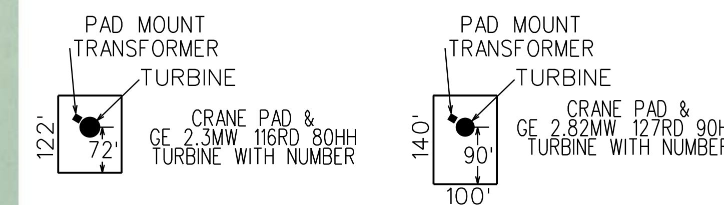


15 — GE 2.82 MW TURBINE WITH NUMBER (127 Meter Rotor Diameter & 90 Meter Hub Height 07-22-19 Array)

11 — GE 2.3 MW TURBINE WITH NUMBER (116 Meter Rotor Diameter & 80 Meter Hub Height 07-22-19 Array = 10 & 11)

PROPOSED ACCESS ROAD

PROPOSED UNDERGROUND COLLECTION

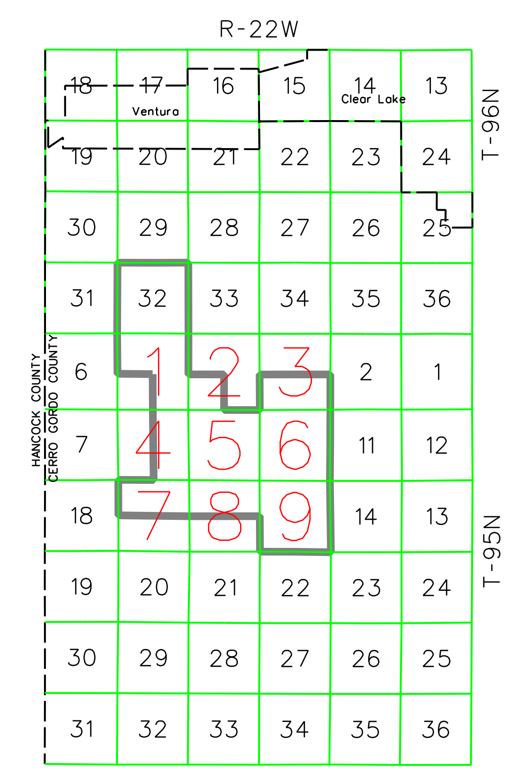
PROPERTY BOUNDARY

EXISTING ROAD RIGHT-OF-WAY

NONPARTICIPATING PARCEL

PROJECT BOUNDARY

SHEET INDEX



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ISSUE DATE: 08-09-2019

NEXTERA ENERGY - CERRO GORDO

SUP MAPBOOK - SEC 04, TWP 95N, RNG 22W

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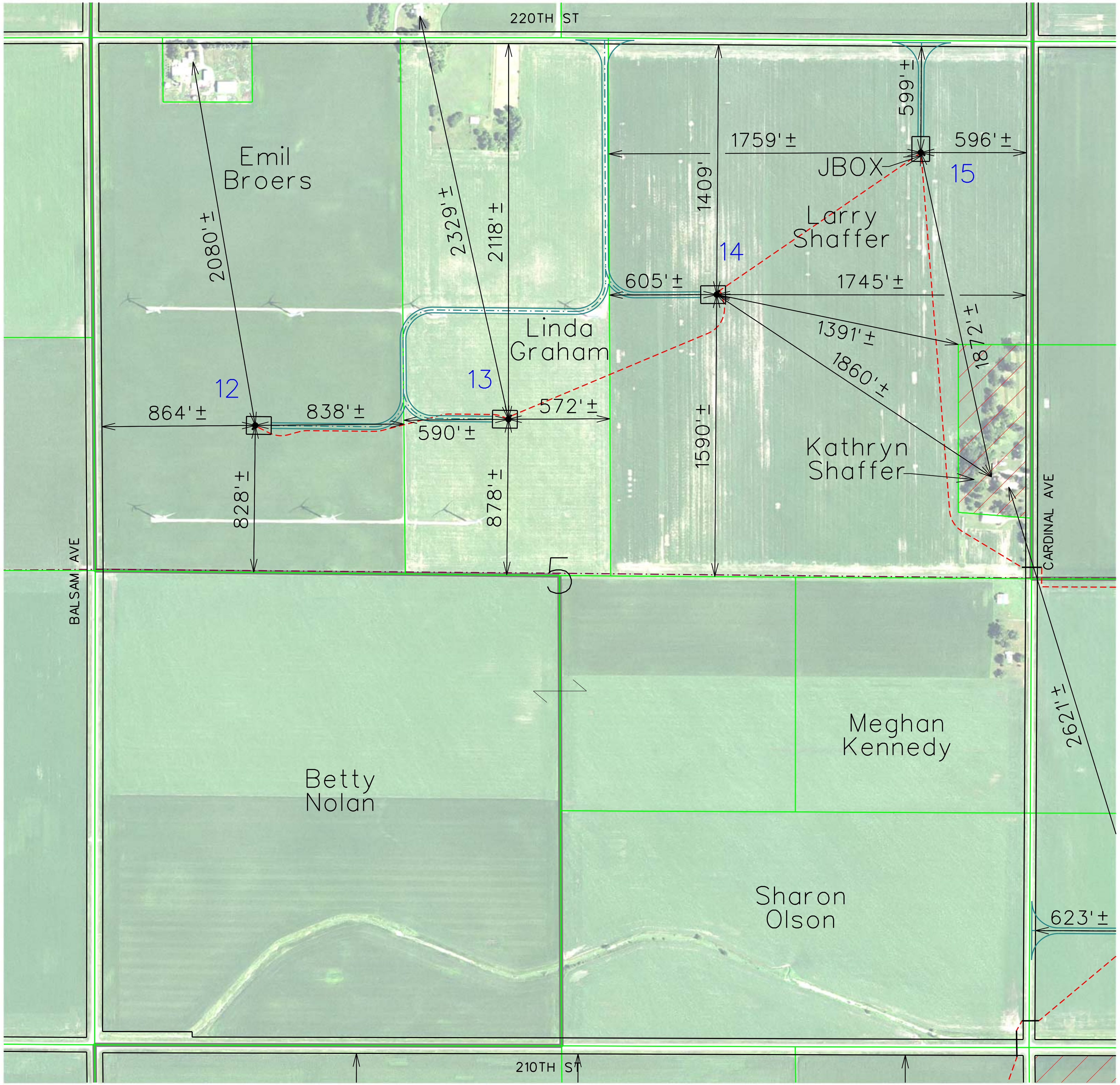
MARK	REVISION	DATE	BY

Engineer: BJF | Checked By: MGG | Scale: 1"= 300'
Technician: DW | Date: 03/13/19 | Field Bk: | Pg:
Project No: 1180779 | Sheet 2 of 9

SNYDER & ASSOCIATES

Project No: 1180779



LEGEND

PAD MOUNT TRANSFORMER
TURBINE
CRANE PAD & GE 2.3MW 116RD 80HH TURBINE WITH NUMBER
122'
72'

PAD MOUNT TRANSFORMER
TURBINE
CRANE PAD & GE 2.82MW 127RD 90HH TURBINE WITH NUMBER
140'
90'
100'

15 — GE 2.82 MW TURBINE WITH NUMBER (127 Meter Rotor Diameter & 90 Meter Hub Height 07-22-19 Array)

11 — GE 2.3 MW TURBINE WITH NUMBER (116 Meter Rotor Diameter & 80 Meter Hub Height 07-22-19 Array = 10 & 11)

- PROPOSED ACCESS ROAD
- PROPOSED UNDERGROUND COLLECTION
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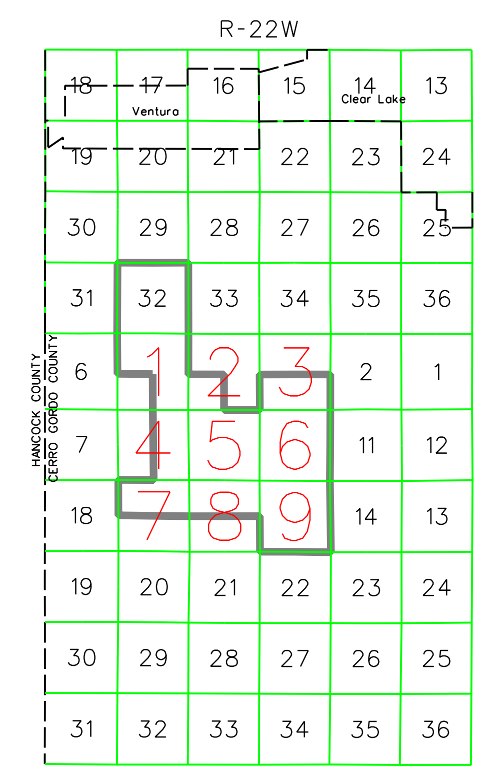
SHEET INDEX



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SCALE (FEET)

ISSUE DATE: 08-09-2019

MARK	REVISION	DATE	BY

Engineer: BJF | Checked By: MGG | Scale: 1"= 300'
Technician: DW | Date: 03/13/19 | Field Bk: | Pg:
Project No: 1180779 | Sheet 1 of 9

NEXTERA ENERGY - CERRO GORDO

SUP MAPBOOK - SEC 05, TWP 95N, RNG 22W

CERRO GORDO COUNTY, IOWA

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SNYDER & ASSOCIATES

Project No: 1180779
Sheet 1 of 9

Decommissioning Plan
Hawkeye Wind Energy Facility

Hawkeye Power Partners, LLC

August 13, 2019

Decommissioning Plan for the Hawkeye Wind Energy Facility

1.0 Introduction

1.1 Background: Existing and Proposed Facilities

Hawkeye Power Partners, LLC (Hawkeye) has prepared this Decommissioning Plan (Plan) to provide documentation of activities necessary to decommission the existing Hawkeye Wind Energy Facility and construct the proposed Hawkeye Power Partners, LLC Project in accordance with Cerro Gordo County, IA requirements. This Plan is therefore intended for activities associated with decommissioning the existing facility and the proposed facility.

On August 13, 2019 Hawkeye will file a Special Use Permit application with Cerro Gordo County proposing to decommission the current 42-megawatt wind farm, and construct, own and operate a new 41.3 megawatt wind farm capable of generating 42-megawatts of clean electrical power which will be sold to Interstate Power Company ("IPC") under a new 25-year power purchase agreement. The proposed Project includes the installation of 15 turbines, a permanent SCADA MET tower, associated access roads, underground collection system, a substation, and associated facilities.

1.2 Anticipated Life of the Project

Hawkeye expects the Project to be in service for 30 years. This estimate is based on Hawkeye's experience operating projects, turbine models, and technology. This does not include the possible additional useful life gained from a future repowering of the site.

2.0 Decommissioning and Restoration

2.1 Decommissioning Preparation Activities

The wind farm will be disconnected from the grid to allow for the safe dismantling of the existing Project. In order to disconnect the Project from the grid, Hawkeye will:

1. Trip the 345 kV breaker at the existing project substation
2. Open the 345 kV disconnect
3. Work with contracted EPC and/or subcontractors to create a zone of protection within the existing substation to safely disconnect the substation conductors.

2.2 Removal of Facilities

2.2.1 Turbines, verify which/all facilities to be removed

The disassembly and removal of this equipment will essentially be the same as its installation, but in reverse order. When decommissioning the turbines, the rotor (hub and blades) will be removed from

the nacelle; and with the help of a smaller crane, turned horizontally and set on the ground. Next, the nacelle will be removed from the top of the tower, followed by each portion of the tower. Once the turbine rotor has been removed, a crew and small crane will disassemble it into the hub and three loose turbine blades. When the rotor is disassembled, the blades will be placed into a carrying frame, which can then be loaded onto a truck for removal from the site. The hub can also be removed once it is disassembled from the blades. Turbine foundations will be removed to a depth of four feet. Hawkeye will work with landowners regarding whether the landowner prefers to keep extracted concrete on their property. If landowners prefer to keep extracted concrete, the concrete will be crushed and provided to the landowner.

MET towers and transmission poles will also be removed in a similar fashion to the turbines. A small crane will be used to dismantle the structures from the top down and will be loaded onto trucks to be removed from the site.

2.2.2 Access Roads

Hawkeye will work with landowners regarding whether the landowner prefers to keep the access road in place. In the event landowners do not want to keep the access road, or portions thereof, the access roads will be removed and the land will be restored.

2.2.3 Underground Collection and Pad Mounted Transformers

Where feasible, all underground collection lines buried at or above four feet below the surface will be removed. Underground collection buried greater than four feet below the surface will be abandoned in place unless requested otherwise by the landowner or other entity. Hawkeye will work with landowners or applicable entities to determine if underground collection lines may be abandoned in place when located above four feet below the surface to minimize impacts to the environment. If the cables are to be removed, a trench will be opened and the cables pulled out. The cables will be cut into manageable sections and removed from the site.

Pad mounted transformers will be disconnected from the collection system and wind turbine generators once the electrical system has been shut off and hauled offsite. The concrete pads will be crushed and either hauled offsite or provided to the landowner, if requested.

2.2.4 Hawkeye Substation and O&M

All above ground structures at the Hawkeye substation including the conductors, switches, transformers, fencing, and other components will be dismantled and removed from the site. Additionally, the structures at the Project O&M facilities will be removed. All concrete foundations will be crushed and either hauled offsite or provided to the landowner, if requested.

2.3 Salvage and Disposal

After dismantling the Project, high value components will be removed for scrap value. The remaining materials will be left on the landowner property where expressly requested by the landowner, or will be reduced to transportable size and removed from the site for disposal. Materials will be disposed where disposal is permitted and where there is capacity for the disposal. Generally, turbines, transformers, electrical components, towers, and transmission poles are refurbished and resold or are recycled for scrap. All unsalvageable materials will be disposed of at authorized sites in accordance with applicable regulations. Decommissioning of the existing turbines will include removal and transport of generators and towers offsite to disposal facilities and/or sale of towers and generators.

2.4 Restoration

Following the dismantling and removal of Project infrastructure, Hawkeye will return the Project Area as close to preconstruction conditions as reasonable. Hawkeye will implement the following:

- All areas where existing infrastructure have been removed will be graded and reseeded, as appropriate.
    - Hawkeye will coordinate with local DNR staff to revegetate non-cropland and pasture areas disturbed during decommissioning with native seed mixes appropriate to the region. Reseeding with native seed mixtures will be used on restoration areas except in cropland areas and in areas where landowners indicate preference for other seeding plans. Reseeding of cropland areas will be conducted in coordination with the landowner.
- Areas compacted by equipment used in the decommissioning may be tilled in a manner adequate to restore the topsoil and subgrade material to a density consistent with the surrounding areas and then will be reseeded. The depth of compaction relief will depend on site-specific conditions.

2.5 Temporary Decommissioning Facilities

As with construction, it may be necessary to establish temporary facilities to facilitate Project decommissioning. The personnel involved in the decommissioning of the Project would require temporary office space, equipment, and material storage. Because the O&M building may be removed as part of the decommissioning, a trailer complex and laydown yards may need to be established similar to those used during the construction stage. These temporary facilities will include standard furnishings, including office section, bathrooms, air conditioning and potable water. Temporary parking will be provided along with security during standard non-working hours.

3.0 Cost Estimate

The estimated decommissioning costs per turbine were prepared using available information from a variety of credible industry sources. The current cost of decommissioning turbines is estimated to be approximately $100,000 per turbine, although this cost will be offset by the salvage value of the towers and the turbine components. The estimated salvage value of each wind turbine would be based on the market value obtained from scrapping the steel. The estimate would be based on the total weight of one wind turbine, which is approximately 331 tons consisting primarily of steel. However, because it did not separate the scrap value of all the constituent materials, this was a very conservative estimate considering approximately 507 tons of the total weight is copper (generator windings), which would yield a higher value than steel. Also, there would be opportunities for re-sale for reuse of all or some wind turbines or their components. The table on the following page summarizes decommissioning costs. This estimate will be updated periodically during the life of the Project.

Table 1. Decommissioning Cost Summary (in current dollars)

PROJECT COMPONENT	ACTIVITY	COST
Removal of a tower	Crane operation to dismantle tower. Preparation of tower to dismantle, oil removal, cut power, etc. tower dismantle and salvage preparation. Crane operation and breakdown	**$45,000**
Removal of concrete to 4 feet below grade:	Demolition of footings and foundations, disposal costs included for up to 5 miles.	**$45,000**
Site Restoration	Spread topsoil, access road removal, planting bed preparation, seeding, and re-vegetation.	**$10,000**
	Total per unit	**$100,000**
	Total 15 WTG units	**$1,500,000**
Reclamation of Access Roads	Removal of gravel, regarding, hauling and disposal of gravel, seeding and re-vegetation	**$500,000**
Substation Removal	Deconstruction of the substation equipment, power circuit breakers. Etc.	**$200,000**
	Total Project Decommissioning	**$2,200,000**

4.0 Decommissioning Security

Hawkeye will establish a performance bond with Cerro Gordo County for the total current dollar estimate cost for decommissioning as detailed above. This security will be reviewed periodically by and between Cerro Gordo County Officials and Hawkeye Power Partners, LLC representatives over the life of the project. The commencement of the decommissioning security shall be _____ 2019.

Cerro Gordo County, Iowa

By: _____

Chairperson, Cerro Gordo County Board of Supervisors
220 N Washington Ave, Mason City, Iowa 50401

Attest: _____
Cerro Gordo County Auditor

Operator

Hawkeye Power Partners, LLC
A Delaware limited liability company

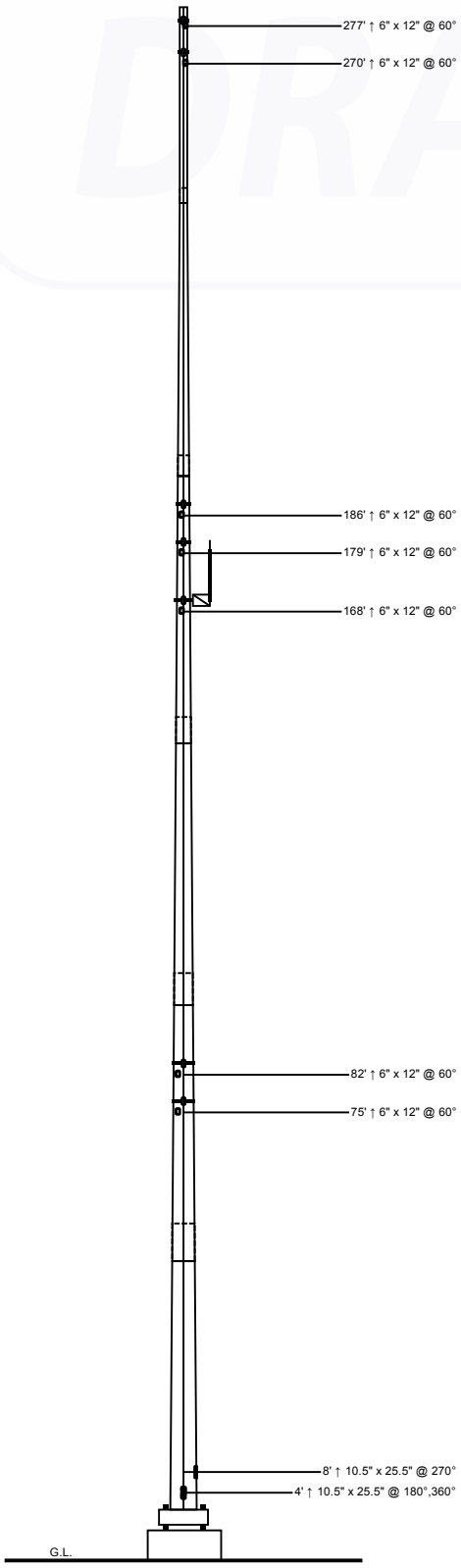
By: _____
John DiDonato, VP Development & Origination

TYPICAL SAFETY SIGNAGE

TYPICAL SAFETY SIGNAGE

SIZES ARE PRELIMINARY AND MAY CHANGE UPON FINAL DESIGN

Length (ft)	53'-3"	53'-6"	53'-6"	53'-6"	53'-6"	53'-6"	36'-6"
Number Of Sides	18						
Lap Splice (ft)	A	B	C	D	E		
Top Diameter (in)	47.82"	40.91"	33.84"	26.49"	18.97"	14"	19.91"
Bottom Diameter (in)	56.45"	49.58"	42.51"	35.15"	27.63"		
Taper (in/ft)	0.162						
Grade	A572-65						
Weight (lbs)	13200	8667	7256	4779	3543	1812	
Overall Steel Height (ft)	279						



Designed Appurtenance Loading

Elev	Description	Tx-Line
292	(2) WindSensor P2546-0PR	(2) 3/8"
279	(2) 200M Wind Vane	(2) 3/8"
279	(1) Pressure Sensor (10in x 4in)	(1) 3/8"
279	(1) Temperature Sensor (10in x 4in)	(1) 3/8"
278	Goal Post - 12'	
278	(2) 16' Boom	
272	16' Boom	
272	(1) Gill Propeller Anemometer 27106T	(1) 3/8"
188	(2) 16' Boom	
188	(2) WindSensor P2546-0PR	(2) 3/8"
181	16' Boom	
181	(1) 200M Wind Vane	(1) 3/8"
174.7	(1) DB636	(1) 7/8"
170	3ft Sidearm	
84	(2) 16' Boom	
84	(2) WindSensor P2546-0PR	(2) 3/8"
77	16' Boom	
77	(1) 200M Wind Vane	(1) 3/8"

Design Criteria - ANSI/TIA-222-G

ASCE 7-16 Ultimate Wind Speed (No Ice)	109 mph
Wind Speed (Ice)	50 mph
Design Ice Thickness	0.50 in
Structure Class	II
Risk Category	II
Exposure Category	C
Topographic Category	1

Load Case Reactions

Description	Axial (kips)	Shear (kips)	Moment (ft-k)	Deflection (ft)	Sway (deg)
3s Gusted Wind	44.84	23.35	3368.33	28.17	11.09
3s Gusted Wind 0.9 Dead	33.69	23.28	3295.52	27.4	10.74
3s Gusted Wind&Ice	52.06	9.46	1394.33	12.08	4.67
Service Loads	37.43	6.67	962.01	8.29	3.21

Base Plate Dimensions

Shape	Diameter	Thickness	Bolt Circle	Bolt Qty	Bolt Diameter
Round	69"	1.75"	63.25"	12	2.25"

Material List

Display	Value
A	7' - 0"
B	6' - 0"
C	5' - 0"
D	4' - 0"
E	2' - 9"

Notes

1) Antenna Feed Lines Run Inside Pole
2) All dimensions are above ground level, unless otherwise specified.
3) Weights shown are estimates. Final weights may vary.
4) Full Height Step Bolts
5) This tower design and, if applicable, the foundation design(s) shown on the following page(s) also meet or exceed the requirements of the 2015 International Building Code.

Sabre Industries™ Towers and Poles

Sabre Communications Corporation
7101 Southbridge Drive
P.O. Box 658
Sioux City, IA 51102-0658
Phone: (712) 258-6690
Fax: (712) 279-0814

Quote:	**20-1501-AMV**
Customer:	NEXTERA ENERGY RESOURCES, LLC
Site Name:	Bronco Plains, CO
Description:	280' Monopole
Date:	7/9/2019 By: RKR

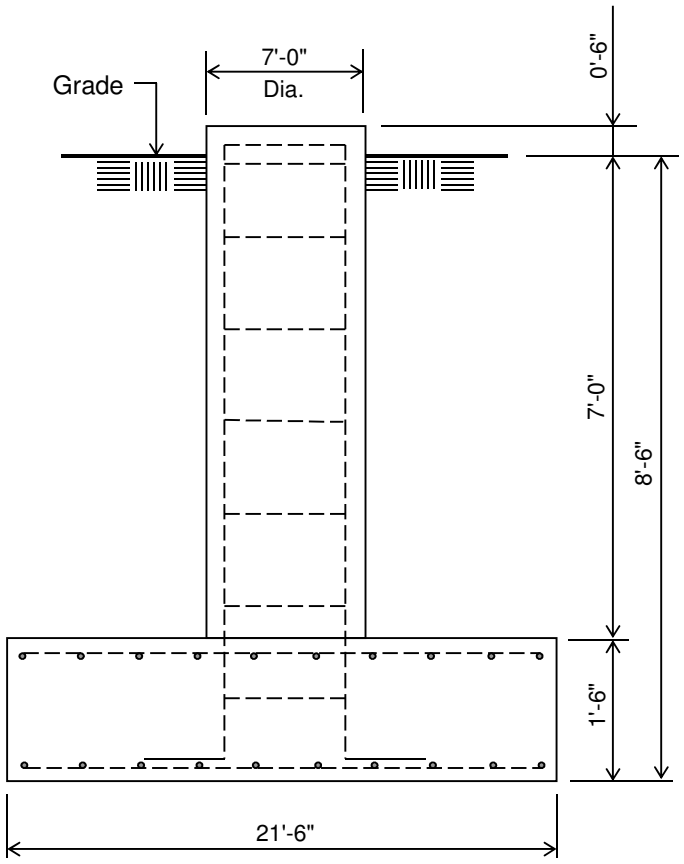
Sabre Industries™
Towers and Poles

No.: 20-1501-AMV

Date: 07/09/19
By: NM

Customer: NEXTERA ENERGY RESOURCES, LLC
Site: Bronco Plains, CO
280' Monopole

PRELIMINARY -NOT FOR CONSTRUCTION-



ELEVATION VIEW
(36.37 Cu. Yds.)
(1 REQUIRED; NOT TO SCALE)

Notes:

1) Concrete shall have a minimum 28-day compressive strength of 4,500 psi, in accordance with ACI 318-11.

2) Rebar to conform to ASTM specification A615 Grade 60.

3) All rebar to have a minimum of 3" concrete cover.

4) All exposed concrete corners to be chamfered 3/4".

5) The foundation design is based on the geotechnical report by RRC Power & Energy, LLC., Project No. GE1807017 dated: March 19th, 2019.

6) See the geotechnical report for compaction requirements, if specified.

7) 7 ft of soil cover is required over the entire area of the foundation slab.

8) The foundation is based on the following factored loads:
   Moment = 3,393.02 k-ft
   Axial = 46.42 k
   Shear = 23.32 k

Rebar Schedule for Pad and Pier	
Pier	(36) #8 vertical rebar w/ hooks at bottom w/ #5 ties, (2) within top 5" of pier, then 12" C/C
Pad	(31) #8 horizontal rebar evenly spaced each way top and bottom (124 total)

7101 Southbridge Drive - P.O. Box 658 - Sioux City, IA 51102-0658 - Phone 712.258.6690 - Fax 712.279.0814

SABRE COMMUNICATIONS CORPORATION
TOWERS, ACCESSORIES AND MODIFICATION MATERIALS
STANDARD TERMS AND CONDITIONS

1. **OVERVIEW**: The written offer to the customer named ("**Customer**") in the written proposal ("**Proposal**") by Sabre Communications Corporation ("**Sabre**") that describes the products ("**Products**") and/or Services ("**Services**") to be provided by Sabre, the prices for the same, the anticipated delivery or commencement date and such additional information as may be included in the Proposal are made subject exclusively to these standard terms and conditions ("**Standard Terms and Conditions**") stated herein and are valid for acceptance by Customer in writing within thirty (30) days of the date of the Proposal. All prices and clerical errors are subject to change and/or correction without notice. The Products to be furnished and/or Services to be accomplished as a result of the Proposal are limited strictly to the Products and/or Services outlined in the Proposal. **CUSTOMER'S SUBMISSION OF A PURCHASE ORDER OR OTHER SIMILAR DOCUMENT IN RESPONSE TO THE PROPOSAL IS CONCLUSIVE ASSENT TO AND ACCEPTANCE OF THESE STANDARD TERMS AND CONDITIONS UNLESS SPECIFIC TERMS ARE OBJECTED TO IN WRITING BY CUSTOMER AND ACCEPTED IN WRITING BY SABRE.** The provisions of the Proposal and these Standard Terms and Conditions shall constitute the entire contract and agreement between Customer and Sabre ("**Agreement**"). Acceptance of this bid through a purchase order or otherwise is limited to the terms and conditions stated herein unless both parties expressly agree otherwise in a writing signed by both parties.

2. **PAYMENT**: If Sabre extends credit to Customer, payment is due net thirty (30) days from the date of the invoice. Invoices for towers shall be issued upon the completion of fabrication regardless of whether Products have been shipped. Unless Customer shall have provided Sabre with a valid and effective tax exemption certificate or satisfactory evidence of the same, all federal, state and local taxes (other than those based upon Sabre's net income) imposed upon the Products or Services performed hereunder shall be paid by Customer. Time is of the essence with respect to payments to Sabre. Past due amounts are subject to an interest charge of the lower of one and one-half per cent (1-1/2%) per month or the highest rate permitted by law plus all reasonable fees and expenses of collection. Payment to Sabre is not contingent upon Customer having received payment from any other party.

3. **DELIVERY**: All Products are delivered F.O.B. Sabre's facility upon completion of fabrication. Title, ownership, risk of loss, risk of material obsolescence as well as risk of material market value decline shall pass to the Customer upon invoicing or shipment to Customer, whichever occurs earlier in time; provided, however, as an accommodation to the Customer, Sabre will maintain insurance coverage against the risk of loss for property damage on all material awaiting shipment.

4. **SHIPMENT**: Off-loading at point of destination not included unless specifically stated otherwise in the Proposal. Sabre will ship Products by common carrier. The carrier (through its driver) shall determine whether the site is accessible for its equipment. If the carrier determines that it is impractical to reach the site without injury/damage to the load, truck, or driver, the Customer will be responsible for finding an alternative site for unloading. No costs shall be incurred by Sabre as a result of the carrier's determination that access to the site is impractical. Customer must make careful inspection of Products when received. Customer must note on the bill of lading any claim that the shipment is not complete or that the Products are warped, bent, scraped, dented, or damaged in any other way, or not in all respects in proper condition prior to off-loading and shall make all claims pertaining to the shipment to Sabre in writing within forty-eight (48) hours of receipt of the Products or Sabre shall have no responsibility with respect to the shipment and such claims will be declined. In addition to the freight charges agreed to by the parties in the Proposal, additional freight charges may be assessed as follows: (i) Customer will have two (2) hours from the scheduled arrival time to unload the shipment, however, if the carrier is delayed more than the free time allowed, an additional rate per hour or maximum charge per day may apply; (ii) if the Customer requests the carrier to hold a delivery overnight to accommodate unloading, layover charges may be incurred in addition to any other unloading delays; (iii) if a load is diverted to a new location by the Customer, a new point-to-point rate will be established as well as additional mileage fees, if required; and/or (iv) if the Customer cancels a shipment on the same day the shipment was scheduled to leave Sabre's facility and the truck has been dispatched to load, a "truck not used" fee may be applied in addition to charges for material handling, however, if notice to cancel the shipment is given not less than one (1) business day prior to the scheduled departure date, no additional fees will apply.

5. **STORAGE**: If Customer declines to accept shipment of the Products immediately upon completion of fabrication, Sabre may agree to store the Products at its facility at Sabre's standard daily storage rate or Sabre may arrange for storage at another location at the expense of Customer.

6. **CHANGE ORDERS**: Customer shall notify Sabre in writing of any requested change(s) to an existing purchase order and Sabre will prepare and submit to Customer a change order incorporating the changes Sabre will agree to and any change in the price(s) associated with said changes (the "**Change Order**"). If Customer agrees in writing to the changes, Customer will sign and return the Change Order. If additional payments are due Sabre as a result of the changes, Sabre will invoice Customer for such changes.

7. **TOWER MODIFICATION PRODUCTS AND/OR SERVICES**: If the Proposal is for tower modification Products, Sabre will not participate to any extent in the physical modification of any existing communication tower structure unless specifically stated in the Proposal. Sabre's sole responsibility shall be the design, drafting, engineering and fabrication of the Products needed for modification of the existing communication tower.

8. **PRODUCT RETURNS**: Prior written authorization from Sabre is required for all returned Products which Sabre may decline in its sole discretion. Requests for return authorization must be received by Sabre within thirty (30) days of original shipment. When a Product return is authorized by Sabre, it must be received within fifteen (15) days of the date the return material authorization number ("**RMA**") is issued by Sabre, bear the RMA number, be shipped freight prepaid to a destination of Sabre's choice, and be in new and unused condition. All returned Products are subject to a restocking charge of 25% of the purchase price unless the Products are returned due to a defect, in which case, no restocking charge shall apply. Unsalable Products returned to Sabre will be scrapped and no credit will be given.

9. **DELAYS**: Sabre shall not be liable for any delay or failure to perform its obligations due to any cause beyond its reasonable control, including, without limitation, lack of cooperation or assistance by Customer, labor difficulties, fire, accident, act of the public enemy, war, public disturbances, sabotage, transportation delay, shortage of raw material, energy, or machinery, or act of God, government or the judiciary or any disruption caused by a third party that materially impairs Sabre's performance hereunder.

10. **EXCLUSIVE WARRANTIES AND REMEDIES**: Sabre's exclusive limited warranty relating to the Products is that the Products will comply with the applicable Product specifications in the Proposal in all material respects and will be free of material defects in materials and workmanship when delivered. The warranty period is for one (1) year from the earlier of the date of Sabre's invoice or shipment of Products to Customer. Sabre reserves the right to change or modify the design or construction of any of its Products and to substitute material equal to or superior to that originally specified. In the event Sabre determines that the Products do not conform with this warranty, Customer's exclusive remedy shall be, at Sabre's option and expense: (i) Sabre shall correct any material defect; (ii) Sabre shall furnish a replacement Product and shall be responsible for labor costs involved in the reinstallation of such Product only if Sabre installed the Product; or (iii) Sabre shall refund the price paid to Sabre for the Product provided that Customer agrees to return the Product (freight prepaid by Sabre) within thirty (30) days of the discovery of the discrepancy during the warranty period. With respect

to Services, Sabre's exclusive limited warranty is that the Services shall be performed in a workmanlike fashion. In the event Sabre breaches this warranty, Customer's exclusive remedy shall be, at Sabre's option and expense: (i) Sabre shall correct such Services within thirty (30) days of the performance of the Services; or (ii) Sabre shall refund the price paid for the applicable portion of the Services. Sabre does not make any warranty as to any services, materials or goods furnished by third parties (e.g., light kits); however, Sabre will assign to Customer any rights it has against such third parties. These warranties shall be effective only if the Products are installed and maintained in accordance with Sabre's recommendations and specifications and that Customer, during the warranty period, shall regularly (not less than semi-annually) inspect and properly maintain the Products.

THE FOREGOING WARRANTIES ARE EXCLUSIVE AND IN LIEU OF ALL OTHER WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND OF ANY OTHER TYPE, WHETHER EXPRESS OR IMPLIED. IT SHALL BE THE CUSTOMER'S SOLE RESPONSIBILITY TO VERIFY THAT THE PRODUCTS MEET THE SUITABILITY AND USABILITY REQUIREMENTS OF THE INTENDED APPLICATION OF CUSTOMER.

11. **LIMITATION OF LIABILITY: IN NO EVENT SHALL SABRE BE LIABLE FOR INCIDENTAL, CONSEQUENTIAL, SPECIAL, INDIRECT, PUNITIVE OR EXEMPLARY DAMAGES, INCLUDING, WITHOUT LIMITATION, LOST PROFITS OR REVENUE OR DOWNTIME, EVEN IF SABRE HAS BEEN ADVISED OF THE POSSIBILITY OF THE FOREGOING. IN NO EVENT SHALL SABRE'S LIABILITY ON ANY CLAIMS FOR DAMAGES ARISING OUT OF OR CONNECTED WITH THE PRODUCTS AND/OR SERVICES OR OTHERWISE EXCEED THE LESSER OF CUSTOMER'S DIRECT DAMAGES OR THE PRICE PAID BY CUSTOMER FOR THE PRODUCTS AND/OR SERVICES**.

12. **CUSTOMER PRODUCT SELECTION AND USE RESPONSIBILITIES**: Customer represents and warrants to Sabre that Customer possesses all necessary expertise to properly select, install and/or use the Products or that Customer has secured the services of a competent professional with respect to the foregoing and acknowledges that the Proposal is based upon the design, information and specifications provided by the Customer being complete, correct, and accurate. Customer agrees to be responsible for all claims, losses, expenses, fines, penalties, damages, demands, judgments, actions, causes of action, suits and liability caused by Customer's improper selection, use, installation or dealings with the Products or the failure of the design, information and specifications provided by the Customer to be complete, correct, and accurate. Customer shall specify any specific design parameters required to conform to local, state or federal requirements which may affect the price in the Proposal prior to Sabre accepting an order from Customer. Plot plans with tower orientation and antenna mounting elevations and azimuths shall be provided by Customer with the Purchase Order.

13. **INDEMNIFICATION**: To the fullest extent allowed by law, each party will indemnify, defend and hold the other party and its respective parents, subsidiaries, affiliates, directors, officers, partners, stockholders, associates, employees and agents (collectively, "**Indemnitees**") harmless from and against all claims, losses, expenses, fines, penalties, damages, demands, judgments, actions, causes of action, suits and liability claimed by a third party for personal injury, death or damage to tangible property (collectively, "**Liabilities**") proximately caused by the party from which indemnification is sought ("**Indemnitor**") provided the Indemnitees give the Indemnitor prompt written notice of any of the foregoing and provide full cooperation and assistance to the Indemnitor in the investigation and defense of such claim and grants the Indemnitor exclusive control of the defense and settlement thereof. No indemnification will be requested by or provided to a party whose actions are a contributing cause, in whole or in part, to the Liabilities.

14. **CONFIDENTIALITY**: The parties agree that if either party provides the other party with non-public written documentation which the disclosing party wants treated as being confidential, the disclosing party will clearly mark the documentation with a legend stating that the documentation is considered confidential by the disclosing party. The recipient will use at least the same effort to avoid disclosure of the confidential documentation as the recipient uses with respect to the recipient's confidential documentation but in no event less than due care. Notwithstanding the foregoing, the recipient shall not be required to protect or hold in confidence any information in the confidential documentation which was or is: (a) part of the public domain, (b) known to the recipient prior to the disclosure to the recipient, (c) disclosed to a third-party by the disclosing party without a written obligation of confidence; (d) rightly received by the recipient from a third party; or (e) independently developed by the recipient without access to the confidential documentation.

15. **INFRINGEMENT**: Sabre's exclusive warranty regarding infringement is that for one (1) year from the earlier of the date of Sabre's invoice or shipment of Products to Customer, the Products created by Sabre or the Services or any works created as a result of the Services solely in accordance with Sabre's plans, drawings, specifications or instructions, will not infringe any United States patent, copyright or trade secret. Sabre agrees to defend Customer against a lawsuit and pay all damages, costs and reasonable attorney's fees finally awarded against Customer resulting from any claim that any Products created by Sabre or the Services performed by Sabre or the works created as a result of the Services infringe any of the foregoing provided that Customer: (a) gives Sabre prompt written notice of any claim; (b) provides reasonable cooperation to Sabre in the investigation and defense of such claim; and (c) grants Sabre exclusive control of the defense and settlement thereof. In the event of any such infringement, Sabre shall, at its option and expense, either (i) replace or modify the Products or the works created as a result of the Services so that they become non-infringing, or (ii) accept return of the Products and refund an amount equal to Customer's depreciated value of the returned Products or works found to be infringing. Sabre shall have no liability for infringements caused in whole or in part by Customer, third parties not hired by Sabre or alterations or combinations not reviewed and approved in writing in advance by Sabre or that are not performed or provided by Sabre. The foregoing constitutes the exclusive warranty of Sabre and exclusive remedy of Customer with respect to any claim or action for infringement. Customer may fully participate in the defense and/or settlement or compromise of any claim of infringement at Customer's expense. Customer shall provide Sabre with the same warranty and defense of claims of infringement with regard to Products created by Sabre in compliance with Customer's plans, drawings, specification or instructions. Sabre does not warrant against infringement any materials or goods furnished by third parties (e.g., light kits); however, Sabre will assign to Customer any rights it has against such third parties.

16. **SABRE'S DRAWINGS & MATERIALS**: Title to all drawings, specifications, brochures, reprints, copies, copies of copies or any other data furnished to Customer are copyrighted by Sabre and title thereto shall remain with Sabre. Customer shall not reproduce, copy or disclose such information in whole or in part for any purpose without prior written permission from Sabre.

17. **LIGHTING REQUIREMENTS**: Customer agrees to comply with the latest standards set forth by the Federal Aviation Administration, the Federal Communications Commission, and any other local, state or federal regulations or ordinances for tower erection and lighting. Customer confirms that the lighting kit ordered for installation on the tower conforms to all such standards and indemnifies Sabre for any loss or expense, including attorney fees, for noncompliance or nonconformance with such standards. It shall be the Customer's responsibility to provide adequate electrical supply at the base of the tower.

18. **EXCLUSIONS FROM PROPOSAL PRICE**: Unless otherwise stated in the Proposal, the prices in the Proposal do not include antennas, transmission lines, jumpers, ground kits, hangars and hardware.

19. **PHOTOGRAPHS**: Sabre at all times reserves the right to take pictures of any or all of its Products after installation for advertising purposes, except those which are under classified government control.

20. **SABRE'S EMPLOYEES**: Sabre reserves the right to determine which of its employees will be assigned to a particular project, to replace or reassign such employees and/or subcontract to qualified third persons part or all of the performance of any Services requested hereunder. Customer may request the removal or reassignment of Sabre's employees on a nondiscriminatory basis at any time and Sabre will promptly provide a suitable replacement. Sabre's employees will comply with all generally applicable work and security rules of Customer.

21. **INDEPENDENT CONTRACTORS**: The parties' relationship during the term of this Agreement shall be that of independent contractors. Neither party shall have, nor shall represent that it has, any power, right or authority to bind the other, or to assume or create any obligation or responsibility, express or implied, on behalf of the other or in such other party's name, except as herein expressly provided. Nothing stated in this Agreement shall be construed as constituting a partnership, joint venture or as creating the relationships of employer/employee or principal/agent between the parties.

22. **NOTICES**: All notices, requests, demands, claims and other communications hereunder will be in writing. Any notice, request, demand, claim or other communication hereunder will be deemed duly given if it is received and/or sent by facsimile, receipted delivery or certified mail, return receipt requested, postage prepaid, and addressed to the intended recipient at the address set forth in the Proposal. Either party may change the address to which notices, requests, demands, claims, and other communications hereunder are to be delivered by giving the other party notice in the manner herein set forth. Each party agrees to promptly provide written notice of any suspected breach of this Agreement, the specifics of any claim of breach or for damages and to provide the other with a reasonable opportunity to investigate and cure any curable matter. In order to bring an action against Sabre for damages, Customer must give notice to Sabre of any claim for damages within six (6) months of the date the claim arises. No claim of breach of this Agreement shall be made by Customer unless and until all uncontested amounts are paid to Sabre.

23. **WAIVER**: Any waiver of any breach of this Agreement shall not be effective unless set forth in a writing signed by an officer of the waiving party.

24. **SURVIVAL**: The termination of this Agreement shall not affect the obligations of either party to the other that arises under the terms and conditions of this Agreement, rights arising from this Agreement, or causes of action which have accrued prior to the date of the termination.

25. **DISPUTES**: The parties agree that any controversy or claim (whether such controversy or claim is based upon statute, contract, tort or otherwise) arising out of or relating to this Agreement, any performance or dealings between the parties, or any dispute arising out of the interpretation or application of this Agreement or any dealings between the parties and/or their respective directors, managers, partners, officers, employees or agents ("**Dispute**"), which the parties are not able to resolve, shall be resolved as follows:

a. The parties will endeavor to settle the Dispute through mediation under the Construction Industry Mediation Rules of the American Arbitration Association ("**AAA**") before recourse to arbitration. Any action for breach of warranty must be commenced within one (1) year after the cause of action accrues. Once one party files a request for mediation with the other party and with the AAA, the parties agree to conclude the mediation within thirty (30) days of filing the request. The mediation shall be conducted in the city where the party commencing the mediation is located. The parties agree to share the fees and expenses of mediation equally.

b. Any Dispute not resolved by mediation, shall be decided by a single arbitrator pursuant to the Construction Industry Arbitration Rules of the AAA then in effect and shall be conducted in the city where the party commences the arbitration. The arbitrator will have the authority to grant injunctive relief in a form similar to that which a court of law would otherwise grant. Judgment upon the award rendered by the arbitrator shall be entered in any court having jurisdiction thereof. The arbitrator will be mutually chosen from a panel of licensed attorneys familiar with the subject matter of this Agreement having at least fifteen (15) years of professional experience and will be appointed within thirty (30) days of the date the demand for arbitration was sent to the other party. Discovery will be permitted in accordance with the Federal Rules of Civil Procedure of the United States of America. If an arbitration proceeding is brought pursuant to this Agreement, the prevailing party will be entitled to recover reasonable attorneys' fees, costs and necessary disbursements incurred in addition to any other relief to which such party may be entitled except that, by the express agreement of the parties, the arbitrator shall not have the power to award incidental, consequential, special, indirect, punitive or exemplary damages. Neither the parties nor the arbitrator may disclose the existence, content or results of the arbitration, except as necessary to enforce award or to comply with legal or regulatory requirements. Before making any such disclosure, the party intending to make the disclosure shall give the other party written notice of such intention and shall afford the other party a reasonable opportunity to protect its interests, which such period shall not be less than twenty (20) days from the non-disclosing party's receipt of the aforementioned written notice. The parties agree that all parties necessary to resolve the claim shall be the parties to the same arbitration proceedings. Appropriate provisions shall be included in all other contracts relating to the work to provide for the consolidation of arbitrations. If Sabre continues to perform, Customer shall continue to make payments in accordance with this Agreement. Nothing herein shall prohibit Sabre from filing a mechanics lien against the real estate or the real estate interest on which any Services are performed. This agreement to arbitrate shall be governed by the Federal Arbitration Act.

26. **SEVERABILITY**: If any provision of this Agreement is held to be illegal, invalid, or unenforceable under present or future laws during the term hereof, such provision shall be fully severable. This Agreement shall be construed and enforced as if such illegal, invalid, or unenforceable provision had never comprised a part hereof, and the remaining provisions hereof shall remain in full force and effect and shall not be affected by the illegal, invalid, or unenforceable provision or by its severance herefrom. Furthermore, in lieu of such illegal, invalid, or unenforceable provision there shall be added automatically as a part of this Agreement a legal, valid, and enforceable provision as similar in terms to the illegal, invalid, or unenforceable provision as may be possible.

27. **GOVERNING LAW**: This Agreement shall be governed by the laws of the State of Iowa. Jurisdiction to enforce the mediation and arbitration provisions of this Agreement is agreed to be in the Federal and/or State District Courts located in Woodbury County, Iowa.

28. **ENTIRE AGREEMENT**: This Agreement constitutes the entire agreement between the parties and may only be modified by a written instrument executed by an authorized officer of both parties. All negotiations and representations (if any) made prior, and with reference to the subject matter of this Agreement, are merged herein. Neither Sabre nor Customer shall be bound by any oral agreement or representation, irrespective of when made. Sabre and Customer agree that Customer's preprinted forms, including Customer's Purchase Order, are for convenience only and all terms and conditions stated thereon which are inconsistent with these Standard Terms and Conditions are void and of no effect and are hereby expressly rejected by Sabre.

GE Renewable Energy

- Original -

Technical Documentation
Wind Turbine Generator Systems
2MW Platform - 60 Hz

Technical Description and Data
Weights and Dimensions

Applicable for Wind Turbine Generators from 2.0 MW to 2.8 MW

Rev. 03 - EN

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GE Renewable Energy

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Table of Contents

1 Introduction

This document provides the estimated weights and dimensions of the 2MW Platform wind turbine generator systems from 2.0 MW to 2.8 MW. The weights and dimensions herein do not include the weights and dimensions of the shipping frames/fixtures. Actual weights may vary depending on final configuration. All weights must be verified prior to installation and transportation.

2 Tower Sections – Weights and Dimensions (Upper Specification Limits)

Turbine	Hub Height					
	80 m	89 m	90 m	94 m	114 m	134 m
2.0 to 2.2 MW, 116 m rotor	x	N/A	N/A	x	N/A	N/A
2.3 to 2.5 MW, 116 m rotor	x	N/A	x	x	N/A	N/A
2.7 MW, 116 m rotor	N/A	N/A	x	N/A	N/A	N/A
2.2 to 2.8 MW, 127 m rotor	N/A	x	x[1]	N/A	x	x

Table 1: Platform configuration

The following table gives the weights and dimensions of the tower sections for the 80 m tower.

Section	Total Weight (kg)	Total Length (m)	Max Diameter (m)
Top	40,234	29.463	3.400
Mid A	45,334	25.912	4.300
Base	58,810	21.925	4.556

Table 2: Weights and dimensions of the 80 m tower

The following table gives the weights and dimensions of the tower sections for the 89 m tower.

Section	Total Weight (kg)	Total Length (m)	Max Diameter (m)
Top	41,480	31.060	3.400
Mid A	53,500	31.600	4.300
Base	61,000	23.342	4.556

Table 3: Weights and dimensions of the 89 m tower

[1] This option is only available for the 2.8-127 turbine in Brazil

The following table gives the weights and dimensions of the tower sections for the 90 m tower (116 m rotor).

Section	Total Weight (kg)	Total Length (m)	Max Diameter (m)
Top	41,480	32.463	3.400
Mid A	53,500	31.600	4.300
Base	61,000	23.342	4.556

Table 4: Weights and dimensions of the 90 m tower (116 m rotor)

The following table gives the weights and dimensions of the tower sections for the 90 m tower (127 m rotor).

Section	Total Weight (kg)	Total Length (m)	Max Diameter (m)
Top	41,980	32.463	3.400
Mid A	55,800	31.600	4.300
Base	62,500	23.342	4.556

Table 5: Weights and dimensions of the 90 m tower (127 m rotor)[2]

The following table gives the weights and dimensions of the tower sections for the 94 m tower.

Section	Total Weight (kg)	Total Length (m)	Max Diameter (m)
Top	40,448	29.463	3.400
Mid A	46,385	25.912	4.300
Mid B	42,180	17.748	4.300
Base	57,728	18.027	4.556

Table 6: Weights and dimensions of the 94 m tower

The following table gives the weights and dimensions of the tower sections for the 114 m tower.

Section	Total Weight (kg)	Total Length (m)	Max Diameter (m)
Top	39,405	32.228	3.400
Mid A	51,175	31.948	4.300
Mid B	54,468	24.388	4.300
Base	69,557	23.342	4.556

Table 7: Weights and dimensions of the 114 m tower

[2] Available in Brazil only

The following table gives the weights and dimensions of the tower sections for the 134 m tower.

Section	Total Weight (kg)	Total Length (m)	Max Diameter (m)
Top	39,526	32.228	3.400
Mid A	51,450	31.948	4.300
Mid B	54,717	24.388	4.300
Mid C	67,815	24.388	4.300
Base	69,753	19.348	4.556

Table 8: Weights and dimensions of the 134 m tower

3 Hub Assembly (Nose Cone Shipped Separately, where applicable)

This section gives the maximum weights and dimensions of the hub assembly with shipping fixtures.

Turbine	Weight (kg)	Length (m)	Diameter (m)	Height (m)
2.0 to 2.5 MW, 116 m rotor (Front Entry Hub)	28,323 nom./29,745 max.	3.5	3.8	3.5
2.0 to 2.7 MW, 116 m rotor (Rear Entry Hub)	27,824 nom./29,324 max.	3.5	3.9	3.5
2.2 to 2.8 MW, 127 m rotor	28,434 nom./29,934 max.	3.5	3.9	3.5
Nose cone	500 max.	3.0	3.1	2.2

Table 9: Weights and dimensions of hub assembly

4 Blades

This section gives the MAXIMUM weight of a single blade including the bolts. The dimensions, however, are for the blades only.

Rotor Diameter (m)	Weight (kg)	Length (m)	Diameter (m)
116	11,432	56.9	2.4
127	14,710	62.2	2.4

Table 10: Weights and dimensions of a single blade

5 Nacelle

This section gives the weight of the nacelle and its internal components. The hub and blades are not included.

Generator In/Out	Configurations	Weight (kg)	Length (m)	Width (m)	Height (m)
Fully assembled nacelle (with generator)	as is	68,360	9.09	3.9	3.6
	With Truck Shipping Fixture	69,020	9.09	3.9	3.7
	With Rail Shipping Fixture	70,210	9.09	3.9	3.84
Nacelle head with generator removed	as is	59,230	9.09	3.9	3.6
	With Truck Shipping Fixture	59,890	9.09	3.9	3.7
	With Rail Shipping Fixture	61,080	9.09	3.9	3.84

Table 11: Weights and dimensions of the nacelle (Cap Bedplate)

Generator In/Out	Configurations	Weight (kg)	Length (m)	Width (m)	Height (m)
Fully assembled nacelle (with generator)	as is	70,487	9.09	3.9	3.59
	With Truck Shipping Fixture	71,757	9.09	3.9	3.70
	With Rail Shipping Fixture	72,337	9.09	3.9	3.83
Nacelle head with generator removed	as is	61,357	9.09	3.9	3.59
	With Truck Shipping Fixture	62,627	9.09	3.9	3.70
	With Rail Shipping Fixture	63,207	9.09	3.9	3.83

Table 12: Weights and dimensions of the nacelle (Compact Bedplate)

6 Down Tower Assembly Components

This section gives the weights and dimensions for the controller only in the down tower assembly.

Component	Weight (kg)	Length (m)	Width (m)	Height (m)
DTA DFIG Converter	2,900	2.300	1.023	2.350 shipped 2.769 installed

Table 13: Weights and dimensions of the down tower assembly components

7 Machine Head Components

This section gives the weights and dimensions for the generator only in the machine head.

Component	Weight (kg)	Length (m)	Width (m)	Height (m)
Generator	8,450	2.950	1.912	2.060

Table 14: Weights and dimensions of the machine head components

GE Renewable Energy

- Original Document -

Technical Documentation
Wind Turbine Generator Systems
2MW Platform - Onshore

Technical Description and Data

Applicable for Wind Turbine Generators from 2.0 MW to 2.8 MW with 116 m and 127 m Rotor Diameter

Rev. 05 - EN 2018-12-13

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Table of Contents

1 Introduction

This document summarizes the technical description and specifications of the GE Renewable Energy (GE) 2MW Platform wind turbine generator systems (applicable for systems from 2.0 MW to 2.8 MW).

2 Technical Description of the Wind Turbine and Major Components

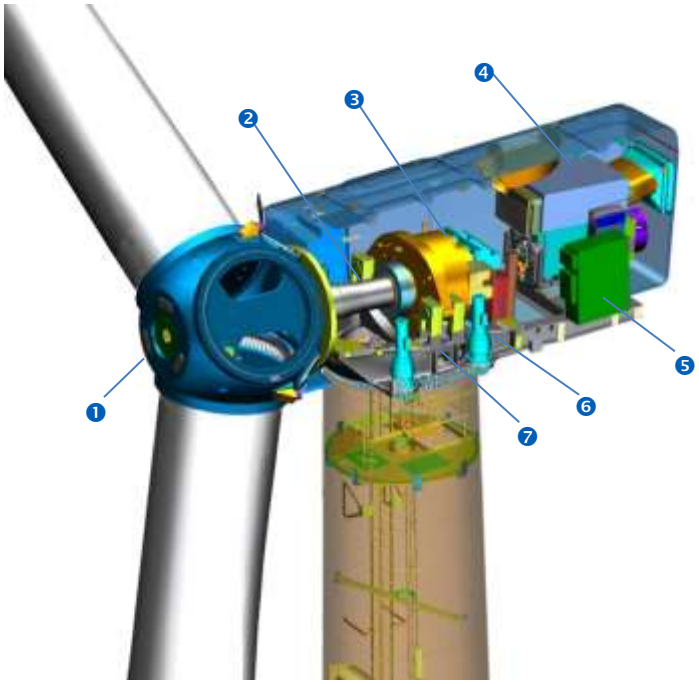
The wind turbine is a three bladed, upwind, horizontal-axis wind turbine with a rotor diameter of 116 or 127m. The turbine rotor and nacelle are mounted on top of a tubular tower with the following hub heights:

	2.0-2.4-116	2.5-116	2.7-116	2.2-2.8-127
50 Hz	80/94 m	N/A	N/A	N/A
60 Hz	80/90/94 m	80/90/94 m	90 m	89/90*/114/134

Table 1: 2MW Platform hub heights for 50/60Hz markets, from 2.0-2.8 MW; *Brazil Only

The Wind Turbine Generator (WTG) employs active yaw control (designed to steer the machine with respect to the wind direction), active blade pitch control (designed to regulate turbine rotor speed), and a generator/power electronic converter system.

The wind turbine generator features a distributed drive train design consisting of a main shaft bearing, gearbox, and generator. Figure 1 shows these, as well as other major components such as the bedplate, yaw drives and an electrical panel box.



1 – Hub

2 – Main shaft

3 - Gearbox

4 - Generator

5 – Electrical panel box

6 – Yaw drive

7 - Bedplate

Figure 1: GE Renewable Energy 2MW Platform wind turbine nacelle layout, for generator systems of 2.0-2.8 MW

2.1 Rotor

Two rotor diameter WTGs are offered: the 116m rotor and the 127m rotor WTGs. Rotor speed on the WTGs is regulated by a combination of blade pitch angle adjustment and generator/converter torque control. The rotor spins in a clock-wise direction under normal operating conditions when viewed from an upwind location.

Full blade pitch angle range is approximately 90°, with the 0° position being with the airfoil chord line flat to the prevailing wind. The blades being pitched to a full feather pitch angle of approximately 90° accomplishes aerodynamic braking of the rotor; whereby the blades “spill” the wind thus limiting rotor speed.

2.2 Blades

There are three rotor blades for each wind turbine generator. The airfoils transition along the blade span with the thicker airfoils being located in-board towards the blade root (hub) and gradually tapering to thinner cross sections out towards the blade tip.

Low Noise Trailing Edge (LNTE) are an optional feature for sites requiring reduced noise capability.

2.3 Blade Pitch Control System

The rotor utilizes three (one for each blade) independent electric pitch motors and controllers to provide adjustment of the blade pitch angle during operation. Blade pitch angle is adjusted by an electric drive that is mounted inside the rotor hub and is coupled to a ring gear mounted to the inner race of the blade pitch bearing (see Figure 1).

GE’s active-pitch controller enables the wind turbine generator rotor to regulate speed, when above rated wind speed, by allowing the blade to “spill” excess aerodynamic lift. Energy from wind gusts below rated wind speed is

captured by allowing the rotor to speed up, transforming this gust energy into kinetic energy which may then be extracted from the rotor.

Three independent back-up units are provided to power each individual blade pitch system to feather the blades and shut down the machine in the event of a grid line outage or other fault. By having all three blades outfitted with independent pitch systems, redundancy of individual blade aerodynamic braking capability is provided.

2.4 Hub

The hub is used to connect the three rotor blades to the wind turbine generator main shaft. The hub also houses the three electric blade pitch systems and is mounted directly to the main shaft. Access to the inside of the hub is provided through a hatch.

2.5 Gearbox

The gearbox in the wind turbine generator is designed to transmit power between the low-rpm turbine rotor and high- rpm electric generator. The gearbox is a multi-stage planetary/helical gear design. The gearbox is mounted to the machine bedplate. The gearing is designed to transfer torsional power from the wind turbine rotor to the electric generator. A parking brake is mounted on the high-speed shaft of the gearbox.

2.6 Bearings

The blade pitch bearing is designed to allow the blade to pitch about a span-wise pitch axis. The inner race of the blade pitch bearing is outfitted with a blade drive gear that enables the blade to be driven in pitch by an electric gear-driven motor/controller.

The main shaft bearing is a roller bearing mounted in a bearing cap arrangement.

The bearings used inside the gearbox are of the cylindrical and tapered roller type. These bearings are designed to provide bearing and alignment of the internal gearing shafts and accommodate radial and axial loads.

2.7 Brake System

The electrically actuated individual blade pitch systems act as the main braking system for the wind turbine generator. Braking under normal operating conditions is accomplished by feathering the blades out of the wind. Any single feathered rotor blade is designed to slow the rotor, and each rotor blade has its own back-up to provide power to the electric drive in the event of a grid line loss.

The wind turbine generator is also equipped with a mechanical brake located at the output (high-speed) shaft of the gearbox. This brake is only applied as an auxiliary brake to the main aerodynamic brake and to prevent rotation of the machinery as required by certain service activities.

2.8 Generator

The generator is a doubly-fed induction type. The generator meets protection class requirements of the International Standard IP 34 (duct ventilated). The generator is mounted to the generator frame and the mounting is designed so as to reduce vibration and noise transfer to the bedplate.

2.9 Flexible Coupling

Designed to protect the drive train from excessive torque loads, a flexible coupling is provided between the generator and gearbox output shaft. This coupling is equipped with a torque-limiting device sized to keep the maximum allowable torque below the maximum design limit of the drive train.

2.10 Yaw System

A ball bearing attached between the nacelle and tower facilitates yaw motion. Planetary yaw drives (with brakes that engage when the drive is disabled) mesh with the outside gear of the yaw bearing and steer the machine to track the wind in yaw. The yaw brakes prevent the yaw drives from experiencing peak loads from turbulent wind.

The controller activates the yaw drives to align the nacelle to the average wind direction based on the wind vane sensor mounted on top of the nacelle.

A cable twist sensor provides a record of nacelle yaw position and cable twisting. After the sensor detects excessive rotation in one direction, the controller automatically brings the rotor to a complete stop, untwists the cable by counter yawing of the nacelle, and restarts the wind turbine.

2.11 Tower

The wind turbine is mounted on top of a tubular tower. The tubular tower is manufactured in sections from steel plate. Access to the turbine is through a lockable steel door at the base of the tower. Service platforms are provided. Access to the nacelle is provided by a ladder and a fall arresting safety system is included. Interior lights are installed at critical points from the base of the tower to the tower top.

2.12 Nacelle

The nacelle houses the main components of the wind turbine generator. Access from the tower into the nacelle is through the bottom of the nacelle. The nacelle is ventilated. It is illuminated with electric light. A hatch at the front end of the nacelle provides access to the blades and hub. The rotor can be secured in place with a rotor lock.

2.13 Anemometer, Wind Vane and Lightning Rod

An anemometer, wind vane and lightning rod are mounted on top of the nacelle housing. Access to these sensors is accomplished through a hatch in the nacelle roof.

2.14 Lightning Protection

The rotor blades are equipped with lightning receptors mounted in the blade. Please refer to GE Renewables Energy Lightning Protection Facility/Lightning Protection Zone Concept document for further details.

2.15 Wind Turbine Control System

The wind turbine machine can be controlled automatically or manually from either an interface located inside the nacelle or from a control box at the bottom of the tower. Control signals can also be sent from a remote computer via a Supervisory Control and Data Acquisition System (SCADA), with local lockout capability provided at the turbine controller.

Service switches at the tower top prevent service personnel at the bottom of the tower from operating certain systems of the turbine while service personnel are in the nacelle. To override any machine operation, Emergency-stop buttons located in the tower base and in the nacelle, can be activated to stop the turbine in the event of an emergency.

2.16 Power Converter

The wind turbine uses a power converter system that consists of a converter on the rotor side, a DC intermediate circuit, and a power inverter on the grid side.

The converter system consists of a power module and the associated electrical equipment. Variable output frequency of the converter allows operation of the generator.

3 Technical Data

3.1 Rotor

	2.0-2.7-116	2.2-2.8-127
Maximum power output	2000 to 2700 kW	2200 to 2820 kW
Diameter	116.5 m	127.2 m
Number of blades	3	3
Swept area	10,660 m^2	12,704 m^2
Rotor speed range	7.4 to 15.7 rpm	7.4 to 15.7 rpm
Rotational direction	Clockwise looking downwind	Clockwise looking downwind
Tip speed @ rated power	81.7 m/s to 85.4 m/s	85.1 m/s to 89.1 m/s
Orientation	Upwind	Upwind
Speed regulation	Pitch control	Pitch control
Aerodynamic brakes	Full feathering	Full feathering

3.2 Pitch System

	2.0-2.7-116	2.2-2.8-127
Principle	Independent blade pitch control	
Actuation	Individual electric drive	

3.3 Yaw System

	2.0-2.7-116	2.2-2.8-127
Yaw rate	0.5 degree/s	

3.4 Corrosion Protection

Atmospheric corrosion protection (corrosion categories as defined by ISO 12944-2:1998)				
50 & 60 Hz	**Standard**		**Enhanced (Option)**	
Recommended Climate	**Dry, arid, inland, non-industrial areas**		**Humid, coastal, industrial areas**	
Component	**Internal**	**External**	**Internal**	**External**
Blades	C-4	C-5	C-4	C-5
Tower shell coating	C-2	C-3	C-4	C-5M
Tower internal fasteners, tower stair fasteners	C-4	C-4	C-4	C-5
Hub, bedplate, generator frame, main shaft, pillow block, gearbox	C-4	C-4	C-4	C-4
Generator	N/A	C-3	N/A	C-5
Nacelle, hub fasteners	C-4	C-4	C-4	C-5
Automatic lubrication system (option for 2MW)	C-3	C-3	C-4	C-5

3.5 Tip Height

	2.0-2.7-116	**2.2-2.8-127**
80 m hub height	138.3 m (Not available on 2.7-116)	Not available
89 m hub height	Not available	152.072 m
90 m hub height	148.3 m	153.3 m (Brazil only offering)
94 m hub height	152.0 m (Not available on 2.7-116)	Not available
114 m hub height	Not available	178.1 m
134 m hub height	Not available	198.5 m

4 Operational Limit

	2.0-2.7-116	2.2-2.8-127
Height above sea level	Maximum 3000 m. See notes in section maximum standard ambient temperature below.	Maximum 3000 m. See notes in section maximum standard ambient temperature below.
Minimum temperature (standard) operational/survival	Standard weather (STW): -15 °C / -20 °C Cold weather (CWE) (60Hz only): -30 °C/ -40 °C	Standard weather (STW): -15 °C / -20 °C Cold weather (CWE) (60Hz only): -30 °C/ -40 °C
Maximum standard ambient temperature (operation / survival)	+40 °C / +50 °C The turbine has a feature reducing the maximum output, resulting in minimized turbine revolutions once the component temperatures approach predefined thresholds. This feature operates best at higher altitudes, as the heat transfer properties of air diminish with decreasing density. Please note that the units are not de-rated in respect to site conditions. The units' reactions related to this feature are based solely on sensor temperatures.	+40 °C / +50 °C The turbine has a feature reducing the maximum output, resulting in minimized turbine revolutions once the component temperatures approach predefined thresholds. This feature operates best at higher altitudes, as the heat transfer properties of air diminish with decreasing density. Please note that the units are not de-rated in respect to site conditions. The units' reactions related to this feature are based solely on sensor temperatures.
Wind conditions according to IEC 61400 **(Design life 20 years)**	2.0-116: 50 / 60 Hz (IECs) Vaverage = 8.0 m/s at 80 m HH Iref = 13.5 % with Ed3 2.1-116: 50 / 60 Hz (IECs) Vaverage = 7.0 m/s at 80 m HH Iref = 12.9 % with Ed3 2.2-116: 50 / 60 Hz (IECs) Vaverage = 7.0 m/s at 80 m HH Iref = 12.9 % with Ed3 2.3-116: 50 / 60 Hz (IECs) Vaverage = 7.0 m/s at 80 m HH Iref = 12.9 % with Ed3 2.5-116: 60 Hz (IECs) Vaverage = 8.0 m/s at 80 m HH Iref = 12.9 % with Ed3 2.7-116: 60 Hz (IECs) Vaverage = 8.0 m/s at 80 m HH Iref = 12.9 % with Ed3	2.2-127: 60 Hz (IECs) Vaverage = 7.85 m/s at 80 m HH Iref = 12.9 % with Ed3 2.5-127: 60 Hz (IECs) Vaverage = 7.85 m/s at 80 m HH Iref = 12.9 % with Ed3 2.8-127: 60 Hz (IECs) Vaverage = 7.85 m/s at 80 m HH Iref = 12.9 % with Ed3
Maximum extreme gust (10 min) according to IEC 61400	50 / 60 Hz: STW and CWE: 38 m/s	60 Hz: STW and CWE: 40 m/s

Sabre Industries™
Towers and Poles

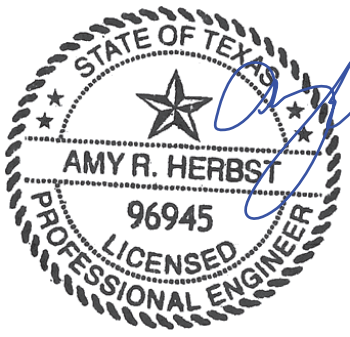
Structural Design Report

282' 1800SRWD Guyed Tower
Site: Blue Summit III SM01, TX
Site Number: WBS3-SM01

Prepared for: NEXTERA ENERGY RESOURCES, LLC
by: Sabre Towers & Poles ™

Job Number: 436011
Revision A

June 13, 2019



6/13/19

Sabre Communications Corporation
Texas Registration Number F-4365

Designed Appurtenance Loading

Elev	Description	Tx-Line
292	Goal Post - 12'	
292	(2) WindSensor P2546-0PR	(2) 3/8"
279	(2) 12' Horizontal Boom	
279	Flush Mount	
279	Flush Mount	
279	(1) Pressure Sensor (10in x 4in)	(1) 3/8"
279	(1) Temperature Sensor (10in x 4in)	(1) 3/8"
279	(2) 200M Wind Vane	(2) 3/8"
272	12' Horizontal Boom	
272	(1) Gill Propeller Anemometer 27106T	(1) 3/8"
190	(2) 12' Horizontal Boom	
190	(2) WindSensor P2546-0PR	(2) 3/8"
184	12' Horizontal Boom	
184	(1) 200M Wind Vane	(1) 3/8"
174.7	(1) DB636	
170	3ft Sidearm	
170		(1) 7/8"
85	(2) 12' Horizontal Boom	
85	(2) WindSensor P2546-0PR	(2) 3/8"
79	12' Horizontal Boom	
79	(1) 200M Wind Vane	(1) 3/8"

Design Criteria - ANSI/TIA-222-G

ASCE 7-16 Ultimate Wind Speed (No Ice)	108 mph
Wind Speed (Ice)	40 mph
Design Ice Thickness	1.50 in
Structure Class	II
Risk Category	II
Exposure Category	C
Topographic Category	1

Base Reactions

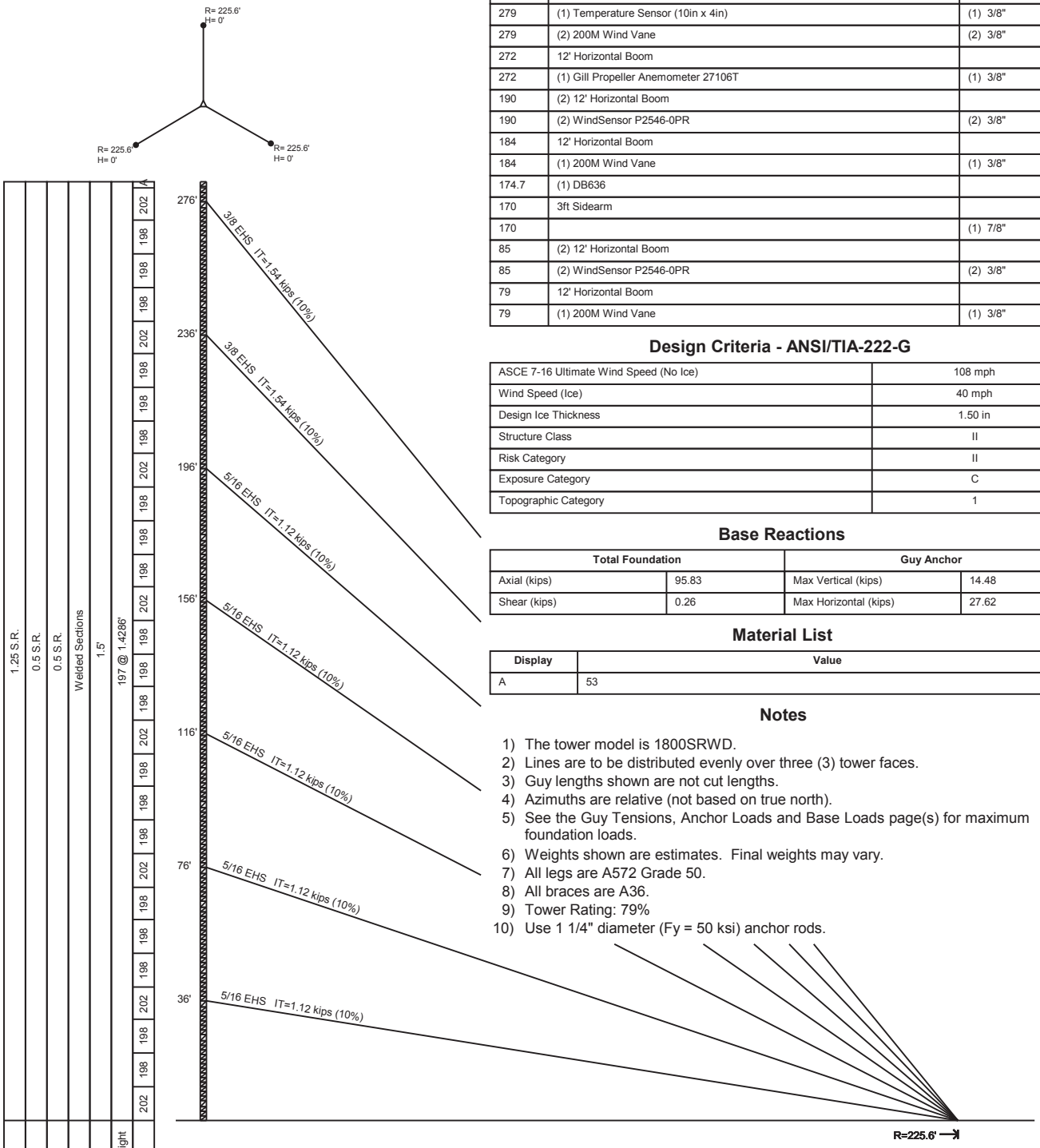
Total Foundation		Guy Anchor	
Axial (kips)	95.83	Max Vertical (kips)	14.48
Shear (kips)	0.26	Max Horizontal (kips)	27.62

Material List

Display	Value
A	53

Notes

1) The tower model is 1800SRWD.
2) Lines are to be distributed evenly over three (3) tower faces.
3) Guy lengths shown are not cut lengths.
4) Azimuths are relative (not based on true north).
5) See the Guy Tensions, Anchor Loads and Base Loads page(s) for maximum foundation loads.
6) Weights shown are estimates. Final weights may vary.
7) All legs are A572 Grade 50.
8) All braces are A36.
9) Tower Rating: 79%
10) Use 1 1/4" diameter (Fy = 50 ksi) anchor rods.



Sabre Industries™ Towers and Poles

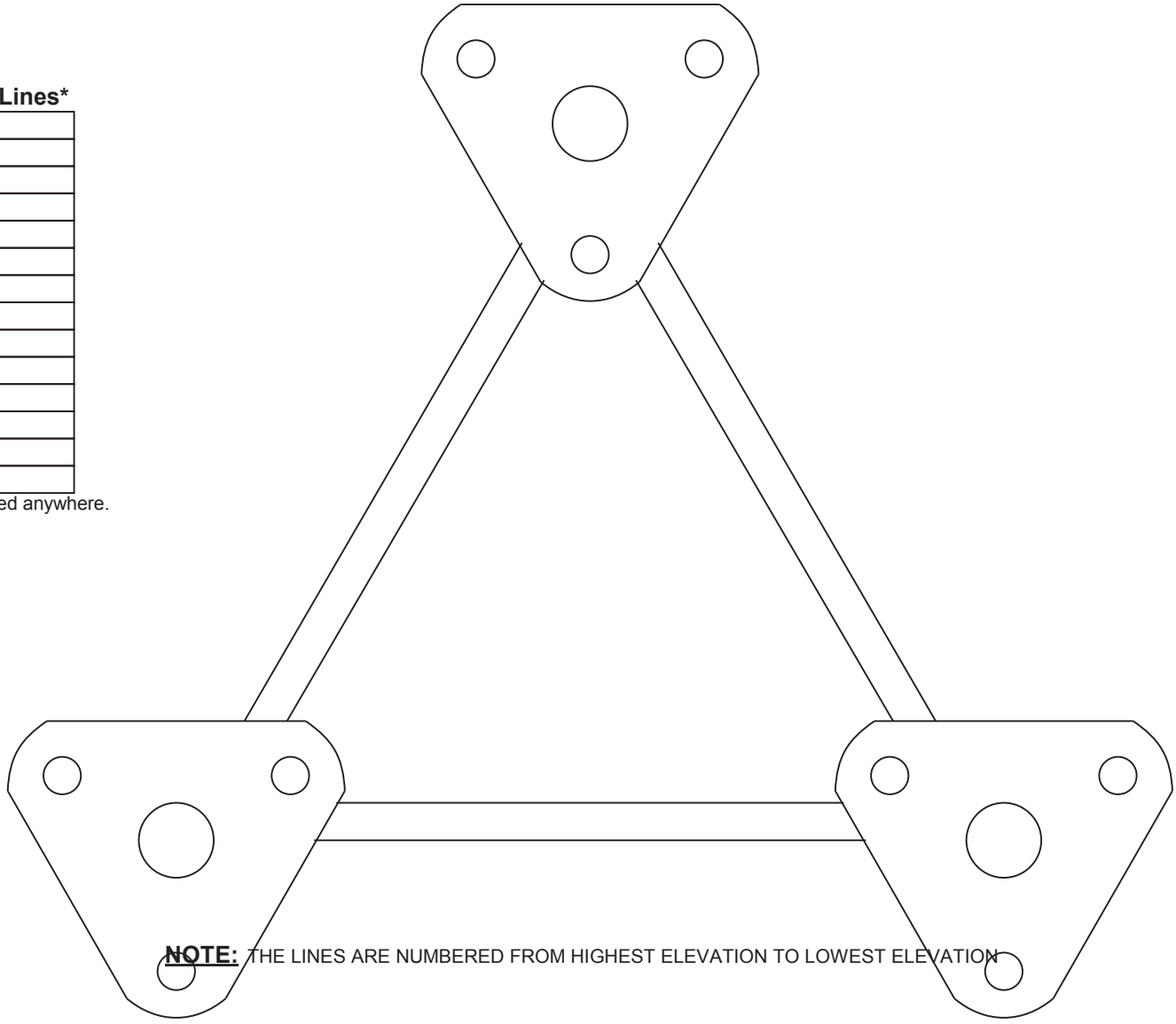
Sabre Communications Corporation
7101 Southbridge Drive
P.O. Box 658
Sioux City, IA 51102-0658
Phone: (712) 258-6690
Fax: (712) 279-0814

Job:	**436011A**
Customer:	NEXTERA ENERGY RESOURCES, LLC
Site Name:	Blue Summit III SM01, TX WBS3-SM01
Description:	282' 1800SRWD
Date:	6/13/2019 By: ARH

Additional Lines*

(1)	3/8
(2)	3/8
(3)	3/8
(4)	3/8
(5)	3/8
(6)	3/8
(7)	3/8
(8)	3/8
(9)	3/8
(10)	3/8
(11)	7/8
(12)	3/8
(13)	3/8
(14)	3/8

* May be located anywhere.



NOTE: THE LINES ARE NUMBERED FROM HIGHEST ELEVATION TO LOWEST ELEVATION

Sabre Industries™ Towers and Poles

Sabre Communications Corporation
7101 Southbridge Drive
P.O. Box 658
Sioux City, IA 51102-0658
Phone: (712) 258-6690
Fax: (712) 279-0814

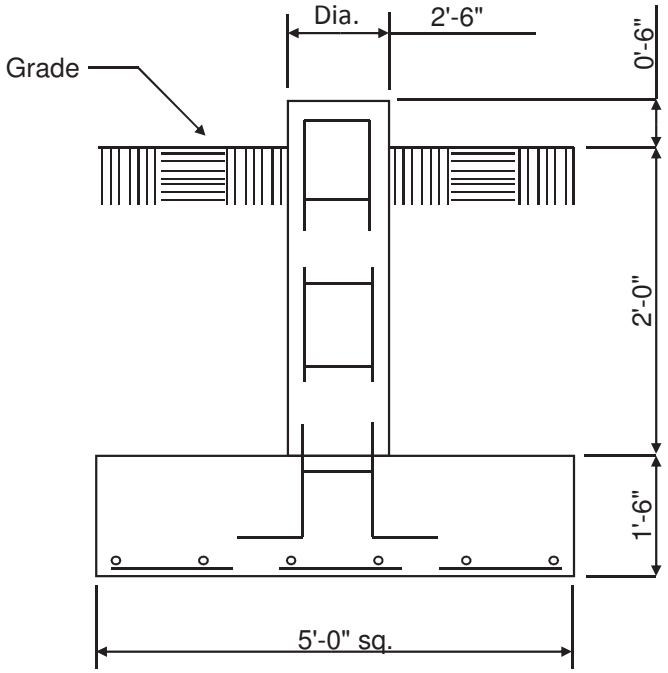
Job:	**436011A**
Customer:	NEXTERA ENERGY RESOURCES, LLC
Site Name:	Blue Summit III SM01, TX WBS3-SM01
Description:	282' 1800SRWD
Date:	6/13/2019 By: ARH

Sabre Industries™
Towers and Poles

No.: 436011

Date: 06/13/2019
By: ARH
Revision A

Customer: NEXTERA ENERGY RESOURCES, LLC
Site: Blue Summit III SM01, TX WBS3-SM01
282' model 1800 SRWD Guyed Tower (18" face)



TOWER BASE
(1.84 Cu. Yds.)
(NOT TO SCALE)

Rebar Schedule	
Pier	(6) #7 vertical rebar w/ #3 ties @12" spacing
Pad	(6) #7 horizontal rebar each way, evenly spaced, bottom only

Notes

1) Concrete shall have a minimum 28-day compressive strength of 4,500 psi, in accordance with ACI 318-11.
2) Rebar to conform to ASTM specification A615 Grade 60.
3) All rebar to have a minimum of 3" concrete cover.
4) All exposed concrete corners to be chamfered 3/4".
5) The foundation design is based on the geotechnical report by RRC Power & Energy, LLC., Project No. GE1807020 dated: January 2nd, 2019.

6) The foundation is based on the following factored loads:
   Factored Axial load (kips) = 95.83
   Factored Shear load (kips) = 0.26
7) See the geotechnical report for compaction requirements, if specified.

7101 Southbridge Drive - P.O. Box 658 - Sioux City, IA 51102-0658 - Phone 712.258.6690 - Fax 712.279.0814

Sabre Industries™
Towers and Poles

No.: 436011

Date: 06/13/2019
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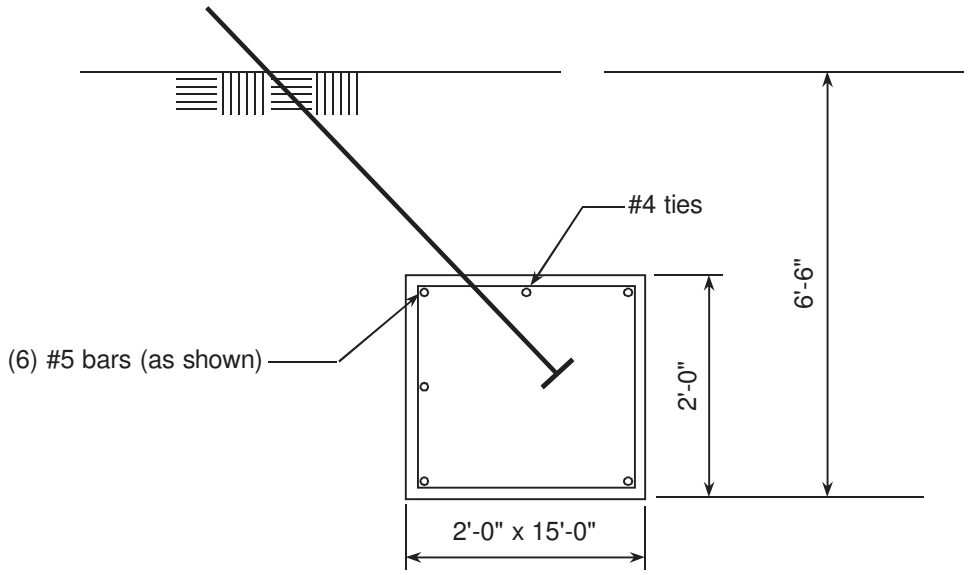
Revision A

Customer: NEXTERA ENERGY RESOURCES, LLC
Site: Blue Summit III SM01, TX WBS3-SM01
282' model 1800 SRWD Guyed Tower (18" face)



GUY ANCHOR
(2.22 Cu. Yds. Each)
(3 REQUIRED; NOT TO SCALE)

Rebar Schedule Per Anchor	
Guy Anchor	(6) #5 horizontal rebar x 14'-6"
	(16) #4 ties evenly spaced

Notes

1) Concrete shall have a minimum 28-day compressive strength of 4,500 psi, in accordance with ACI 318-11.
2) Rebar to conform to ASTM specification A615 Grade 60.
3) All rebar to have a minimum of 3" concrete cover.
4) The foundation design is based on the geotechnical report by RRC Power & Energy, LLC., Project No. GE1807020 dated: January 2nd, 2019.

5) The foundation is based on the following factored loads:
   Uplift (kips) = 14.48
   Horizontal force (kips) = 27.62
6) When the soil electrical resistivity is less than 50 ohm-m and/or the measured soil pH values are below 3 or greater than 9, additional corrosion control is required. See the geotechnical report for these parameters and compaction requirements, if specified.

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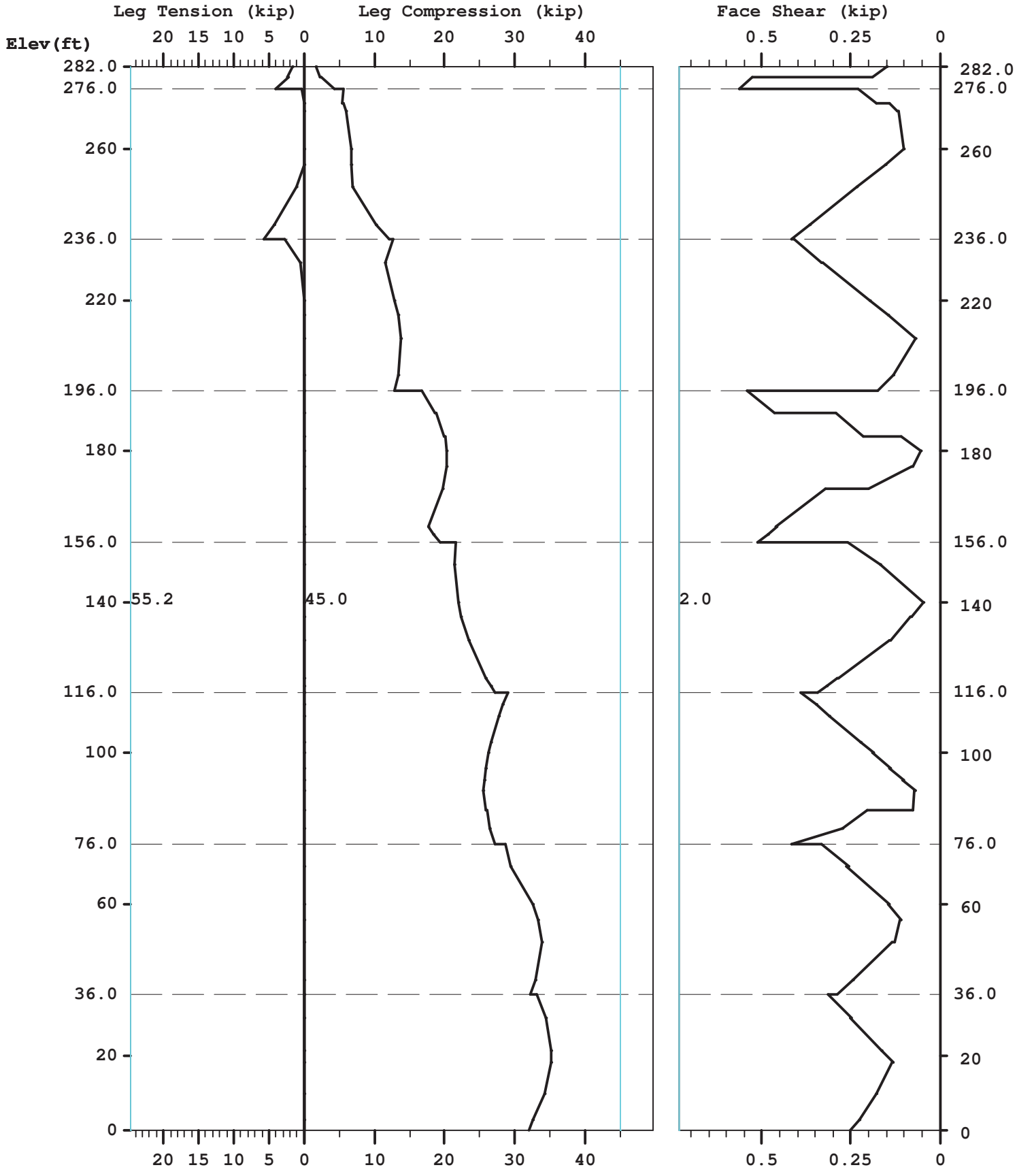
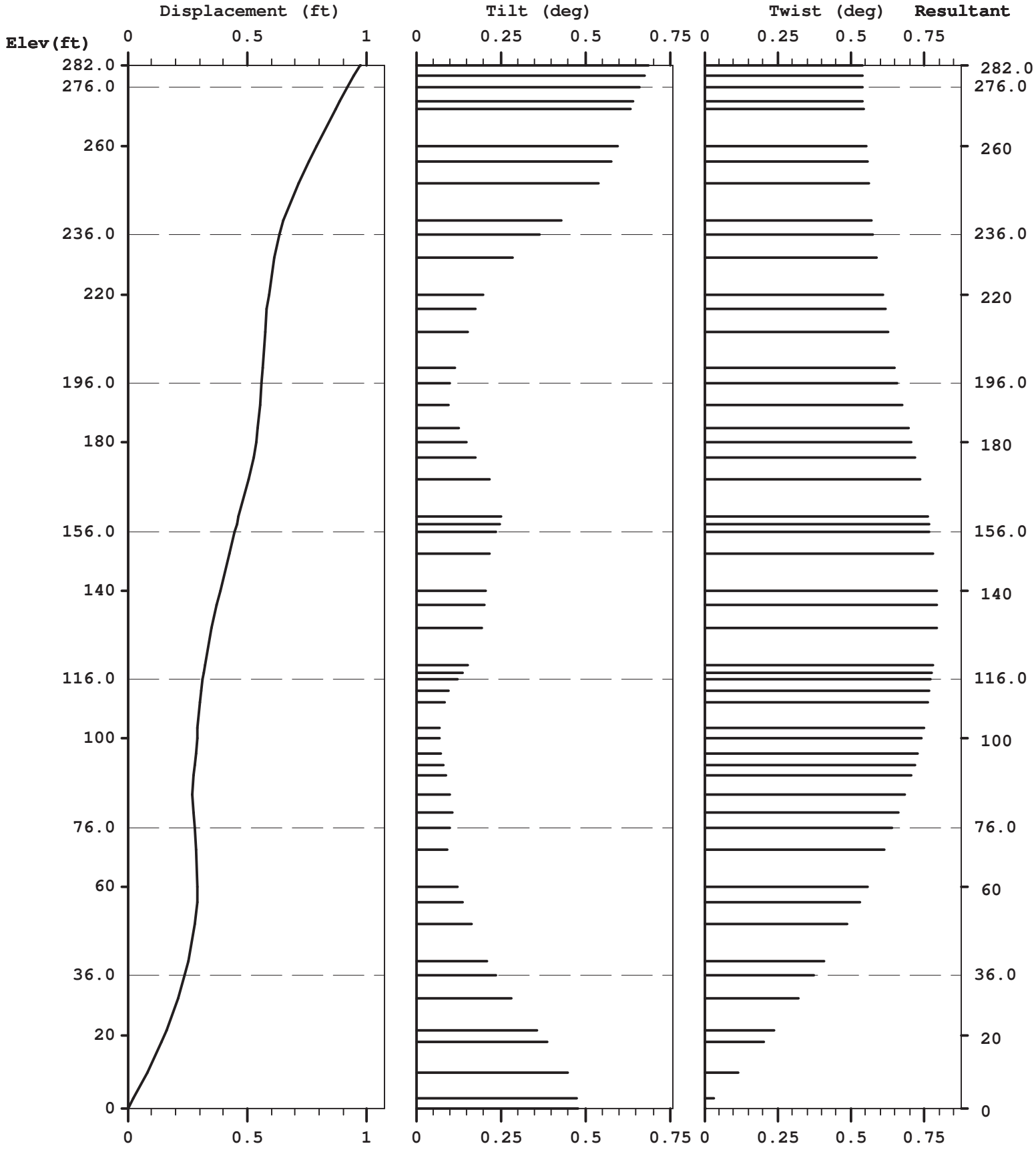
Maximum

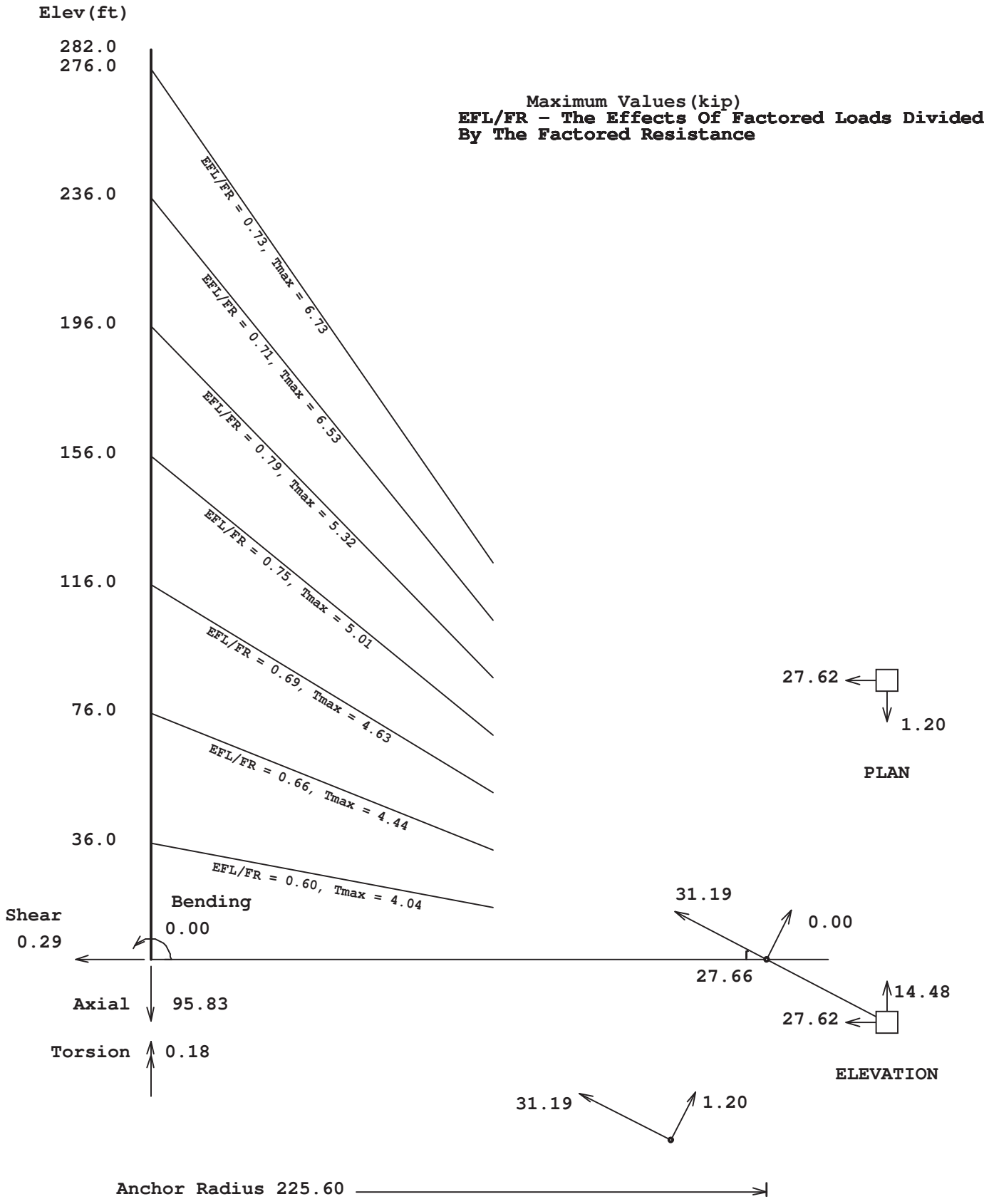

Leg Tension (kip)
Leg Compression (kip)
Face Shear (kip)
Elev(ft)
20 15 10 5 0
10 20 30 40
0.5 0.25 0
282.0
276.0
260
236.0
220
196.0
180
156.0
140
116.0
100
76.0
60
36.0
20
0
55.2
45.0
2.0

Maximum


Displacement (ft)
Tilt (deg)
Twist (deg)
Resultant
Elev(ft)
0
0.5
1
0.25
0.75
282.0
276.0
260
236.0
220
196.0
180
156.0
140
116.0
100
76.0
60
36.0
20

Maximum

Guy Tensions, Anchor Loads and Base Loads



MAST DATA

UPPER ELEV FT	MAST TYPE OF WEB	NO OF LEGS *	GEOM FACE WIDTH FT	GEOM PANEL HEIGHT FT *	X-SECTION-AREA ONE LEG IN.SQ.	X-SECTION-AREA ONE DIAG IN.SQ. *	BARE WEIGHT K/FT.	ELASTIC MODULUS KIP/IN.SQ	TEMP COEFF /DEG
282.0	2	3	1.500	1.429	1.230	0.200	0.013	29000.0	0.0000117
280.0	2	3	1.500	1.429	1.230	0.200	0.018	29000.0	0.0000117
270.0	2	3	1.500	1.429	1.230	0.200	0.018	29000.0	0.0000117
260.0	2	3	1.500	1.429	1.230	0.200	0.018	29000.0	0.0000117
250.0	2	3	1.500	1.429	1.230	0.200	0.018	29000.0	0.0000117
240.0	2	3	1.500	1.429	1.230	0.200	0.018	29000.0	0.0000117
230.0	2	3	1.500	1.429	1.230	0.200	0.018	29000.0	0.0000117
220.0	2	3	1.500	1.429	1.230	0.200	0.018	29000.0	0.0000117
210.0	2	3	1.500	1.429	1.230	0.200	0.018	29000.0	0.0000117
200.0	2	3	1.500	1.429	1.230	0.200	0.018	29000.0	0.0000117
190.0	2	3	1.500	1.429	1.230	0.200	0.018	29000.0	0.0000117
180.0	2	3	1.500	1.429	1.230	0.200	0.018	29000.0	0.0000117
170.0	2	3	1.500	1.429	1.230	0.200	0.018	29000.0	0.0000117
160.0	2	3	1.500	1.429	1.230	0.200	0.018	29000.0	0.0000117
150.0	2	3	1.500	1.429	1.230	0.200	0.018	29000.0	0.0000117
140.0	2	3	1.500	1.429	1.230	0.200	0.018	29000.0	0.0000117
130.0	2	3	1.500	1.429	1.230	0.200	0.018	29000.0	0.0000117
120.0	2	3	1.500	1.429	1.230	0.200	0.018	29000.0	0.0000117
110.0	2	3	1.500	1.429	1.230	0.200	0.018	29000.0	0.0000117
100.0	2	3	1.500	1.429	1.230	0.200	0.018	29000.0	0.0000117
90.0	2	3	1.500	1.429	1.230	0.200	0.018	29000.0	0.0000117
80.0	2	3	1.500	1.429	1.230	0.200	0.018	29000.0	0.0000117
70.0	2	3	1.500	1.429	1.230	0.200	0.018	29000.0	0.0000117
60.0	2	3	1.500	1.429	1.230	0.200	0.018	29000.0	0.0000117
50.0	2	3	1.500	1.429	1.230	0.200	0.018	29000.0	0.0000117
40.0	2	3	1.500	1.429	1.230	0.200	0.018	29000.0	0.0000117
30.0	2	3	1.500	1.429	1.230	0.200	0.018	29000.0	0.0000117
20.0	2	3	1.500	1.429	1.230	0.200	0.018	29000.0	0.0000117
10.0	2	3	1.500	1.429	1.230	0.200	0.018	29000.0	0.0000117

* If NO OF LEGS is 1 : that part of the mast is assumed to be Cylindrical
and : FACE WIDTH = outside diameter
PANEL HEIGHT = thickness
AREA OF DIAG = Poisson ratio

GUY GEOMETRY
============

ELEV FT	GUY AZI DEG	DIAMETER IN.	HEIGHT FT.	RADIUS FT.	MAST ATTACH RADIUS FT.	ATTACH AZI DEG	INITIAL TENSION KIP
276.0	240.0	0.375	276.0	225.6	0.866	240.0	1.540
276.0	120.0	0.375	276.0	225.6	0.866	120.0	1.540
276.0	0.0	0.375	276.0	225.6	0.866	0.0	1.540
236.0	240.0	0.375	236.0	225.6	0.866	240.0	1.540
236.0	120.0	0.375	236.0	225.6	0.866	120.0	1.540
236.0	0.0	0.375	236.0	225.6	0.866	0.0	1.540
196.0	240.0	0.312	196.0	225.6	0.866	240.0	1.120
196.0	120.0	0.312	196.0	225.6	0.866	120.0	1.120
196.0	0.0	0.312	196.0	225.6	0.866	0.0	1.120
156.0	240.0	0.312	156.0	225.6	0.866	240.0	1.120
156.0	120.0	0.312	156.0	225.6	0.866	120.0	1.120
156.0	0.0	0.312	156.0	225.6	0.866	0.0	1.120
116.0	240.0	0.312	116.0	225.6	0.866	240.0	1.120
116.0	120.0	0.312	116.0	225.6	0.866	120.0	1.120
116.0	0.0	0.312	116.0	225.6	0.866	0.0	1.120
76.0	240.0	0.312	76.0	225.6	0.866	240.0	1.120
76.0	120.0	0.312	76.0	225.6	0.866	120.0	1.120
76.0	0.0	0.312	76.0	225.6	0.866	0.0	1.120
36.0	240.0	0.312	36.0	225.6	0.866	240.0	1.120
36.0	120.0	0.312	36.0	225.6	0.866	120.0	1.120
36.0	0.0	0.312	36.0	225.6	0.866	0.0	1.120

GUY MATERIAL PROPERTIES
=======================

ELEV FT	GUY AZI DEG	BREAKING STRENGTH KIP	GUY WEIGHT LBS/FT	GUY AREA IN.SQ	ELASTIC MODULUS KIP/IN.SQ	THERMAL COEFF /DEG	UNSTRESS LENGTH FT
276.0	240.0	15.400	0.270	0.084	21000.0	0.0000117	355.622
276.0	120.0	15.400	0.270	0.084	21000.0	0.0000117	355.622
276.0	0.0	15.400	0.270	0.084	21000.0	0.0000117	355.622
236.0	240.0	15.400	0.270	0.084	21000.0	0.0000117	325.608
236.0	120.0	15.400	0.270	0.084	21000.0	0.0000117	325.608
236.0	0.0	15.400	0.270	0.084	21000.0	0.0000117	325.608
196.0	240.0	11.200	0.222	0.059	21000.0	0.0000117	297.941
196.0	120.0	11.200	0.222	0.059	21000.0	0.0000117	297.941
196.0	0.0	11.200	0.222	0.059	21000.0	0.0000117	297.941
156.0	240.0	11.200	0.222	0.059	21000.0	0.0000117	273.338
156.0	120.0	11.200	0.222	0.059	21000.0	0.0000117	273.338
156.0	0.0	11.200	0.222	0.059	21000.0	0.0000117	273.338
116.0	240.0	11.200	0.222	0.059	21000.0	0.0000117	252.692
116.0	120.0	11.200	0.222	0.059	21000.0	0.0000117	252.692
116.0	0.0	11.200	0.222	0.059	21000.0	0.0000117	252.692
76.0	240.0	11.200	0.222	0.059	21000.0	0.0000117	237.039
76.0	120.0	11.200	0.222	0.059	21000.0	0.0000117	237.039
76.0	0.0	11.200	0.222	0.059	21000.0	0.0000117	237.039
36.0	240.0	11.200	0.222	0.059	21000.0	0.0000117	227.411
36.0	120.0	11.200	0.222	0.059	21000.0	0.0000117	227.411
36.0	0.0	11.200	0.222	0.059	21000.0	0.0000117	227.411

FACTORED LEG AND FACE SHEAR RESISTANCE
======================================

BOTTOM ELEV ft	TOP ELEV ft	LEG COMP kip	FACE SHEAR kip	LEG TENS kip
0.00	10.00	45.04	2.00	55.22
10.00	20.00	45.04	2.00	55.22
20.00	30.00	45.04	2.00	55.22
30.00	40.00	45.04	2.00	55.22
40.00	50.00	45.04	2.00	55.22
50.00	60.00	45.04	2.00	55.22
60.00	70.00	45.04	2.00	55.22
70.00	80.00	45.04	2.00	55.22
80.00	90.00	45.04	2.00	55.22
90.00	100.00	45.04	2.00	55.22
100.00	110.00	45.04	2.00	55.22
110.00	120.00	45.04	2.00	55.22
120.00	130.00	45.04	2.00	55.22
130.00	140.00	45.04	2.00	55.22
140.00	150.00	45.04	2.00	55.22
150.00	160.00	45.04	2.00	55.22

160.00	170.00	45.04	2.00	55.22
170.00	180.00	45.04	2.00	55.22
180.00	190.00	45.04	2.00	55.22
190.00	200.00	45.04	2.00	55.22
200.00	210.00	45.04	2.00	55.22
210.00	220.00	45.04	2.00	55.22
220.00	230.00	45.04	2.00	55.22
230.00	240.00	45.04	2.00	55.22
240.00	250.00	45.04	2.00	55.22
250.00	260.00	45.04	2.00	55.22
260.00	270.00	45.04	2.00	55.22
270.00	280.00	45.04	2.00	55.22
280.00	282.00	45.04	2.00	55.22

==========

* 12 wind directions were analyzed. Only 2 condition(s) shown in full

==========

LOADING CONDITION A ==========

108 mph Ultimate wind with no ice. Wind Azimuth: 0◆

MAST LOADING
============

LOAD TYPE	ELEV FT	.FORCES (KIP & KIP/FT) N	E	DOWN	.MOMENTS(FT.K & FT.K/FT) N	E	TORSION	ANT-ORIENT AZI DEG	VERT DEG
C	292.0	-0.225	0.000	0.002	0.00	0.00	0.00	0.0	0.00
C	279.0	-0.082	0.000	0.072	0.00	0.00	0.00	0.0	0.00
C	279.0	-0.082	0.000	0.072	0.00	0.00	0.00	0.0	0.00
C	279.0	-0.344	0.000	0.242	0.00	0.00	0.00	0.0	0.00
C	272.0	-0.140	0.000	0.121	0.00	0.00	0.00	0.0	0.00
C	190.0	-0.257	0.000	0.242	0.00	0.00	0.00	0.0	0.00
C	184.0	-0.159	0.000	0.121	0.00	0.00	0.00	0.0	0.00
C	174.7	-0.084	0.000	0.036	0.00	0.00	0.00	0.0	0.00
C	170.0	-0.191	0.000	0.180	0.00	0.00	0.00	0.0	0.00
C	85.0	-0.217	0.000	0.242	0.00	0.00	0.00	0.0	0.00
C	79.0	-0.133	0.000	0.121	0.00	0.00	0.00	0.0	0.00
D	282.0	-0.018	0.000	0.022	0.00	0.00	0.00		
D	275.7	-0.020	0.000	0.024	0.00	0.00	0.00		
D	275.7	-0.020	0.000	0.023	0.00	0.00	0.00		
D	270.0	-0.020	0.000	0.023	0.00	0.00	0.00		
D	270.0	-0.020	0.000	0.023	0.00	0.00	0.00		
D	261.4	-0.020	0.000	0.023	0.00	0.00	0.00		
D	261.4	-0.020	0.000	0.023	0.00	0.00	0.00		
D	251.4	-0.020	0.000	0.023	0.00	0.00	0.00		
D	251.4	-0.020	0.000	0.023	0.00	0.00	0.00		
D	241.4	-0.020	0.000	0.023	0.00	0.00	0.00		
D	241.4	-0.020	0.000	0.023	0.00	0.00	0.00		
D	231.4	-0.020	0.000	0.023	0.00	0.00	0.00		
D	231.4	-0.020	0.000	0.023	0.00	0.00	0.00		
D	221.4	-0.019	0.000	0.023	0.00	0.00	0.00		
D	221.4	-0.019	0.000	0.023	0.00	0.00	0.00		
D	211.4	-0.019	0.000	0.023	0.00	0.00	0.00		
D	211.4	-0.019	0.000	0.023	0.00	0.00	0.00		
D	201.4	-0.019	0.000	0.023	0.00	0.00	0.00		
D	201.4	-0.019	0.000	0.023	0.00	0.00	0.00		
D	191.4	-0.019	0.000	0.023	0.00	0.00	0.00		
D	191.4	-0.019	0.000	0.024	0.00	0.00	0.00		
D	184.3	-0.020	0.000	0.024	0.00	0.00	0.00		
D	184.3	-0.020	0.000	0.024	0.00	0.00	0.00		
D	180.0	-0.020	0.000	0.024	0.00	0.00	0.00		
D	180.0	-0.020	0.000	0.024	0.00	0.00	0.00		
D	175.7	-0.020	0.000	0.024	0.00	0.00	0.00		
D	175.7	-0.020	0.000	0.024	0.00	0.00	0.00		
D	171.4	-0.020	0.000	0.024	0.00	0.00	0.00		
D	171.4	-0.021	0.000	0.025	0.00	0.00	0.00		
D	161.4	-0.023	0.000	0.026	0.00	0.00	0.00		
D	161.4	-0.022	0.000	0.025	0.00	0.00	0.00		
D	151.4	-0.022	0.000	0.025	0.00	0.00	0.00		
D	151.4	-0.022	0.000	0.025	0.00	0.00	0.00		
D	141.4	-0.021	0.000	0.025	0.00	0.00	0.00		
D	141.4	-0.021	0.000	0.025	0.00	0.00	0.00		
D	131.4	-0.021	0.000	0.025	0.00	0.00	0.00		
D	131.4	-0.021	0.000	0.025	0.00	0.00	0.00		
D	121.4	-0.021	0.000	0.025	0.00	0.00	0.00		
D	121.4	-0.021	0.000	0.025	0.00	0.00	0.00		
D	111.4	-0.020	0.000	0.025	0.00	0.00	0.00		
D	111.4	-0.020	0.000	0.025	0.00	0.00	0.00		

D	101.4	-0.020	0.000	0.025	0.00	0.00	0.00
D	101.4	-0.020	0.000	0.025	0.00	0.00	0.00
D	91.4	-0.020	0.000	0.025	0.00	0.00	0.00
D	91.4	-0.020	0.000	0.025	0.00	0.00	0.00
D	85.7	-0.019	0.000	0.025	0.00	0.00	0.00
D	85.7	-0.020	0.000	0.026	0.00	0.00	0.00
D	80.0	-0.020	0.000	0.026	0.00	0.00	0.00
D	80.0	-0.020	0.000	0.026	0.00	0.00	0.00
D	71.4	-0.020	0.000	0.027	0.00	0.00	0.00
D	71.4	-0.020	0.000	0.026	0.00	0.00	0.00
D	61.4	-0.019	0.000	0.026	0.00	0.00	0.00
D	61.4	-0.019	0.000	0.026	0.00	0.00	0.00
D	51.4	-0.019	0.000	0.026	0.00	0.00	0.00
D	51.4	-0.019	0.000	0.026	0.00	0.00	0.00
D	41.4	-0.018	0.000	0.026	0.00	0.00	0.00
D	41.4	-0.018	0.000	0.026	0.00	0.00	0.00
D	31.4	-0.017	0.000	0.026	0.00	0.00	0.00
D	31.4	-0.017	0.000	0.026	0.00	0.00	0.00
D	21.4	-0.016	0.000	0.026	0.00	0.00	0.00
D	21.4	-0.016	0.000	0.026	0.00	0.00	0.00
D	17.1	-0.015	0.000	0.026	0.00	0.00	0.00
D	17.1	-0.015	0.000	0.026	0.00	0.00	0.00
D	11.4	-0.015	0.000	0.026	0.00	0.00	0.00
D	11.4	-0.015	0.000	0.026	0.00	0.00	0.00
D	2.9	-0.014	0.000	0.026	0.00	0.00	0.00
D	2.9	-0.014	0.000	0.026	0.00	0.00	0.00
D	0.0	-0.014	0.000	0.026	0.00	0.00	0.00

GUY LOADING
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.. WIND LOADING ... AZI	SPEED	REF PRESS	TEMP CHANGE	.ICE LOAD.. RAD	DENS	CONV TOL	PROFILES. CAB	WIND	.LOAD FACTORS. WIND	DEAD	ICE
DEG	MPH	PSF	DEG	IN	PCF						
0.0	84.0	0.00	0.00	0.00	56.00	0.0100	1	4	1.60	1.00	1.00

CABLE PROFILE: 1 - CATENARY 2 - PARABOLIC

WIND PROFILE: 1 - EIA 222 default
2 - Constant Kz=1, Kiz=1
3 - Step function for Kz, Kiz
(requires definition of Exposure Factor Kz, Kiz table)
4 - Special Factors
5 - Site specific wind formula, Kiz as EIA 222 default
(requires definition of Exposure Factor Qh formula table)

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LOADING CONDITION M ==========

40 mph wind with 1.5 ice. Wind Azimuth: 0◆

MAST LOADING
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LOAD TYPE	ELEV FT	.FORCES (KIP & KIP/FT) N	E	DOWN	.MOMENTS(FT.K & FT.K/FT) N	E	TORSION	ANT-ORIENT AZI DEG	VERT DEG
C	292.0	-0.085	0.000	0.006	0.00	0.00	0.00	0.0	0.00
C	279.0	-0.034	0.000	0.183	0.00	0.00	0.00	0.0	0.00
C	279.0	-0.034	0.000	0.183	0.00	0.00	0.00	0.0	0.00
C	279.0	-0.117	0.000	0.618	0.00	0.00	0.00	0.0	0.00
C	272.0	-0.046	0.000	0.309	0.00	0.00	0.00	0.0	0.00
C	190.0	-0.084	0.000	0.603	0.00	0.00	0.00	0.0	0.00
C	184.0	-0.052	0.000	0.301	0.00	0.00	0.00	0.0	0.00
C	174.7	-0.026	0.000	0.089	0.00	0.00	0.00	0.0	0.00
C	170.0	-0.052	0.000	0.357	0.00	0.00	0.00	0.0	0.00
C	85.0	-0.068	0.000	0.575	0.00	0.00	0.00	0.0	0.00
C	79.0	-0.042	0.000	0.287	0.00	0.00	0.00	0.0	0.00
D	282.0	-0.013	0.000	0.090	0.00	0.00	0.00		
D	280.6	-0.013	0.000	0.090	0.00	0.00	0.00		
D	280.6	-0.021	0.000	0.141	0.00	0.00	0.00		
D	280.0	-0.021	0.000	0.141	0.00	0.00	0.00		
D	280.0	-0.015	0.000	0.096	0.00	0.00	0.00		
D	278.6	-0.015	0.000	0.096	0.00	0.00	0.00		
D	278.6	-0.018	0.000	0.111	0.00	0.00	0.00		
D	272.9	-0.018	0.000	0.111	0.00	0.00	0.00		
D	272.9	-0.018	0.000	0.114	0.00	0.00	0.00		

D	268.6	-0.018	0.000	0.116	0.00	0.00	0.00
D	268.6	-0.018	0.000	0.116	0.00	0.00	0.00
D	261.4	-0.018	0.000	0.116	0.00	0.00	0.00
D	261.4	-0.018	0.000	0.116	0.00	0.00	0.00
D	251.4	-0.018	0.000	0.115	0.00	0.00	0.00
D	251.4	-0.018	0.000	0.115	0.00	0.00	0.00
D	241.4	-0.017	0.000	0.114	0.00	0.00	0.00
D	241.4	-0.017	0.000	0.114	0.00	0.00	0.00
D	231.4	-0.017	0.000	0.114	0.00	0.00	0.00
D	231.4	-0.017	0.000	0.114	0.00	0.00	0.00
D	221.4	-0.017	0.000	0.113	0.00	0.00	0.00
D	221.4	-0.017	0.000	0.113	0.00	0.00	0.00
D	211.4	-0.017	0.000	0.112	0.00	0.00	0.00
D	211.4	-0.017	0.000	0.112	0.00	0.00	0.00
D	201.4	-0.017	0.000	0.112	0.00	0.00	0.00
D	201.4	-0.017	0.000	0.112	0.00	0.00	0.00
D	191.4	-0.017	0.000	0.111	0.00	0.00	0.00
D	191.4	-0.017	0.000	0.114	0.00	0.00	0.00
D	184.3	-0.016	0.000	0.123	0.00	0.00	0.00
D	184.3	-0.016	0.000	0.124	0.00	0.00	0.00
D	180.0	-0.016	0.000	0.125	0.00	0.00	0.00
D	180.0	-0.016	0.000	0.124	0.00	0.00	0.00
D	175.7	-0.016	0.000	0.124	0.00	0.00	0.00
D	175.7	-0.016	0.000	0.124	0.00	0.00	0.00
D	171.4	-0.016	0.000	0.124	0.00	0.00	0.00
D	171.4	-0.016	0.000	0.126	0.00	0.00	0.00
D	161.4	-0.016	0.000	0.133	0.01	0.00	0.00
D	161.4	-0.016	0.000	0.130	0.00	0.00	0.00
D	150.0	-0.016	0.000	0.129	0.00	0.00	0.00
D	150.0	-0.016	0.000	0.128	0.00	0.00	0.00
D	140.0	-0.016	0.000	0.128	0.00	0.00	0.00
D	140.0	-0.015	0.000	0.127	0.00	0.00	0.00
D	130.0	-0.015	0.000	0.127	0.00	0.00	0.00
D	130.0	-0.015	0.000	0.126	0.00	0.00	0.00
D	120.0	-0.015	0.000	0.126	0.00	0.00	0.00
D	120.0	-0.015	0.000	0.124	0.00	0.00	0.00
D	112.9	-0.015	0.000	0.124	0.00	0.00	0.00
D	112.9	-0.015	0.000	0.124	0.00	0.00	0.00
D	102.9	-0.015	0.000	0.123	0.00	0.00	0.00
D	102.9	-0.015	0.000	0.123	0.00	0.00	0.00
D	92.9	-0.014	0.000	0.121	0.00	0.00	0.00
D	92.9	-0.014	0.000	0.120	0.01	0.00	0.00
D	80.0	-0.014	0.000	0.126	0.00	0.00	0.00
D	80.0	-0.014	0.000	0.128	0.00	0.00	0.00
D	70.0	-0.014	0.000	0.132	0.01	0.00	0.00
D	70.0	-0.013	0.000	0.128	0.00	0.00	0.00
D	60.0	-0.013	0.000	0.128	0.00	0.00	0.00
D	60.0	-0.013	0.000	0.125	0.00	0.00	0.00
D	50.0	-0.013	0.000	0.126	0.00	0.00	0.00
D	50.0	-0.012	0.000	0.122	0.00	0.00	0.00
D	40.0	-0.012	0.000	0.123	0.00	0.00	0.00
D	40.0	-0.012	0.000	0.119	0.00	0.00	0.00
D	30.0	-0.012	0.000	0.119	0.00	0.00	0.00
D	30.0	-0.011	0.000	0.114	0.00	0.00	0.00
D	20.0	-0.011	0.000	0.115	0.00	0.00	0.00
D	20.0	-0.010	0.000	0.108	0.00	0.00	0.00
D	10.0	-0.010	0.000	0.109	0.00	0.00	0.00
D	10.0	-0.010	0.000	0.103	0.00	0.00	0.00
D	0.0	-0.013	0.000	0.125	0.01	0.01	0.00

GUY LOADING
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.. WIND LOADING ... AZI	SPEED	REF PRESS	TEMP CHANGE	.ICE LOAD.. RAD	DENS	CONV TOL	PROFILES. CAB	WIND	.LOAD FACTORS. WIND	DEAD	ICE
DEG	MPH	PSF	DEG	IN	PCF						
0.0	40.0	0.00	-10.00	0.75	56.00	0.0100	1	4	1.00	1.00	1.00

CABLE PROFILE: 1 - CATENARY 2 - PARABOLIC

WIND PROFILE: 1 - EIA 222 default
2 - Constant Kz=1, Kiz=1
3 - Step function for Kz, Kiz
(requires definition of Exposure Factor Kz, Kiz table)
4 - Special Factors
5 - Site specific wind formula, Kiz as EIA 222 default
(requires definition of Exposure Factor Qh formula table)

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MAXIMUM LEG LOADS AND FACE SHEARS (KIP - stress in KSI)
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MAST ELEV FT	MAX LEG LOADS AXIAL	BENDING TENS	BENDING COMP	TOTAL TENS	TOTAL COMP	MAX FACE SHEARS TORSN	BEAM	TOTAL
282.00								
	0.0U	1.7A	1.7G	1.7A	1.7G	0.0A	-0.2J	0.2J
	0.1U	2.3I	2.3K	2.3I	2.3K	0.0Q	-0.2J	0.2F
279.00								
	0.4U	2.3I	2.3K	2.2I	2.5K	0.0Q	0.5D	0.5F
	0.5U	4.2I	4.2G	4.0I	4.4G	0.0Q	0.6D	0.6F
276.00								
	5.1O	2.8E	2.8K	0.4E	5.6S	0.0K	0.2J	0.2F
	5.2O	1.9E	2.0K	0.0A	5.5M	0.0K	0.2J	0.2F
272.00								
	5.3O	1.9E	2.0K	0.0A	5.6M	0.0K	0.1V	0.1X
	5.4O	1.8E	1.9K	0.0A	5.9M	0.0K	0.1V	0.1X
270.00								
	5.4O	1.8E	1.9K	0.0A	5.9M	0.0K	0.1V	0.1X
	5.8O	2.0A	2.3G	0.0A	6.7M	0.0K	-0.1B	0.1D
260.00								
	5.8O	2.0A	2.3G	0.0A	6.7M	0.0K	-0.1B	0.1D
	5.9O	2.5A	2.9G	0.0A	6.7M	0.0K	-0.1B	0.2D
256.00								
	5.9O	2.5A	2.9G	0.0A	6.7M	0.0K	-0.1B	0.2D
	6.2O	3.7A	4.3G	1.1A	6.8G	0.0K	-0.2B	0.2D
250.00								
	6.2O	3.7A	4.3G	1.1A	6.8G	0.0J	-0.2B	0.2D
	6.5O	6.9A	7.7G	4.2A	10.3G	0.0J	-0.4B	0.4D
240.00								
	6.5O	6.9A	7.7G	4.2A	10.3G	0.0J	-0.4B	0.4D
	6.7O	8.6A	9.4G	5.8A	12.1G	0.0J	-0.4B	0.4D
236.00								
	10.9O	7.5A	8.3G	2.8A	12.7G	0.0K	0.4J	0.4L
	11.1O	5.1A	6.0G	0.4A	11.5N	0.0K	0.3J	0.3L
230.00								
	11.1O	5.1A	6.0G	0.4A	11.5N	0.0K	0.3J	0.3L
	11.5O	2.3A	3.3G	0.0A	12.8R	0.0J	0.2J	0.2L
220.00								
	11.5O	2.3A	3.3G	0.0A	12.8R	0.0J	0.2J	0.2L
	11.6O	2.7O	2.6G	0.0A	13.3Q	0.0J	0.1J	0.1L
216.00								
	11.6O	2.7O	2.6G	0.0A	13.3Q	0.0J	0.1J	0.1L
	11.8O	2.9O	2.0G	0.0A	13.7Q	0.0J	0.1J	0.1E
210.00								
	11.8O	2.9O	2.0G	0.0A	13.7Q	0.0J	0.1J	0.1I
	12.2O	1.9S	2.1G	0.0A	13.3R	0.0J	0.1P	0.1P
200.00								
	12.2O	1.9S	2.1G	0.0A	13.3R	0.0J	0.1P	0.1P
	12.4O	1.4A	2.5G	0.0A	12.9S	0.0J	0.2P	0.2R
196.00								
	15.6S	1.8S	1.7G	0.0A	16.7R	0.0K	-0.5L	0.5L
	15.8S	3.7S	3.0Q	0.0A	18.6Q	0.0K	-0.4L	0.5L
190.00								
	16.0S	3.7S	3.0Q	0.0A	18.8Q	0.0K	-0.3L	0.3L
	16.3S	4.7S	4.5E	0.0A	19.9Q	0.0K	-0.2L	0.2L
184.00								
	16.4S	4.7S	4.5E	0.0A	20.0Q	0.0K	-0.1L	0.1L
	16.5S	4.8S	4.8E	0.0A	20.3Q	0.0J	0.0O	0.1K
180.00								
	16.5S	4.8S	4.8E	0.0A	20.3Q	0.0J	0.0O	0.1K
	16.7S	4.6S	4.7E	0.0A	20.3Q	0.0J	0.1P	0.1O
176.00								
	16.7S	4.6S	4.7E	0.0A	20.3Q	0.0J	0.1P	0.1O

	17.0S	3.6S	3.9E	0.0A	19.6Q	0.0J	0.2D	0.2D
170.00								
	17.1S	3.6S	3.9E	0.0A	19.8Q	0.0C	0.3D	0.3D
	17.5S	0.8C	1.7C	0.0A	17.7T	0.0C	0.4D	0.5D
160.00								
	17.5S	0.8C	1.7C	0.0A	17.7T	0.0C	0.4D	0.5D
	17.6S	1.7A	2.7C	0.0A	18.4W	0.0C	0.5D	0.5D
158.06								
	17.6S	1.7A	2.7C	0.0A	18.4W	0.0C	0.5D	0.5D
	17.7S	2.9I	3.9C	0.0A	19.4O	0.0H	0.5D	0.5D
156.00								
	20.5S	2.3I	3.3C	0.0A	21.6O	0.0E	0.2J	0.3F
	20.7S	1.1I	2.0C	0.0A	21.4O	0.0I	0.1J	0.2H
150.00								
	20.7S	1.1I	2.0C	0.0A	21.4O	0.0H	0.1J	0.2H
	21.2S	0.9Q	1.1C	0.0A	21.9O	0.0H	0.0O	0.0O
140.00								
	21.2S	0.9Q	1.1C	0.0A	21.9O	0.0H	0.0O	0.0O
	21.3S	1.2Q	1.2G	0.0A	22.4O	0.0H	-0.1N	0.1S
136.00								
	21.3S	1.2Q	1.2G	0.0A	22.4O	0.0H	-0.1N	0.1S
	21.6S	1.9Q	1.9O	0.0A	23.5O	0.0H	-0.1N	0.1R
130.00								
	21.6S	1.9Q	1.9O	0.0A	23.5O	0.0H	-0.1N	0.1L
	22.0S	3.8Q	4.0G	0.0A	25.9S	0.0D	-0.3B	0.3L
120.00								
	22.0S	3.8Q	4.0G	0.0A	25.9S	0.0D	-0.3B	0.3L
	22.1S	4.3Q	4.7G	0.0A	26.5S	0.0D	-0.3B	0.3L
117.88								
	22.1S	4.3Q	4.7G	0.0A	26.5S	0.0D	0.3L	0.3L
	22.2S	4.9E	5.3G	0.0A	27.1S	0.0D	0.3L	0.3L
116.00								
	24.4S	4.4E	4.9G	0.0A	29.0S	0.0H	0.4F	0.4H
	24.6S	3.6Q	3.8S	0.0A	28.3S	0.0H	0.3F	0.3H
112.86								
	24.6S	3.6Q	3.8S	0.0A	28.3S	0.0H	0.3F	0.3H
	24.7S	2.9Q	3.1S	0.0A	27.8S	0.0H	0.3F	0.3H
110.00								
	24.7S	2.9Q	3.1S	0.0A	27.8S	0.0D	0.3F	0.3J
	25.0S	1.5Q	1.6S	0.0A	26.6S	0.0D	0.2F	0.2J
102.86								
	25.0S	1.5Q	1.6S	0.0A	26.6S	0.0D	0.2F	0.2J
	25.1S	1.1Q	1.1S	0.0A	26.2S	0.0D	0.2F	0.2J
100.00								
	25.1S	1.1Q	1.1S	0.0A	26.2S	0.0D	0.2F	0.2J
	25.3S	1.0C	1.0A	0.0A	25.8S	0.0D	-0.1G	0.1J
96.00								
	25.3S	1.0C	1.0A	0.0A	25.8S	0.0D	-0.1G	0.1J
	25.4S	1.4C	1.3A	0.0A	25.6S	0.0D	-0.1G	0.1J
92.86								
	25.4S	1.4C	1.3A	0.0A	25.6S	0.0D	-0.1G	0.1J
	25.5S	1.6C	1.4A	0.0A	25.6W	0.0D	0.0G	0.1K
90.00								
	25.5S	1.6C	1.4A	0.0A	25.6W	0.0D	0.0G	0.1K
	25.7S	1.6C	1.3A	0.0A	25.8W	-0.1D	0.0B	0.1E
85.00								
	25.9S	1.6C	1.3A	0.0A	26.0W	-0.1D	-0.2B	0.2L
	26.1S	0.5M	0.3R	0.0A	26.3S	-0.1D	-0.3B	0.3L
80.00								
	26.1S	0.5M	0.3R	0.0A	26.3S	-0.1D	-0.3B	0.3L
	26.4S	1.6A	1.5H	0.0A	27.2S	-0.1D	-0.4B	0.4L
76.00								
	28.0S	1.3A	1.3H	0.0A	28.6S	0.1J	-0.3H	0.3J
	28.3S	2.0W	1.5Q	0.0A	29.4Q	0.1J	-0.2T	0.3J
70.00								

	28.3S	2.0W	1.5Q	0.0A	29.4Q	0.1J	-0.2T	0.3J
	28.7S	4.9W	4.1Q	0.0A	32.5Q	0.1J	-0.1T	0.1T
60.00								
	28.7S	4.9W	4.1Q	0.0A	32.5Q	0.1J	-0.1T	0.1V
	28.8S	5.5O	4.7Q	0.0A	33.3Q	0.1J	-0.1T	0.1V
56.00								
	28.8S	5.5O	4.7Q	0.0A	33.3Q	0.1J	-0.1T	0.1V
	29.1S	5.8O	4.9Q	0.0A	33.8Q	0.1J	-0.1C	0.1K
50.00								
	29.1S	5.8O	4.9Q	0.0A	33.8Q	0.1J	-0.1C	0.1K
	29.5S	4.5O	3.8Q	0.0A	33.0Q	0.1J	0.2D	0.2K
40.00								
	29.5S	4.5O	3.8Q	0.0A	33.0Q	0.1J	0.2D	0.2K
	29.7S	3.4S	2.8Q	0.0A	32.2Q	0.1J	0.2D	0.3K
36.00								
	30.6S	3.5S	2.9Q	0.0A	33.2Q	0.1J	0.2J	0.3J
	30.8S	4.6S	4.0Q	0.0A	34.5Q	0.1J	0.1J	0.2J
30.00								
	30.8S	4.6S	4.0Q	0.0A	34.5Q	0.1J	0.1J	0.3J
	31.1S	4.9S	4.4Q	0.0A	35.2Q	0.1J	-0.1O	0.2J
21.43								
	31.1S	4.9S	4.4Q	0.0A	35.2Q	0.1J	-0.1O	0.2J
	31.3S	4.7S	4.2Q	0.0A	35.1Q	0.1J	-0.1O	0.1J
18.00								
	31.3S	4.7S	4.2Q	0.0A	35.1Q	0.1J	-0.1O	0.1J
	31.6S	3.2S	2.9Q	0.0A	34.2Q	0.1J	-0.1N	0.2J
10.00								
	31.6S	3.2S	2.9Q	0.0A	34.2Q	0.1J	-0.1N	0.2J
	31.8S	1.0S	0.9U	0.0A	32.5T	0.1J	-0.2N	0.2E
2.86								
	31.8S	1.0S	0.9U	0.0A	32.5T	0.1J	-0.2N	0.2E
	31.9S	0.0P	0.0P	0.0A	31.9S	0.1J	-0.2N	0.3E
0.00								

FORCE/RESISTANCE RATIO
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MAST ELEV ft	- LEG COMPRESSION - MAX COMP	COMP RESIST	FORCE/ RESIST RATIO	--- LEG TENSION --- MAX TENS	TENS RESIST	FORCE/ RESIST RATIO	---- FACE SHEAR --- MAX FACE SHEAR	FACE SHEAR RESIST	FORCE/ RESIST RATIO
282.00									
	1.73	45.04	0.04	1.73	55.22	0.03	0.15	2.00	0.08
	2.14	45.04	0.05	2.11	55.22	0.04	0.18	2.00	0.09
280.00									
	2.14	45.04	0.05	2.11	55.22	0.04	0.18	2.00	0.09
	2.34	45.04	0.05	2.29	55.22	0.04	0.19	2.00	0.09
279.00									
	2.47	45.04	0.05	2.16	55.22	0.04	0.53	2.00	0.26
	4.38	45.04	0.10	4.03	55.22	0.07	0.56	2.00	0.28
276.00									
	5.63	45.04	0.13	0.39	55.22	0.01	0.23	2.00	0.12
	5.48	45.04	0.12	0.00	55.22	0.00	0.18	2.00	0.09
272.00									
	5.58	45.04	0.12	0.00	55.22	0.00	0.14	2.00	0.07
	5.92	45.04	0.13	0.00	55.22	0.00	0.12	2.00	0.06
270.00									
	5.92	45.04	0.13	0.00	55.22	0.00	0.11	2.00	0.06
	6.75	45.04	0.15	0.00	55.22	0.00	0.10	2.00	0.05
260.00									
	6.75	45.04	0.15	0.00	55.22	0.00	0.10	2.00	0.05
	6.69	45.04	0.15	0.00	55.22	0.00	0.15	2.00	0.08
256.00									
	6.69	45.04	0.15	0.00	55.22	0.00	0.15	2.00	0.08
	6.83	45.04	0.15	1.07	55.22	0.02	0.23	2.00	0.12
250.00									
	6.83	45.04	0.15	1.07	55.22	0.02	0.23	2.00	0.12
	10.30	45.04	0.23	4.18	55.22	0.08	0.36	2.00	0.18
240.00									
	10.30	45.04	0.23	4.18	55.22	0.08	0.36	2.00	0.18
	12.08	45.04	0.27	5.82	55.22	0.11	0.42	2.00	0.21
236.00									
	12.69	45.04	0.28	2.82	55.22	0.05	0.41	2.00	0.20
	11.48	45.04	0.25	0.45	55.22	0.01	0.33	2.00	0.17

230.00								
	11.48	45.04	0.25	0.45	55.22	0.01	0.33	2.00	0.16
	12.82	45.04	0.28	0.00	55.22	0.00	0.20	2.00	0.10
220.00								
	12.82	45.04	0.28	0.00	55.22	0.00	0.20	2.00	0.10
	13.34	45.04	0.30	0.00	55.22	0.00	0.15	2.00	0.07
216.00								
	13.34	45.04	0.30	0.00	55.22	0.00	0.14	2.00	0.07
	13.74	45.04	0.31	0.00	55.22	0.00	0.07	2.00	0.03
210.00								
	13.74	45.04	0.31	0.00	55.22	0.00	0.07	2.00	0.03
	13.32	45.04	0.30	0.00	55.22	0.00	0.13	2.00	0.07
200.00								
	13.32	45.04	0.30	0.00	55.22	0.00	0.13	2.00	0.07
	12.92	45.04	0.29	0.00	55.22	0.00	0.18	2.00	0.09
196.00								
	16.66	45.04	0.37	0.00	55.22	0.00	0.54	2.00	0.27
	18.63	45.04	0.41	0.00	55.22	0.00	0.46	2.00	0.23
190.00								
	18.83	45.04	0.42	0.00	55.22	0.00	0.29	2.00	0.15
	19.94	45.04	0.44	0.00	55.22	0.00	0.21	2.00	0.11
184.00								
	20.04	45.04	0.44	0.00	55.22	0.00	0.11	2.00	0.05
	20.29	45.04	0.45	0.00	55.22	0.00	0.05	2.00	0.03
180.00								
	20.29	45.04	0.45	0.00	55.22	0.00	0.05	2.00	0.03
	20.26	45.04	0.45	0.00	55.22	0.00	0.08	2.00	0.04
176.00								
	20.26	45.04	0.45	0.00	55.22	0.00	0.08	2.00	0.04
	19.64	45.04	0.44	0.00	55.22	0.00	0.20	2.00	0.10
170.00								
	19.76	45.04	0.44	0.00	55.22	0.00	0.32	2.00	0.16
	17.75	45.04	0.39	0.00	55.22	0.00	0.46	2.00	0.23
160.00								
	17.75	45.04	0.39	0.00	55.22	0.00	0.46	2.00	0.23
	18.37	45.04	0.41	0.00	55.22	0.00	0.48	2.00	0.24
158.06								
	18.37	45.04	0.41	0.00	55.22	0.00	0.48	2.00	0.24
	19.36	45.04	0.43	0.00	55.22	0.00	0.51	2.00	0.26
156.00								
	21.61	45.04	0.48	0.00	55.22	0.00	0.26	2.00	0.13
	21.39	45.04	0.47	0.00	55.22	0.00	0.17	2.00	0.08
150.00								
	21.39	45.04	0.47	0.00	55.22	0.00	0.17	2.00	0.08
	21.90	45.04	0.49	0.00	55.22	0.00	0.05	2.00	0.02
140.00								
	21.90	45.04	0.49	0.00	55.22	0.00	0.05	2.00	0.02
	22.40	45.04	0.50	0.00	55.22	0.00	0.08	2.00	0.04
136.00								
	22.40	45.04	0.50	0.00	55.22	0.00	0.08	2.00	0.04
	23.47	45.04	0.52	0.00	55.22	0.00	0.14	2.00	0.07
130.00								
	23.47	45.04	0.52	0.00	55.22	0.00	0.14	2.00	0.07
	25.91	45.04	0.58	0.00	55.22	0.00	0.29	2.00	0.14
120.00								
	25.91	45.04	0.58	0.00	55.22	0.00	0.29	2.00	0.14
	26.53	45.04	0.59	0.00	55.22	0.00	0.32	2.00	0.16
117.88								
	26.53	45.04	0.59	0.00	55.22	0.00	0.32	2.00	0.16
	27.09	45.04	0.60	0.00	55.22	0.00	0.34	2.00	0.17
116.00								
	29.00	45.04	0.64	0.00	55.22	0.00	0.39	2.00	0.20
	28.33	45.04	0.63	0.00	55.22	0.00	0.35	2.00	0.17
112.86								
	28.33	45.04	0.63	0.00	55.22	0.00	0.35	2.00	0.17
	27.76	45.04	0.62	0.00	55.22	0.00	0.31	2.00	0.15
110.00								
	27.76	45.04	0.62	0.00	55.22	0.00	0.31	2.00	0.16
	26.56	45.04	0.59	0.00	55.22	0.00	0.22	2.00	0.11
102.86								
	26.56	45.04	0.59	0.00	55.22	0.00	0.22	2.00	0.11
	26.19	45.04	0.58	0.00	55.22	0.00	0.19	2.00	0.09
100.00								
	26.19	45.04	0.58	0.00	55.22	0.00	0.19	2.00	0.09
	25.79	45.04	0.57	0.00	55.22	0.00	0.14	2.00	0.07
96.00								
	25.79	45.04	0.57	0.00	55.22	0.00	0.14	2.00	0.07
	25.60	45.04	0.57	0.00	55.22	0.00	0.10	2.00	0.05
92.86								
	25.60	45.04	0.57	0.00	55.22	0.00	0.10	2.00	0.05
	25.58	45.04	0.57	0.00	55.22	0.00	0.07	2.00	0.03
90.00								
	25.58	45.04	0.57	0.00	55.22	0.00	0.07	2.00	0.04
	25.85	45.04	0.57	0.00	55.22	0.00	0.07	2.00	0.04
85.00								
	26.04	45.04	0.58	0.00	55.22	0.00	0.20	2.00	0.10

	26.34	45.04	0.58	0.00	55.22	0.00	0.27	2.00	0.14
80.00									
	26.34	45.04	0.58	0.00	55.22	0.00	0.27	2.00	0.14
	27.19	45.04	0.60	0.00	55.22	0.00	0.42	2.00	0.21
76.00									
	28.58	45.04	0.63	0.00	55.22	0.00	0.33	2.00	0.17
	29.44	45.04	0.65	0.00	55.22	0.00	0.25	2.00	0.13
70.00									
	29.44	45.04	0.65	0.00	55.22	0.00	0.26	2.00	0.13
	32.54	45.04	0.72	0.00	55.22	0.00	0.14	2.00	0.07
60.00									
	32.54	45.04	0.72	0.00	55.22	0.00	0.14	2.00	0.07
	33.27	45.04	0.74	0.00	55.22	0.00	0.11	2.00	0.05
56.00									
	33.27	45.04	0.74	0.00	55.22	0.00	0.11	2.00	0.06
	33.77	45.04	0.75	0.00	55.22	0.00	0.13	2.00	0.06
50.00									
	33.77	45.04	0.75	0.00	55.22	0.00	0.13	2.00	0.07
	33.00	45.04	0.73	0.00	55.22	0.00	0.24	2.00	0.12
40.00									
	33.00	45.04	0.73	0.00	55.22	0.00	0.25	2.00	0.12
	32.18	45.04	0.71	0.00	55.22	0.00	0.29	2.00	0.14
36.00									
	33.18	45.04	0.74	0.00	55.22	0.00	0.31	2.00	0.16
	34.49	45.04	0.77	0.00	55.22	0.00	0.25	2.00	0.12
30.00									
	34.49	45.04	0.77	0.00	55.22	0.00	0.25	2.00	0.13
	35.23	45.04	0.78	0.00	55.22	0.00	0.16	2.00	0.08
21.43									
	35.23	45.04	0.78	0.00	55.22	0.00	0.16	2.00	0.08
	35.19	45.04	0.78	0.00	55.22	0.00	0.15	2.00	0.07
20.00									
	35.19	45.04	0.78	0.00	55.22	0.00	0.15	2.00	0.07
	35.14	45.04	0.78	0.00	55.22	0.00	0.13	2.00	0.06
18.00									
	35.14	45.04	0.78	0.00	55.22	0.00	0.13	2.00	0.07
	34.15	45.04	0.76	0.00	55.22	0.00	0.18	2.00	0.09
10.00									
	34.15	45.04	0.76	0.00	55.22	0.00	0.18	2.00	0.09
	32.50	45.04	0.72	0.00	55.22	0.00	0.23	2.00	0.11
2.86									
	32.50	45.04	0.72	0.00	55.22	0.00	0.23	2.00	0.11
	31.94	45.04	0.71	0.00	55.22	0.00	0.25	2.00	0.13
0.00									

MAXIMUM MAST DEFORMATION CALCULATED
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MAST ELEV FT	.....DEFLECTIONS (FT)..... HORIZONTAL ..... NORTH	EAST	TOTAL	DOWN	.....ROTATIONS (DEG)..... TILT ..... NORTH	EAST	TOTAL	TWIST
282.0	-0.97A	0.94J	0.97A	0.15S	0.69G	0.59J	0.69G	0.54D
279.0	-0.95A	0.91J	0.95A	0.15S	0.68G	0.58J	0.68G	0.54D
276.0	-0.92A	0.88J	0.92A	0.15S	0.66G	0.56J	0.66G	0.54D
272.0	-0.89A	0.84J	0.89A	0.15S	0.64G	-0.54C	0.64G	0.54D
270.0	-0.87A	0.82J	0.87A	0.15S	0.63G	-0.54C	0.63G	0.54D
260.0	-0.79A	0.73J	0.79A	0.15S	0.60G	-0.50C	0.60G	0.55D
256.0	-0.76A	0.70J	0.76A	0.15S	0.58G	-0.49C	0.58G	0.56D
250.0	-0.71A	0.65J	0.71A	0.15S	0.54G	-0.45C	0.54G	0.56D
240.0	-0.65A	0.58J	0.65A	0.14S	0.43G	-0.36C	0.43G	0.57D
236.0	-0.63A	0.56J	0.63A	0.14S	0.36G	-0.30C	0.36G	0.57D
230.0	-0.61A	0.53J	0.61A	0.14S	0.28G	-0.24C	0.28G	0.59D
220.0	-0.59A	0.51I	0.59A	0.14S	0.20G	-0.16C	0.20G	0.61D
216.0	-0.58A	0.50I	0.58A	0.14S	0.18G	-0.14C	0.18G	0.62D
210.0	-0.57A	0.49I	0.57A	0.13S	0.15G	-0.12C	0.15G	-0.63J
200.0	-0.56A	-0.48E	0.56A	0.13S	0.12G	-0.10C	0.12G	-0.65J
196.0	-0.56A	-0.48E	0.56A	0.13S	0.10G	-0.08C	0.10G	-0.66J
190.0	-0.55A	-0.48E	0.55A	0.13S	0.10G	-0.08C	0.10G	-0.68J
184.0	-0.55A	-0.47E	0.55A	0.12S	0.13G	0.11J	0.13G	-0.70J
180.0	-0.54A	-0.46E	0.54A	0.12S	0.15G	0.14J	0.15G	-0.71J
176.0	-0.53A	-0.45E	0.53A	0.12S	0.18G	0.17J	0.18G	-0.72J

170.0	-0.51A	-0.44E	0.51A	0.12S	-0.22A	0.22J	0.22I	-0.74J
160.0	-0.46A	-0.40E	0.46A	0.11S	-0.25A	0.24J	0.25E	-0.76J
158.1	-0.46A	-0.39E	0.46A	0.11S	-0.25A	0.24J	0.25E	-0.77J
156.0	-0.45A	-0.39E	0.45A	0.11S	-0.23A	0.23J	0.24E	-0.77J
150.0	-0.42A	-0.37E	0.42A	0.11S	-0.21A	0.20J	0.22E	-0.78J
140.0	-0.39A	-0.33E	0.39A	0.10S	-0.20A	0.19J	0.21E	-0.79J
136.0	-0.37A	-0.32E	0.37A	0.10S	-0.20A	0.19J	0.20E	-0.79J
130.0	-0.35A	-0.30E	0.35A	0.09S	-0.19A	0.18J	0.19E	-0.79J
120.0	-0.32A	-0.28E	0.32A	0.09S	-0.15A	-0.13E	0.15A	-0.78J
117.9	-0.32A	-0.27E	0.32A	0.09S	-0.14A	-0.12E	0.14A	-0.78J
116.0	-0.31A	-0.27E	0.31A	0.09S	-0.12A	-0.10E	0.12A	-0.77J
112.9	-0.31A	-0.26E	0.31A	0.08S	-0.10A	-0.08E	0.10A	-0.77J
110.0	-0.30A	-0.26E	0.30A	0.08S	-0.08A	-0.07E	0.08A	-0.76J
102.9	-0.29A	-0.25P	0.29A	0.08S	-0.07A	-0.06E	0.07A	-0.75J
100.0	-0.29A	-0.25P	0.29A	0.08S	-0.07A	-0.06E	0.07A	-0.74J
96.0	-0.28A	-0.25P	0.28A	0.07S	-0.07A	-0.06E	0.07A	-0.73J
92.9	-0.28A	-0.26P	0.28A	0.07S	-0.08A	-0.07E	0.08A	-0.72J
90.0	-0.28A	-0.26P	0.28A	0.07S	-0.09A	-0.07E	0.09A	-0.71J
85.0	0.27S	-0.26P	0.27W	0.07S	-0.10A	-0.09E	0.10A	-0.69J
80.0	0.27S	-0.26P	0.28W	0.06S	-0.11A	-0.09E	0.11A	-0.66J
76.0	0.28S	-0.26P	0.28W	0.06S	-0.10A	-0.09E	0.10A	-0.64J
70.0	0.29S	-0.27P	0.29W	0.05S	-0.09A	-0.08E	0.09A	-0.61J
60.0	0.29S	-0.27P	0.29W	0.05S	-0.12A	0.10I	0.12A	-0.56J
56.0	0.29S	-0.27P	0.29W	0.04S	-0.14A	0.12I	0.14A	-0.53J
50.0	0.28S	-0.26P	0.28W	0.04S	-0.17A	0.14I	0.17A	-0.49J
40.0	0.25S	-0.23P	0.25W	0.03S	0.21S	-0.20P	0.21W	-0.41J
36.0	0.24S	-0.21P	0.24W	0.03S	0.23S	-0.22P	0.24W	-0.38J
30.0	0.21S	-0.19P	0.21W	0.02S	0.28S	-0.25P	0.28W	-0.32J
21.4	0.16S	-0.15P	0.16W	0.02S	0.36S	-0.32P	0.36W	-0.24J
18.0	0.14S	-0.13P	0.14W	0.01S	0.39S	-0.35P	0.39W	-0.20J
10.0	0.08S	-0.07P	0.08W	0.01S	0.45S	-0.40P	0.45W	-0.12J
2.9	0.02S	-0.02P	0.02W	0.00S	0.47S	-0.43P	0.48W	-0.03J
0.0	0.00A	0.00A	0.00A	0.00A	0.48S	-0.43P	0.48W	0.00A

MAXIMUM ANTENNA ROTATIONS

ELEV	ORIENTATION		..... BEAM DEFLECTIONS (DEG)			
FT	AZI DEG	ELEV DEG	ROLL	YAW	PITCH	TOTAL
292.0	0.0	0.0	-0.587 J	0.539 D	-0.688 G	0.720 G
279.0	0.0	0.0	-0.576 J	0.539 D	-0.676 G	0.709 G
279.0	0.0	0.0	-0.576 J	0.539 D	-0.676 G	0.709 G
279.0	0.0	0.0	-0.576 J	0.539 D	-0.676 G	0.709 G
272.0	0.0	0.0	0.541 C	0.542 D	-0.640 G	0.676 G
190.0	0.0	0.0	0.080 C	0.677 J	-0.098 G	0.677 J
184.0	0.0	0.0	-0.106 J	0.696 J	-0.126 G	0.696 J
174.7	0.0	0.0	-0.180 J	0.723 J	-0.185 G	0.723 J
170.0	0.0	0.0	-0.215 J	0.737 J	0.217 A	0.737 J
85.0	0.0	0.0	0.086 E	0.686 J	0.101 A	0.687 J
79.0	0.0	0.0	0.090 E	0.657 J	0.106 A	0.658 J

MAXIMUM INTERNAL MAST FORCES

MAST ELEV FT	TOTAL AXIAL KIP	SHEAR N - S KIP	SHEAR E - W KIP	MOMENT N - S FT-KIP	MOMENT E - W FT-KIP	TORSION FT-KIP
282.0	0.01 U	0.23 G	0.23 J	2.25 A	2.25 D	0.00 A
	0.31 U	0.28 G	0.28 J	-3.01 G	-3.01 J	0.00 Q
279.0	1.30 U	0.79 G	-0.79 D	-3.01 G	-3.01 J	0.00 Q
	1.62 U	0.85 G	-0.84 D	-5.46 G	-5.46 J	0.01 Q
	*	+	+	&	&	@
276.0	13.56 O	1.24 A	-1.22 J	-1.83 A	-1.81 D	0.02 K
	15.18 O	0.34 A	-0.33 J	-3.61 G	-3.65 J	0.02 K
	15.63 O	0.26 A	-0.25 J	-2.58 G	-2.54 J	0.02 K
272.0	15.94 O	-0.21 S	-0.20 V	-2.58 G	-2.54 J	0.02 K
	16.16 O	-0.17 S	-0.16 V	-2.46 G	-2.39 J	0.02 K
270.0	16.16 O	-0.17 S	-0.16 V	-2.46 G	-2.39 J	0.02 K
	17.32 O	0.15 G	-0.13 D	-3.04 G	-2.80 J	0.02 K
260.0	17.32 O	0.15 G	-0.13 D	-3.04 G	-2.80 J	0.02 K
	17.79 O	0.23 G	-0.21 D	-3.82 G	-3.52 J	0.02 K
256.0	17.79 O	0.23 G	-0.21 D	-3.82 G	-3.52 J	0.01 K
	18.48 O	0.35 G	-0.33 D	-5.57 G	-5.16 J	0.01 K
250.0	18.48 O	0.35 G	-0.33 D	-5.57 G	-5.16 J	0.01 J
	19.62 O	0.55 G	-0.53 D	-9.98 G	-9.41 J	0.01 J
240.0	19.62 O	0.55 G	-0.53 D	-9.98 G	-9.41 J	0.01 J
	20.08 O	0.63 G	-0.61 D	-12.25 G	-11.62 J	0.01 J
	*	+	+	&	&	@
236.0	12.47 S	-1.18 G	-1.16 J	1.46 G	1.44 J	0.03 K
	32.55 O	0.59 A	-0.59 J	-10.77 G	-10.18 J	0.03 K
	33.23 O	0.47 A	-0.47 J	-7.84 G	-7.17 J	0.03 K
230.0	33.23 O	0.47 A	-0.47 J	-7.84 G	-7.17 J	0.03 K
	34.37 O	0.27 A	-0.27 J	-4.32 G	3.65 C	0.03 J
220.0	34.37 O	0.27 A	-0.27 J	-4.32 G	3.65 C	0.03 J
	34.82 O	0.20 A	-0.20 J	3.48 S	-3.07 O	0.03 J
216.0	34.82 O	0.20 A	-0.20 J	3.48 S	-3.07 O	0.03 J
	35.49 O	0.08 A	-0.08 J	3.68 S	-3.23 O	0.03 J
210.0	35.49 O	0.08 A	-0.08 J	3.68 S	-3.23 O	0.03 J
	36.61 O	0.18 S	-0.19 P	-2.68 G	2.19 C	0.03 J
200.0	36.61 O	0.18 S	-0.19 P	-2.68 G	2.19 C	0.03 J
	37.06 O	0.25 S	-0.25 P	-3.22 G	2.66 C	0.03 J
	*	+	+	&	&	@
196.0	9.73 S	0.98 A	0.98 D	-0.97 A	-0.96 D	0.03 X
	46.78 S	-0.77 G	-0.77 J	2.34 S	-2.00 O	0.05 K
	47.46 S	-0.65 G	-0.65 J	4.87 S	-4.27 P	0.05 K
190.0	48.06 S	-0.40 G	-0.40 J	4.87 S	-4.27 P	0.05 K
	48.78 S	-0.28 G	-0.28 J	6.07 S	-5.41 P	0.05 K
184.0	49.08 S	-0.12 G	-0.12 J	6.07 S	-5.41 P	0.04 K
	49.57 S	-0.04 F	-0.04 O	6.19 S	5.68 J	0.04 J

```
180.0 ..........................................................................
       49.57 S     -0.04 F     -0.04 O      6.19 S      5.68 J      0.04 J

       50.07 S      0.11 S     -0.11 P     -6.07 A      5.68 J      0.04 J
176.0 ..........................................................................
       50.07 S      0.11 S     -0.11 P     -6.07 A      5.68 J      0.04 J

       50.91 S     -0.26 A     -0.25 D     -4.95 A      4.59 J      0.04 J
170.0 ..........................................................................
       51.26 S     -0.45 A     -0.44 D     -4.95 A      4.59 J     -0.04 C

       52.56 S     -0.66 A     -0.66 D     -2.16 G      1.87 C     -0.03 C
160.0 ..........................................................................
       52.56 S     -0.66 A     -0.66 D     -2.16 G      1.87 C     -0.03 C

       52.82 S     -0.71 A     -0.70 D     -3.52 G      3.05 C     -0.03 C
158.1 ..........................................................................
       52.82 S     -0.71 A     -0.70 D     -3.52 G      3.05 C     -0.03 C

       53.08 S     -0.75 A     -0.75 D     -5.04 G      4.38 C      0.03 H
-------------------------------------------------------------------------------
         *           +           +           &           &           @
156.0   8.38 S      1.11 A     -1.10 J     -0.82 A     -0.82 D     -0.03 F
-------------------------------------------------------------------------------
       61.46 S     -0.36 G     -0.35 J     -4.22 G      3.67 C     -0.04 E

       62.24 S     -0.23 G     -0.22 J     -2.57 G      2.24 C      0.03 I
150.0 ..........................................................................
       62.24 S     -0.23 G     -0.22 J     -2.57 G      2.24 C      0.03 H

       63.52 S      0.06 S     -0.06 O     -1.44 G      1.26 C      0.03 H
140.0 ..........................................................................
       63.52 S      0.06 S     -0.06 O     -1.44 G      1.26 C      0.03 H

       64.03 S      0.13 S     -0.12 P     -1.57 G      1.37 Q      0.03 H
136.0 ..........................................................................
       64.03 S      0.13 S     -0.12 P     -1.57 G      1.37 Q      0.02 H

       64.79 S      0.22 S     -0.21 D      2.39 M      2.26 P      0.02 H
130.0 ..........................................................................
       64.79 S      0.22 S     -0.21 D      2.39 M      2.26 P      0.02 H

       66.05 S     -0.42 A     -0.42 D     -5.22 G      4.79 P      0.03 D
120.0 ..........................................................................
       66.05 S     -0.42 A     -0.42 D     -5.22 G      4.79 P      0.03 D

       66.31 S     -0.46 A     -0.46 D     -6.06 G     -5.62 J      0.03 D
117.9 ..........................................................................
       66.31 S     -0.46 A     -0.46 D     -6.06 G     -5.62 J      0.03 D

       66.55 S     -0.50 A     -0.50 D     -6.87 G     -6.47 J      0.03 D
-------------------------------------------------------------------------------
         *           +           +           &           &           @
116.0   6.75 S      1.01 A     -1.01 J     -0.54 A      0.54 J     -0.03 F
-------------------------------------------------------------------------------
       73.30 S     -0.58 G     -0.55 J     -6.32 G     -5.93 J      0.03 H

       73.69 S     -0.51 G     -0.49 J     -4.89 S      4.58 P      0.03 H
112.9 ..........................................................................
       73.69 S     -0.51 G     -0.49 J     -4.89 S      4.58 P      0.03 H

       74.04 S     -0.46 G     -0.43 J     -4.00 S      3.71 P      0.03 H
110.0 ..........................................................................
       74.04 S     -0.46 G     -0.43 J     -4.00 S      3.71 P      0.03 D

       74.92 S     -0.31 G     -0.29 J     -2.06 S      1.83 P      0.04 D
102.9 ..........................................................................
       74.92 S     -0.31 G     -0.29 J     -2.06 S      1.83 P      0.04 D

       75.27 S     -0.26 G     -0.23 J     -1.43 S     -1.23 V      0.04 D
100.0 ..........................................................................
       75.27 S     -0.26 G     -0.23 J     -1.43 S     -1.23 V      0.05 D

       75.76 S     -0.18 G     -0.15 K     -1.28 A     -1.13 D      0.05 D
 96.0 ..........................................................................
       75.76 S     -0.18 G     -0.15 K     -1.28 A     -1.13 D      0.05 D

       76.14 S     -0.12 G     -0.10 K      1.73 G     -1.53 C      0.06 D
 92.9 ..........................................................................
       76.14 S     -0.12 G     -0.10 K      1.73 G     -1.53 C      0.06 D

       76.48 S     -0.06 G     -0.05 K      1.99 G     -1.75 C      0.06 D
 90.0 ..........................................................................
       76.48 S     -0.06 G     -0.05 K      1.99 G     -1.75 C      0.06 D

       77.10 S     -0.07 A     -0.06 D      2.03 G     -1.79 C      0.07 D
```

85.0						
	77.67 S	-0.28 A	-0.28 D	2.03 G	-1.79 C	0.07 D
	78.29 S	-0.38 A	-0.38 D	0.60 M	0.44 Q	0.07 D
80.0						
	78.29 S	-0.38 A	-0.38 D	0.60 M	0.44 Q	0.08 D
	79.10 S	-0.60 A	-0.59 D	2.10 A	2.18 D	0.08 D
	*	+	+	&	&	@
76.0	4.88 S	1.05 A	-1.03 J	-0.36 A	0.35 J	-0.03 F
	83.97 S	0.42 A	-0.41 J	1.75 A	1.82 D	-0.07 J
	84.76 S	-0.32 S	-0.30 V	2.46 S	2.26 W	-0.08 J
70.0						
	84.76 S	-0.32 S	-0.30 V	2.46 S	2.26 W	-0.09 J
	86.04 S	-0.18 S	-0.17 V	6.26 S	-5.52 O	-0.09 J
60.0						
	86.04 S	-0.18 S	-0.17 V	6.26 S	-5.52 O	-0.10 J
	86.54 S	-0.13 S	-0.12 V	7.08 S	-6.24 P	-0.10 J
56.0						
	86.54 S	-0.13 S	-0.12 V	7.08 S	-6.24 P	-0.10 J
	87.29 S	0.11 G	-0.09 C	7.45 S	-6.55 P	-0.11 J
50.0						
	87.29 S	0.11 G	-0.09 C	7.45 S	-6.55 P	-0.12 J
	88.52 S	0.29 G	-0.28 D	5.83 S	-5.04 O	-0.12 J
40.0						
	88.52 S	0.29 G	-0.28 D	5.83 S	-5.04 O	-0.13 J
	88.99 S	0.36 G	-0.35 D	4.47 S	-3.84 O	-0.13 J
	*	+	+	&	&	@
36.0	2.75 O	-0.72 G	-0.70 J	0.12 S	0.12 V	-0.03 F
	91.75 S	-0.31 G	-0.31 J	4.59 S	-3.94 O	-0.14 J
	92.46 S	-0.21 G	-0.21 J	6.00 S	5.18 V	-0.14 J
30.0						
	92.46 S	-0.21 G	-0.21 J	6.00 S	5.18 V	-0.15 J
	93.44 S	0.09 S	-0.08 O	6.43 S	5.71 V	-0.15 J
21.4						
	93.44 S	0.09 S	-0.08 O	6.43 S	5.71 V	-0.15 J
	93.82 S	0.13 S	-0.12 O	6.07 S	5.43 V	-0.16 J
18.0						
	93.82 S	0.13 S	-0.12 O	6.07 S	5.43 V	-0.16 J
	94.69 S	0.21 S	-0.19 P	4.15 S	3.76 V	-0.17 J
10.0						
	94.69 S	0.21 S	-0.19 P	4.15 S	3.76 V	-0.17 J
	95.48 S	0.28 S	-0.27 P	1.35 S	1.24 V	-0.17 J
2.9						
	95.48 S	0.28 S	-0.27 P	1.35 S	1.24 V	-0.18 J
	95.83 S	0.32 S	-0.31 P	0.00 M	0.00 P	-0.18 J
base reaction	95.83 S	0.29 S	0.26 W	0.00 T	0.00 W	0.18 J

* VERTICAL GUY LOAD & GUY ECCENTRIC MOMENT
\+ HORIZONTAL REACTION @ TORSIONAL RESISTANCE

MAXIMUM GUY FORCES AT MAST
==========

GUY LEVEL FT	GUY AZI	.....COMPONENTS AT MAST..... N KIP	E KIP	DOWN KIP	TOTAL KIP	EFL/FR * RATIO	...GUY ANGLES... VERT DEG	HORIZ DEG
276.0	0.0	3.7M	-0.3P	5.6M	6.7M	0.7M	-57.0N	6.8I
	120.0	-1.9P	3.2Q	5.6Q	6.7Q	0.7Q	-57.0R	-6.8I
	240.0	-1.9V	-3.2U	5.6U	6.7U	0.7U	-57.0T	6.8E

236.0	0.0	4.0M	-0.2P	5.2M	6.5M	0.7M	-52.4S	5.8I
	120.0	-2.0P	3.5Q	5.2Q	6.5Q	0.7Q	-52.4W	-5.8I
	240.0	-2.0V	-3.5U	5.2U	6.5U	0.7U	-52.4O	5.8E
196.0	0.0	3.6M	0.2V	3.9M	5.3M	0.8M	-48.1S	5.5I
	120.0	-1.8P	3.1Q	3.9Q	5.3Q	0.8Q	-48.1W	5.5A
	240.0	-1.8V	-3.1U	3.9U	5.3U	0.8U	-48.1O	-5.5A
156.0	0.0	3.8M	0.2V	3.3M	5.0M	0.7M	-41.9S	4.7I
	120.0	-1.9P	3.3Q	3.3Q	5.0Q	0.7Q	-41.9W	-4.7I
	240.0	-1.9V	-3.3U	3.3U	5.0U	0.7U	-41.9O	4.7E
116.0	0.0	3.9M	-0.1P	2.5M	4.6M	0.7M	-34.4S	-4.0D
	120.0	-2.0P	3.4Q	2.5Q	4.6Q	0.7Q	-34.4W	4.0B
	240.0	-2.0V	-3.3U	2.5U	4.6U	0.7U	-34.4O	-4.0L
76.0	0.0	4.1M	-0.1P	1.8M	4.4M	0.7M	-25.9S	-3.4D
	120.0	-2.0P	3.5Q	1.8Q	4.4Q	0.7Q	-25.9W	-3.4H
	240.0	-2.0V	-3.5U	1.8U	4.4U	0.7U	-25.9O	3.4F
36.0	0.0	3.9M	-0.1P	1.0M	4.0M	0.6M	-16.0S	-2.8D
	120.0	-2.0P	3.4Q	1.0Q	4.0Q	0.6Q	-16.0W	-2.8H
	240.0	-2.0V	-3.4U	1.0U	4.0U	0.6U	-16.0O	2.8F

* EFL/FR = EFFECTS OF FACTORED LOADS DIVIDED BY THE FACTORED RESISTANCE

MAXIMUM GUY FORCES AT ANCHOR
==========

GUY LEVEL FT	GUY AZI	GUY ATT AZI	.....COMPONENTS AT ANCHOR..... RAD KIP	LAT KIP	VERT KIP	TOTAL KIP	EFL/FR * RATIO
276.0	0.0	0.0	3.9M	-0.3V	3.8M	5.4M	0.6M
	120.0	120.0	3.9Q	-0.3N	3.8Q	5.4Q	0.6Q
	240.0	240.0	3.9U	0.3X	3.8U	5.4U	0.6U
236.0	0.0	0.0	4.2M	-0.2V	3.5M	5.5M	0.6M
	120.0	120.0	4.2Q	-0.2N	3.5Q	5.5Q	0.6Q
	240.0	240.0	4.2U	0.2X	3.5U	5.5U	0.6U
196.0	0.0	0.0	3.7M	0.2P	2.5M	4.5M	0.7M
	120.0	120.0	3.7Q	-0.2N	2.5Q	4.5Q	0.7Q
	240.0	240.0	3.7U	0.2X	2.5U	4.5U	0.7U
156.0	0.0	0.0	3.9M	0.2P	2.0M	4.4M	0.7M
	120.0	120.0	3.9Q	-0.2N	2.1Q	4.4Q	0.7Q
	240.0	240.0	3.9U	0.2X	2.1U	4.4U	0.7U
116.0	0.0	0.0	3.9M	0.1P	1.5M	4.2M	0.6M
	120.0	120.0	3.9Q	-0.1N	1.5Q	4.2Q	0.6Q
	240.0	240.0	3.9U	-0.1R	1.5U	4.2U	0.6U
76.0	0.0	0.0	4.1M	0.1P	0.9M	4.2M	0.6M
	120.0	120.0	4.1Q	-0.1N	0.9Q	4.2Q	0.6Q
	240.0	240.0	4.1U	0.1X	0.9U	4.2U	0.6U
36.0	0.0	0.0	3.9M	0.1P	0.3A	3.9M	0.6M
	120.0	120.0	3.9Q	-0.1N	0.3E	3.9Q	0.6Q
	240.0	240.0	3.9U	0.1X	0.3I	3.9U	0.6U

MAXIMUM ANCHOR LOADS
==========

AZI DEG	RADIUS FT	GUY TO ELEV FT	....ANCHOR LOADS..... HORIZ KIP	VERT KIP	LATER-AL KIP	AXIAL KIP	.....SHAFT FORCES..... ...LATERAL... VERT PLANE KIP	HORIZ PLANE KIP	ANGLE DEG
0.0	225.6	276.0	3.9M	3.8M	-0.3V	5.2M	1.5M	-0.3V	
		236.0	4.2M	3.5M	-0.2V	5.3M	1.1M	-0.2V	
		196.0	3.7M	2.5M	0.2P	4.5M	0.5M	0.2P	
		156.0	3.9M	2.0M	0.2P	4.4M	0.1S	0.2P	
		116.0	3.9M	1.5M	0.1P	4.2M	-0.5M	0.1P	
		76.0	4.1M	0.9M	0.1P	4.0M	-1.1M	0.1P	
		36.0	3.9M	0.3A	0.1P	3.6M	-1.6M	0.1P	

```
                          27.6M   14.5M    1.2P   31.2M    0.0O    1.2P   27.7M


 120.0   225.6   276.0    3.9Q    3.8Q   -0.3N    5.2Q    1.5Q   -0.3N
                 236.0    4.2Q    3.5Q    0.2T    5.3Q    1.1Q    0.2T
                 196.0    3.7Q    2.5Q   -0.2N    4.5Q    0.5Q   -0.2N
                 156.0    3.9Q    2.1Q   -0.2N    4.4Q    0.1W   -0.2N
                 116.0    3.9Q    1.5Q   -0.1N    4.2Q   -0.5Q   -0.1N
                  76.0    4.1Q    0.9Q   -0.1N    4.0Q   -1.1Q   -0.1N
                  36.0    3.9Q    0.3E   -0.1N    3.6Q   -1.6Q   -0.1N
                         -------------------------------------------------
                          27.6Q   14.5Q   -1.2N   31.2Q    0.0O   -1.2N   27.7Q


 240.0   225.6   276.0    3.9U    3.8U    0.3X    5.2U    1.5U    0.3X
                 236.0    4.2U    3.5U    0.2X    5.3U    1.1U    0.2X
                 196.0    3.7U    2.5U    0.2X    4.5U    0.5U    0.2X
                 156.0    3.9U    2.1U    0.2X    4.4U    0.1O    0.2X
                 116.0    3.9U    1.5U   -0.1R    4.2U   -0.5U   -0.1R
                  76.0    4.1U    0.9U    0.1X    4.0U   -1.1U    0.1X
                  36.0    3.9U    0.3I    0.1X    3.6U   -1.6U    0.1X
                         -------------------------------------------------
                          27.6U   14.5U    1.2X   31.2U    0.0Q    1.2X   27.7U

 MAXIMUM LOADS ON TOWER PIER
 ===========================

    AXIAL     .........SHEAR.........      ..............MOMENT..............
              NORTH      EAST     TOTAL      NORTH      EAST      TOTAL  TORSIONAL
     kip       kip       kip       kip      ft-kip     ft-kip    ft-kip  ft-kip

  95.8312    0.2924    0.2557    0.2924     0.0000     0.0000    0.0000     0.1777
      S         S         W         S          T          W         X          J


 ================================================================================


 ================================================================================
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 282' 180OSRWD / Blue Summit III SM01, TX


********************************************************************************
*************************  Service Load Condition  *****************************
********************************************************************************


================================================================================
* 12 wind directions were analyzed.  Only 1 condition(s) shown in full

================================================================================
 LOADING CONDITION  A    ========================================================

60 mph wind with no ice. Wind Azimuth: 0◆


 MAST LOADING
 ============

 LOAD   ELEV  .FORCES (KIP & KIP/FT) .MOMENTS(FT.K & FT.K/FT)   ANT-ORIENT
 TYPE              N        E    DOWN       N        E TORSION    AZI   VERT
           FT                                                    DEG    DEG

 C     292.0  -0.072   0.000   0.002    0.00    0.00    0.00    0.0   0.00
 C     279.0  -0.026   0.000   0.060    0.00    0.00    0.00    0.0   0.00
 C     279.0  -0.026   0.000   0.060    0.00    0.00    0.00    0.0   0.00
 C     279.0  -0.110   0.000   0.202    0.00    0.00    0.00    0.0   0.00
 C     272.0  -0.045   0.000   0.101    0.00    0.00    0.00    0.0   0.00
 C     190.0  -0.082   0.000   0.202    0.00    0.00    0.00    0.0   0.00
 C     184.0  -0.051   0.000   0.101    0.00    0.00    0.00    0.0   0.00
 C     174.7  -0.027   0.000   0.030    0.00    0.00    0.00    0.0   0.00
 C     170.0  -0.061   0.000   0.150    0.00    0.00    0.00    0.0   0.00
```

C	85.0	-0.069	0.000	0.202	0.00	0.00	0.00	0.0	0.00
C	79.0	-0.042	0.000	0.101	0.00	0.00	0.00	0.0	0.00
D	282.0	-0.006	0.000	0.019	0.00	0.00	0.00		
D	272.9	-0.007	0.000	0.020	0.00	0.00	0.00		
D	272.9	-0.006	0.000	0.020	0.00	0.00	0.00		
D	261.4	-0.006	0.000	0.020	0.00	0.00	0.00		
D	261.4	-0.006	0.000	0.020	0.00	0.00	0.00		
D	257.1	-0.006	0.000	0.020	0.00	0.00	0.00		
D	257.1	-0.006	0.000	0.020	0.00	0.00	0.00		
D	251.4	-0.006	0.000	0.020	0.00	0.00	0.00		
D	251.4	-0.006	0.000	0.020	0.00	0.00	0.00		
D	241.4	-0.006	0.000	0.020	0.00	0.00	0.00		
D	241.4	-0.006	0.000	0.020	0.00	0.00	0.00		
D	231.4	-0.006	0.000	0.020	0.00	0.00	0.00		
D	231.4	-0.006	0.000	0.020	0.00	0.00	0.00		
D	221.4	-0.006	0.000	0.020	0.00	0.00	0.00		
D	221.4	-0.006	0.000	0.020	0.00	0.00	0.00		
D	211.4	-0.006	0.000	0.020	0.00	0.00	0.00		
D	211.4	-0.006	0.000	0.020	0.00	0.00	0.00		
D	201.4	-0.006	0.000	0.020	0.00	0.00	0.00		
D	201.4	-0.006	0.000	0.020	0.00	0.00	0.00		
D	191.4	-0.006	0.000	0.020	0.00	0.00	0.00		
D	191.4	-0.006	0.000	0.020	0.00	0.00	0.00		
D	184.3	-0.006	0.000	0.020	0.00	0.00	0.00		
D	184.3	-0.007	0.000	0.021	0.00	0.00	0.00		
D	180.0	-0.007	0.000	0.021	0.00	0.00	0.00		
D	180.0	-0.007	0.000	0.021	0.00	0.00	0.00		
D	175.7	-0.006	0.000	0.021	0.00	0.00	0.00		
D	175.7	-0.006	0.000	0.021	0.00	0.00	0.00		
D	171.4	-0.006	0.000	0.021	0.00	0.00	0.00		
D	171.4	-0.007	0.000	0.021	0.00	0.00	0.00		
D	161.4	-0.007	0.000	0.022	0.00	0.00	0.00		
D	161.4	-0.007	0.000	0.022	0.00	0.00	0.00		
D	151.4	-0.007	0.000	0.022	0.00	0.00	0.00		
D	151.4	-0.007	0.000	0.022	0.00	0.00	0.00		
D	141.4	-0.007	0.000	0.022	0.00	0.00	0.00		
D	141.4	-0.007	0.000	0.022	0.00	0.00	0.00		
D	131.4	-0.007	0.000	0.022	0.00	0.00	0.00		
D	131.4	-0.007	0.000	0.022	0.00	0.00	0.00		
D	121.4	-0.007	0.000	0.022	0.00	0.00	0.00		
D	121.4	-0.007	0.000	0.022	0.00	0.00	0.00		
D	111.4	-0.007	0.000	0.022	0.00	0.00	0.00		
D	111.4	-0.007	0.000	0.022	0.00	0.00	0.00		
D	101.4	-0.006	0.000	0.022	0.00	0.00	0.00		
D	101.4	-0.006	0.000	0.022	0.00	0.00	0.00		
D	91.4	-0.006	0.000	0.022	0.00	0.00	0.00		
D	91.4	-0.006	0.000	0.022	0.00	0.00	0.00		
D	85.7	-0.006	0.000	0.022	0.00	0.00	0.00		
D	85.7	-0.006	0.000	0.022	0.00	0.00	0.00		
D	81.4	-0.006	0.000	0.022	0.00	0.00	0.00		
D	81.4	-0.006	0.000	0.022	0.00	0.00	0.00		
D	71.4	-0.006	0.000	0.023	0.00	0.00	0.00		
D	71.4	-0.006	0.000	0.023	0.00	0.00	0.00		
D	61.4	-0.006	0.000	0.023	0.00	0.00	0.00		
D	61.4	-0.006	0.000	0.023	0.00	0.00	0.00		
D	51.4	-0.006	0.000	0.023	0.00	0.00	0.00		
D	51.4	-0.006	0.000	0.023	0.00	0.00	0.00		
D	41.4	-0.006	0.000	0.023	0.00	0.00	0.00		
D	41.4	-0.006	0.000	0.023	0.00	0.00	0.00		
D	31.4	-0.005	0.000	0.023	0.00	0.00	0.00		
D	31.4	-0.005	0.000	0.023	0.00	0.00	0.00		
D	21.4	-0.005	0.000	0.023	0.00	0.00	0.00		
D	21.4	-0.005	0.000	0.023	0.00	0.00	0.00		
D	14.3	-0.005	0.000	0.023	0.00	0.00	0.00		
D	14.3	-0.005	0.000	0.023	0.00	0.00	0.00		
D	10.0	-0.005	0.000	0.023	0.00	0.00	0.00		
D	10.0	-0.004	0.000	0.023	0.00	0.00	0.00		
D	2.9	-0.004	0.000	0.023	0.00	0.00	0.00		
D	2.9	-0.004	0.000	0.023	0.00	0.00	0.00		
D	0.0	-0.004	0.000	0.023	0.00	0.00	0.00		

GUY LOADING
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.. WIND LOADING ... AZI DEG	SPEED MPH	REF PRESS PSF	TEMP CHANGE DEG	.ICE LOAD.. RAD IN	DENS PCF	CONV TOL	PROFILES. CAB	WIND	.LOAD FACTORS. WIND	DEAD	ICE
0.0	60.0	0.00	0.00	0.00	56.00	0.0100	1	4	1.00	1.00	1.00

CABLE PROFILE: 1 - CATENARY 2 - PARABOLIC

WIND PROFILE: 1 - EIA 222 default
2 - Constant Kz=1, Kiz=1
3 - Step function for Kz, Kiz
(requires definition of Exposure Factor Kz, Kiz table)
4 - Special Factors
5 - Site specific wind formula, Kiz as EIA 222 default
(requires definition of Exposure Factor Qh formula table)

MAXIMUM LEG LOADS AND FACE SHEARS (KIP - stress in KSI)

MAST ELEV FT	MAX LEG LOADS AXIAL	BENDING TENS	BENDING COMP	TOTAL TENS	TOTAL COMP	MAX FACE SHEARS TORSN	BEAM	TOTAL
282.00	0.0E	0.6I	0.6K	0.6I	0.6K	0.0A	0.0L	0.0L
	0.0G	0.7I	0.7K	0.7I	0.8K	0.0E	0.1D	0.1L
279.00	0.1G	0.7I	0.7K	0.6I	0.9K	0.0E	0.2D	0.2L
	0.1G	1.3I	1.3G	1.2I	1.5G	0.0E	0.2D	0.2L
276.00	1.5A	0.9I	0.9K	0.0A	2.4C	0.0E	0.1J	0.1L
	1.6A	0.7A	0.7C	0.0A	2.3C	0.0E	0.1J	0.1L
274.28	1.6A	0.7A	0.7C	0.0A	2.3C	0.0E	0.1J	0.1L
	1.6A	0.6A	0.6C	0.0A	2.1C	0.0E	0.1J	0.1L
272.00	1.6A	0.6A	0.6C	0.0A	2.1C	0.0E	0.0J	0.0L
	1.6A	0.5A	0.5C	0.0A	2.1C	0.0E	0.0J	0.0L
270.00	1.6A	0.5A	0.5C	0.0A	2.1C	0.0E	0.0J	0.0L
	1.7A	0.5A	0.4K	0.0A	2.1K	0.0E	0.0F	0.0E
260.00	1.7A	0.5A	0.4K	0.0A	2.1K	0.0E	0.0F	0.0E
	1.7A	0.7A	0.6K	0.0A	2.2K	0.0E	0.0F	0.0D
256.00	1.7A	0.7A	0.6K	0.0A	2.2K	0.0E	0.0F	0.0D
	1.8A	1.0A	0.9G	0.0A	2.6G	0.0E	-0.1F	0.1D
250.00	1.8A	1.0A	0.9G	0.0A	2.6G	0.0I	-0.1F	0.1D
	1.8A	2.0A	1.8G	0.2A	3.6G	0.0I	-0.1F	0.1D
240.00	1.8A	2.0A	1.8G	0.2A	3.6G	0.0I	-0.1F	0.1D
	1.8A	2.5A	2.3G	0.7A	4.1G	0.0I	-0.1F	0.1D
236.00	3.1A	2.2A	2.0G	0.0A	5.0G	0.0E	-0.1L	0.1L
	3.2A	1.5A	1.3G	0.0A	4.4G	0.0E	-0.1L	0.1L
230.00	3.2A	1.5A	1.3G	0.0A	4.4G	0.0E	-0.1L	0.1L
	3.2A	0.6A	0.5G	0.0A	3.7G	0.0E	-0.1L	0.1L
220.00	3.2A	0.6A	0.5G	0.0A	3.7G	0.0E	-0.1L	0.1L
	3.2A	0.4A	0.3G	0.0A	3.6H	0.0I	0.0L	0.0L
216.00	3.2A	0.4A	0.3G	0.0A	3.6H	0.0I	0.0L	0.0L
	3.3A	0.2A	0.2G	0.0A	3.5H	0.0I	0.0A	0.0I
210.00	3.3A	0.2A	0.2G	0.0A	3.5H	0.0I	0.0A	0.0I
	3.4A	0.3A	0.4G	0.0A	3.7G	0.0I	0.0D	0.0C
200.00	3.4A	0.3A	0.4G	0.0A	3.7G	0.0I	0.0D	0.0C
	3.4A	0.5A	0.6G	0.0A	3.9G	0.0I	0.0D	0.1D
196.00	4.2A	0.2A	0.3G	0.0A	4.5G	0.0E	-0.2H	0.2L

	4.3A	0.8K	0.9E	0.0A	5.1E	0.0I	-0.1H	0.1L
190.00	4.3A	0.8K	0.9E	0.0A	5.2E	0.0I	-0.1H	0.1L
	4.4A	1.3K	1.4E	0.0A	5.8E	0.0I	-0.1H	0.1L
184.00	4.4A	1.3K	1.4E	0.0A	5.8E	0.0I	0.0H	0.0L
	4.4A	1.4K	1.5E	0.0A	5.9E	0.0I	0.0G	0.0C
180.00	4.4A	1.4K	1.5E	0.0A	5.9E	0.0I	0.0G	0.0C
	4.5A	1.4K	1.5E	0.0A	5.9E	0.0I	0.0E	0.0I
176.00	4.5A	1.4K	1.5E	0.0A	5.9E	0.0I	0.0E	0.0I
	4.5A	1.4G	1.4E	0.0A	5.9E	0.0I	0.0D	0.0D
174.28	4.5A	1.4G	1.4E	0.0A	5.9E	0.0I	0.0D	0.0D
	4.5A	1.2G	1.2E	0.0A	5.7E	0.0I	0.1D	0.1D
170.00	4.6A	1.2G	1.2E	0.0A	5.7E	0.0I	0.1D	0.1D
	4.6A	0.2I	0.2C	0.0A	4.8D	0.0I	0.1D	0.1D
160.00	4.6A	0.2I	0.2C	0.0A	4.8D	0.0I	0.1D	0.1D
	4.6A	0.6I	0.5C	0.0A	5.1C	0.0B	0.1D	0.2D
158.05	4.6A	0.6I	0.5C	0.0A	5.1C	0.0B	0.1D	0.2D
	4.7A	0.9I	0.9C	0.0A	5.5C	0.0B	0.2D	0.2D
156.00	5.4A	0.7I	0.7C	0.0A	6.0C	0.0H	0.1F	0.1H
	5.4A	0.3I	0.3C	0.0A	5.6D	0.0H	0.0F	0.1H
150.00	5.4A	0.3I	0.3C	0.0A	5.6D	0.0H	0.0F	0.1H
	5.5A	0.1G	0.0G	0.0A	5.5I	0.0H	0.0G	0.0H
140.00	5.5A	0.1G	0.0G	0.0A	5.5I	0.0H	0.0G	0.0H
	5.5A	0.1I	0.0I	0.0A	5.5I	0.0H	0.0B	0.0I
136.00	5.5A	0.1I	0.0I	0.0A	5.5I	0.0H	0.0B	0.0A
	5.6A	0.3I	0.2B	0.0A	5.7B	0.0H	0.0B	0.0A
130.00	5.6A	0.3I	0.2B	0.0A	5.7B	0.0J	0.0B	0.0A
	5.6A	1.0I	0.9K	0.0A	6.5K	0.0J	-0.1B	0.1L
120.00	5.6A	1.0I	0.9K	0.0A	6.5K	0.0J	-0.1B	0.1L
	5.6A	1.2I	1.1K	0.0A	6.7K	0.0J	-0.1B	0.1L
117.85	5.6A	1.2I	1.1K	0.0A	6.7K	0.0J	-0.1B	0.1L
	5.7A	1.4I	1.3K	0.0A	6.9K	0.0J	-0.1B	0.1L
116.00	6.2A	1.3I	1.2K	0.0A	7.3K	0.0H	-0.1H	0.1H
	6.3A	0.6I	0.5K	0.0A	6.7K	0.0J	-0.1H	0.1J
110.00	6.3A	0.6I	0.5K	0.0A	6.7K	0.0J	-0.1H	0.1J
	6.3A	0.3C	0.2E	0.0A	6.5A	0.0J	0.0H	0.1J
100.00	6.3A	0.3C	0.2E	0.0A	6.5A	0.0J	0.0H	0.1J
	6.4A	0.5C	0.4I	0.0A	6.8A	0.0J	0.0H	0.0J
96.00	6.4A	0.5C	0.4I	0.0A	6.8A	0.0J	0.0H	0.0J
	6.4A	0.6C	0.5I	0.0A	6.9A	0.0J	0.0I	0.0J
90.00	6.4A	0.6C	0.5I	0.0A	6.9A	0.0J	0.0I	0.0J
	6.4A	0.6C	0.5I	0.0A	6.9I	0.0J	0.0L	0.0K
85.00	6.5A	0.6C	0.5I	0.0A	7.0I	0.0J	0.1L	0.1K
	6.5A	0.2C	0.1C	0.0A	6.6I	0.0J	0.1L	0.1K
80.00								

	6.5A	0.2C	0.1C	0.0A	6.6I	0.0J	0.1L	0.1K
	6.6A	0.5E	0.4G	0.0A	7.0G	0.0J	0.1L	0.1L
76.00								
	7.0A	0.4E	0.3G	0.0A	7.3L	0.0J	0.1J	0.1J
	7.1A	0.2C	0.2I	0.0A	7.2I	0.0J	0.1J	0.1J
70.00								
	7.1A	0.2C	0.2I	0.0A	7.2I	0.0J	0.1J	0.1J
	7.1A	0.7C	0.7I	0.0A	7.8I	0.0J	0.0J	0.0J
60.00								
	7.1A	0.7C	0.7I	0.0A	7.8I	0.0J	0.0J	0.0J
	7.2A	0.7C	0.7I	0.0A	7.9I	0.0J	0.0E	0.0J
56.00								
	7.2A	0.7C	0.7I	0.0A	7.9I	0.0J	0.0E	0.0J
	7.2A	0.7G	0.7I	0.0A	7.9I	0.0J	0.0B	0.0D
50.00								
	7.2A	0.7G	0.7I	0.0A	7.9I	0.0J	0.0B	0.0D
	7.3A	0.1G	0.2I	0.0A	7.5I	0.0J	-0.1B	0.1K
40.00								
	7.3A	0.1G	0.2I	0.0A	7.5I	0.0J	-0.1B	0.1K
	7.3A	0.1A	0.2C	0.0A	7.5D	0.0J	-0.1B	0.1K
36.00								
	7.5A	0.1A	0.2C	0.0A	7.7D	0.0D	-0.1H	0.1J
	7.6A	0.2G	0.3I	0.0A	7.8I	0.0D	0.0H	0.1J
30.00								
	7.6A	0.2G	0.3I	0.0A	7.8I	0.0D	0.0H	0.1J
	7.6A	0.5G	0.6I	0.0A	8.2I	0.0D	0.0H	0.1J
21.43								
	7.6A	0.5G	0.6I	0.0A	8.2I	0.0D	0.0H	0.1J
	7.6A	0.6G	0.6I	0.0A	8.3I	0.0D	0.0F	0.0J
18.00								
	7.6A	0.6G	0.6I	0.0A	8.3I	0.0D	0.0F	0.0J
	7.7A	0.6G	0.6I	0.0A	8.3I	0.0D	0.0B	0.1D
14.28								
	7.7A	0.6G	0.6I	0.0A	8.3I	0.0D	0.0B	0.1D
	7.7A	0.5G	0.5I	0.0A	8.2I	0.0D	0.0B	0.1D
10.00								
	7.7A	0.5G	0.5I	0.0A	8.2I	0.0D	0.0B	0.1D
	7.8A	0.2G	0.2I	0.0A	7.9A	0.0D	0.0B	0.1E
2.86								
	7.8A	0.2G	0.2I	0.0A	7.9A	0.0D	0.0B	0.1E
	7.8A	0.0E	0.0E	0.0A	7.8A	0.0D	-0.1B	0.1E
0.00								

FORCE/RESISTANCE RATIO
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MAST ELEV ft	- LEG COMPRESSION - MAX COMP	COMP RESIST	FORCE/ RESIST RATIO	--- LEG TENSION --- MAX TENS	TENS RESIST	FORCE/ RESIST RATIO	---- FACE SHEAR --- MAX FACE SHEAR	FACE SHEAR RESIST	FORCE/ RESIST RATIO
282.00									
	0.55	45.04	0.01	0.55	55.22	0.01	0.05	2.00	0.02
	0.69	45.04	0.02	0.66	55.22	0.01	0.06	2.00	0.03
280.00									
	0.69	45.04	0.02	0.66	55.22	0.01	0.06	2.00	0.03
	0.76	45.04	0.02	0.72	55.22	0.01	0.06	2.00	0.03
279.00									
	0.87	45.04	0.02	0.61	55.22	0.01	0.17	2.00	0.08
	1.49	45.04	0.03	1.19	55.22	0.02	0.18	2.00	0.09
276.00									
	2.40	45.04	0.05	0.00	55.22	0.00	0.08	2.00	0.04
	2.26	45.04	0.05	0.00	55.22	0.00	0.08	2.00	0.04
274.28									
	2.26	45.04	0.05	0.00	55.22	0.00	0.08	2.00	0.04
	2.10	45.04	0.05	0.00	55.22	0.00	0.07	2.00	0.03
272.00									
	2.13	45.04	0.05	0.00	55.22	0.00	0.04	2.00	0.02
	2.07	45.04	0.05	0.00	55.22	0.00	0.03	2.00	0.01
270.00									
	2.07	45.04	0.05	0.00	55.22	0.00	0.03	2.00	0.01
	2.09	45.04	0.05	0.00	55.22	0.00	0.02	2.00	0.01

260.00								
	2.09	45.04	0.05	0.00	55.22	0.00	0.02	2.00	0.01
	2.23	45.04	0.05	0.00	55.22	0.00	0.04	2.00	0.02
256.00								
	2.23	45.04	0.05	0.00	55.22	0.00	0.04	2.00	0.02
	2.59	45.04	0.06	0.00	55.22	0.00	0.06	2.00	0.03
250.00								
	2.59	45.04	0.06	0.00	55.22	0.00	0.06	2.00	0.03
	3.58	45.04	0.08	0.21	55.22	0.00	0.11	2.00	0.05
240.00								
	3.58	45.04	0.08	0.21	55.22	0.00	0.11	2.00	0.05
	4.10	45.04	0.09	0.70	55.22	0.01	0.12	2.00	0.06
236.00								
	5.03	45.04	0.11	0.00	55.22	0.00	0.12	2.00	0.06
	4.39	45.04	0.10	0.00	55.22	0.00	0.10	2.00	0.05
230.00								
	4.39	45.04	0.10	0.00	55.22	0.00	0.10	2.00	0.05
	3.69	45.04	0.08	0.00	55.22	0.00	0.06	2.00	0.03
220.00								
	3.69	45.04	0.08	0.00	55.22	0.00	0.06	2.00	0.03
	3.55	45.04	0.08	0.00	55.22	0.00	0.04	2.00	0.02
216.00								
	3.55	45.04	0.08	0.00	55.22	0.00	0.04	2.00	0.02
	3.47	45.04	0.08	0.00	55.22	0.00	0.02	2.00	0.01
210.00								
	3.47	45.04	0.08	0.00	55.22	0.00	0.02	2.00	0.01
	3.68	45.04	0.08	0.00	55.22	0.00	0.04	2.00	0.02
200.00								
	3.68	45.04	0.08	0.00	55.22	0.00	0.04	2.00	0.02
	3.90	45.04	0.09	0.00	55.22	0.00	0.05	2.00	0.03
196.00								
	4.48	45.04	0.10	0.00	55.22	0.00	0.17	2.00	0.09
	5.14	45.04	0.11	0.00	55.22	0.00	0.15	2.00	0.07
190.00								
	5.21	45.04	0.12	0.00	55.22	0.00	0.09	2.00	0.05
	5.76	45.04	0.13	0.00	55.22	0.00	0.07	2.00	0.03
184.00								
	5.79	45.04	0.13	0.00	55.22	0.00	0.03	2.00	0.02
	5.90	45.04	0.13	0.00	55.22	0.00	0.02	2.00	0.01
180.00								
	5.90	45.04	0.13	0.00	55.22	0.00	0.02	2.00	0.01
	5.92	45.04	0.13	0.00	55.22	0.00	0.02	2.00	0.01
176.00								
	5.92	45.04	0.13	0.00	55.22	0.00	0.02	2.00	0.01
	5.90	45.04	0.13	0.00	55.22	0.00	0.04	2.00	0.02
174.28								
	5.90	45.04	0.13	0.00	55.22	0.00	0.04	2.00	0.02
	5.69	45.04	0.13	0.00	55.22	0.00	0.06	2.00	0.03
170.00								
	5.74	45.04	0.13	0.00	55.22	0.00	0.10	2.00	0.05
	4.78	45.04	0.11	0.00	55.22	0.00	0.14	2.00	0.07
160.00								
	4.78	45.04	0.11	0.00	55.22	0.00	0.14	2.00	0.07
	5.12	45.04	0.11	0.00	55.22	0.00	0.15	2.00	0.08
158.05								
	5.12	45.04	0.11	0.00	55.22	0.00	0.15	2.00	0.08
	5.50	45.04	0.12	0.00	55.22	0.00	0.16	2.00	0.08
156.00								
	6.01	45.04	0.13	0.00	55.22	0.00	0.09	2.00	0.04
	5.62	45.04	0.12	0.00	55.22	0.00	0.06	2.00	0.03
150.00								
	5.62	45.04	0.12	0.00	55.22	0.00	0.06	2.00	0.03
	5.50	45.04	0.12	0.00	55.22	0.00	0.01	2.00	0.01
140.00								
	5.50	45.04	0.12	0.00	55.22	0.00	0.01	2.00	0.01
	5.54	45.04	0.12	0.00	55.22	0.00	0.02	2.00	0.01
136.00								
	5.54	45.04	0.12	0.00	55.22	0.00	0.02	2.00	0.01
	5.69	45.04	0.13	0.00	55.22	0.00	0.04	2.00	0.02
130.00								
	5.69	45.04	0.13	0.00	55.22	0.00	0.04	2.00	0.02
	6.45	45.04	0.14	0.00	55.22	0.00	0.09	2.00	0.04
120.00								
	6.45	45.04	0.14	0.00	55.22	0.00	0.09	2.00	0.04
	6.69	45.04	0.15	0.00	55.22	0.00	0.10	2.00	0.05
117.85								
	6.69	45.04	0.15	0.00	55.22	0.00	0.10	2.00	0.05
	6.91	45.04	0.15	0.00	55.22	0.00	0.11	2.00	0.05
116.00								
	7.34	45.04	0.16	0.00	55.22	0.00	0.12	2.00	0.06
	6.68	45.04	0.15	0.00	55.22	0.00	0.10	2.00	0.05
110.00								
	6.68	45.04	0.15	0.00	55.22	0.00	0.10	2.00	0.05
	6.54	45.04	0.15	0.00	55.22	0.00	0.06	2.00	0.03
100.00								
	6.54	45.04	0.15	0.00	55.22	0.00	0.06	2.00	0.03

	6.75	45.04	0.15	0.00	55.22	0.00	0.05	2.00	0.02
96.00									
	6.75	45.04	0.15	0.00	55.22	0.00	0.05	2.00	0.02
	6.92	45.04	0.15	0.00	55.22	0.00	0.02	2.00	0.01
90.00									
	6.92	45.04	0.15	0.00	55.22	0.00	0.02	2.00	0.01
	6.92	45.04	0.15	0.00	55.22	0.00	0.03	2.00	0.02
85.00									
	6.99	45.04	0.16	0.00	55.22	0.00	0.07	2.00	0.04
	6.60	45.04	0.15	0.00	55.22	0.00	0.09	2.00	0.05
80.00									
	6.60	45.04	0.15	0.00	55.22	0.00	0.09	2.00	0.05
	6.96	45.04	0.15	0.00	55.22	0.00	0.14	2.00	0.07
76.00									
	7.28	45.04	0.16	0.00	55.22	0.00	0.11	2.00	0.05
	7.21	45.04	0.16	0.00	55.22	0.00	0.09	2.00	0.04
70.00									
	7.21	45.04	0.16	0.00	55.22	0.00	0.09	2.00	0.04
	7.80	45.04	0.17	0.00	55.22	0.00	0.05	2.00	0.02
60.00									
	7.80	45.04	0.17	0.00	55.22	0.00	0.05	2.00	0.02
	7.89	45.04	0.18	0.00	55.22	0.00	0.03	2.00	0.02
56.00									
	7.89	45.04	0.18	0.00	55.22	0.00	0.03	2.00	0.02
	7.88	45.04	0.17	0.00	55.22	0.00	0.04	2.00	0.02
50.00									
	7.88	45.04	0.17	0.00	55.22	0.00	0.05	2.00	0.02
	7.47	45.04	0.17	0.00	55.22	0.00	0.08	2.00	0.04
40.00									
	7.47	45.04	0.17	0.00	55.22	0.00	0.08	2.00	0.04
	7.48	45.04	0.17	0.00	55.22	0.00	0.10	2.00	0.05
36.00									
	7.66	45.04	0.17	0.00	55.22	0.00	0.10	2.00	0.05
	7.84	45.04	0.17	0.00	55.22	0.00	0.08	2.00	0.04
30.00									
	7.84	45.04	0.17	0.00	55.22	0.00	0.08	2.00	0.04
	8.20	45.04	0.18	0.00	55.22	0.00	0.06	2.00	0.03
21.43									
	8.20	45.04	0.18	0.00	55.22	0.00	0.06	2.00	0.03
	8.22	45.04	0.18	0.00	55.22	0.00	0.05	2.00	0.03
20.00									
	8.22	45.04	0.18	0.00	55.22	0.00	0.05	2.00	0.03
	8.25	45.04	0.18	0.00	55.22	0.00	0.05	2.00	0.02
18.00									
	8.25	45.04	0.18	0.00	55.22	0.00	0.05	2.00	0.02
	8.26	45.04	0.18	0.00	55.22	0.00	0.05	2.00	0.03
14.28									
	8.26	45.04	0.18	0.00	55.22	0.00	0.05	2.00	0.03
	8.19	45.04	0.18	0.00	55.22	0.00	0.06	2.00	0.03
10.00									
	8.19	45.04	0.18	0.00	55.22	0.00	0.06	2.00	0.03
	7.94	45.04	0.18	0.00	55.22	0.00	0.07	2.00	0.04
2.86									
	7.94	45.04	0.18	0.00	55.22	0.00	0.07	2.00	0.04
	7.78	45.04	0.17	0.00	55.22	0.00	0.08	2.00	0.04
0.00									

MAXIMUM MAST DEFORMATION CALCULATED
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MAST ELEV FT	.....DEFLECTIONS (FT)..... HORIZONTAL ..... NORTH	EAST	TOTAL	DOWN	.....ROTATIONS (DEG)..... TILT ..... NORTH	EAST	TOTAL	TWIST
282.0	-0.21A	0.18I	0.21A	0.01A	-0.13A	0.11J	0.13A	0.25D
279.0	-0.20A	0.17I	0.20A	0.01A	-0.13A	0.11J	0.13A	0.25D
276.0	-0.20A	0.17I	0.20A	0.01A	-0.12A	-0.10E	0.12A	0.25D
274.3	-0.19A	0.16I	0.19A	0.01A	-0.12A	-0.10E	0.12A	0.25D
272.0	-0.19A	0.16I	0.19A	0.01A	-0.12A	-0.10E	0.12A	0.25D
270.0	-0.19A	0.16I	0.19A	0.01A	-0.12A	-0.10E	0.12A	0.25D
260.0	-0.17A	0.14I	0.17A	0.01A	-0.11A	-0.09E	0.11A	0.25D
256.0	-0.16A	0.14I	0.16A	0.01A	-0.10A	-0.08E	0.10A	0.25D
250.0	-0.15A	0.13I	0.15A	0.01A	-0.09A	0.08I	0.09A	0.25D
240.0	-0.13A	0.12I	0.13A	0.00A	-0.06A	0.05I	0.06A	0.25D
236.0	-0.13A	0.11I	0.13A	0.00A	-0.05A	0.04I	0.05A	0.26D
230.0	-0.13A	0.11I	0.13A	0.00A	-0.03A	0.02I	0.03A	0.26D

220.0	-0.12A	0.11I	0.12A	0.00A	-0.01G	-0.01K	0.02K	0.26D
216.0	-0.12A	0.11I	0.12A	0.00A	-0.02G	-0.02K	0.02K	0.27D
210.0	-0.12A	0.11I	0.12A	0.00A	-0.02G	-0.02K	0.02K	0.27D
200.0	-0.12A	0.11I	0.12A	0.00A	-0.03G	-0.02K	0.03K	0.27D
196.0	-0.12A	0.11I	0.12A	0.00A	-0.03G	-0.03K	0.03K	0.28D
190.0	-0.12A	0.11I	0.12A	0.00A	-0.03G	-0.02K	0.03G	0.28D
184.0	-0.12A	0.11I	0.12A	0.00A	-0.01G	-0.01K	0.01G	0.29D
180.0	-0.12A	-0.11E	0.12A	0.00A	-0.02A	0.02I	0.02I	0.29D
176.0	-0.12A	-0.10E	0.12A	0.00A	-0.03A	0.03I	0.03I	0.29D
174.3	-0.12A	-0.10E	0.12A	0.00A	-0.04A	0.03I	0.04I	0.29D
170.0	-0.12A	-0.10E	0.12A	0.00A	-0.05A	0.04I	0.05I	0.30D
160.0	-0.11A	-0.09E	0.11A	0.00A	-0.06A	0.05I	0.06I	0.30D
158.1	-0.11A	-0.09E	0.11A	0.00A	-0.06A	0.05I	0.06I	0.30D
156.0	-0.10A	-0.09E	0.10A	0.00A	-0.05A	0.05I	0.05I	0.30D
150.0	-0.10A	-0.08E	0.10A	0.00A	-0.05A	0.04I	0.05I	0.31D
140.0	-0.09A	-0.08E	0.09A	0.00A	-0.04A	0.04I	0.04I	0.31D
136.0	-0.09A	-0.08E	0.09A	0.00A	-0.04A	-0.04E	0.04A	0.31D
130.0	-0.08A	-0.07E	0.08A	0.00A	-0.04A	-0.04E	0.04A	0.30D
120.0	-0.08A	-0.07E	0.08A	0.00A	-0.03A	-0.03E	0.03A	0.30D
117.9	-0.07A	-0.06E	0.07A	0.00A	-0.03A	-0.02E	0.03A	0.30D
116.0	-0.07A	-0.06E	0.07A	0.00A	-0.02A	-0.02E	0.02A	0.29D
110.0	-0.07A	-0.06E	0.07A	0.00A	-0.01A	-0.01E	0.01A	0.29D
100.0	-0.07A	-0.06E	0.07A	0.00A	0.01J	0.01H	0.01J	0.28D
96.0	-0.07A	0.06I	0.07A	0.00A	-0.01A	-0.01E	0.01A	0.27D
90.0	-0.07A	0.06I	0.07A	0.00A	-0.02A	-0.01E	0.02A	0.26D
85.0	-0.07A	0.06I	0.07A	0.00A	-0.02A	-0.02E	0.02A	0.25D
80.0	-0.07A	0.06I	0.07A	0.00A	-0.02A	-0.02E	0.02A	0.24D
76.0	-0.06A	0.05I	0.06A	0.00A	-0.02A	-0.02E	0.02A	0.24D
70.0	-0.06A	0.05I	0.06A	0.00A	-0.02A	-0.02E	0.02A	0.22D
60.0	-0.06A	0.05I	0.06I	0.00A	-0.03A	-0.02E	0.03A	0.20D
56.0	-0.05A	0.05I	0.06I	0.00A	-0.03A	-0.03E	0.03A	0.19D
50.0	-0.05A	0.04I	0.05I	0.00A	-0.04A	-0.04E	0.04A	0.18D
40.0	-0.04A	0.04J	0.04I	0.00A	-0.05A	0.04I	0.05A	0.15D
36.0	-0.04A	0.03J	0.04I	0.00A	-0.05A	0.04I	0.05I	0.14D
30.0	-0.03A	0.03J	0.03I	0.00A	-0.05A	0.04I	0.05I	0.12D
21.4	-0.03A	0.02J	0.03I	0.00A	-0.06A	0.05I	0.06I	0.09D
18.0	-0.02A	0.02J	0.02I	0.00A	-0.06A	0.05I	0.06I	0.07D
14.3	-0.02A	0.02J	0.02I	0.00A	-0.07A	0.06J	0.07I	0.06D
10.0	-0.01A	0.01J	0.01I	0.00A	-0.07A	0.06J	0.07I	0.04D
2.9	0.00A	0.00J	0.00I	0.00A	-0.08A	0.07J	0.08I	0.01D
0.0	0.00A	0.00A	0.00A	0.00A	-0.08A	0.07J	0.08I	0.00A

MAXIMUM ANTENNA ROTATIONS
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ELEV FT	ORIENTATION AZI DEG	ORIENTATION ELEV DEG	..... BEAM DEFLECTIONS (DEG) ..... ROLL	YAW	PITCH	TOTAL
292.0	0.0	0.0	-0.112 J	0.247 D	0.133 A	0.248 J
279.0	0.0	0.0	-0.108 J	0.247 D	0.129 A	0.248 J
279.0	0.0	0.0	-0.108 J	0.247 D	0.129 A	0.248 J
279.0	0.0	0.0	-0.108 J	0.247 D	0.129 A	0.248 J
272.0	0.0	0.0	0.098 E	0.248 D	0.118 A	0.248 J
190.0	0.0	0.0	0.023 K	0.281 D	0.027 G	0.282 J
184.0	0.0	0.0	0.012 K	0.286 D	0.015 G	0.286 J
174.7	0.0	0.0	-0.031 I	0.293 D	0.035 A	0.293 J

170.0	0.0	0.0	-0.041 I	0.297 D	0.047 A	0.297 J	
85.0	0.0	0.0	0.018 E	0.254 D	0.021 A	0.254 D	
79.0	0.0	0.0	0.020 E	0.243 D	0.023 A	0.243 D	

MAXIMUM INTERNAL MAST FORCES

MAST ELEV FT	TOTAL AXIAL KIP	.....SHEAR..... N - S KIP	E - W KIP	.....MOMENT..... N - S FT-KIP	E - W FT-KIP	TORSION FT-KIP
282.0						
	0.00 E	-0.07 A	-0.07 D	-0.72 G	-0.72 J	0.00 A
	0.06 G	-0.09 A	-0.09 D	-0.96 G	-0.96 J	0.00 E
279.0						
	0.38 G	-0.25 A	-0.25 D	-0.96 G	-0.96 J	0.00 E
	0.44 G	-0.27 A	-0.27 D	-1.74 G	-1.74 J	0.00 E
	*	+	+	&	&	@
276.0	4.20 A	-0.40 G	-0.39 J	0.60 G	-0.59 D	-0.01 E
	4.64 A	-0.12 G	-0.12 J	1.15 A	-1.15 J	-0.01 E
	4.68 A	-0.11 G	-0.11 J	0.97 A	-0.96 J	-0.01 E
274.3						
	4.68 A	-0.11 G	-0.11 J	0.97 A	-0.96 J	-0.01 E
	4.72 A	-0.10 G	-0.09 J	0.76 A	-0.74 J	-0.01 E
272.0						
	4.82 A	-0.05 G	-0.05 J	0.76 A	-0.74 J	-0.01 E
	4.86 A	-0.04 G	-0.04 J	0.69 A	-0.66 J	-0.01 E
270.0						
	4.86 A	-0.04 G	-0.04 J	0.69 A	-0.66 J	0.00 E
	5.06 A	-0.03 A	-0.03 D	0.71 A	-0.63 J	0.00 E
260.0						
	5.06 A	-0.03 A	-0.03 D	0.71 A	-0.63 J	0.00 E
	5.14 A	-0.06 A	-0.05 D	0.89 A	-0.80 J	0.00 E
256.0						
	5.14 A	-0.06 A	-0.05 D	0.89 A	-0.80 J	0.00 E
	5.25 A	-0.10 A	-0.09 D	1.36 A	-1.24 J	0.00 E
250.0						
	5.25 A	-0.10 A	-0.09 D	1.36 A	-1.24 J	0.00 I
	5.45 A	-0.16 A	-0.16 D	2.63 A	-2.46 J	0.00 I
240.0						
	5.45 A	-0.16 A	-0.16 D	2.63 A	-2.46 J	0.00 I
	5.53 A	-0.18 A	-0.18 D	3.31 A	-3.12 J	0.00 I
	*	+	+	&	&	@
236.0	3.83 A	0.36 A	0.35 D	-0.45 A	-0.44 D	-0.01 E
	9.36 A	0.18 A	-0.17 J	2.85 A	-2.68 J	-0.01 E
	9.47 A	0.14 A	-0.14 J	1.91 A	-1.77 J	-0.01 E
230.0						
	9.47 A	0.14 A	-0.14 J	1.91 A	-1.77 J	-0.01 E
	9.67 A	0.08 A	-0.08 J	0.80 A	-0.71 J	-0.01 E
220.0						
	9.67 A	0.08 A	-0.08 J	0.80 A	-0.71 J	-0.01 E
	9.75 A	0.06 A	-0.05 J	0.53 A	-0.46 J	0.01 I
216.0						
	9.75 A	0.06 A	-0.05 J	0.53 A	-0.46 J	0.01 I
	9.87 A	0.02 A	0.02 E	0.30 A	-0.26 J	0.01 I
210.0						
	9.87 A	0.02 A	0.02 E	0.30 A	-0.26 J	0.01 I
	10.06 A	0.05 G	-0.05 D	-0.49 G	-0.41 J	0.01 I
200.0						
	10.06 A	0.05 G	-0.05 D	-0.49 G	-0.41 J	0.01 I

	10.14 A	0.08 G	-0.07 D	-0.74 G	-0.64 J	0.01 I
	*	+	+	&	&	@
196.0	2.50 A	-0.33 G	-0.32 J	0.32 G	0.32 J	0.01 L
	12.64 A	-0.25 G	-0.25 J	-0.42 G	0.32 C	-0.01 E
	12.76 A	-0.21 G	-0.21 J	-1.11 A	-1.09 D	0.01 I
190.0	.....	.....	.....	.....	.....	.....
	12.96 A	-0.13 G	-0.13 J	-1.11 A	-1.09 D	0.01 I
	13.09 A	-0.09 G	-0.09 J	-1.79 A	1.77 J	0.01 I
184.0	.....	.....	.....	.....	.....	.....
	13.19 A	-0.04 G	-0.04 J	-1.79 A	1.77 J	0.01 I
	13.27 A	-0.02 G	-0.01 K	-1.89 A	1.88 J	0.01 I
180.0	.....	.....	.....	.....	.....	.....
	13.27 A	-0.02 G	-0.01 K	-1.89 A	1.88 J	0.01 I
	13.35 A	-0.01 A	-0.01 E	-1.89 A	1.88 J	0.01 I
176.0	.....	.....	.....	.....	.....	.....
	13.35 A	-0.02 A	-0.01 E	-1.89 A	1.88 J	0.01 I
	13.42 A	-0.05 A	-0.05 D	-1.84 A	1.83 J	0.01 I
174.3	.....	.....	.....	.....	.....	.....
	13.42 A	-0.05 A	-0.05 D	-1.84 A	1.83 J	0.01 I
	13.50 A	-0.08 A	-0.08 D	1.54 G	1.54 J	0.01 I
170.0	.....	.....	.....	.....	.....	.....
	13.65 A	-0.14 A	-0.14 D	1.54 G	1.54 J	0.01 I
	13.87 A	-0.21 A	-0.21 D	0.27 A	0.27 D	0.01 I
160.0	.....	.....	.....	.....	.....	.....
	13.87 A	-0.21 A	-0.21 D	0.27 A	0.27 D	0.01 I
	13.91 A	-0.22 A	-0.22 D	0.70 A	0.70 D	-0.01 B
158.1	.....	.....	.....	.....	.....	.....
	13.91 A	-0.22 A	-0.22 D	0.70 A	0.70 D	-0.01 B
	13.96 A	-0.24 A	-0.24 D	1.19 A	1.19 D	-0.01 B
	*	+	+	&	&	@
156.0	2.14 E	0.35 A	-0.36 J	-0.26 A	0.26 J	0.01 L
	16.09 A	-0.12 G	-0.12 J	0.93 A	0.92 D	0.01 H
	16.22 A	-0.08 G	-0.07 J	0.38 A	0.37 D	0.01 H
150.0	.....	.....	.....	.....	.....	.....
	16.22 A	-0.08 G	-0.07 J	0.38 A	0.37 D	0.01 H
	16.44 A	-0.01 G	0.01 C	0.08 G	0.06 K	0.01 H
140.0	.....	.....	.....	.....	.....	.....
	16.44 A	-0.01 G	0.01 C	0.08 G	0.06 K	0.01 H
	16.52 A	-0.02 A	-0.02 D	0.06 A	-0.08 I	0.01 H
136.0	.....	.....	.....	.....	.....	.....
	16.52 A	-0.02 A	-0.02 D	0.06 A	-0.08 I	0.01 H
	16.65 A	-0.07 A	-0.06 D	0.33 A	-0.30 I	0.01 H
130.0	.....	.....	.....	.....	.....	.....
	16.65 A	-0.07 A	-0.06 D	0.33 A	-0.30 I	-0.01 J
	16.87 A	-0.13 A	-0.13 D	1.30 A	1.22 D	-0.01 J
120.0	.....	.....	.....	.....	.....	.....
	16.87 A	-0.13 A	-0.13 D	1.30 A	1.22 D	-0.01 J
	16.92 A	-0.15 A	-0.14 D	1.58 A	1.50 D	-0.01 J
117.9	.....	.....	.....	.....	.....	.....
	16.92 A	-0.15 A	-0.14 D	1.58 A	1.50 D	-0.02 J
	16.96 A	-0.16 A	-0.16 D	1.85 A	1.77 D	-0.02 J
	*	+	+	&	&	@
116.0	1.71 K	0.32 A	-0.32 J	-0.17 A	0.17 J	0.01 L
	18.65 A	0.17 A	-0.17 J	1.68 A	1.60 D	0.01 H
	18.78 A	0.13 A	-0.13 J	0.76 A	0.69 D	-0.01 J
110.0	.....	.....	.....	.....	.....	.....
	18.78 A	0.13 A	-0.13 J	0.76 A	0.69 D	-0.02 J
	19.00 A	0.07 A	-0.07 J	0.41 G	-0.38 C	-0.02 J
100.0	.....	.....	.....	.....	.....	.....
	19.00 A	0.07 A	-0.07 J	0.41 G	-0.38 C	-0.02 J
	19.08 A	0.04 A	-0.04 J	0.64 G	-0.58 C	-0.02 J

96.0						
	19.08 A	0.04 A	-0.04 J	0.64 G	-0.58 C	-0.02 J
	19.21 A	0.01 A	-0.01 I	0.78 G	-0.72 D	-0.02 J
90.0						
	19.21 A	0.01 A	-0.01 I	0.78 G	-0.72 D	-0.03 J
	19.32 A	0.02 G	-0.02 D	0.73 G	-0.67 D	-0.03 J
85.0						
	19.52 A	0.09 G	-0.09 D	0.73 G	-0.67 D	-0.03 J
	19.64 A	0.13 G	-0.13 D	0.16 G	-0.17 C	-0.03 J
80.0						
	19.64 A	0.13 G	-0.13 D	0.16 G	-0.17 C	-0.03 J
	19.83 A	0.19 G	-0.19 D	0.62 A	-0.60 J	-0.03 J
	*	+	+	&	&	@
76.0	1.20 K	-0.33 G	0.33 D	0.11 G	-0.11 D	0.01 L
	21.02 A	0.13 A	-0.13 J	0.51 A	-0.49 J	-0.03 J
	21.15 A	0.09 A	-0.09 J	0.26 G	-0.26 C	-0.03 J
70.0						
	21.15 A	0.09 A	-0.09 J	0.26 G	-0.26 C	-0.03 J
	21.38 A	0.03 A	-0.03 J	0.89 G	0.86 J	-0.04 J
60.0						
	21.38 A	0.03 A	-0.03 J	0.89 G	0.86 J	-0.04 J
	21.47 A	0.01 A	-0.01 I	0.96 G	0.93 J	-0.04 J
56.0						
	21.47 A	0.01 A	-0.01 I	0.96 G	0.93 J	-0.04 J
	21.60 A	0.03 G	-0.03 D	-0.87 A	0.85 J	-0.04 J
50.0						
	21.60 A	0.03 G	-0.03 D	-0.87 A	0.85 J	-0.04 J
	21.83 A	0.09 G	-0.09 D	-0.24 A	0.22 I	-0.05 J
40.0						
	21.83 A	0.09 G	-0.09 D	-0.24 A	0.22 I	-0.05 J
	21.92 A	0.11 G	-0.11 D	-0.27 H	0.25 D	-0.05 J
	*	+	+	&	&	@
36.0	0.62 C	-0.22 G	0.22 D	0.04 G	-0.04 D	0.01 L
	22.53 A	-0.10 G	-0.10 J	-0.23 H	0.21 D	0.05 D
	22.67 A	-0.07 G	-0.07 J	-0.36 A	0.33 I	0.05 D
30.0						
	22.67 A	-0.07 G	-0.07 J	-0.36 A	0.33 I	0.05 D
	22.86 A	-0.02 G	-0.02 J	-0.74 A	0.71 J	0.06 D
21.4						
	22.86 A	-0.02 G	-0.02 J	-0.74 A	0.71 J	0.06 D
	22.94 A	-0.01 H	0.00 L	-0.78 A	0.76 J	0.06 D
18.0						
	22.94 A	-0.01 H	0.00 L	-0.78 A	0.76 J	0.06 D
	23.02 A	-0.02 A	-0.01 D	-0.75 A	0.73 J	0.06 D
14.3						
	23.02 A	-0.02 A	-0.01 D	-0.75 A	0.73 J	0.06 D
	23.12 A	-0.04 A	-0.03 D	-0.63 A	0.62 J	0.06 D
10.0						
	23.12 A	-0.04 A	-0.03 D	-0.63 A	0.62 J	0.06 D
	23.28 A	-0.07 A	-0.07 D	-0.23 A	0.22 J	0.06 D
2.9						
	23.28 A	-0.07 A	-0.07 D	-0.23 A	0.22 J	0.06 D
	23.34 A	-0.08 A	-0.08 D	0.00 G	0.00 E	0.06 D
base reaction	23.34 A	-0.06 G	0.06 D	0.00 L	0.00 E	-0.06 D

* VERTICAL GUY LOAD & GUY ECCENTRIC MOMENT
\+ HORIZONTAL REACTION @ TORSIONAL RESISTANCE

MAXIMUM GUY FORCES AT MAST

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GUY LEVEL FT	GUY AZI	.....COMPONENTS AT MAST..... N KIP	E KIP	DOWN KIP	TOTAL KIP	EFL/FR * RATIO	...GUY ANGLES... VERT DEG	HORIZ DEG
276.0	0.0	1.4A	-0.1D	1.9A	2.3A	0.3A	-52.5B	-3.1D
	120.0	-0.7E	1.2E	1.8E	2.3E	0.3E	-52.5D	-3.1H
	240.0	-0.7I	-1.2I	1.8I	2.3I	0.3I	-52.5H	-3.1L
236.0	0.0	1.5A	-0.1D	1.6A	2.2A	0.2A	-47.9B	2.6J
	120.0	-0.7E	1.3E	1.6E	2.2E	0.2E	-47.9D	-2.6H
	240.0	-0.7I	-1.3I	1.6I	2.2I	0.2I	-47.9H	-2.6L
196.0	0.0	1.2A	0.0D	1.1A	1.6A	0.2A	-42.6L	-2.4D
	120.0	-0.6E	1.0E	1.1E	1.6E	0.2E	-42.6F	2.4B
	240.0	-0.6I	-1.0I	1.1I	1.6I	0.2I	-42.6H	-2.4L
156.0	0.0	1.3A	0.0D	0.9A	1.5A	0.2A	-36.2B	-2.0D
	120.0	-0.6E	1.1E	0.9E	1.6E	0.2E	-36.2G	2.0B
	240.0	-0.6I	-1.1I	0.9I	1.6I	0.2I	-36.2G	-2.0L
116.0	0.0	1.3A	0.0D	0.7A	1.5A	0.2A	-28.6K	-1.6D
	120.0	-0.6E	1.1E	0.7E	1.5E	0.2E	-28.6C	1.6B
	240.0	-0.6I	-1.1I	0.7I	1.5I	0.2I	-28.6G	-1.6L
76.0	0.0	1.3A	0.0J	0.5A	1.4A	0.2A	-20.1G	-1.3D
	120.0	-0.7E	1.2E	0.5E	1.4E	0.2E	-20.1K	1.3B
	240.0	-0.7I	-1.2I	0.5I	1.4I	0.2I	-20.1C	-1.3L
36.0	0.0	1.3A	0.0J	0.2A	1.3A	0.2A	-10.5G	1.0J
	120.0	-0.6E	1.1E	0.2E	1.3E	0.2E	-10.5K	1.0B
	240.0	-0.6I	-1.1I	0.2I	1.3I	0.2I	-10.5C	-1.0L

* EFL/FR = EFFECTS OF FACTORED LOADS DIVIDED BY THE FACTORED RESISTANCE

MAXIMUM GUY FORCES AT ANCHOR
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GUY LEVEL FT	GUY AZI	GUY ATT AZI	.....COMPONENTS AT ANCHOR..... RAD KIP	LAT KIP	VERT KIP	TOTAL KIP	EFL/FR * RATIO
276.0	0.0	0.0	1.5A	0.1D	1.7A	2.3A	0.2A
	120.0	120.0	1.5E	-0.1B	1.7E	2.3E	0.2E
	240.0	240.0	1.5I	-0.1F	1.7I	2.3I	0.2I
236.0	0.0	0.0	1.5A	0.1D	1.5A	2.1A	0.2A
	120.0	120.0	1.5E	-0.1B	1.5E	2.1E	0.2E
	240.0	240.0	1.5I	-0.1F	1.5I	2.1I	0.2I
196.0	0.0	0.0	1.2A	0.0D	1.0A	1.5A	0.2A
	120.0	120.0	1.2E	0.0H	1.0E	1.5E	0.2E
	240.0	240.0	1.2I	0.0F	1.0I	1.5I	0.2I
156.0	0.0	0.0	1.3A	0.0D	0.8A	1.5A	0.2A
	120.0	120.0	1.3E	0.0B	0.8E	1.5E	0.2E
	240.0	240.0	1.3I	0.0F	0.8I	1.5I	0.2I
116.0	0.0	0.0	1.3A	0.0D	0.6A	1.4A	0.2A
	120.0	120.0	1.3E	0.0H	0.6E	1.4E	0.2E
	240.0	240.0	1.3I	0.0F	0.6I	1.4I	0.2I
76.0	0.0	0.0	1.3A	0.0D	0.4A	1.4A	0.2A
	120.0	120.0	1.3E	0.0B	0.4E	1.4E	0.2E
	240.0	240.0	1.3I	0.0F	0.4I	1.4I	0.2I
36.0	0.0	0.0	1.3A	0.0D	0.2A	1.3A	0.2A
	120.0	120.0	1.3E	0.0B	0.2E	1.3E	0.2E
	240.0	240.0	1.3I	0.0F	0.2I	1.3I	0.2I

MAXIMUM ANCHOR LOADS
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AZI DEG	RADIUS FT	GUY TO ELEV FT	....ANCHOR LOADS..... HORIZ KIP	VERT KIP	LATERAL KIP	.....SHAFT FORCES..... AXIAL KIP	...LATERAL... VERT PLANE	HORIZ PLANE	ANGLE DEG

							KIP	KIP	
0.0	225.6	276.0	1.5A	1.7A	0.1D	2.2A	0.6A	0.1D	
		236.0	1.5A	1.5A	0.1D	2.1A	0.4A	0.1D	
		196.0	1.2A	1.0A	0.0D	1.5A	0.2A	0.0D	
		156.0	1.3A	0.8A	0.0D	1.5A	0.0G	0.0D	
		116.0	1.3A	0.6A	0.0D	1.4A	-0.2A	0.0D	
		76.0	1.3A	0.4A	0.0D	1.4A	-0.4A	0.0D	
		36.0	1.3A	0.2A	0.0D	1.2A	-0.6A	0.0D	
			9.4A	6.3A	0.3D	11.3A	0.0B	0.3D	33.8A
120.0	225.6	276.0	1.5E	1.7E	-0.1B	2.2E	0.6E	-0.1B	
		236.0	1.5E	1.5E	-0.1B	2.1E	0.4E	-0.1B	
		196.0	1.2E	1.0E	0.0H	1.5E	0.2E	0.0H	
		156.0	1.3E	0.8E	0.0B	1.5E	0.0K	0.0B	
		116.0	1.3E	0.6E	0.0H	1.4E	-0.2E	0.0H	
		76.0	1.3E	0.4E	0.0B	1.4E	-0.4E	0.0B	
		36.0	1.3E	0.2E	0.0B	1.2E	-0.6E	0.0B	
			9.4E	6.3E	-0.3B	11.3E	0.0C	-0.3B	33.7E
240.0	225.6	276.0	1.5I	1.7I	-0.1F	2.2I	0.6I	-0.1F	
		236.0	1.5I	1.5I	-0.1F	2.1I	0.4I	-0.1F	
		196.0	1.2I	1.0I	0.0F	1.5I	0.2I	0.0F	
		156.0	1.3I	0.8I	0.0F	1.5I	0.0C	0.0F	
		116.0	1.3I	0.6I	0.0F	1.4I	-0.2I	0.0F	
		76.0	1.3I	0.4I	0.0F	1.4I	-0.4I	0.0F	
		36.0	1.3I	0.2I	0.0F	1.2I	-0.6I	0.0F	
			9.4I	6.3I	-0.3F	11.3I	0.0K	-0.3F	33.7I

MAXIMUM LOADS ON TOWER PIER
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AXIAL	.....SHEAR.....			.....MOMENT.....			
	NORTH	EAST	TOTAL	NORTH	EAST	TOTAL	TORSIONAL
kip	kip	kip	kip	ft-kip	ft-kip	ft-kip	ft-kip
23.3432	-0.0602	0.0597	0.0611	0.0000	0.0000	0.0000	-0.0637
A	G	D	K	L	E	E	D

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GUYED TOWER SPREAD FOOTING DESIGN BY SABRE TOWERS & POLES

282' 1800 SRWD NEXTERA ENERGY RESOURCES, LLC Blue Summit III SM01, TX (436011) 2019-06-13 ARH

Factored Axial Load (kips)	95.83		
Factored Shear (kips)	0.26		
Ultimate Bearing Pressure	13.5	Allowable Bearing Pressure (ksf)	4.50
Bearing Φs	0.6	Safety Factor	3.00
Bearing Design Strength (ksf)	8.1	Maximum Factored Net Soil Bearing Pressure (ksf)	3.97
Diameter of Pier (ft)	2.5	Equivalent Square b (ft)	2.22
Ht. of Pier Above Ground (ft)	0.5		
Depth to Bottom of Slab (ft)	3.5		
Ht. of Pier Below Ground (ft)	2		
Water Table Below Grade (ft)	35		
Width of Pad (ft)	5		
Thickness of Pad (ft)	1.5		
Quantity of Bars in Pad	6		
Bar Diameter in Pad (in)	0.875		
Area of Bars in Pad (in^2)	3.61		
Spacing of Bars in Pad (in)	10.63	Recommended Spacing (in)	6 to 12
Quantity of Bars Pier	6		
Bar Diameter in Pier (in)	0.875		
Area of Bars in Pier (in^2)	3.61	Minimum Pier Area of Steel (in^2)	3.53
Spacing of Bars in Pier (in)	11.72	Recommended Spacing (in)	6 to 12
f'c (ksi)	4.5		
fy (ksi)	60		
Unit Wt. of Soil (kcf)	0.115		
Unit Wt. of Concrete (kcf)	0.15		
Volume of Concrete (yd^3)	1.84		
Two-Way Shear Action:			
Average d (in)	14.13		
ϕV_c (kips)	446.6	V_u (kips)	55.6
$\phi V_c = \phi(2 + 4/\beta_c)f'_c{}^{1/2}b_o d$	669.9		
$\phi V_c = \phi(\alpha_s d/b_o+2)f'_c{}^{1/2}b_o d$	678.3		
$\phi V_c = \phi\ 4f'_c{}^{1/2}b_o d$	446.6		
Shear perimeter, b_o (in)	138.62		
β_c	1		
One-Way Shear:			
ϕV_c (kips)	96.6	V_u (kips)	4.2
Flexure:			
ϕM_n (ft-kips)	221.7	M_u (ft-kips)	18.7
a (in)	0.94		
Steel Ratio	0.00426		
β_1	0.83		
Maximum Steel Ratio	0.0197		
Minimum Steel Ratio	0.0018		
Rebar Development in Pad (in)	13.71	Required Development in Pad (in)	12.00

Condition	1 is OK, 0 Fails
Two-Way Shear Action	1
One-way Shear	1
Flexure	1
Steel Ratio	1
Pier Area of Steel	1
Maximum Soil Bearing Pressure	1
Length of Development in Pad	1

GUY ANCHOR BLOCK DESIGN BY SABRE TOWERS & POLES

282' 1800 SRWD NEXTERA ENERGY RESOURCES, LLC Blue Summit III SM01, TX (436011) 2019-06-13 A

Anchor Block Dimensions:

Length (ft)	15		
Height (ft)	2	Length/Height Ratio	7.5
Width (ft)	2	Length/Width Ratio	7.5
Longitudinal Bar Diameter (in)	0.625	Height/Width Ratio	1.00
Quantity of Bars in Top	3	Width/Height Ratio	1.00
Area of Bars in Top (in^2)	0.92	Vertical Flexure Ratio	0.33
Spacing of Bars in Top (in)	8.19	Horizontal Flexure Ratio	0.63
Quantity of Bars Front	3	Horizontal Force Ratio	0.99
Area of Bars in Front (in^2)	0.92	Vertical Force Ratio	0.37
Spacing of Bars in Front (in)	8.19		
Quantity of Bars in Bottom	2		
Spacing of Bars in Bottom (in)	16.38	Recommended Spacing (in)	5 to 30
Quantity of Bars in Back	2		
Spacing of Bars in Back (in)	16.38	Recommended Spacing (in)	5 to 30
Quantity of Ties	16		
Tie Bar Diameter (in)	0.5		
Factored Uplift (kips)	**14.48**	Angle from Horizontal (deg)	28
Factored Horizontal Force (kips)	**27.62**		
Ultimate Passive Pressure	**1.238**		
Horizontal Φs	**0.75**		
Horizontal Design Strength (ksf)	**0.928125**		
Angle of Internal Friction (deg.)	**30**		
Unit Wt. of Soil (kcf)	**0.110**		
Water Table Below Grade (ft)	**35**		
Depth to Bottom of Block (ft)	**6.5**		
f'c (ksi)	4.5		
fy (ksi)	60		
Unit Wt. of Concrete (kcf)	0.15		
Volume of Concrete (yd^3)	2.22		

Horizontal Force:

Factored Horizontal Force (kips)	27.6	Horizontal Design Strength (kips)	27.8

Uplift:

Wc, Weight of Concrete (kips)	9.0		
W_R, Soil Resistance (kips)	41.2		
Uplift Φs (kips)	0.75		
$(\Phi s)(W_R+W_C)$ (kips)	39.0		
Factored Uplift (kips)	14.5	Uplift Design Strength (kips)	39.0

Vertical Shear:

V_u (kips)	7.2	ϕV_n(kips)	55.3
$V_c = 2\ f'_c{}^{1/2} b_w d$ (kips)	65.0		
V_s (kips)	0.0	*** V_s max = $4\ f'_c{}^{1/2} b_w d$ (kips)	130.0
Spacing of Ties (in)	11.57		
Max. Spacing (in)	10.09	(Only if Shear Ties are Required)	

*** Ref. To Spacing Requirements ACI 11.5.4.3

GUY ANCHOR BLOCK DESIGN BY SABRE TOWERS & POLES (CONTINUED)

282' 1800 SRWD NEXTERA ENERGY RESOURCES, LLC Blue Summit III SM01, TX (436011) 2019-06-13 A

Horizontal Shear

V_u (kips)	13.8	ϕV_n (kips)	55.3
$V_c = 2\ f'_c{}^{1/2} b_w d$ (kips)	65.0		
V_s (kips)	0.0	*** V_s max = $4\ f'_c{}^{1/2} b_w d$ (kips)	130.0
Spacing of Ties (in)	11.57		
Max. Spacing (in)	10.09	(Only if Shear Ties are Required)	
$(V_u/fV_n)_V+(Vu/fV_n)_H$	0.38		<1 OK

*** Ref. To Spacing Requirements ACI 11.5.4.3

Vertical Flexure:

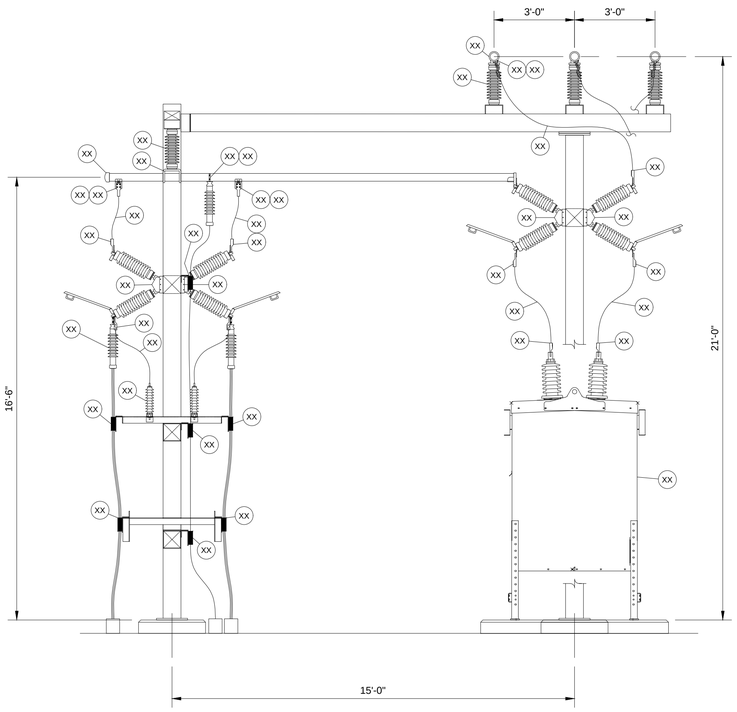
M_u (ft-kips)	27.2	ϕM_n (ft-kips)	82.4
a (in)	0.60		
Steel Ratio	0.0019		
b_1	0.83		
Maximum Steel Ratio	0.0233		
Minimum Steel Ratio	0.0018		
Rebar Development (in)	87.00	Required Rebar Development (in)	4.54

Horizontal Flexure:

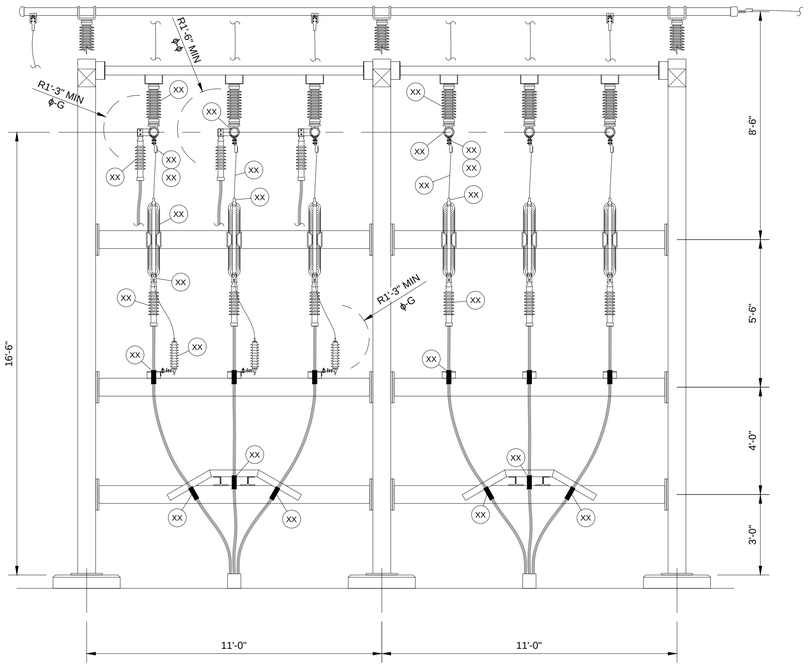
M_u (ft-kips)	51.8	ϕM_n (ft-kips)	82.4
a (in)	0.60		
Steel Ratio	0.0019		
Maximum Steel Ratio	0.023		
Minimum Steel Ratio	0.0018		
Rebar Development (in)	87.00	Required Rebar Development (in)	8.66
$(M_u/fM_n)_V+(Mu/fM_n)_H$	0.96	$(M_u/fM_n)_V+(Mu/\phi M_n)_H$	<1 OK

Condition	1 is OK, 0 Fails
Uplift Force	1
Horizontal Force	1
Flexure	1
Shear	1
Length of Development in Block	1
Steel Ratio	1

Calculated Strength > Factored Load O.K.



E Q.100 SECTION



F Q.100 SECTION

LEGEND

- NEW CONSTRUCTION

NEXTera® ENERGY RESOURCES

Mesa Associates, Inc.

Engineers, Consultants, and Land Surveyors
200 Union Blvd. G18
Lakewood, CO, 80028
Phone: (720) 799-2041
http://www.mesainc.com

STATE REGISTRATION: N/A

REVISIONS

REV	DESCRIPTION	DWN / CHK / APP	DATE
A	2020 SUBSTATION REBUILD	BLW / BVB / PSF	05/10/19

0 4' 8'
3/8"=1'-0"
ORIGINAL DRAWING SIZE IS 24 x 36

NEXTERA ENERGY RESOURCES CERRO GORDO SUBSTATION

EQUIPMENT ELEVATIONS E & F

PRELIMINARY

ISSUE DATE:	05/10/19
DRAWN BY:	B. WATSON
CHECKED BY:	B. VAN BRIESEN
APPROVED BY:	P. FJELD

DWG TYPE: Q DWG NUMBER: 103

SHEET 1 OF 1

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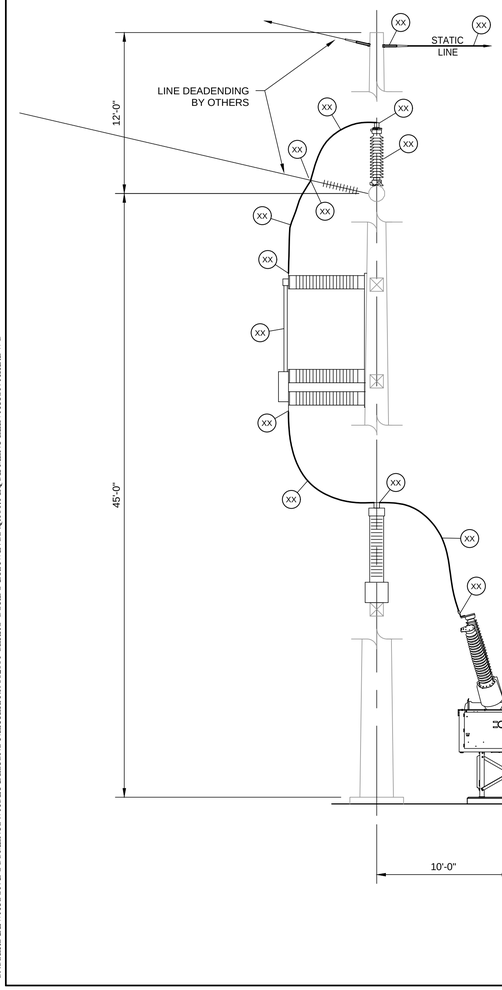
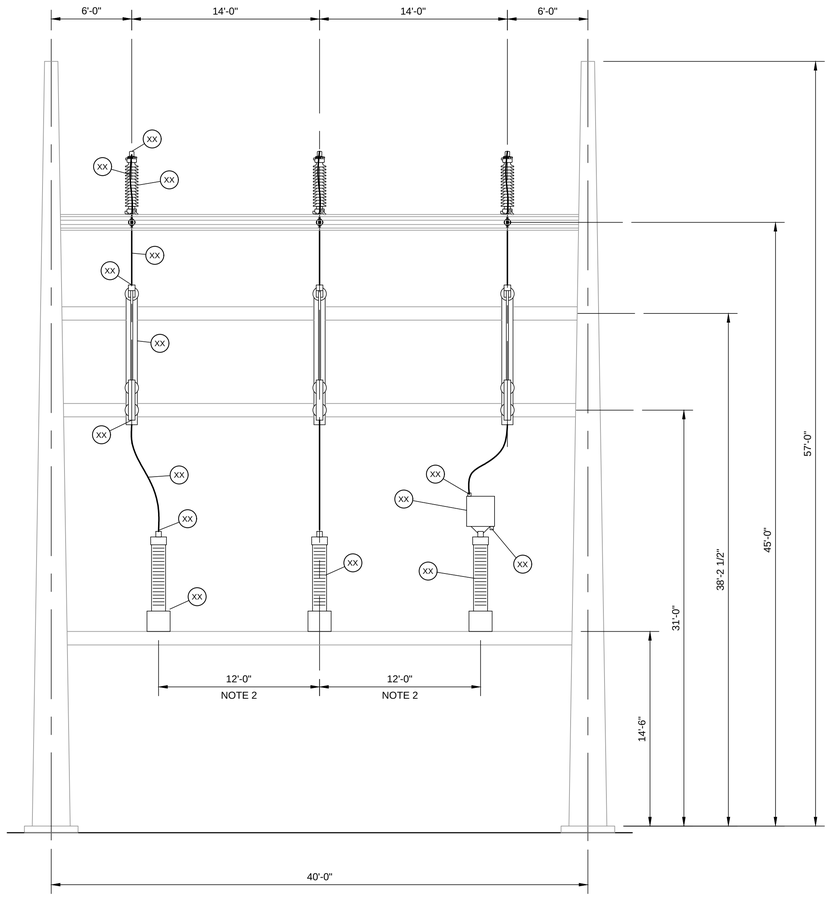
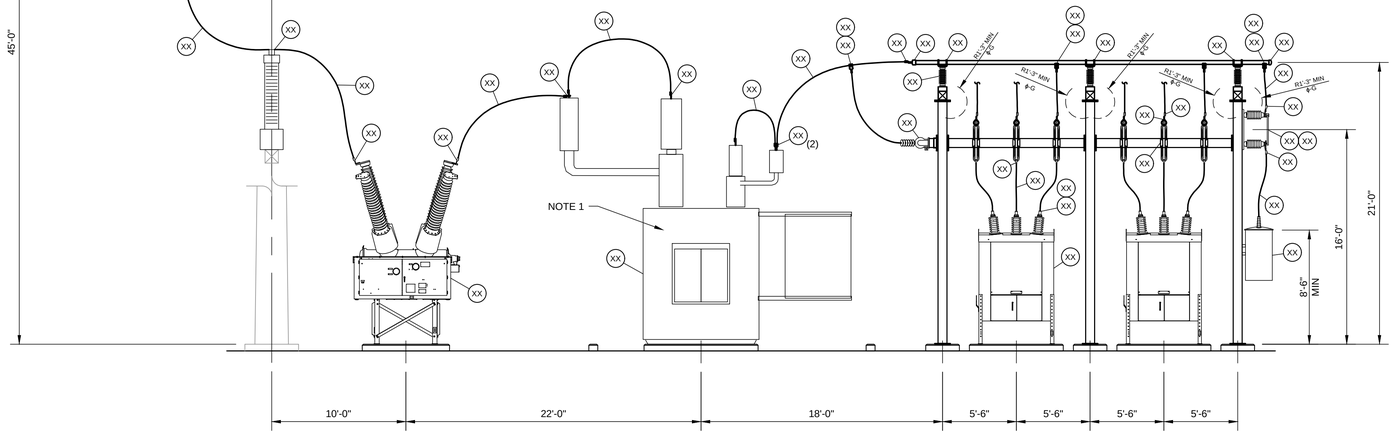




A Q.100 SECTION



B Q.100 SECTION

NOTES

1. CONSERVATOR TANK ON TRANSFORMER NOT SHOWN FOR CLARITY.
2. INSTALL STEEL BRACKETS FOR THE TWO (2) OUTSIDE CCVT'S.

LEGEND

- NEW CONSTRUCTION
- EXISTING CONSTRUCTION

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Lakewood, CO, 80028
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http://www.mesainc.com

STATE REGISTRATION: N/A

REVISIONS

REV	DESCRIPTION	DWN / CHK / APP	DATE
A	2020 SUBSTATION REBUILD	BLW / BVB / PSF	05/10/19

0 4' 8' 12' 16'
3/16"=1'-0"
ORIGINAL DRAWING SIZE IS 24 x 36

NEXTERA ENERGY RESOURCES CERRO GORDO SUBSTATION

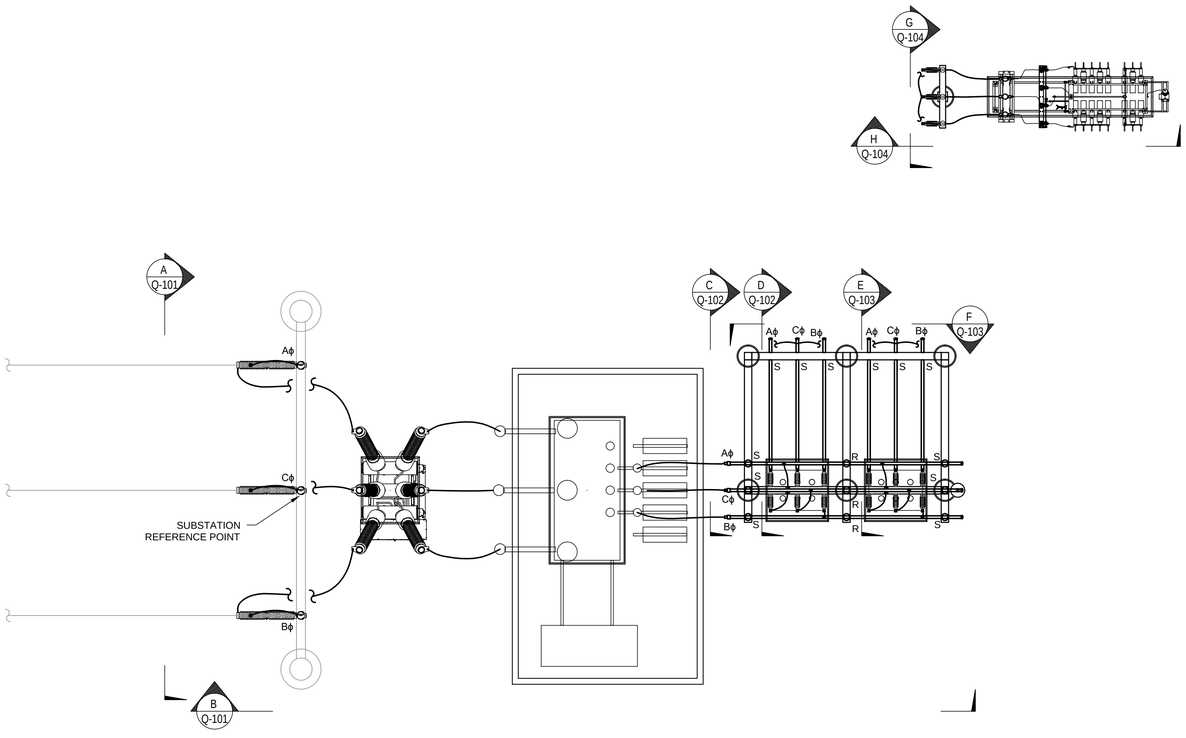
EQUIPMENT ELEVATIONS A & B

PRELIMINARY

ISSUE DATE:	05/10/19
DRAWN BY:	B. WATSON
CHECKED BY:	B. VAN BRIESEN
APPROVED BY:	P. FJELD

DWG TYPE: Q DWG NUMBER: 101
SHEET 1 OF 1

C:\USERS\BLWATSON\DOCUMENTS\VAULT\DESIGNS\NEXTERA\19082001 CERRO GORDO\DRAWINGS\Q.101.1 EQUIPMENT ELEVATION A&B.DWG



MIN. DISTANCES, 161 kV, 750 kV BIL

PHASE ℄ TO ℄ - 10'-0"
METAL TO METAL - 78"
PHASE TO GROUND - 72"
CLEAR ABOVE GRADE - 15'-0"

MIN. DISTANCES, 34.5 kV, 200 kV BIL

PHASE ℄ TO ℄ - 3'-0"
METAL TO METAL - 18"
PHASE TO GROUND - 15"
CLEAR ABOVE GRADE - 12'-0"

NOTES

1. ALL HORIZONTAL BUS RUNS SHALL HAVE A 1/8"Ø WEEP HOLE AT MID-SPAN.
2. 3" BUS: ALL HORIZONTAL BUS SPANS GREATER THAN 10' SHALL CONTAIN A SINGLE 336.4 kcmil ACSR, 26/7 STRAND "LINNET" DAMPING CONDUCTOR.

LEGEND

- NEW CONSTRUCTION
- EXISTING CONSTRUCTION
E - EXPANSION BUS FITTING
S - SLIP FIT CONNECTION
R - RIGID OR WELDED CONNECTION

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Phone: (720) 799-2041
http://www.mesainc.com

STATE REGISTRATION: N/A

REVISIONS

REV	DESCRIPTION	DWN / CHK / APP	DATE
A	2020 SUBSTATION REBUILD	BLW / BVB / PSF	05/10/19

0' 1' 5' 10' 15'
SCALE: 1/8"=1'-0"
ORIGINAL DRAWING SIZE IS 24 x 36

NEXTERA ENERGY RESOURCES CERRO GORDO SUBSTATION

EQUIPMENT PLAN

PRELIMINARY

ISSUE DATE:	05/10/19
DRAWN BY:	B. WATSON
CHECKED BY:	B. VAN BRIESEN
APPROVED BY:	P. FJELD

DWG TYPE: Q | DWG NUMBER: 100
SHEET 1 OF 1

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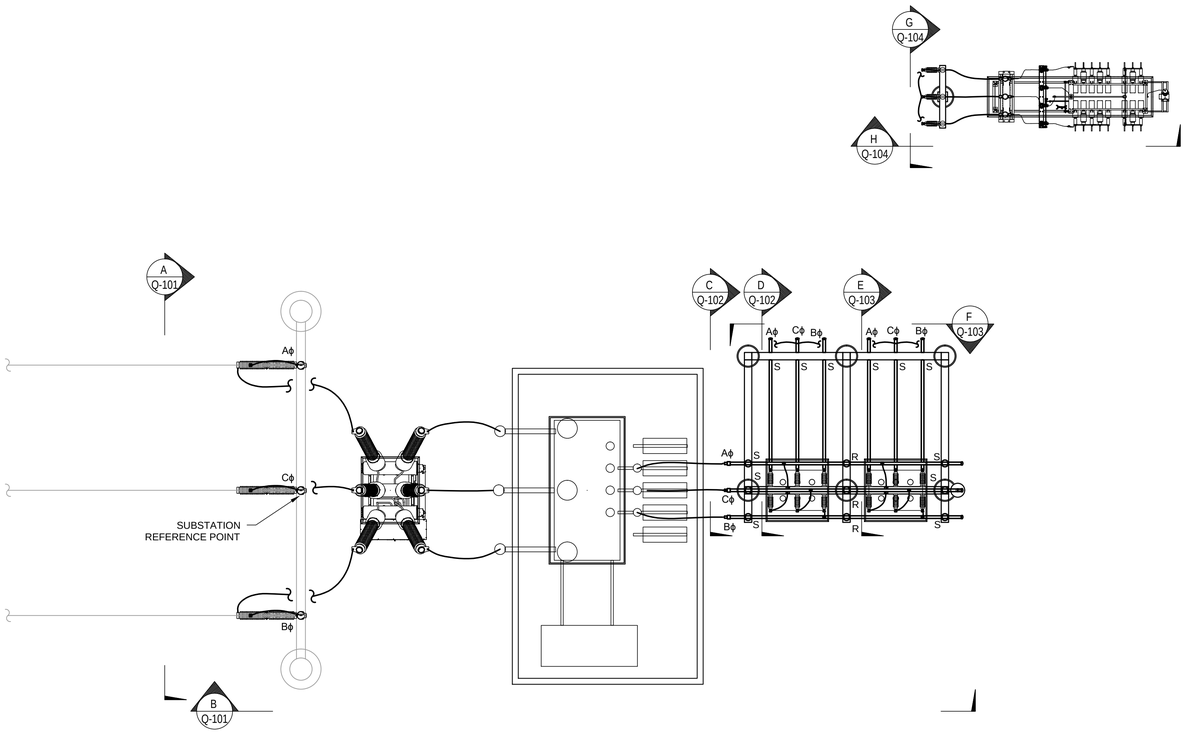

MIN. DISTANCES, 161 kV, 750 kV BIL

PHASE ℄ TO ℄ - 10'-0"
METAL TO METAL - 78"
PHASE TO GROUND - 72"
CLEAR ABOVE GRADE - 15'-0"

MIN. DISTANCES, 34.5 kV, 200 kV BIL

PHASE ℄ TO ℄ - 3'-0"
METAL TO METAL - 18"
PHASE TO GROUND - 15"
CLEAR ABOVE GRADE - 12'-0"

NOTES

1. ALL HORIZONTAL BUS RUNS SHALL HAVE A 1/8"Ø WEEP HOLE AT MID-SPAN.
2. 3" BUS: ALL HORIZONTAL BUS SPANS GREATER THAN 10' SHALL CONTAIN A SINGLE 336.4 kcmil ACSR, 26/7 STRAND "LINNET" DAMPING CONDUCTOR.

LEGEND

- NEW CONSTRUCTION
- EXISTING CONSTRUCTION
E - EXPANSION BUS FITTING
S - SLIP FIT CONNECTION
R - RIGID OR WELDED CONNECTION

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STATE REGISTRATION: N/A

REVISIONS

REV	DESCRIPTION	DWN / CHK / APP	DATE
A	2020 SUBSTATION REBUILD	BLW / BVB / PSF	05/10/19

0' 1' 5' 10' 15'
SCALE: 1/8"=1'-0"
ORIGINAL DRAWING SIZE IS 24 x 36

NEXTERA ENERGY RESOURCES CERRO GORDO SUBSTATION

EQUIPMENT PLAN

PRELIMINARY

ISSUE DATE:	05/10/19
DRAWN BY:	B. WATSON
CHECKED BY:	B. VAN BRIESEN
APPROVED BY:	P. FJELD

DWG TYPE: Q | DWG NUMBER: 100
SHEET 1 OF 1

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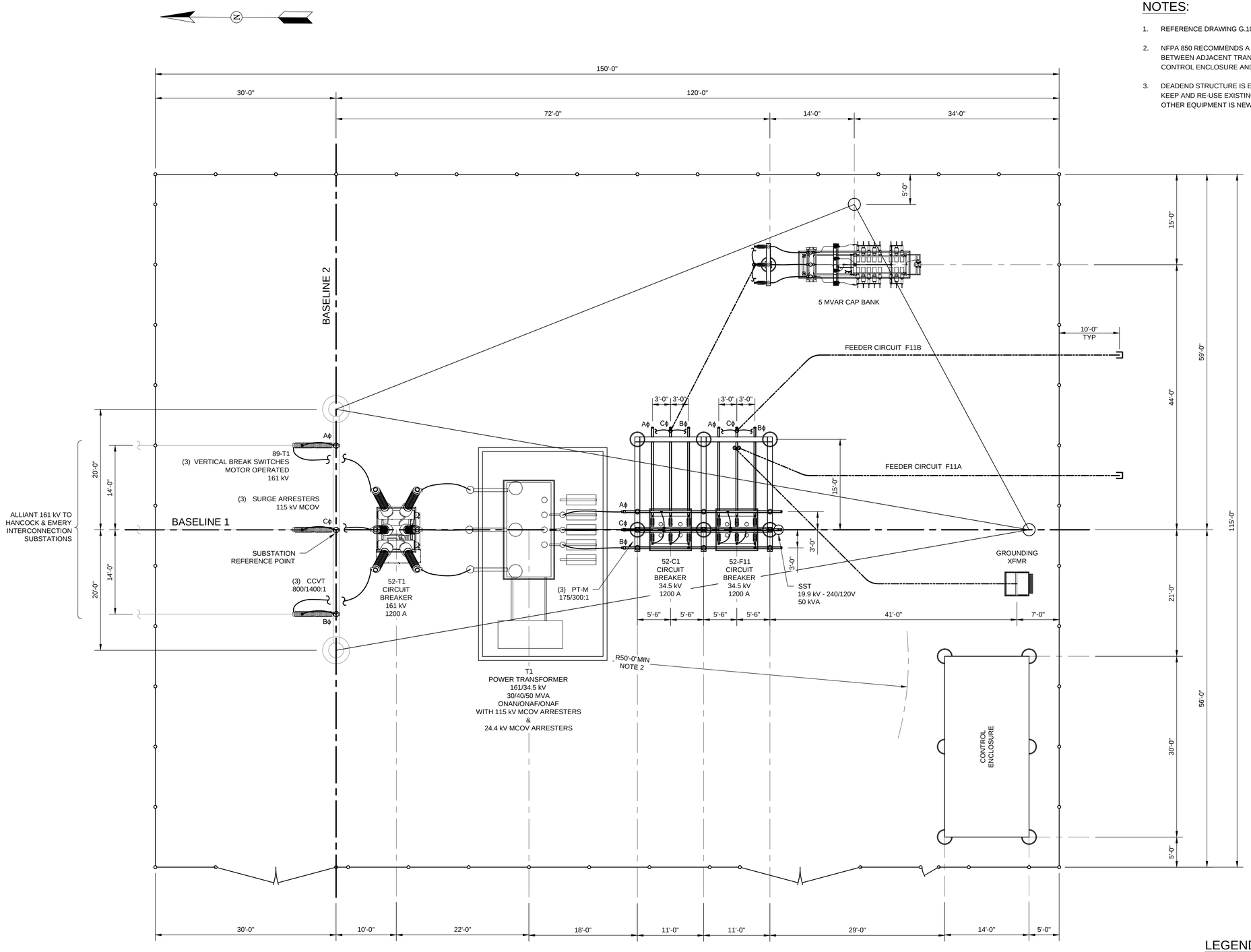
NOTES:

1. REFERENCE DRAWING G.100.1 FOR EQUIPMENT RATINGS.
2. NFPA 850 RECOMMENDS A MINIMUM SEPARATION DISTANCE BETWEEN ADJACENT TRANSFORMERS AND BETWEEN THE CONTROL ENCLOSURE AND TRANSFORMER OF 50'-0".
3. DEADEND STRUCTURE IS EXISTING. CONTRACTOR SHALL KEEP AND RE-USE EXISTING LINE TRAP AND TUNER. ALL OTHER EQUIPMENT IS NEW.



LEGEND

- NEW CONSTRUCTION
- 34.5 kV POWER CONDUIT
- NEW SUBSTATION FENCE
- EXISTING CONSTRUCTION

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http://www.mesainc.com

STATE REGISTRATION: N/A

REVISIONS

REV	DESCRIPTION	DWN / CHK / APP	DATE
A	2020 SUBSTATION REBUILD	BLW / BVB / PSF	05/10/19

0' 1' 5' 10' 15'
SCALE: 1/8"=1'-0"
ORIGINAL DRAWING SIZE IS 24 x 36

NEXTERA ENERGY RESOURCES CERRO GORDO SUBSTATION

GENERAL ARRANGEMENT

PRELIMINARY

ISSUE DATE:	05/10/19
DRAWN BY:	B. WATSON
CHECKED BY:	B. VAN BRIESEN
APPROVED BY:	P. FJELD

DWG TYPE: G | DWG NUMBER: 110

SHEET 1 OF 1

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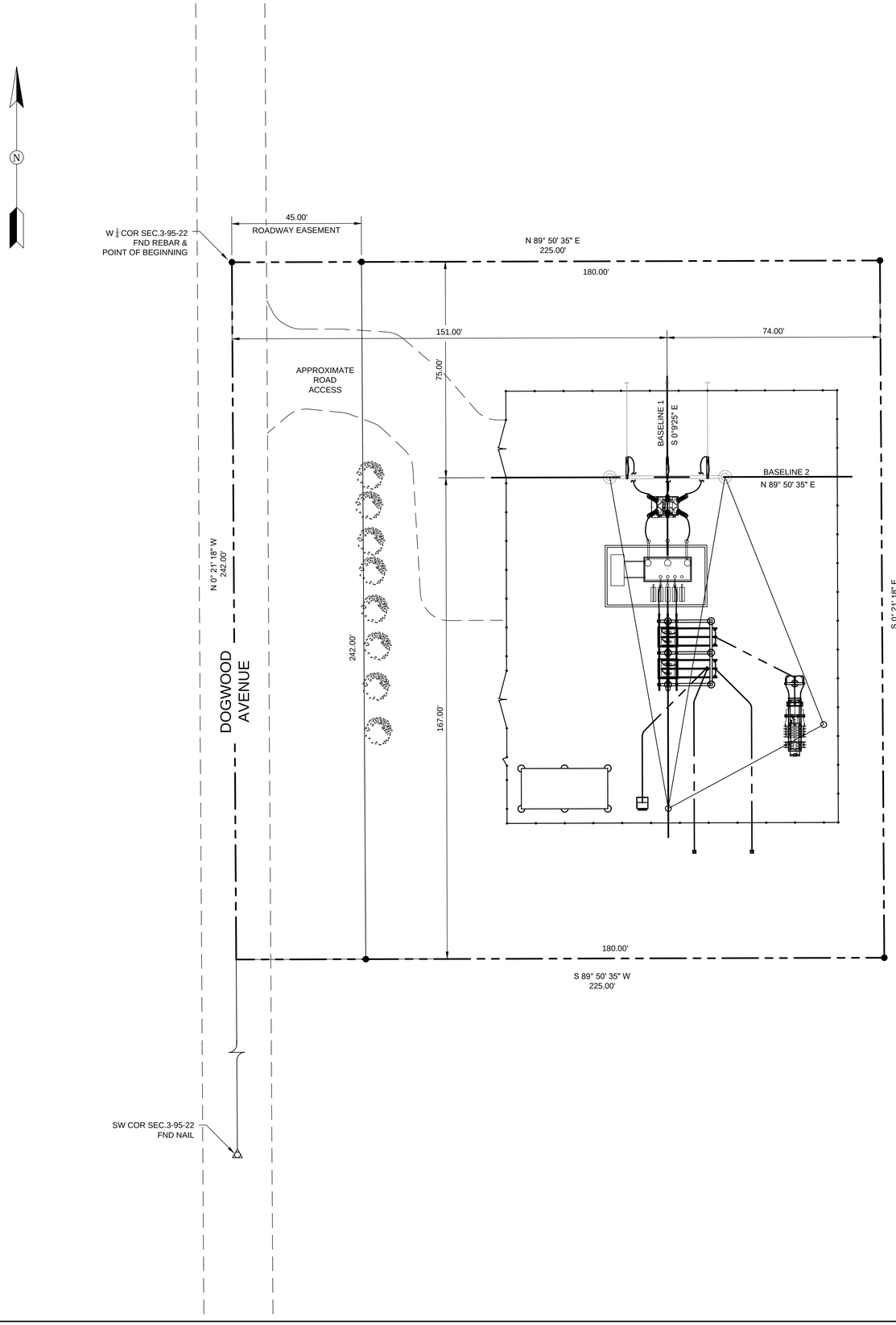

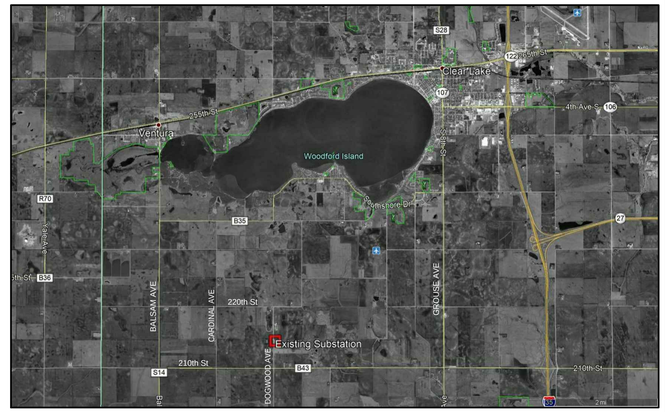

VICINITY MAP

SCALE: NONE

LEGEND

- NEW CONSTRUCTION
- 34.5 kV POWER CONDUIT
- NEW SUBSTATION FENCE
- EXISTING CONSTRUCTION

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http://www.mesainc.com

STATE REGISTRATION: N/A

REVISIONS

REV	DESCRIPTION	DWN / CHK / APP	DATE
A	2020 SUBSTATION REBUILD	BLW / BVB / PSF	05/10/19

0 20' 40'

ORIGINAL DRAWING SIZE IS 24 x 36

NEXTERA ENERGY RESOURCES CERRO GORDO SUBSTATION

SITE PLAN

PRELIMINARY

ISSUE DATE:	05/10/19
DRAWN BY:	B. WATSON
CHECKED BY:	B. VAN BRIESEN
APPROVED BY:	P. FJELD

DWG TYPE: C DWG NUMBER: 100

SHEET 1 OF 1

C:\USERS\BLWATSON\DOCUMENTS\VAULT\DESIGNS\NEXTERA\19882001 CERRO GORDO\DRAWING\SC 100.1 SITE PLAN.DWG

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY): 04/25/2019

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER MCGRIFF, SEIBELS & WILLIAMS, INC. P.O. Box 10265 Birmingham, AL 35202	**CONTACT NAME:** **PHONE (A/C, No, Ext):** 800-476-2211 **FAX (A/C, No):** **E-MAIL ADDRESS:**
	INSURER(S) AFFORDING COVERAGE / **NAIC #** **INSURER A :** Federal Insurance Company / 20281
INSURED NextEra Energy, Inc. and NextEra Energy Resources, LLC including Hawkeye Power Partners, LLC 700 Universe Boulevard Juno Beach, FL 33408-2657	**INSURER B :** **INSURER C :** **INSURER D :** **INSURER E :** **INSURER F :**

COVERAGES **CERTIFICATE NUMBER:** R3HLWF7N **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
A	X **COMMERCIAL GENERAL LIABILITY** ☐ CLAIMS-MADE ☒ OCCUR ☐ ☐ GEN'L AGGREGATE LIMIT APPLIES PER: ☒ POLICY ☐ PRO-JECT ☐ LOC ☐ OTHER:			37110930	09/15/2018	09/15/2019	EACH OCCURRENCE DAMAGE TO RENTED PREMISES (Ea occurrence) MED EXP (Any one person) PERSONAL & ADV INJURY GENERAL AGGREGATE PRODUCTS - COMP/OP AGG $	$ 1,000,000 $ 1,000,000 $ 10,000 $ 1,000,000 $ 2,000,000 $ 1,000,000 $
	AUTOMOBILE LIABILITY ☐ ANY AUTO ☐ OWNED AUTOS ONLY ☐ SCHEDULED AUTOS ☐ HIRED AUTOS ONLY ☐ NON-OWNED AUTOS ONLY ☐						COMBINED SINGLE LIMIT (Ea accident) BODILY INJURY (Per person) BODILY INJURY (Per accident) PROPERTY DAMAGE (Per accident) $	$ $ $ $ $
	☐ **UMBRELLA LIAB** ☐ OCCUR ☐ **EXCESS LIAB** ☐ CLAIMS-MADE ☐ DED ☐ RETENTION $						EACH OCCURRENCE AGGREGATE $	$ $ $
	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY Y / N ANY PROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? ☐ **(Mandatory in NH)** If yes, describe under DESCRIPTION OF OPERATIONS below	N / A					☐ PER STATUTE ☐ OTH-ER E.L. EACH ACCIDENT E.L. DISEASE - EA EMPLOYEE E.L. DISEASE - POLICY LIMIT	 $ $ $
								$ $ $ $ $

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

Re: Cerro Gordo SEP Application.

CERTIFICATE HOLDER

Cerro Gordo County, Iowa
220 N. Washington Avenue
Mason City, IA 50401-3254

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE