Large Filing Separator Sheet

Case Number : 10-369-EL-BGN

File Date : 5/14/2010

Section : 1 of 3

Number of Pages : 200

Description of Document : Volume II:
Exhibit A – Exhibit M

VOLUME II: EXHIBIT A – EXHIBIT M

EXHIBIT A

Motion for Waivers

Exhibit A

BEFORE THE OHIO POWER SITING BOARD

In the Matter of the Application of Paulding Wind Farm II LLC for a Certificate to Install Numerous Electricity Generating Wind Turbines in Paulding County, Ohio	)	**Case No. 10-369-EL-BGN**

MOTION FOR WAIVERS

Pursuant to Section 4906.06(A)(6), Revised Code and Rule 4906-1-03 of the Ohio Administrative Code, Paulding Wind Farm II LLC ("Paulding Wind II" or "the Applicant"), moves the Ohio Power Siting Board ("Power Siting Board") to grant waivers from Section 4906.06(A)(6), Revised Code and from Chapter 4906-17 of the Ohio Administrative Code for the reasons detailed in the following Memorandum in Support.

Paulding Wind II will be filing an application for a wind-powered electric generation facility of more than 5 MW in the above styled docket. Although the application is being filed in accordance with Chapter 4906-17 of the Ohio Administrative Code, Paulding Wind II seeks certain waivers primarily based on the unique nature of a wind-powered electric generation facility. The requested waivers will not impact the Power Siting Board's review and analysis of the proposed generation facility.

WHEREFORE, Paulding Wind respectfully requests that the Power Siting Board grant a waiver from the one-year notice provision of Section 4906.06(A)(6), Revised Code and waivers in part or in whole from Rules 4906-17-05(A)(4), 4906-17-05(B)(2)(h), 4906-17-08(A)(3), 4906-17-08(B)(2)(a), 4906 -17-08(C)(2)(c) and 4906-17-08(D)(2) of the Ohio Administrative Code.

Respectfully submitted,

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MEMORANDUM IN SUPPORT

I. Introduction

Paulding Wind Farm II LLC, a wholly owned subsidiary of Horizon Wind Energy LLC (hereafter referred to as "the Applicant" or "Paulding Wind") is proposing to construct a wind-powered electric generation facility located in Paulding County known as the Timber Road II Wind Farm. The energy generated at the Timber Road II Wind Farm, hereafter referred to as the "Project" or the "Facility," will collect to a transmission line and electric substation operated by the Ohio Power Company. The proposed Project consists of up to 109 wind turbines capable of generating no more than 150.4 MW and associated infrastructure including a new interconnection switch yard and Project Substation which will be owned by the Ohio Power Company. The electricity generated by the Facility will be transferred to the transmission grid operated by PJM Interconnection LLC for sale at wholesale or under a purchase power agreement.

Through this motion, Paulding Wind is seeking waivers from certain requirements of the Revised Code and Chapter 4906-17 of the Ohio Administrative Code. These waivers are necessary given that Paulding Wind is not a public utility and given the unique nature of the proposed Timber Road II Wind Farm. For example, Rule 4906-17-05(B)(2)(h) requires the Applicant to supply a map of the proposed electric power generating site showing the grade elevations where modified during construction. However, because of the number and small footprint of the wind turbines as compared to a conventional electric generating plant, the information on grade elevations modified during construction will not be definitively available until after construction (i.e., as-built surveys). Therefore, a waiver is being sought from the requirement to provide maps showing grade elevations resulting from construction. A similar motion was granted in the case of In re Paulding Wind Farm LLC, Case No. 09-980-EL-BGN, Entry, February 23, 2010.

Accordingly, as more fully set forth below, Paulding Wind seeks a waiver from the one-year notice provision of Section 4906.06(A)(6), Revised Code and waivers in part or in whole from Rules 4906-17-05(A)(4), 4906-17-05(B)(2)(h), 4906-17-08(B)(2)(a), 4906-17-08(C)(2)(c) and 4906-17-08(D)(2) of the Ohio Administrative Code.

II. Section 4906.06(A)(6), Revised Code

Section 4906.06(A)(6), Revised Code indicates that an application filed with the Ohio Power Siting Board ("Power Siting Board") must be filed not less than one year nor more than five years prior to the planned date of commencement of construction. Either period may be waived by the Board for good cause shown. The one-year requirement was associated with electric generation facilities of public utilities -- the financial risk of which under Section 4909.18, Revised Code and the monopoly franchise provision of Section 4933.81, Revised Code rests with the general public who are served in the franchised service area. Since the financial risk of generation facilities owned by independent power producers rests with the non-utility owner, the one year time frame to assess the public need for the facility is not required. The Power Siting Board for that reason has routinely waived the one-year requirement for such generation facilities.[1]

The Applicant intends to begin construction of the Facility as soon as it is authorized by the Power Siting Board. Without the waiver of the one-year notice provision, Paulding Wind

[1] See In re: Rolling Hills Generating, LLC, a Subsidiary of Dynegy Power, Case No. 00-1616-EL-BGN, Entry, December 8, 2000; In re: Sun Coke Company, a Division of Sunoco, Case No. 04-1254-EL-BGN, Entry, April 26, 2005; In re: Middletown Coke Company, a Subsidiary of Sun Coke Energy, Case No. 08-281-EL-BGN, Entry, May 28, 2008; In re: Buckeye Wind LLC, Case No. 08-0666-EL-BGN, Entry dated July 31, 2009; In re: Hardin Energy LLC, Case No. 09-479-EL-BGN, Entry dated July 17, 2009; and In re: Paulding Wind Farm LLC, Case No. 09-980-EL-BGN, Entry dated February 23, 2010.

will not be permitted to commence construction at that time. Further, the General Assembly has set a yearly goal of renewable energy, totaling 12.5% by 2025 of which half is to be sited in Ohio. Failure to grant waivers of the one year minimum for this and similar projects could impair reaching the statutory goal of 6.25% Ohio based renewable generation. Thus, good cause exists for granting the requested waiver.

III. <u>Rule 4906-17-05(A)(4) of the Ohio Administrative Code (Cross-Sectional View and Test Borings)</u>

Rule 4901-17-05(A)(4) of the OAC requires the Applicant to provide a map(s) of suitable scale and a corresponding cross-sectional view, showing the geological features of the proposed project area and the location of proposed test borings. The Applicant will provide a cross-sectional view with geological features as part of the Application, but not in relation to the test boring locations. The locations of the test borings will be provided subsequent to the filing of the Application. The delay will permit the geotechnical engineer to review all available desktop information and determine the number and location of the borings to be drilled. In addition, the Applicant anticipates that the County Engineer will want road borings done. The location and timing of road borings will be done in concert with the Paulding County Engineer.

Thus, the Applicant respectfully requests that the Power Siting Board grant a waiver from the above cited rule requirement that a map containing the cross-sectional view also provide the location of the test borings at the time of the initial Application. The Applicant will provide responsive information to this requirement and other related data requests when the final selection of ground and road borings are made. A similar request for waiver was granted in the matter of <u>In re: Buckeye Wind LLC</u>, Case No. 08-666-EL-BGN, Entry dated July 31, 2009 and in the matter of In re: Paulding Wind Farm LLC, Case No. 09-980-EL-BGN, Entry dated February 23, 2010.

IV. Rule 4906-17-05(B)(2)(h) of the Ohio Administrative Code (Grade Elevations Where Modified During Construction)

Rule 4906-17-05(B)(2)(h) requires an applicant to supply a map of the proposed electric power generating site showing the grade elevations where modified during construction. Unlike a conventional electric generating plant in which a large tract of contiguous acreage property must be graded in order to properly site the generation facility, a wind turbine sits on a relatively small base generally only 50 to 60 feet in diameter. The impact of the grading will be minimal and possibly not known until after construction of the pedestal. Thus, the Applicant requests a waiver of the above cited rule and agrees in lieu of the rule to generate proposed contours/grade modifications during preparation of the Facility construction drawings, which can be provided to the Staff of the Power Siting Board when available. A similar request for waiver was granted in the matter of In re: Buckeye Wind LLC, Case No. 08-666-EL-BGN, Entry dated July 31, 2009 and in the matter of In re: Paulding Wind Farm LLC, Case No. 09-980-EL-BGN, Entry dated February 23, 2010.

V. Rule 4906-17-08(A)(3) (Impact of Construction and Operation to Public and Private Water Supplies)

Rule 4906-17-08(A)(3) requires that the Applicant estimate the impact to public and private water supplies due to construction and operation of the proposed facility. The Applicant has done so using a a desktop review of available hydrogeology and geotechnical information for the proposed Facility which will be attached to the Application as Exhibit G. The Applicant's consultant, Hull & Associates, Inc. also mailed a brief well survey to landowners that were under contract with the Applicant at the time of mailing in March, 2010. The well survey results will not be attached to the Application because an inadequate number of responses have been received at this time. Provided a sufficient number of responses are received, the Applicant anticipates that the survey results will be submitted to Staff by June 15, 2010. Accordingly, the Applicant respectfully requests for a temporary waiver until June 15, 2010 to submit to the Staff the report setting forth the results of the well survey.

VI. Rule 4906-17-08(B)(2) (Impact of Construction)

Rule 4906-17-08(B)(2) requires the Applicant to estimate the impact of construction on areas within a half-mile radius from the proposed facility, such as undeveloped or abandoned land such as wetlands. To identify and evaluate potential wetlands and surface waters that could be affected by the Facility, the Applicant's consultant, JFNew, conducted a reference map, desktop analysis and a brief site reconnaissance to identify jurisdictional status and approximate impact areas of wetlands, streams, and water bodies that occur in the vicinity of the Project area that will be attached to the application as Exhibit K. However, no differentiation between wetlands and streams has yet been made since the site overview was conducted during winter months, and vegetation was not yet entirely visible. Therefore, a site-specific wetland and stream delineation will be conducted during the 2010 growing season to confirm and/or refine JFNew's preliminary findings. The formal delineation will be based on the methodology described in the USACE Wetland Delineation Manual and the corresponding Draft Regional Supplement to the Corps of Engineers Wetland Delineation Manual: Northcentral and Northeast Region. Once the site-specific wetland delineation is complete, a report will be prepared describing all observed wetlands on-site and any refinements to the projected impacts to jurisdictional and non-jurisdictional wetlands. It is anticipated that this report would be provided to the OPSB Staff by July 15, 2010.

The Applicant respectfully requests for a temporary waiver until July 15, 2010 to submit to the Staff the site-specific wetland delineation report.

VII. Rule 4906-17-08(C)(2)(c) of the Ohio Administrative Code (Increase in Tax Revenues)

Rule 4906-17-08(C)(2)(c) requires an applicant to estimate the increase in county, township, city, and school district tax revenue accruing from the facility. The Applicant seeks a temporary waiver from this requirement because agreements regarding tax or payment in lieu of taxes are currently being negotiated, so no values are available to report at this time. However, an estimate of the increase to county, township, city and school district tax revenue will be supplied upon finalization of all agreements. Accordingly, the Applicant seeks a temporary waiver to supply the information required by Rule 4906-17-08(C)(2) no later than eight weeks prior to the public hearing.

VIII. Rule 4906-17-08(D)(2) (Impact to Landmarks)

Rule 4906-17-08(D)(2) of the OAC requires the Applicant to estimate the impact of the proposed facility on the preservation and continued meaningfulness of landmarks and to describe plans to mitigate any adverse impact. The Applicant will satisfy that requirement in its Application. Above and beyond the requirements of Rule 4906-17-08(D)(2), the Applicant has initiated an archaeological reconnaissance survey and a historical architecture survey because literature reviews indicated that the Project Area had not been systematically surveyed for cultural resources. The Applicant would like to submit the results of these studies when complete. Accordingly, the Applicant seeks leave to submit the results of these studies no later than eight weeks prior to the public hearing in this matter. In the event the Administrative Law Judge believes a waiver is required, the Applicant seeks a temporary waiver from Rule 4906-17-08(D)(2) to allow for the submittal of the study results.

IX. Conclusion

Good cause exists for granting the waivers. Paulding Wind II respectfully requests that the Power Siting Board grant a waiver from the one-year notice provision of Section 4906.06(A)(6), Revised Code and waivers in part or in whole from Rules 4906-17-05(A)(4), 4906-17-05(B)(2)(h), 4906-17-08(A)(3), 4906-17-08(B)(2), 4906-17-08(C)(2)(c) and 4906-17-08(D)(2) of the Ohio Administrative Code.

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EXHIBIT B

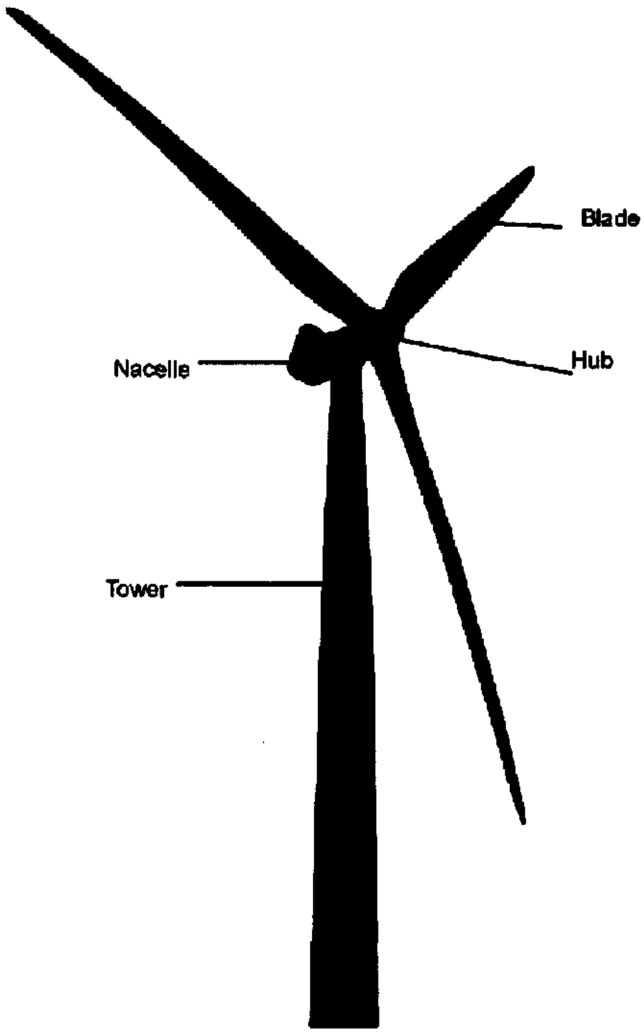
Turbine Information

General Information
Acciona AW82
Vestas V90
Vestas V100
GE 1.6 xle (submitted under seal)

Wind Turbines

A wind turbine generator (WTG) features a nacelle mounted on a tower. The nacelle houses the generator and gearbox, and supports the rotor and blades at the hub. The turbine tower supports and provides access to the nacelle.

Typical Wind Turbine Components



Tower

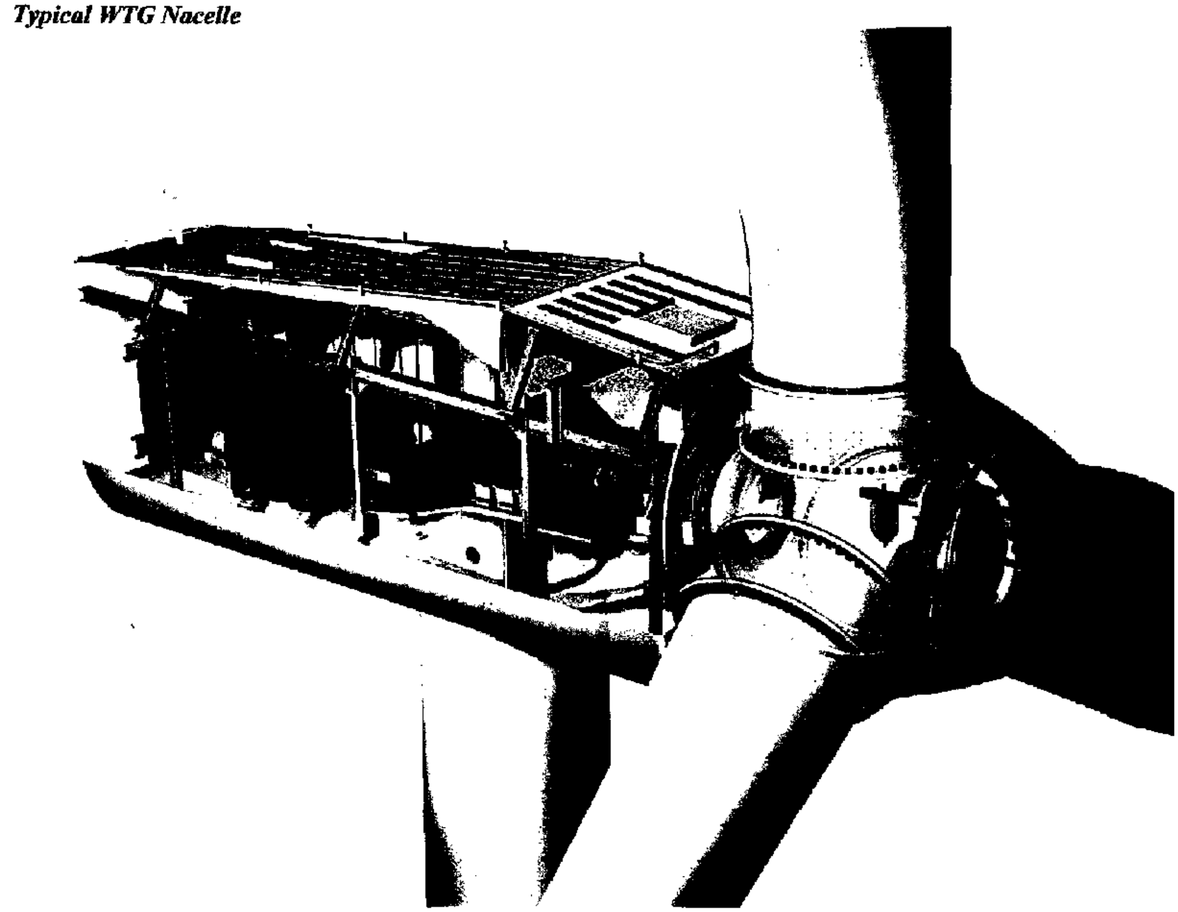
The WTG tower is a tubular conical steel structure that is manufactured in multiple sections depending on the tower height. Towers for the Facility will be fabricated, delivered and erected in 3 or 4 sections each. A service platform at the top of each section allows for access to the tower connecting bolts for routine inspection. An internal ladder runs to the top platform of the tower just below the nacelle. A nacelle ladder extends from the machine bed to the tower top platform allowing nacelle access independent of its orientation. The tower is equipped with interior lighting and a safety glide cable alongside the ladder.

The tower design is certified by experienced and qualified structural engineers who have designed several generations of turbine towers that have proven themselves well in some of the most aggressive wind regions of the world.

Nacelle

The figure below shows the general arrangement of a typical nacelle that houses the main mechanical components of the WTG. The nacelle consists of a robust machine platform

Typical WTG Nacelle



mounted on a roller bearing sliding yaw ring that allows it to rotate (yaw) to keep the turbine pointed into the wind to maximize energy capture. A wind vane and anemometer are mounted at the rear of the nacelle to signal the controller with wind speed and direction information.

The main components inside the nacelle are the drive train, a gearbox and the generator. On some turbines, the step-up transformer is situated at the rear of the nacelle, which eliminates the need for a pad-mounted transformer at the base of the tower.

The nacelle is housed by a fully-enclosed, steel-reinforced fiberglass or an all steel shell that protects internal machinery from the environment and dampens noise emissions. The shell is designed to allow for adequate ventilation to cool internal machinery such as the gearbox and generator.

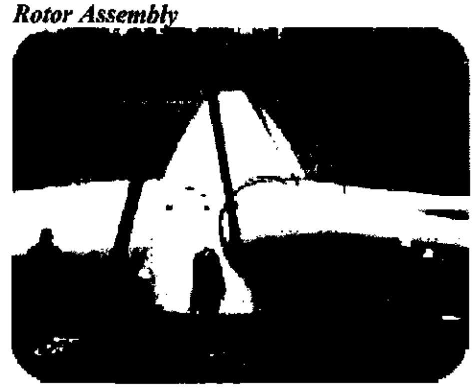
Drive Train

The rotor blades are all bolted to a central hub. The hub is bolted to the main shaft on a large flange at the front of the nacelle. The main shaft is independently supported by the main bearing at the front of the nacelle. The rotor transmits torque to the main shaft that is coupled to the gearbox. The gearbox increases the rotational speed of the high speed shaft that drives the generator at 1200-1800 RPM to provide electrical power at 60 Hertz (Hz).

Rotor Blades

The modern WTGs under consideration for the Facility have 3-bladed rotors up to a maximum span of 100 meters (330 feet) in diameter. The adjacent figure illustrates the rotor hub, spinner nose cone, and rotor blade assembly on the ground prior to erection. The rotor blades turn quite slowly; typically about 15 RPM, resulting in a graceful appearance during operation. The rotor blades are typically made from a glass-reinforced polyester composite similar to that used in the marine industry for sophisticated racing hulls. Much of the design and materials experience comes from both the marine and aerospace industries and has been developed and tuned for wind turbines over the past 25 years. The blades are non-metallic, but are still equipped with a sophisticated lightning suppression system.

Rotor Assembly



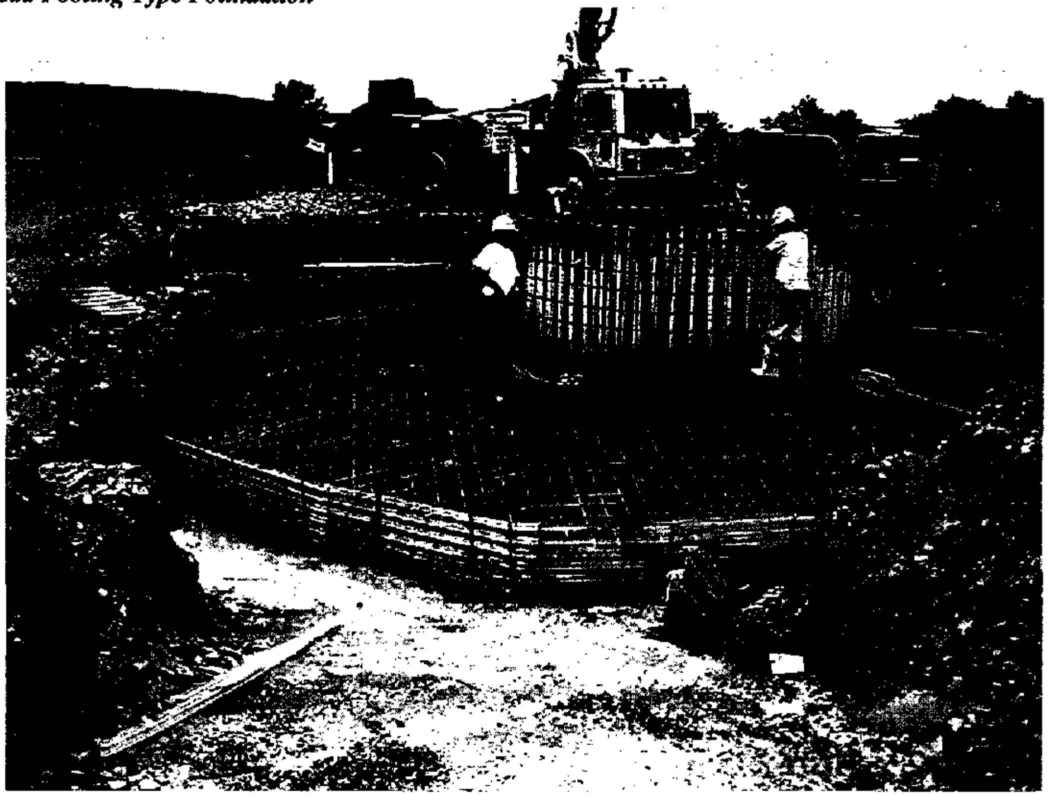
Turbine Control Systems

Wind turbines are equipped with sophisticated computer control systems which constantly monitor variables such as wind speed and direction, air and machine temperatures, electrical voltages, currents, vibrations, blade pitch and yaw angles, etc. The main functions of the control system include nacelle operations as well as power operations. Generally, nacelle functions include yawing the nacelle into the wind, pitching the blades, and applying the brakes if necessary. Power operations controlled at the bus cabinet inside the base of the tower include operations of the main breakers to engage the generator with the grid as well as control of ancillary breakers and systems. The control system is always running and ensures that the machines are operating efficiently and safely.

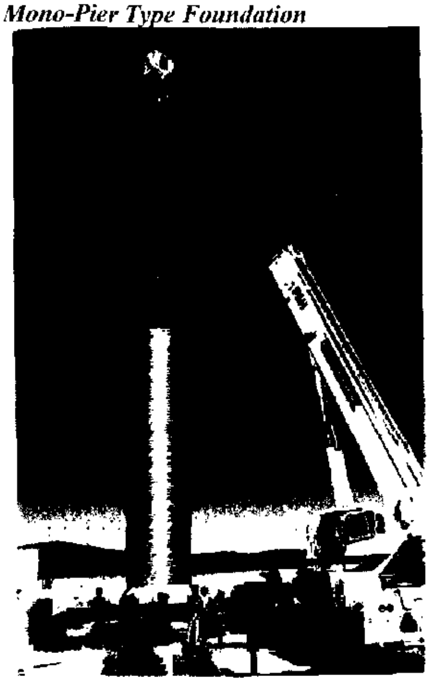
Turbine Foundations

During the detailed engineering design phase of the Facility and prior to construction, a formal geotechnical investigation will be performed to analyze soil conditions and test for voids and homogeneous ground conditions. Depending on the results of the geotechnical investigation, either spread footing type foundation or a vertical mono-pier foundation will be used for the WTG foundation design. The foundation design will be tailored to suit the soil and subsurface conditions at the various turbine sites. The foundation design will be certified by an experienced and qualified, state-registered structural engineer.

Spread Footing Type Foundation



Mono-Pier Type Foundation

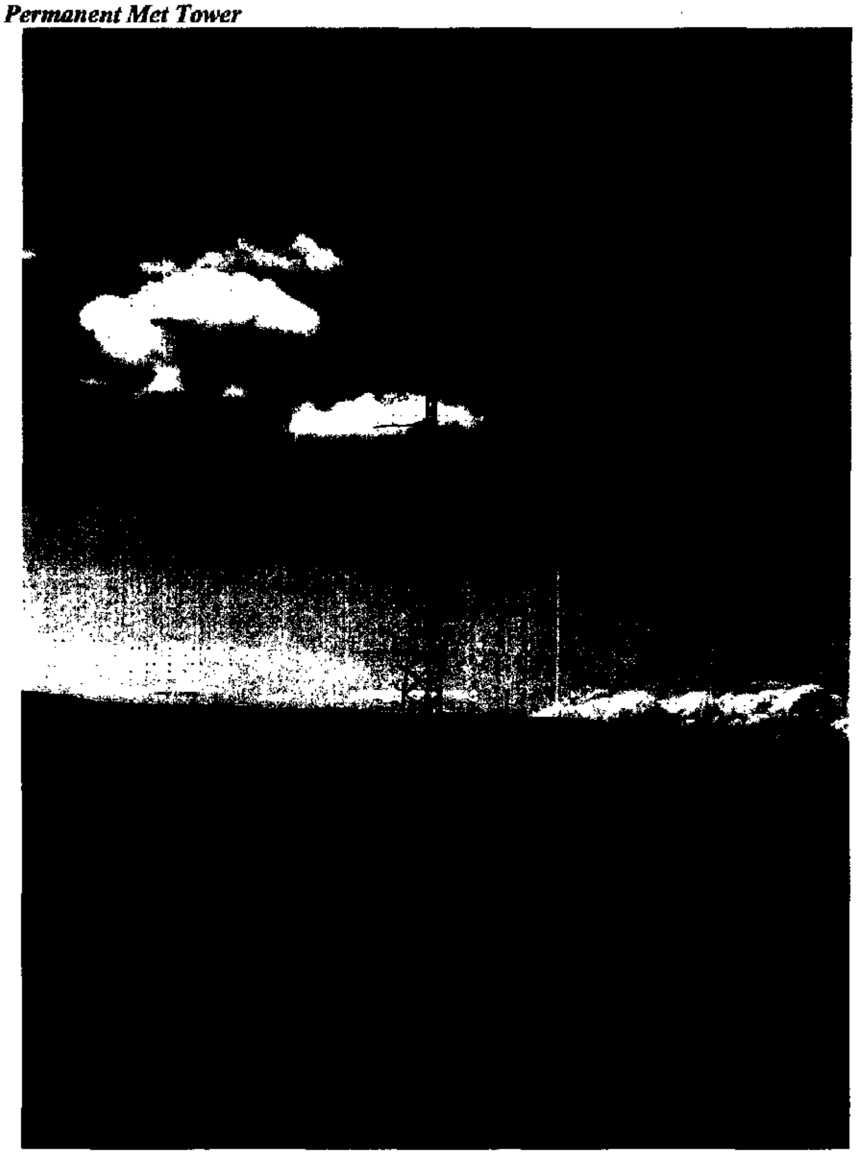


Met Towers

The Facility will include permanent meteorological (met) towers that are fitted with multiple sensors to track and monitor wind speed and direction and temperatures. The met towers will be connected to the wind plant's central SCADA system. The permanent towers will be free-standing, un-guyed structures to reduce the risk of avian collisions and will be as tall as the hub height (HH) of the WTGs.

Each met tower will also have a grounding system similar to that of the wind turbines with a buried copper ring and grounding rods which will all be tied to the lightning dissipaters or rods installed at the top of the towers.

Permanent Met Tower

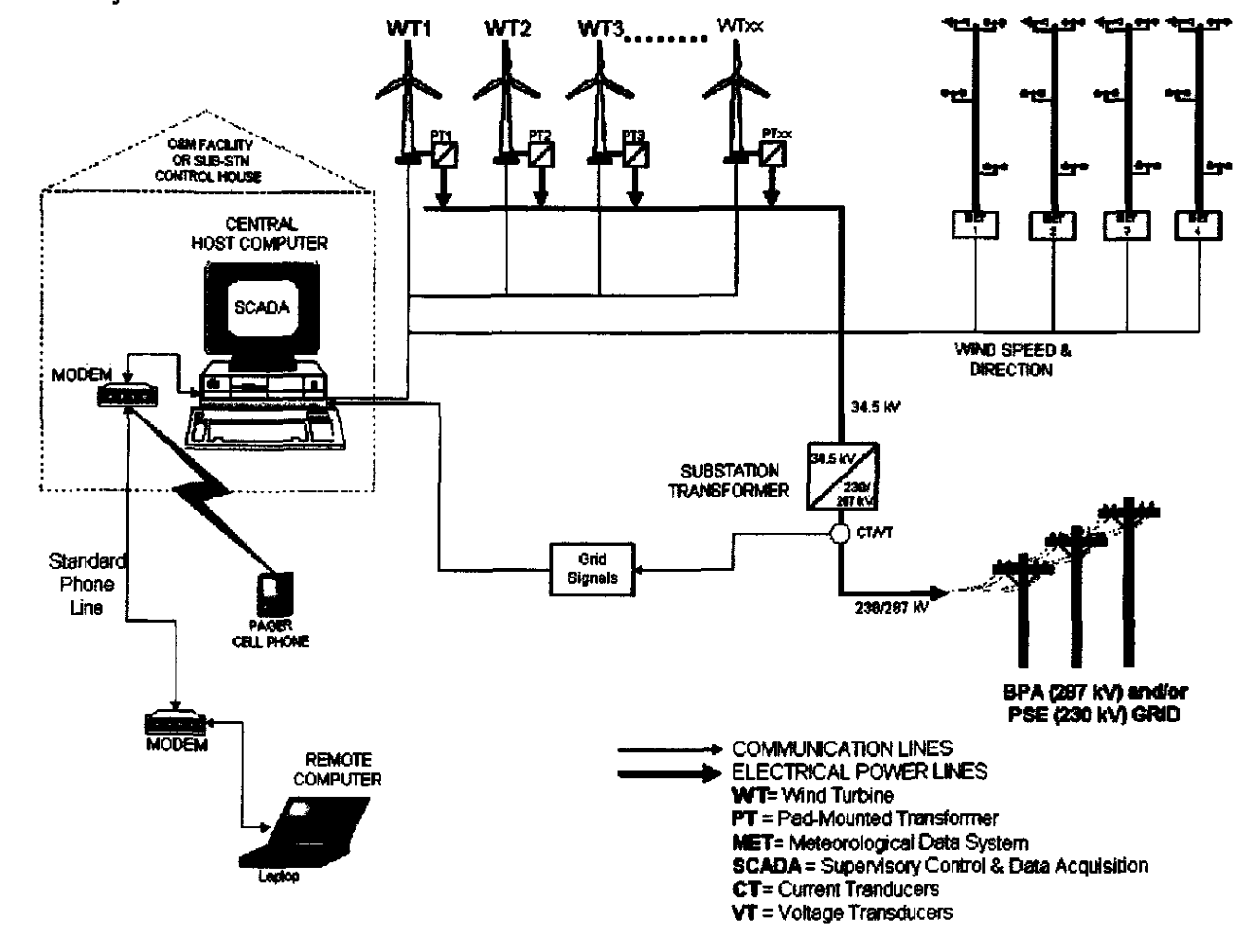


SCADA System

Each turbine is connected to a central Supervisory Control and Data Acquisition (SCADA) System, through a network of underground fiber optic cable. The SCADA system allows for remote control monitoring of individual turbines and the wind plant as a whole from both the central host computer and from a remote PC. In the event of faults, the SCADA system can also send signals to a fax, pager, or cell phone to alert operations staff.

The SCADA system delivers real-time power output from the Facility which can be accessed by power scheduling and system controls personnel to support real-time and hour-ahead power schedule schemes.

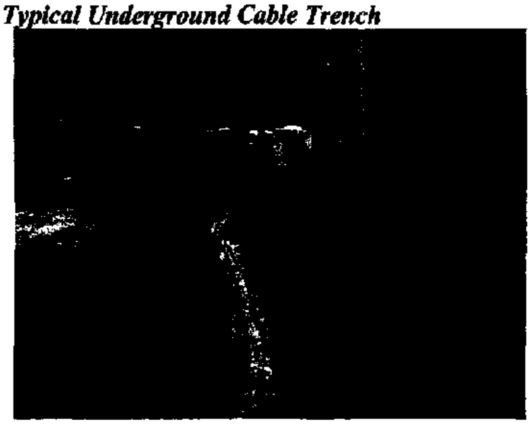
SCADA System



Electrical System and Collection System Infrastructure

Electrical power generated by the wind turbines will be transformed and collected through a network of underground and overhead cables that terminate at the Facility substation.

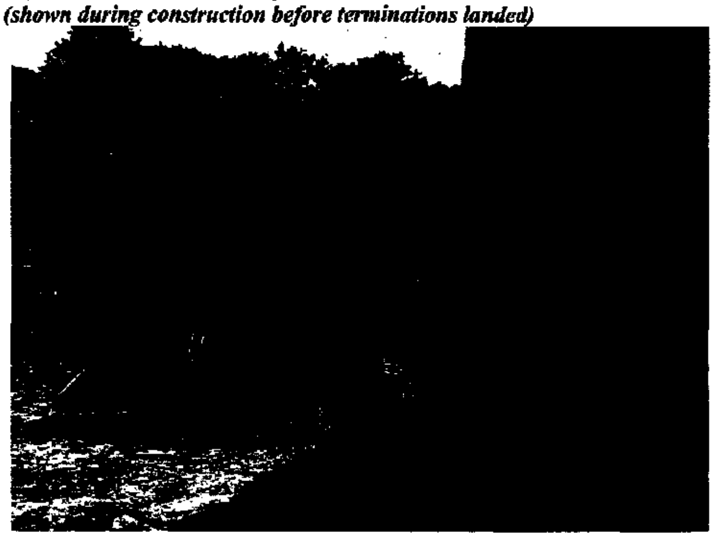
Typical Underground Cable Trench



Power from the turbines is fed through a breaker panel at the turbine base inside the tower and is interconnected to a nacelle-encased or pad-mounted step-up transformer at the tower base that steps the voltage up to 34.5 kilovolts (kV). The transformers are networked on the high side to underground cables that connect all of the turbines together electrically. Where practicable, the underground cables are installed in a trench that runs beside the Facility's roadways as shown in the adjacent figure. Depending on geotechnical analysis at the site, native material or a clean fill material such as sand or fine gravel will be used to cover the cable before the native soil and rock are backfilled over the top. In locations where two or more sets of underground lines converge, underground vaults and/or pad mounted switch panels will be utilized to tie the lines together into one or more sets of larger feeder conductors.

The below figure shows a typical pad-mount transformer used at each wind turbine. The underground collection cables feed to larger feeder lines that run to the main substation.

Typical Pad-Mount Transformer
(shown during construction before terminations landed)



The collection cables feed to a project substation where the voltage is stepped up to interconnection voltage (69kV).

Substation and Interconnection Facilities

Typical Wind Power Facility Substation

The main functions of the substation and interconnection facilities are to provide fault protection and to step up the voltage from the collection lines (at 34.5 kV) to the transmission level required to interconnect to the utility grid. The basic elements of the substation and interconnection facilities are a control house, a bank of main transformers, outdoor breakers, relaying equipment, high voltage bus work, steel support structures, and overhead lightning suppression conductors. All of these main elements will be installed on concrete foundations that are designed for the soil conditions at the substation sites. The substations and interconnection facilities each consist of a graveled footprint area, a chain link perimeter fence, and an outdoor lighting system.

Final adjustment to the substation and interconnect are generally made during design review with the interconnecting utility and their system protection engineers to accommodate for conditions on the grid at the time of construction.

Operations & Maintenance Facility

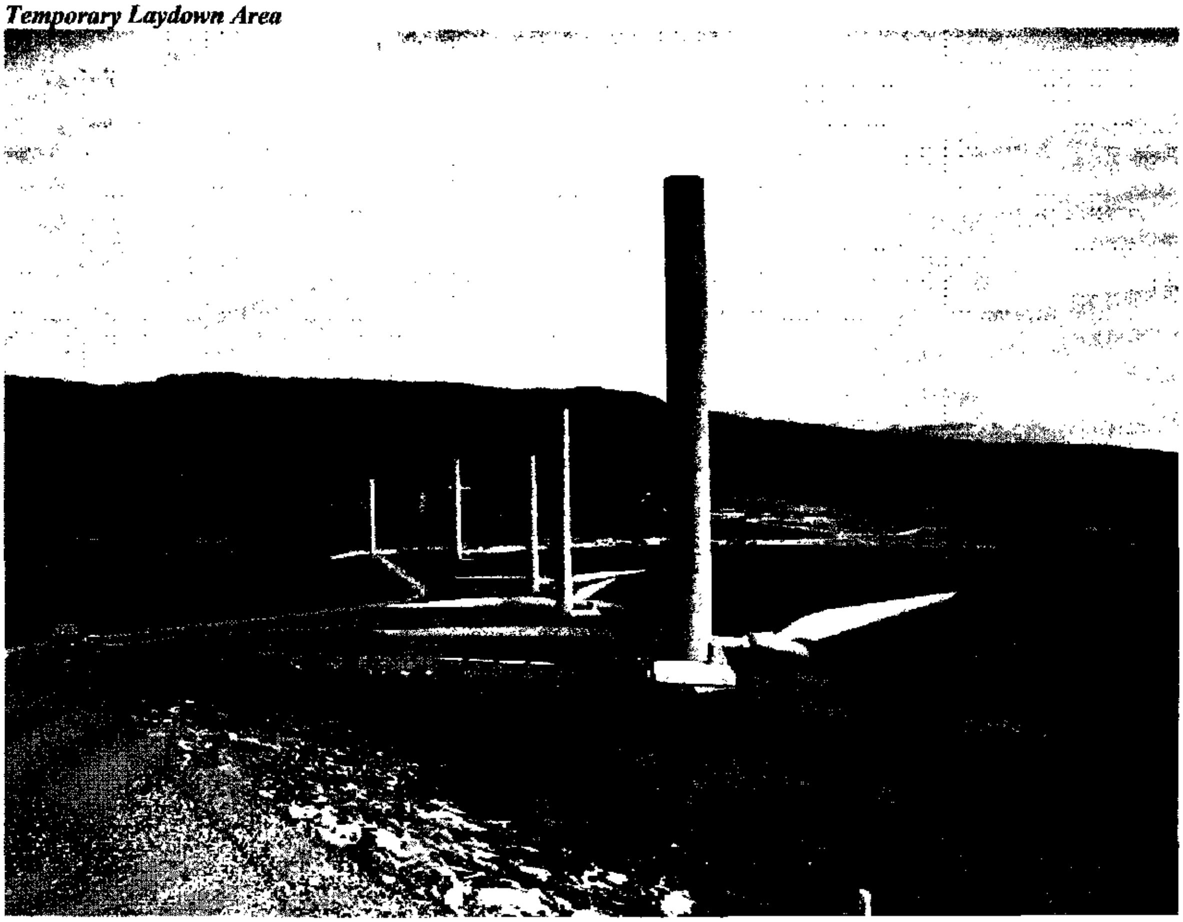
An O&M facility will be located near the Facility site. The O&M Facility will include a main building with offices, spare parts storage, restrooms, a shop area, outdoor parking facilities, a turn-around area for larger vehicles, outdoor lighting and a gated access with partial or full perimeter fencing. The O&M facility area will be leveled and graded.

Top of Iowa O&M

Laydown Areas

It is anticipated that there will be a principal temporary laydown area for the staging of construction equipment, wind turbines and their components, towers, and other parts, facilities, and equipment. The temporary laydown area will be up to 22 acres and will be covered with gravel. The gravel will be removed and the area restored after construction has been completed and the ground restored. Additionally, smaller temporary laydown areas will be located at each wind turbine location as depicted in the below figure.

Temporary Laydown Area

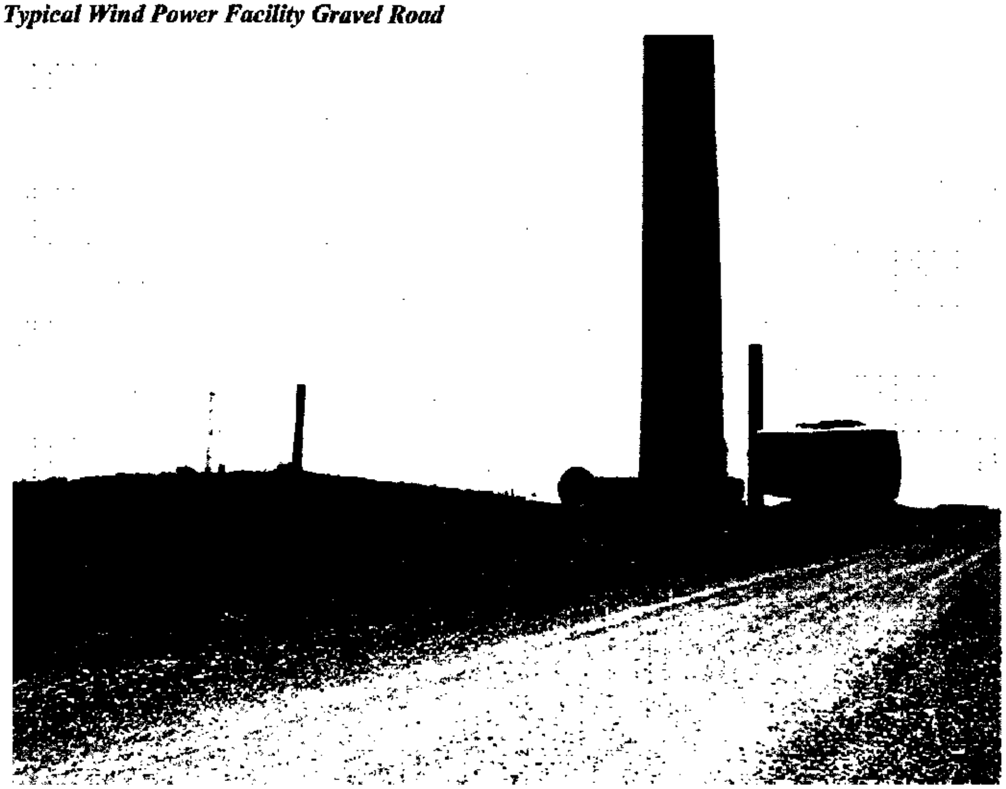


Roads and Civil Construction Work

Access to the various rows of turbines will be achieved via graveled access roads. The new site roads are designed to allow heavy equipment to traverse the Facility site and will be used throughout the life of the Facility to allow access to and from the wind turbines, substation and meteorological monitoring towers. The Facility site access roads will be maintained by the Applicant over the life of the Facility.

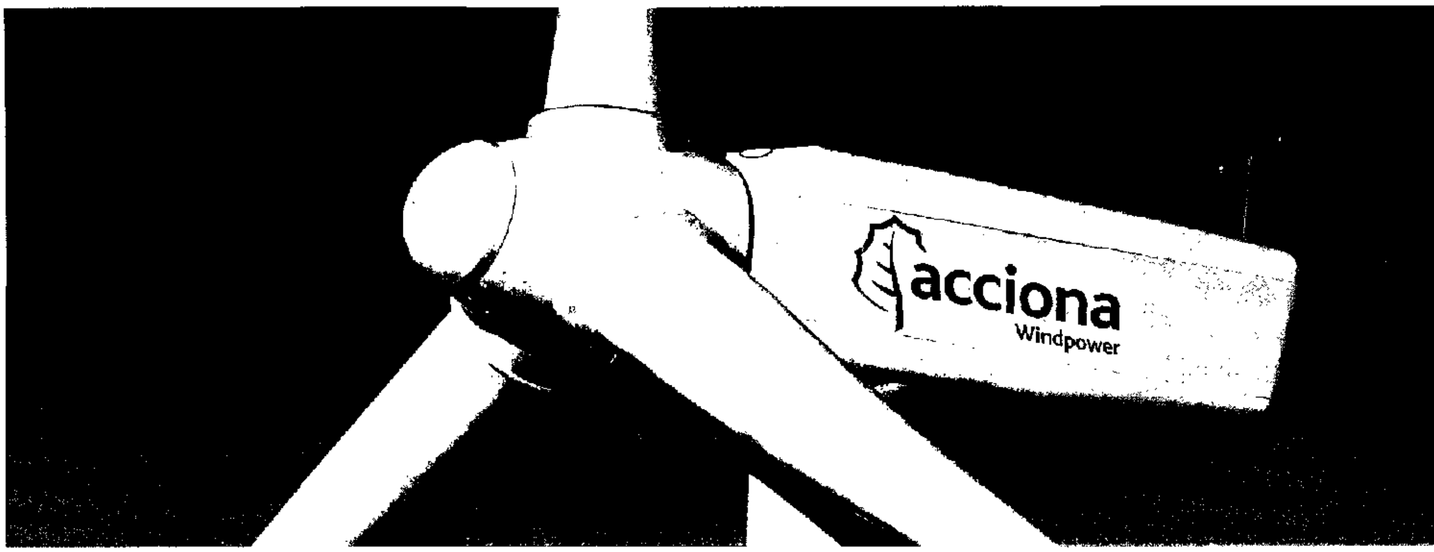
The road design has been prepared to minimize the overall disturbance footprint and avoid erosion risks. Wherever practical, existing roads have been utilized to minimize new ground disturbance. The roads will consist of a 16-foot wide compacted graveled surface in most areas, with some areas of road between turbines up to 40 feet wide to support large cranes used to erect the WTGs.

Typical Wind Power Facility Gravel Road



ACCIONA Windpower

AW-1500



acciona
Windpower

AW-1500
WIND TURBINE

The AW-1500 is based on Acciona's experience of operating thousands of megawatts of wind turbines worldwide in all types of conditions. It has been designed to optimize the life-cycle cost of a wind turbine, not merely the upfront capital cost.

The turbine is designed from an owner's perspective. Features such as two bearings reducing the axial loads on the gear box, access to the inside of the hub from the nacelle, and a wider nacelle for easier serviceability.

The AW-1500 is a 1500 kW power-rated horizontal shaft wind turbine, with three blades, variable speed, 12 kV rated voltage and available in frequencies of 50 or 60 Hz.

Certified by Germanischer Lloyd (GL) for a wide range of wind types, available in IEC classifications: classes Ia, IIa and IIIb.

Rotor

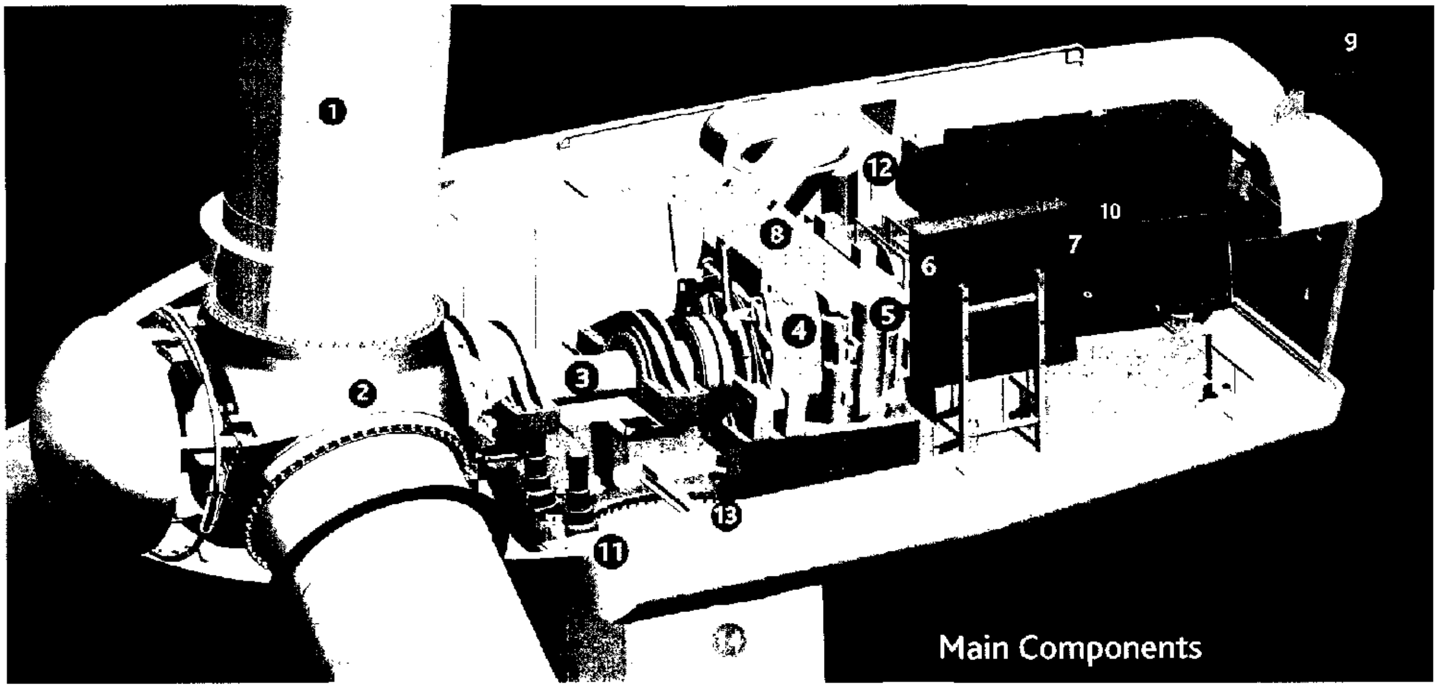
- Available in three diameters for sites with different wind conditions: 70 meters (class IEC Ia), 77 meters (IEC IIa) and 82 meters (IEC IIIb).
- Hub heights of 60 m, 71.5 m and 80 m in tubular steel towers.
- Clockwise turn with a 5° inclination angle (tilt) to the vertical.
- Hub made of nodular cast iron. The hub contains the hydraulic pitch system capable of locking the blades in the event of an emergency stop.
- Designed for easy access to the interior of the hub from the nacelle. Eliminates the need to enter from outside.

Blades

- Made of fiberglass-reinforced polyester or epoxy resin and coated with a special surface protection.
- Available in three lengths depending on the rotor diameter: 34.0 m, 37.3 m. and 40.0 m.
- Equipped with an independent pitch system that allows the pitch angle of each blade to turn on its horizontal axis to optimize the regulation of capacity generated at high winds and increase the safety of the aerodynamic braking system.

Nacelle

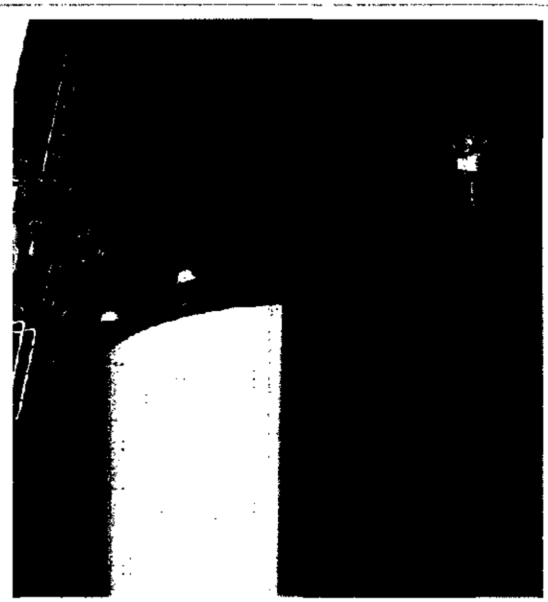
- Cover made of fiberglass-reinforced polyester.
- Spacious interior with easy access to the hub.
- Crane to hoist materials of up to 250 kg (550 pounds)
- Robust double frame that reduces the stress on the drive train
- Three-phase asynchronous induction generator (double power supply) with wound rotor and excitation by collector rings. Generates power at medium voltage (12 kV) to reduce losses and avoid the need for a transformer.
- Yaw system uses a gear ring integrated into the tower and four geared motors integrated into the nacelle. Active hydraulic braking.



1 Rotor blades
2 Hub
3 Main shaft
4 Gearbox
5 Disk brake
6 Generator coupling
7 Control system monitoring
8 Cooling radiator
9 Wind measuring system
10 Generator
11 Yaw drive
12 Hydraulic system
13 Yaw bearing
14 Tower

Tower

- Tapered tubular steel tower consisting of three sections, with specific designs for different hub heights (60 m, 71.5 m and 80 m) and wind classes. A lift for safe and easier nacelle access is available as an option.

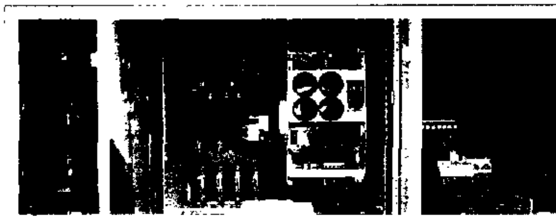


Automatic Greasing System

- Automatic lubrication system for yaw system, main shaft bearings, blade bearings and generator bearings (Optional).

Control and Power Unit

- Based on the INGECON-W system, the AW-1500 is capable of continuously optimizing its power production in a wide range of wind speeds.



Condition Monitoring System

- Predictive maintenance system with sensors in the gearbox, the main shaft bearings and the generator bearings (Optional).

AW-1500 Benefits

1 **Reliability** The result of more than ten years' experience in the operation of wind parks by the ACCIONA group with different technologies and under a variety of conditions.

2 **Durability** Designed to extend the turbine's working life and maximize its profitability.

3 **Versatility** Offers a wide range of models with configurations designed for a variety of sites.

4 **Cost reduction** Medium-voltage generator (12 kV) that minimizes power losses and equipment costs.

5 **Ease of operation** Spacious ergonomically designed nacelle with easy access to the hub.

6 **Technology** Variable speed with independent hydraulic pitch control for each blade, to minimize loads and capture the maximum energy. Optimal calculation and design of all components, aimed at maximum durability.

7 **Strengh** Double support for the main shaft to reduce loads on the gearbox and extend its working life. Main frame is made of ductile cast iron and is designed to deal with the most demanding conditions.

8 **Safety** Access to the hub from the nacelle. Protection from rotating parts. Anti-slip materials inside and outside the nacelle. Noise insulation and fireproof materials.

9 **Advanced engineering** Control software to monitor and automatically manage the operation. Double-fed asynchronous generator of IGBT's (PMW) that improves voltage and frequency stability. Supplies reactive power to the grid when required and operates the power factor in inductive or capacitive power as required.

10 **Appearance** Ideal combination of aerodynamics and aesthetics.

Technical information

	AW-70/1500	AW-77/1500	AW-82/1500
Rotor diameter	70 m.	77 m.	82 m.
Wind class (IEC)	IEC Ia	IEC IIa	IEC IIIb

OPERATING DATA

Cut-in wind speed	4 m/s	3.5 m/s	3.0 m/s
Nominal power wind speed	11.6 m/s	11.1 m/s	10.5 m/s
Cut-out wind speed	25 m/s		20 m/s
Nominal Power	1,500 kW		

COMPONENT DATA

Number of blades	3		
Orientation	Upwind		
Diameter	70.062 m	76.662 m	82 m
Swept area	3,855.27 m²	4,615.83 m²	5,289 m²
Rotational direction	Clockwise		
Nominal rotational speed	20.2 rpm	18.3 rpm	16.7 rpm
Power regulation Overspeed control	Full span blade pitch		
Rotor shaft tilt angle	5°		
Nominal tip speed	74.1 m/s	73.9 m/s	71.7 m/s
Cone angle	0°		

BLADES

Model	34.0	37.3	40.3
Material	GFRP		
Total length	34.0 m	37.3 m	40.3 m
Weight	5,160 kg / blade	5,522 kg / blade	5,780 kg / blade
Pitch	Full span		
Aerodynamic Brake	Full feathering		

HUB

Hub type	Rigid
Material	Cast iron GJS 400 18U LT
Protection	Metallized Zn + Epoxy

PITCH SYSTEM

Pitch bearings	Double row four point contact
Actuation	Hydraulic
Linkage	Through hydraulic cilindres
Failsafes	Piston accumulators on hub

DRIVE TRAIN

Gearbox	3 stages planetary/helical		
Gearbox nominal power	1,500 kW		
Gearbox ratio	1:59 (50 Hz)/1:71 (60 Hz)	1:65 (50 Hz)/1:78 (60 Hz)	1:65 (50 Hz)/1:78 (60Hz)
Input nominal speed	20.2 rpm	18.3 rpm	16.7 rpm
Output nominal speed	1,200 (50 Hz)/1,440 (60 Hz)	1,200 (50 Hz)/1,440 (60 Hz)	1,100 (50 Hz)/1,320 (60Hz)
Lubrication	Pressure and splash with oil cooler/oil filter		
Gearbox oil volume	270 Litres		

ROTOR SHAFT

Type	Forged hollow shaft
Material	34 Cr Ni Mo 6
Supporting	2 bearings

DRIVE TRAIN BEARINGS

Type	Double spherical roller bearings

PARKING BRAKE

Type	Single disk
Location	High speed shaft

YAW SYSTEM

Type	Four point ball bearing
Slewing ring	External
Slewing ring/yaw drive pinion ration	11.6:1
Braking system	Friction pads

YAW GEARS AND MOTORS

Type	4 Planetary stages
Ratio	1:1451
Yaw rate	0.08 rpm
Motor types	4 Asynchronous poles
Voltage / Frequency	230/400 V - 50 Hz
Power rating	4 x 1.5 kW

HYDRAULIC POWER UNIT

Motor type	18.5 kW
Voltage / Frequency	380 V / 50 Hz

GENERATOR

Type	6 poles, double feeding	
Insulation type (stator / rotor)	H/H	
Rated power	1,500 kW	
Degree of protection	IP 54	
Frequency	50 / 60 Hz	
Voltage	12,000 V	
Speed range	770-1,300 rpm 50 (Hz) 920-1,560 rpm 60 (Hz)	770-1,200 rpm 50 (Hz) 920-1,440 rpm 60 (Hz)

CONTROL SYSTEM

Type	Ingecon-W
Master processor	80 – 386.32 bits
Scada interface	OPMT
Power factor correction	Programmable by software

TOWER

Type	Tubular steel tower with 60 m. 71.5 m. and 80 m. (hub). Concrete tower with 80 m. and 100 m. (hub)
Tower height (hub 60/80 m)	56.9 m / 76.9 m.
Material	S355 J2G3
Protection	Epoxy - Zn
Access to tower	Door with lock system
Access to nacelle cabin	Ladder or lift
Weight steel tower (60/80 m)	95 t / 135 t
Foundation connection Steel tower	Two studs races embedded in concrete

WEIGHT

Nacelle	52.5 t
Nacelle + hub	67.5 t

DIMENSIONS NACELLE + HUB

Lenght	12.5 m
Width	4.2 m
Height	4 m

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Windpower

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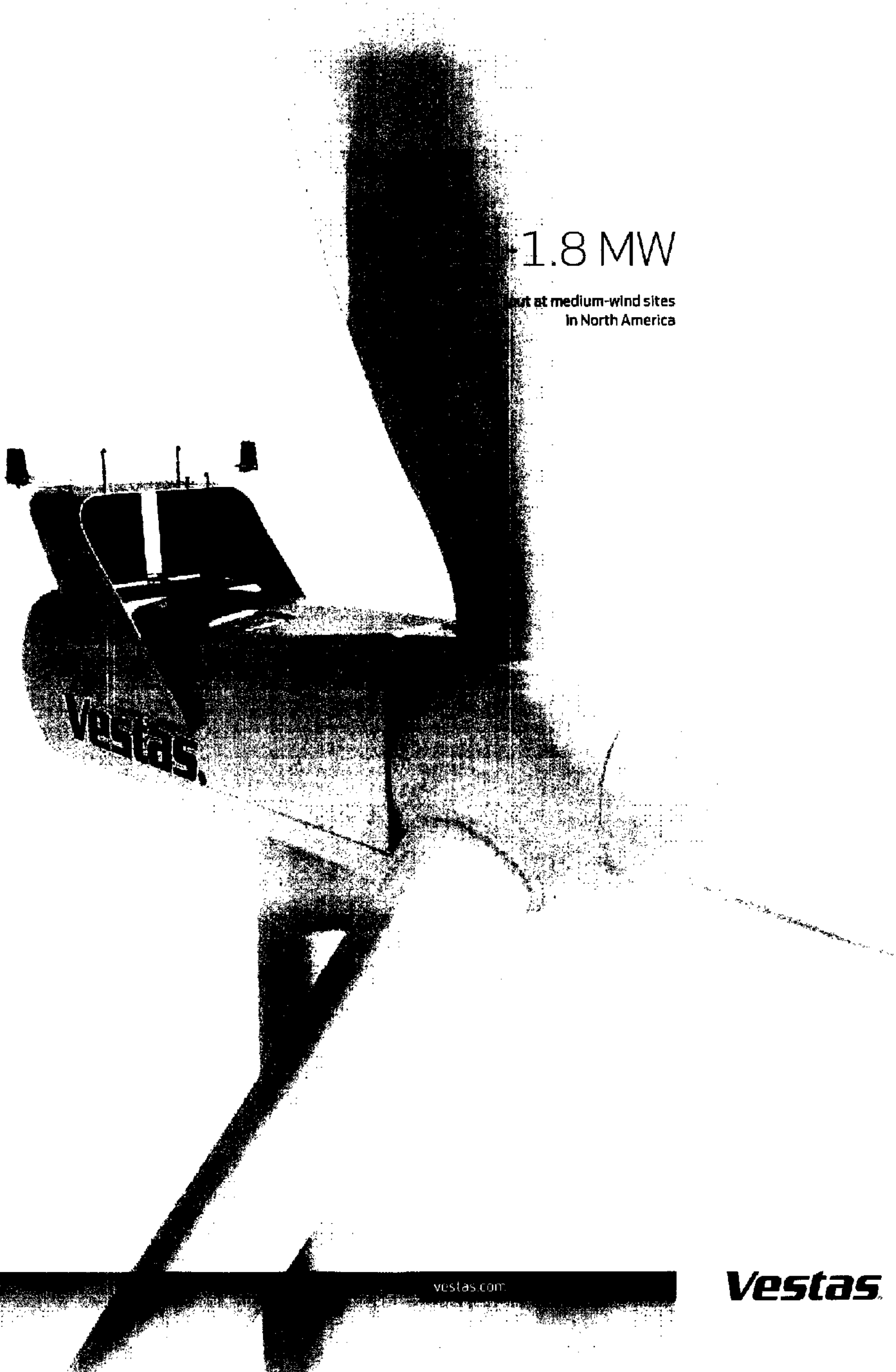
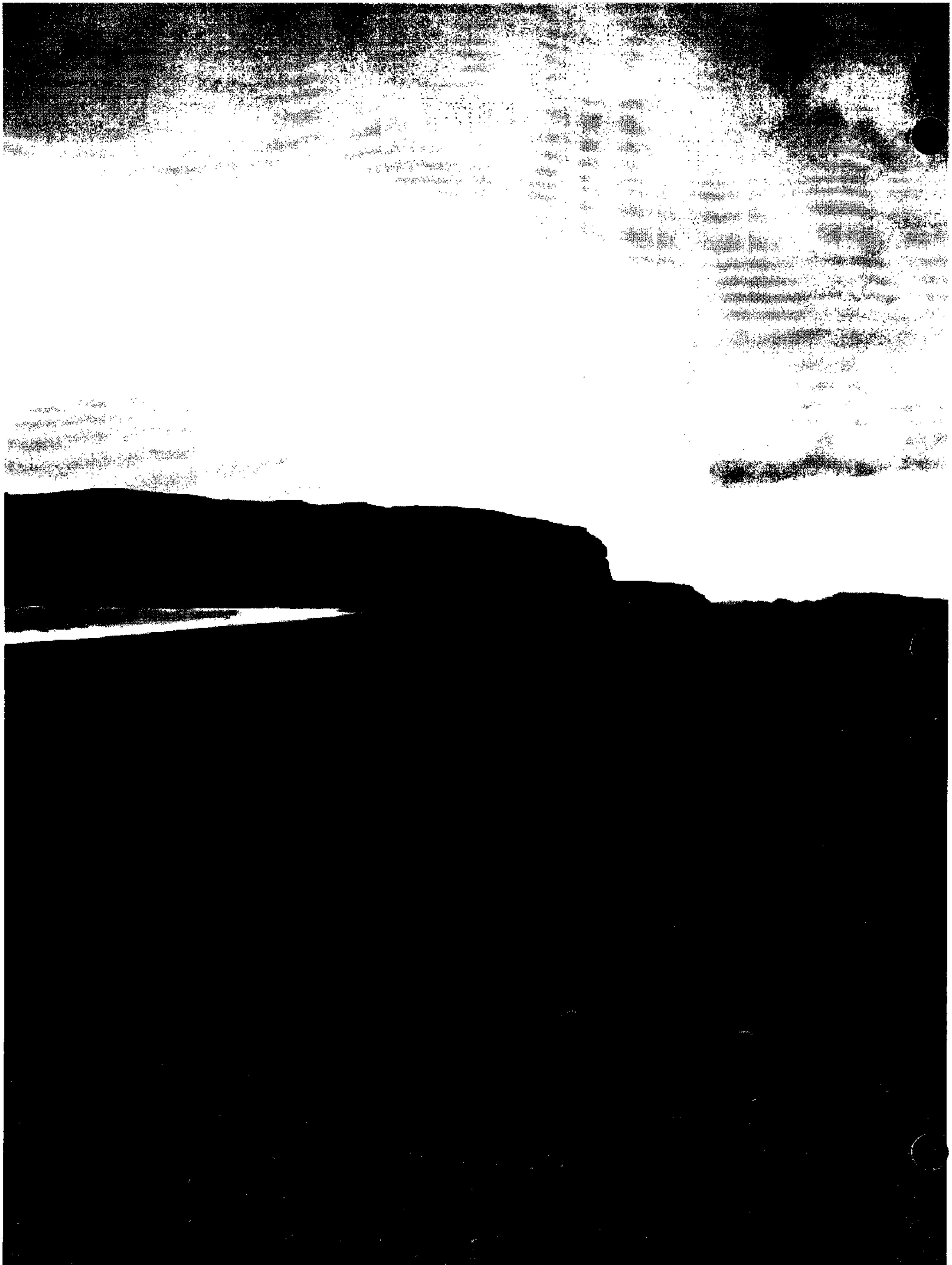
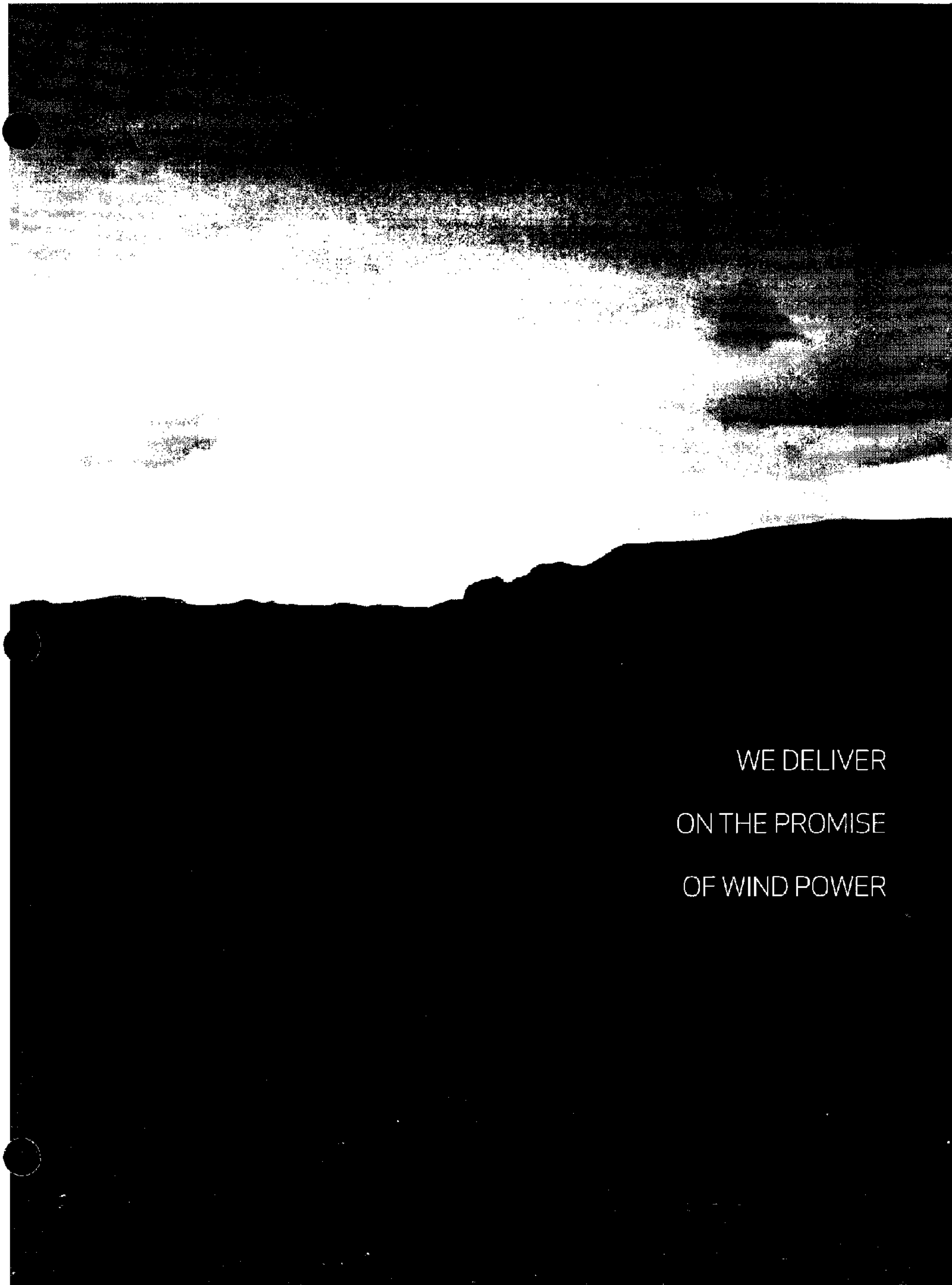


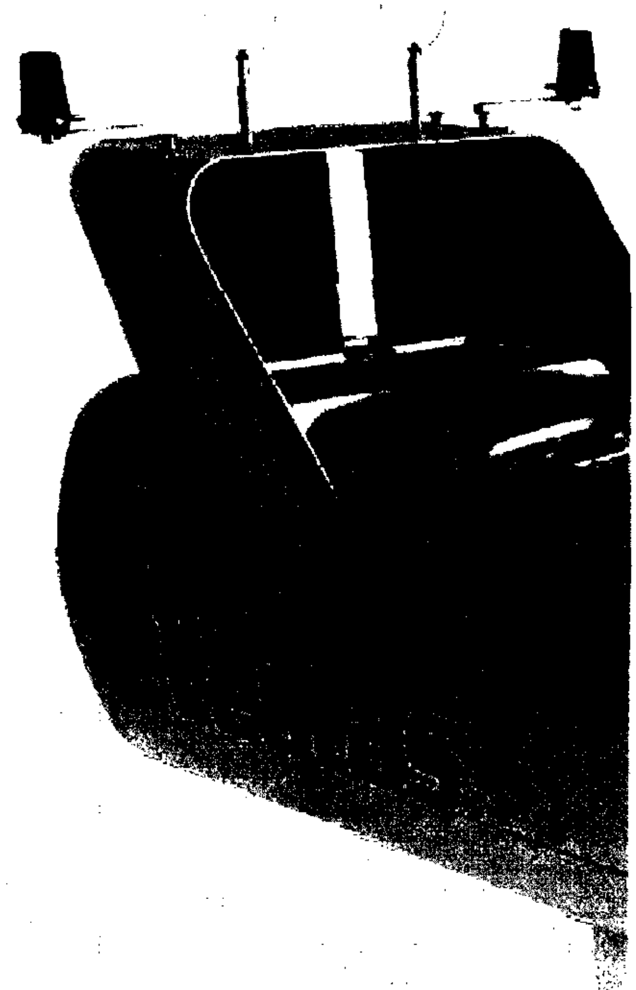
1.8 MW

ut at medium-wind sites
in North America

Vestas



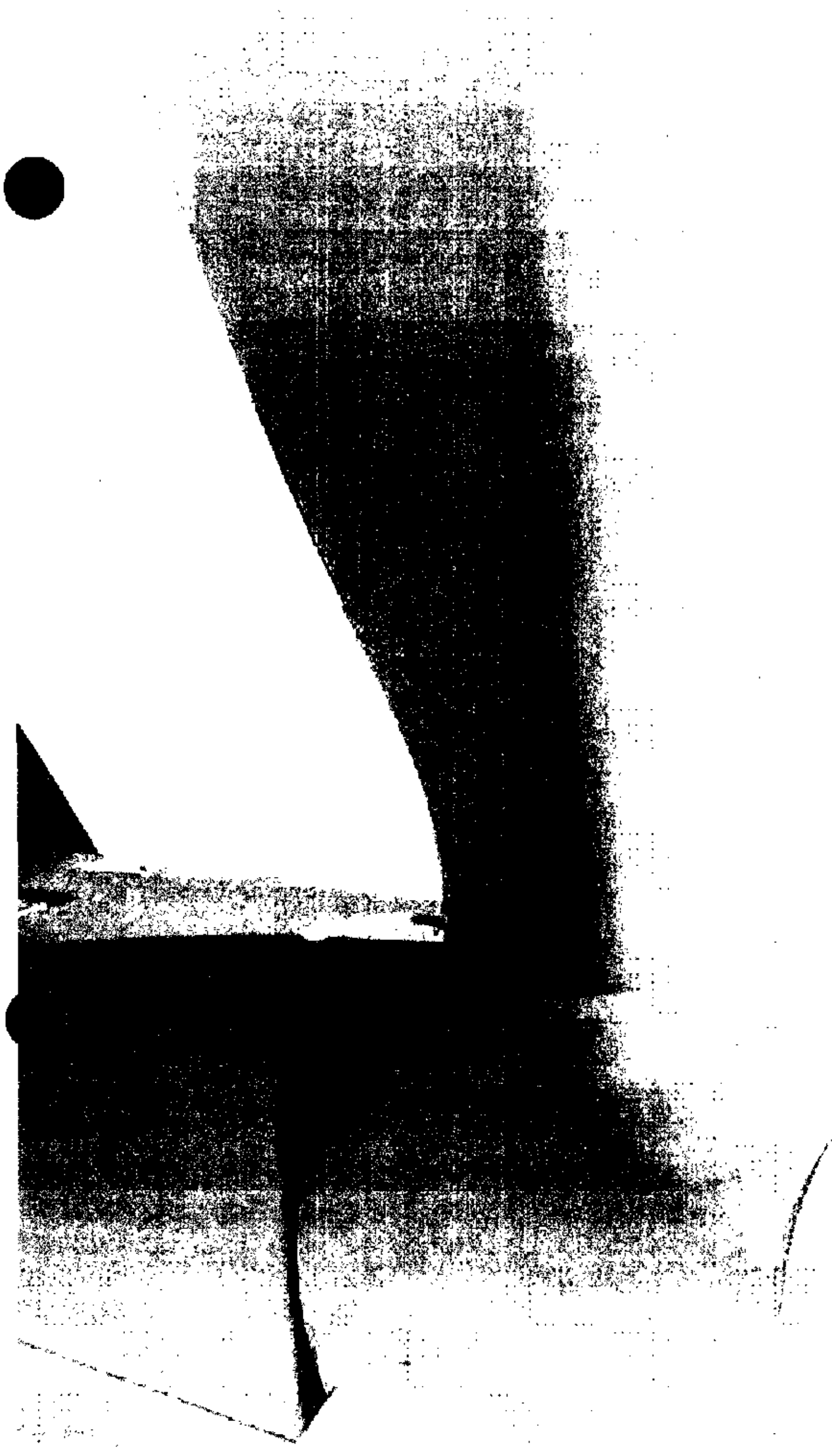

WE DELIVER
ON THE PROMISE
OF WIND POWER

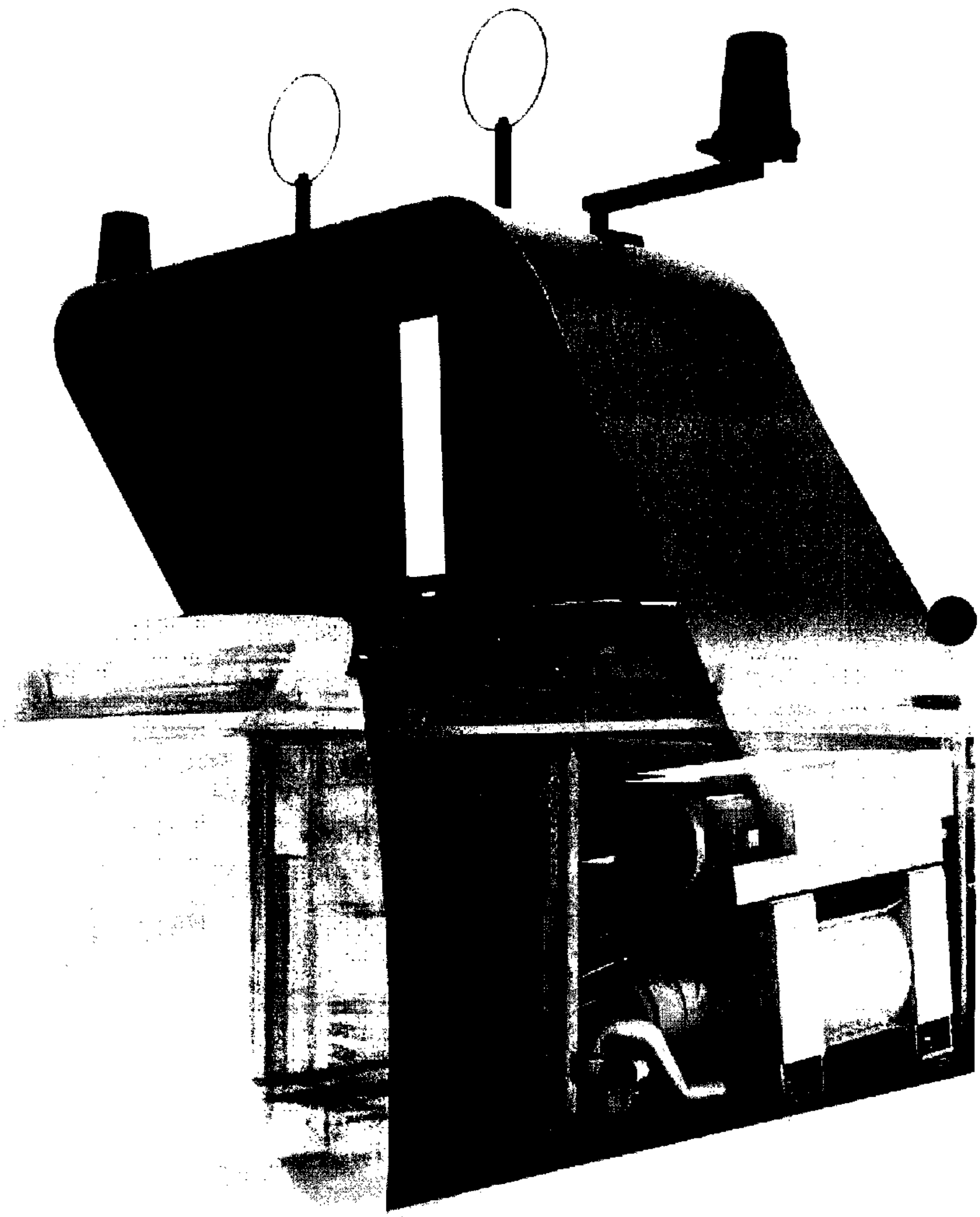


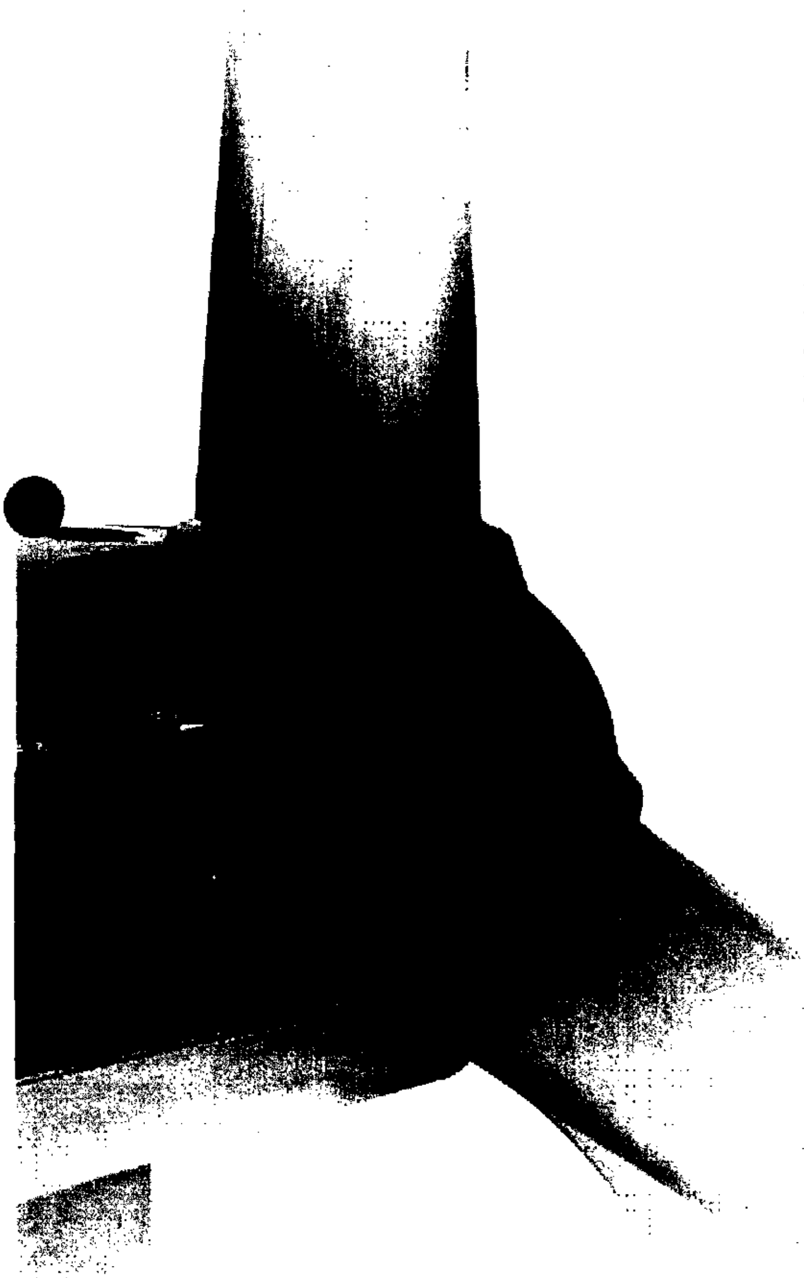
SUPERIOR YIELD AT MEDIUM-WIND SITES

Built on experience
The V90-1.8 MW is designed to deliver optimal yield at medium-wind sites (IEC IIA) and builds on decades of experience with existing Vestas turbines. We started with the nacelle from the V80-2.0 MW workhorse. Then we added the revolutionary blades used on the V90-3.0 MW high-wind turbine. Finally, all components were tuned to operate in harmony and take advantage of the special characteristics of medium-wind sites.

Documented high availability and production
Vestas has installed more than 1,500 V90-2 MW class turbines, since the first one was launched in Europe in 2004. If you count the entire 2 MW class, that number climbs to 5,000. All these turbines offer documented high availability and production. The V90-1.8 MW delivers low cost of energy, thanks to documented reliability and the highest yield in its class.





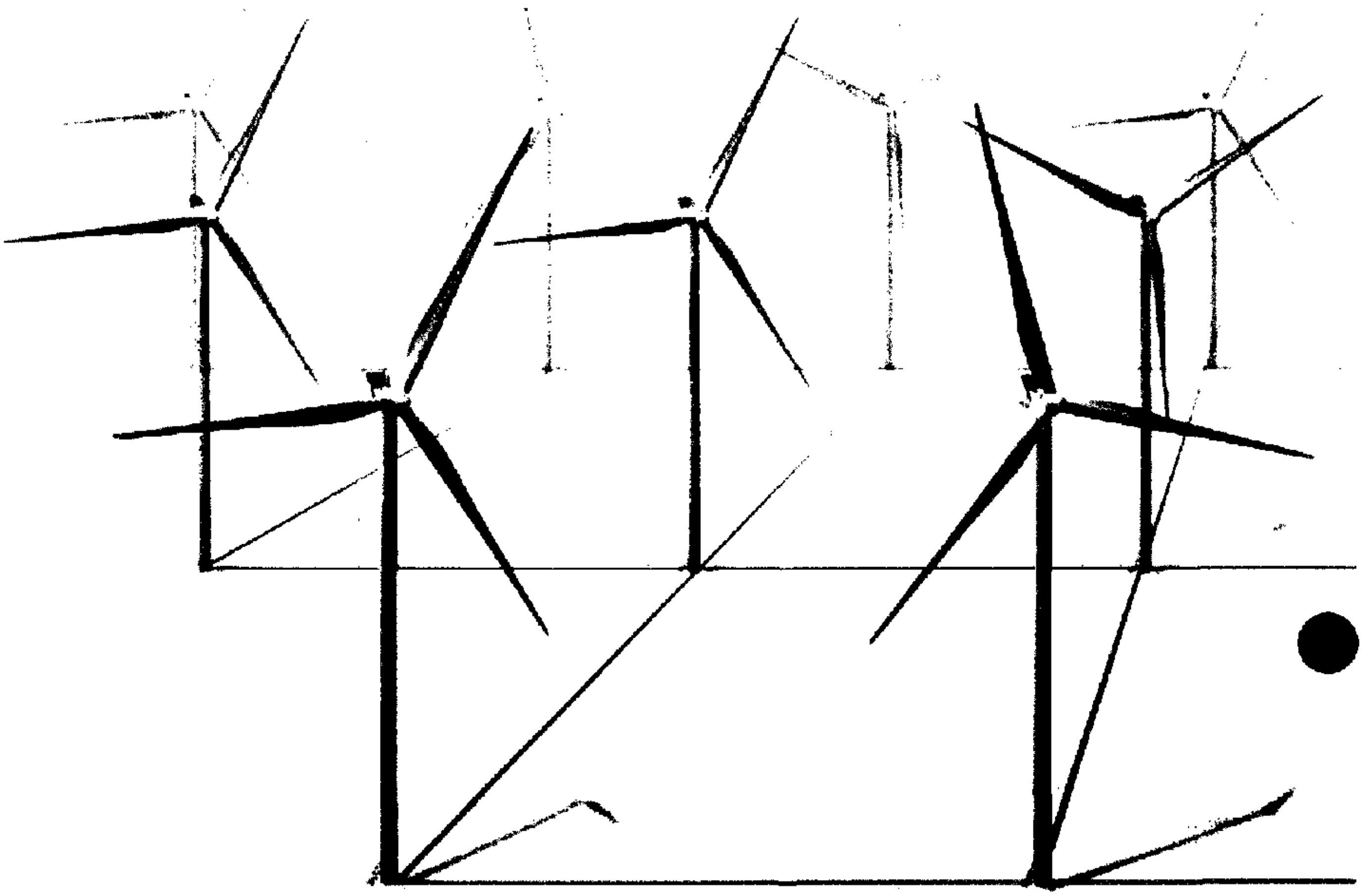


A NEW STANDARD FOR RELIABILITY

Mature technology ensures stable revenue
The many V90-1.8 MW turbines already in operation provide Vestas with invaluable knowledge on which to base further development. This means the V90-1.8 MW is built on a mature, reliable design platform, with several turbines sharing innovative, high-performance technology. The turbine features a rugged 6-gear yaw system, a proven, conventional drive train concept, a 60 Hz 6-pole generator and a transformer, which is integrated with the nacelle to minimize power losses. Finally, the V90-1.8 MW is designed around a large number of standard components that several suppliers can provide, improving overall reliability and availability of the turbine.

Next-generation control system
The V90-1.8 MW is equipped with the latest turbine control and operation software, a state-of-the-art modular software platform developed to run the next generation of Vestas turbines. This software ensures reliable, automatic management of the V90-1.8 MW around the clock. Furthermore the software supports the service organization in monitoring and troubleshooting the wind turbines on site and remotely.

Innovative solutions for lubrication
The V90-1.8 MW offers a number of features that boost reliability and serviceability, including innovative solutions for lubricating key components such as the blade-bearing system and the yaw system.

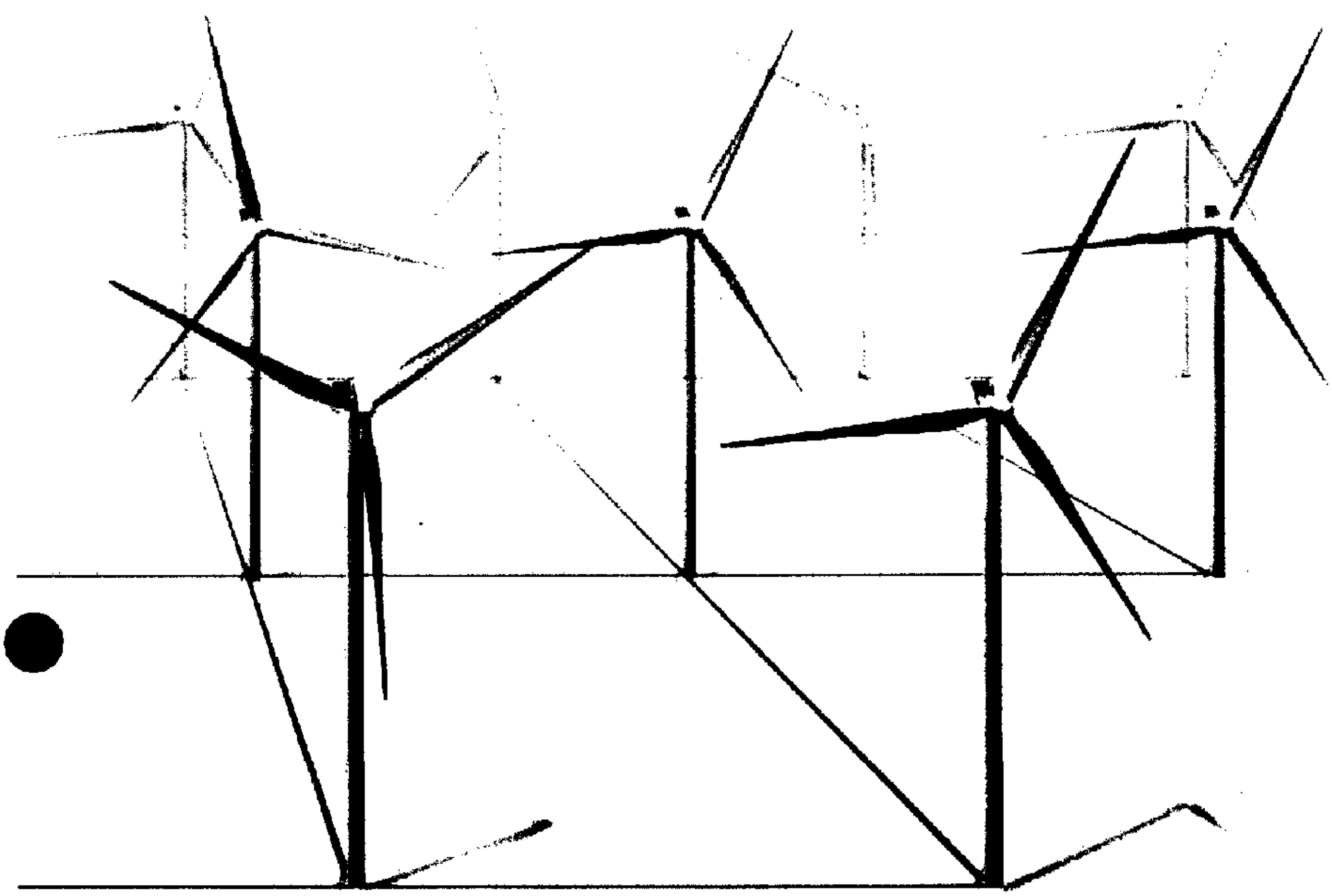


GROUNDBREAKING DESIGN AND EASY MAINTENANCE

Advanced grid operation and stable output
The V90-1.8 MW is equipped with VCUS™ (Vestas Converter Unity System), which ensures a constant and consistent output to the grid. Along with the turbine's pitch control, VCUS™ also ensures energy optimization, low-noise operation and reduced load on the gearbox and other key components. Other VCUS™ advantages include effective fault ride through and complete variable speed capability.

Safety first and easy maintenance
Like all Vestas turbines, the V90-1.8 MW is designed for safe, convenient maintenance. Rotating parts are shielded, and all components are positioned to minimize service time and manpower.

3x44 meters of cutting edge
The revolutionary blades are made from carbon fiber and other lightweight materials. Even though V90s sweep a 27% greater area than V80s, the blade weight is almost the same. What's more, the shape of the blades has been refined to deliver the greatest possible output while minimizing the load on the turbine. The shape also makes these blades less sensitive to dirt, providing better performance at sites affected by salt, insects or other particles in the air.



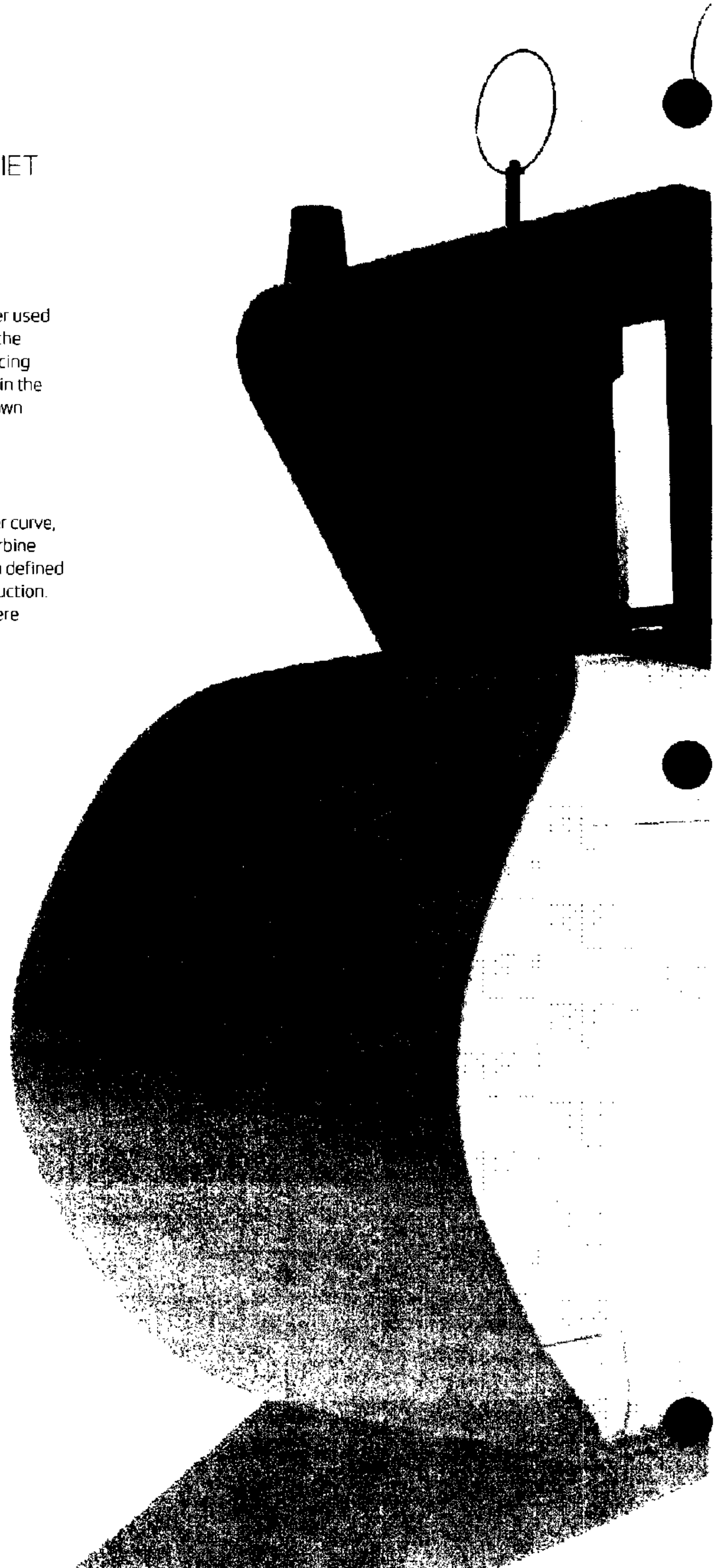
Can be installed almost anywhere
The V90-1.8 MW is designed for fast, easy transport by truck and rail to virtually any site in the world. The weight, height and width of all parts and main components are designed in consideration of local and international limits for standard transport. Installation, service and maintenance can be carried out using standard tools and equipment.

Special options
The V90-1.8 MW is available with a number of special options that can be provided at the customer's request. These options include:
- Condition monitoring system
- VestasOnline®, Compact or Business
- Switchgear
- Aviation markings on the blades
- Aviation lights
- Company logo
- Ice detection system
- Low temperature package allowing operation in temperatures as low as -30°C.

INNOVATIVE TECHNOLOGY FOR QUIET AND COOL OPERATION

CoolerTop™ saves energy and reduces sound levels
The environmentally friendly CoolerTop™ cools the water used in the turbine's cooling system by channeling wind into the heat exchanger. This boosts reliability, not least by reducing the number of moving parts and electrical components in the cooling system. CoolerTop™ also reduces the turbine's own energy consumption and it keeps sound levels low.

Low sound levels, high productivity
The V90-1.8 MW is a quiet turbine throughout its power curve, but it is even quieter during low-noise operation. The turbine can be operated in configurable modes that keep within defined noise levels, without having a significant effect on production. This makes the V90-1.8 MW ideally suited for sites where sound levels are a concern.




Vestas®

Verified component lifetime

[illegible] performance and reliability through [illegible] 20 [illegible]. These tests push the components beyond their specifications. One method is known as Highly Accelerated Life Testing, which is performed [illegible] extreme fluctuations in temperatures combined with heavy vibrations are just some of the stress tests the components are subjected to here. This enables Vestas to address design flaws before a turbine is introduced to the market.

Surveillance 24/7/365

[illegible] 24/7 all year round to [illegible] remote troubleshooting and other services. These services can also detect potential errors and disruptions before they occur, as data from your turbines is gathered and analyzed. This enables us to prepare a plan for preventative maintenance in an effort to minimize unexpected production stops and costly downtime.

Service and maintenance

Vestas has service centers around the globe and we are able to cover your every need, from simple cleaning and planned maintenance to emergency call-outs and on-site inventories customized for your turbines.

Asset management and operation risk mitigation

[illegible] avoid [illegible] your investment [illegible]. And that is exactly what Active Output Management [illegible] to ensure – that you get the greatest possible return on your investment in a Vestas wind turbine. AOM provides a number of advantages, such as detailed plans for service and maintenance, online monitoring, optimization and troubleshooting, and a competitive insurance scheme. We even offer a full availability guarantee, where Vestas pays compensation if the turbine fails to meet the agreed availability targets.

Project management for effective plants

[illegible] That [illegible] offers to take on project management from the initial wind measurements to complete [illegible] of the wind power plant. More than 30 years of international experience and local expertise enable us to complete:

- Wind and site studies
- Designing the wind power project
- Selecting wind turbine types
- Installing the wind farm
- Servicing and maintenance throughout the turbine's service life
- Monitoring and remote troubleshooting

TECHNICAL DATA FOR V90-1.8 MV

Power regulation pitch regulated with variable speed

Operating data

Rated power	1,800 kW
Cut-in wind speed	4 m/s
Rated wind speed	12 m/s
Cut-out wind speed	25 m/s
Wind Class	IEC IIA
Operating temperature	standard range -20°C to 40°C low temperature option -30°C to 40°C

Sound power
(*10 m above ground, hub height 80 m,* standard air density 1,225 kg/m3)

4 m/s	95.6 dB(A)
5 m/s	99.4 dB(A)
6 m/s	102.3 dB(A)
7 m/s	103.1 dB(A)
> 8 m/s	103.5 dB(A)

Rotor

Rotor diameter	90 m
Swept area	6,362 m^2
Nominal revolutions	14.5 rpm
Operational interval	9.3 - 16.6 rpm
Air brake	full blade feathering with 3 pitch cylinders

Tower

Type	tubular steel tower
Hub heights	80 m and 95 m

Generator

Type	6-pole asynchronous with variable speed
Nominal output	1,800 kW
Operational data	60 Hz 690 V

Gearbox

Type	3-stage planetary/helical

All specifications are for informational purposes and are subject to change without notice. Vestas does not make any representations or extend any warranties, expressed or implied, as to the adequacy or accuracy of this information.

Main dimensions

Blade

Length	44 m
Max. chord	3.5 m
Weight	6,700 kg

Nacelle

Height for transport	4 m
Height installed (including CoolerTop):	5.4 m
Length	10.4 m
Width	3.4 m
Weight	70 metric tonnes

Hub

Max diameter	3.3 m
Max. width	4 m
Length	4.2 m
Weight	18 metric tonnes

Tower

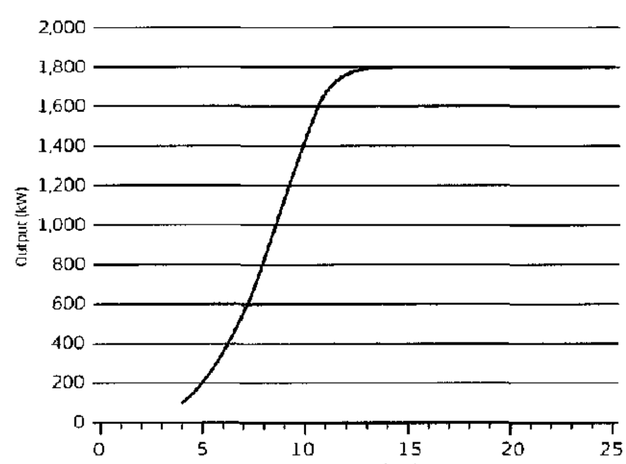
80 m

Weight	155 metric tonnes

95 m

Weight	205 metric tonnes

Power curve V90-1.8 MW



Noise reduced sound power modes are available.

No. 1 in Modern Energy

The world needs ever-greater supplies of clean, sustainable energy. Modern energy that promotes sustainable development and greater prosperity for all our planet's inhabitants. Vestas wind turbines are already generating more than 60 million MWh of electricity every year – enough to power all of Spain, for example – and we are ready to go even further. After more than 30 years in business, Vestas continues to pioneer the wind energy business, achieving breakthroughs that transform our entire industry.

No. 1 in Modern Energy

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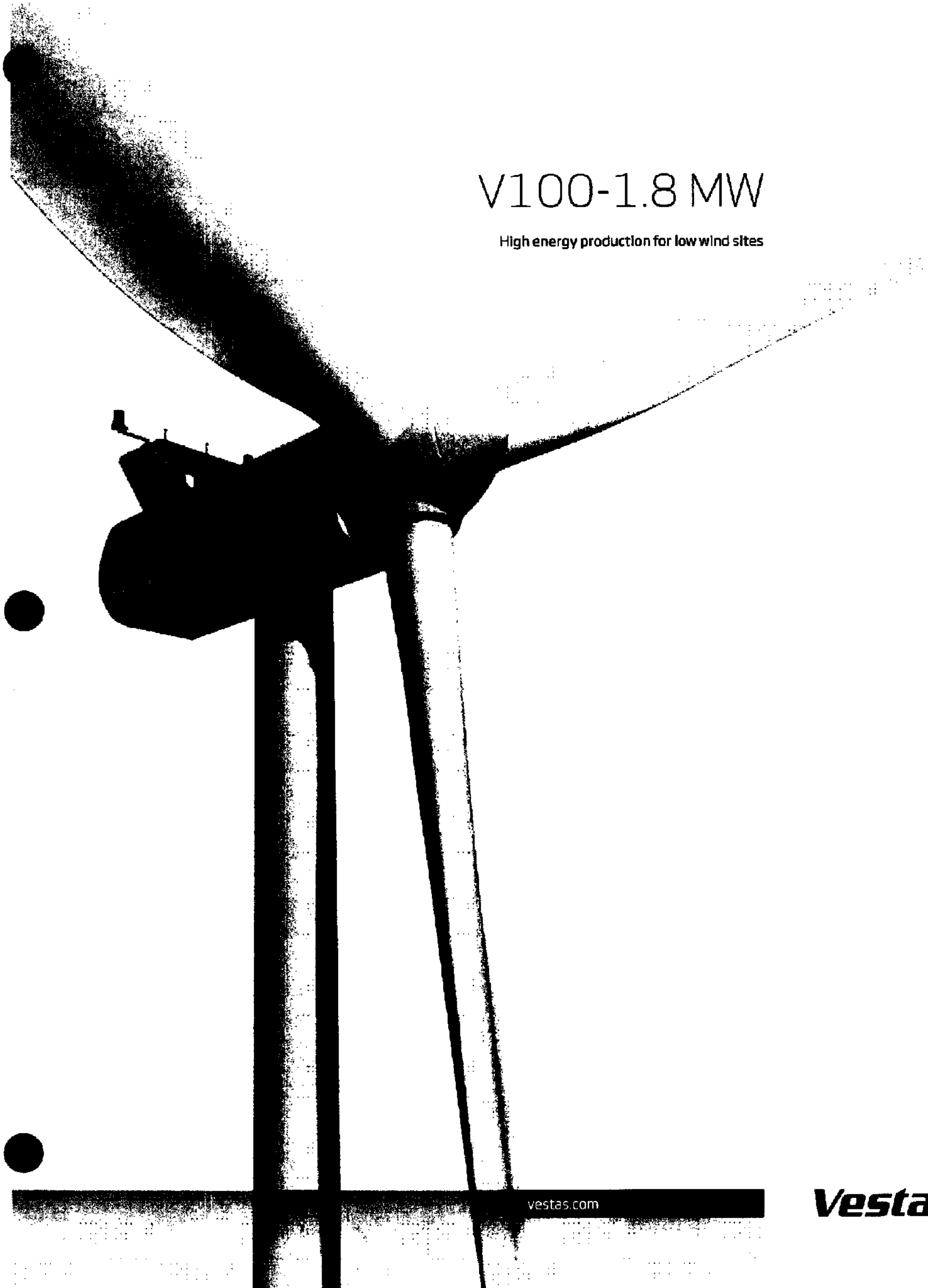
Vestas

V100-1.8 MW

High energy production for low wind sites



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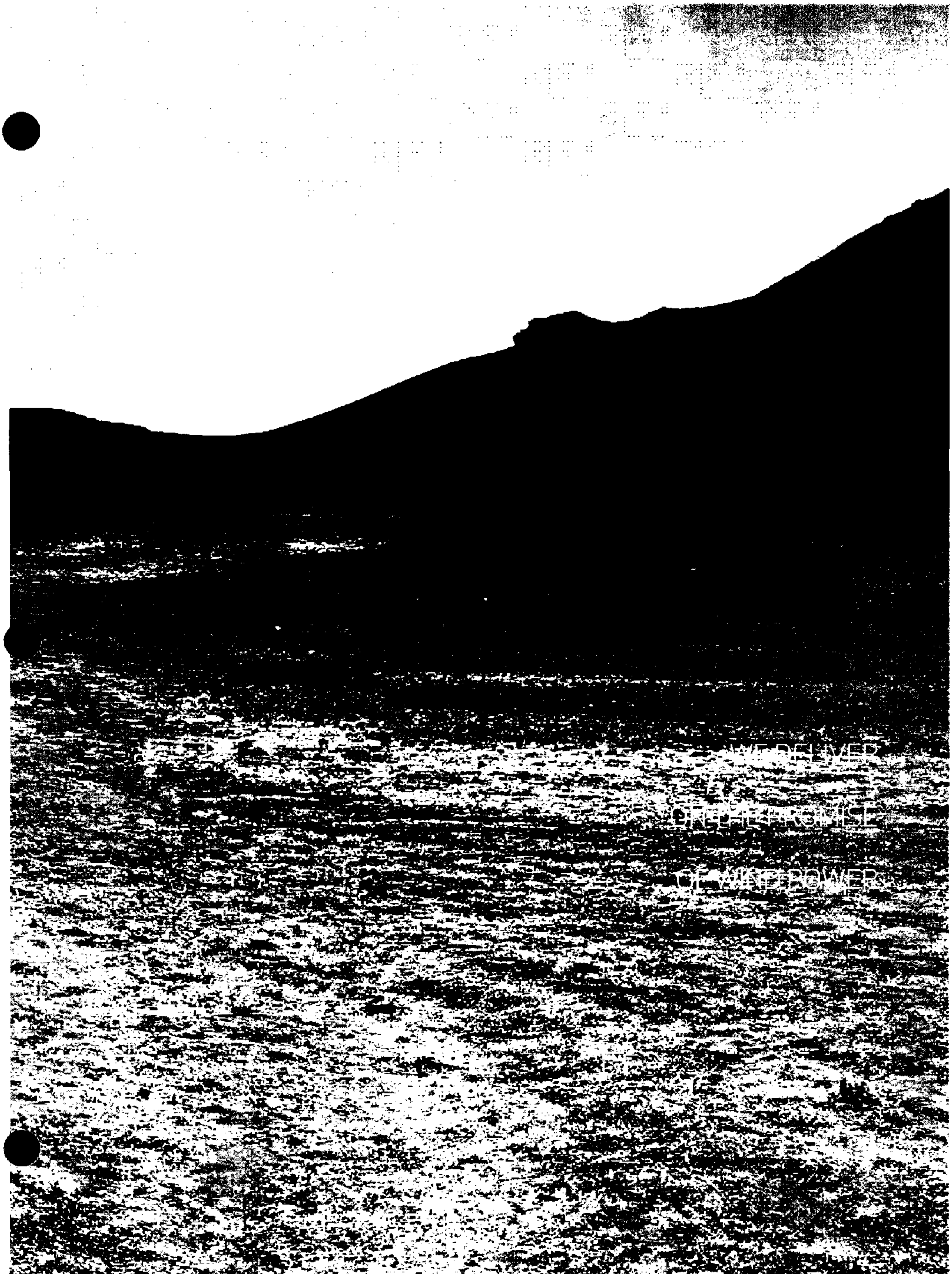
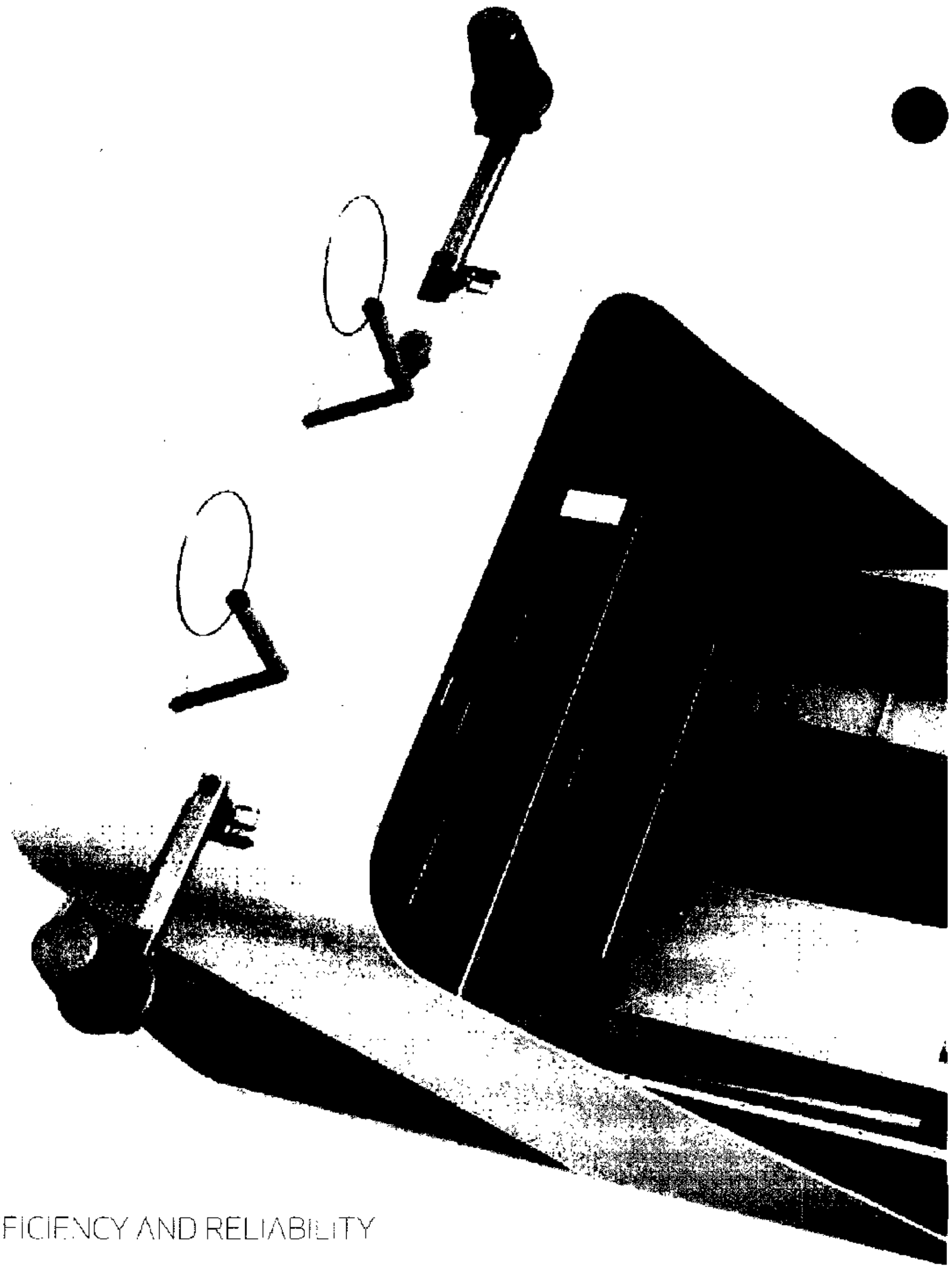

WE DELIVER
ON THE PROMISE
OF WIND POWER

A WORKHORSE OF UNRIVALED AVAILABILITY

Truly best of class
The V100-1.8 MW brings together the very best of the 2.0 MW class in a single turbine designed for low wind onshore sites. It features a greater rotor diameter, enabling it to deliver higher output at low wind speeds.

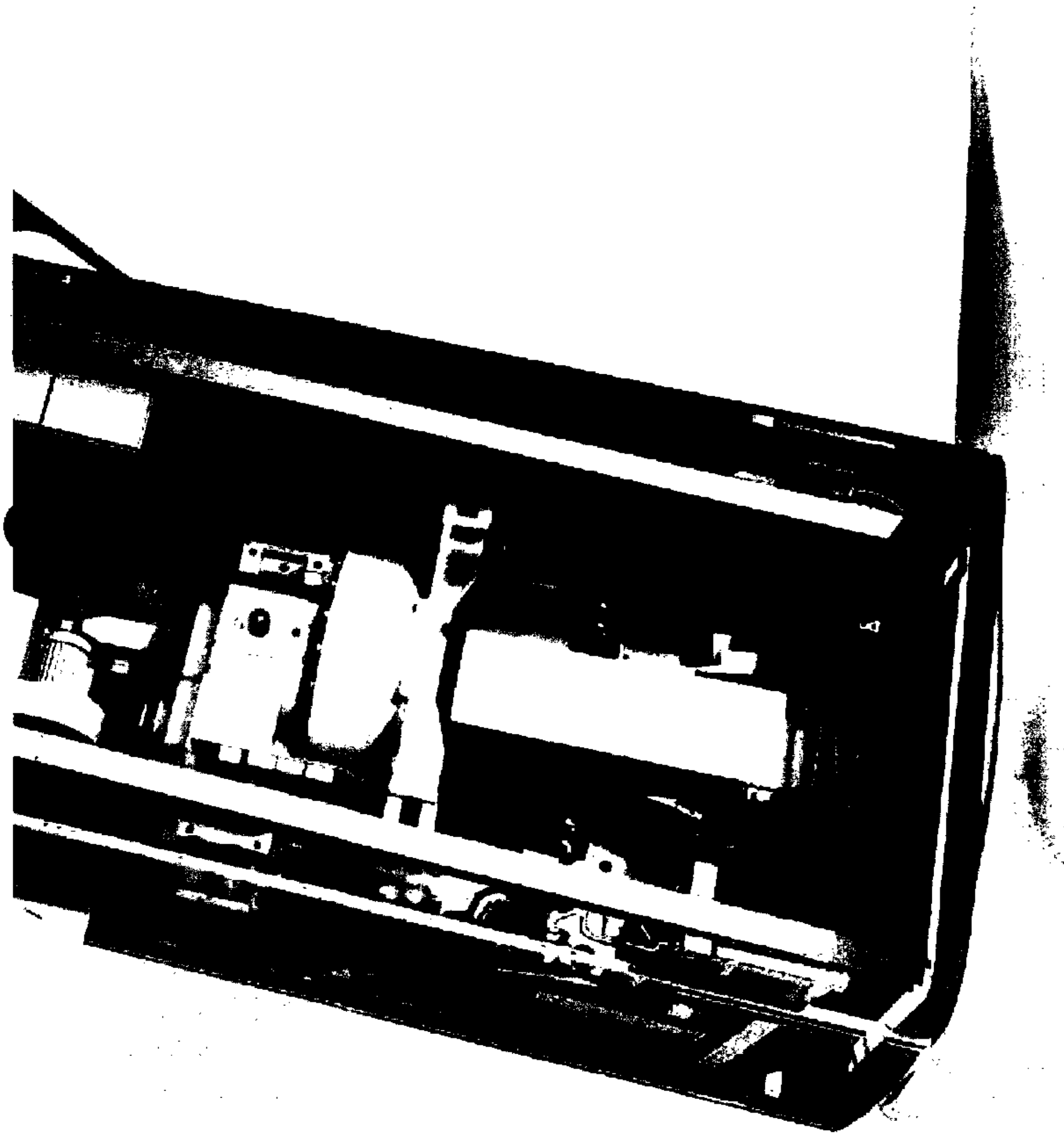
Because of this, the V100-1.8 MW delivers excellent return on investment, even at sites where wind power plants have not previously been profitable. These sites can now be used to produce clean, stable, sustainable and competitive energy.

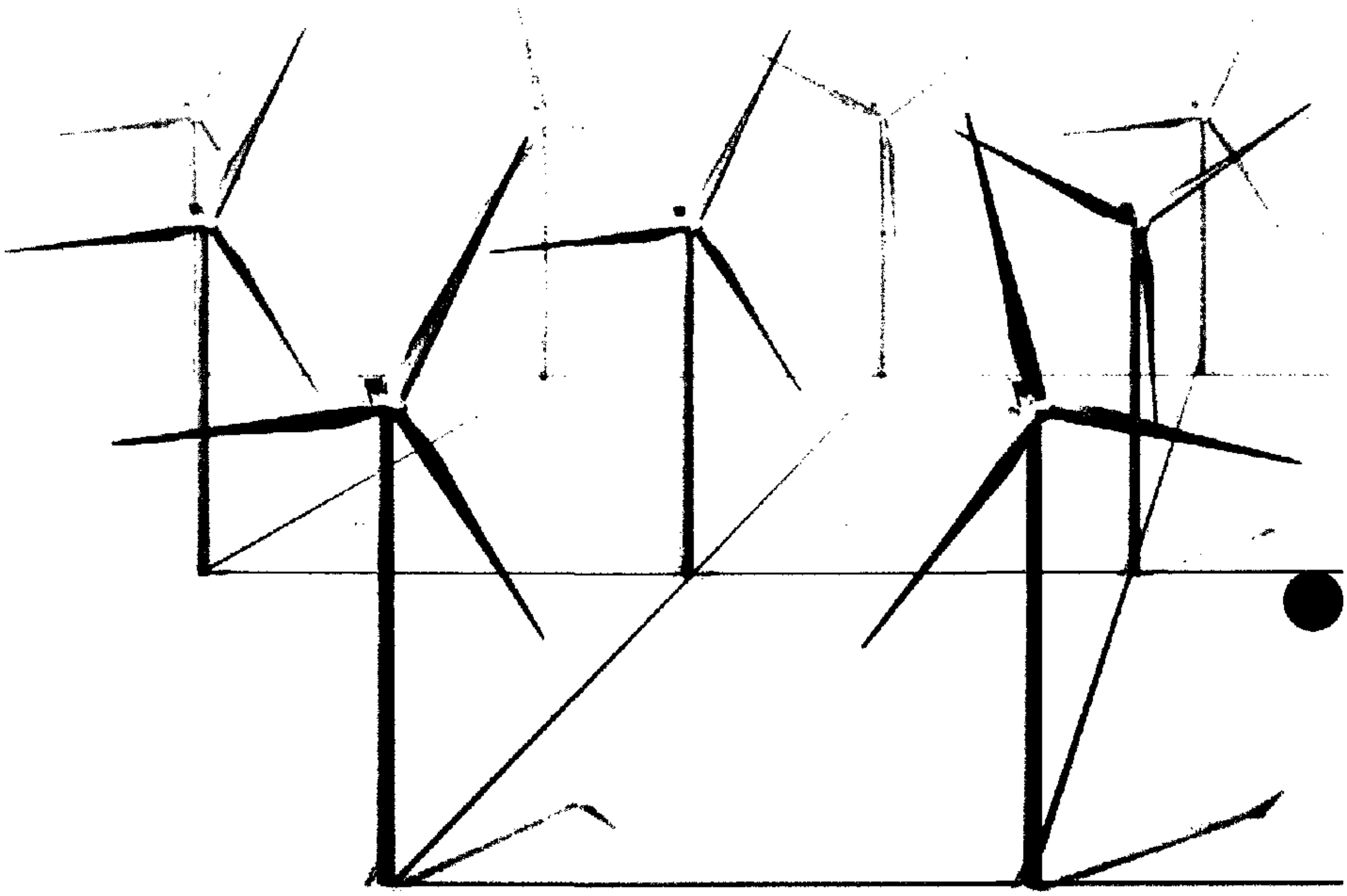


NEW STANDARDS FOR EFFICIENCY AND RELIABILITY

Unrivalled availability under any conditions
We've made extensive use of our experience with the 2.0 MW class in designing the V100-1.8 MW, producing a turbine that delivers market-leading availability.
The V100-1.8 MW features a modular design, with several turbines sharing innovative, high-performance technology. Our turbines in this class boast a rugged design, grid compliance and high, thoroughly documented performance. Vestas has installed more than 5,000 2.0 MW turbines since 2003 at highly diverse wind sites around the globe. They've proved their solid performance both onshore and offshore, and they have a long track record of documented high availability even in the most extreme conditions.

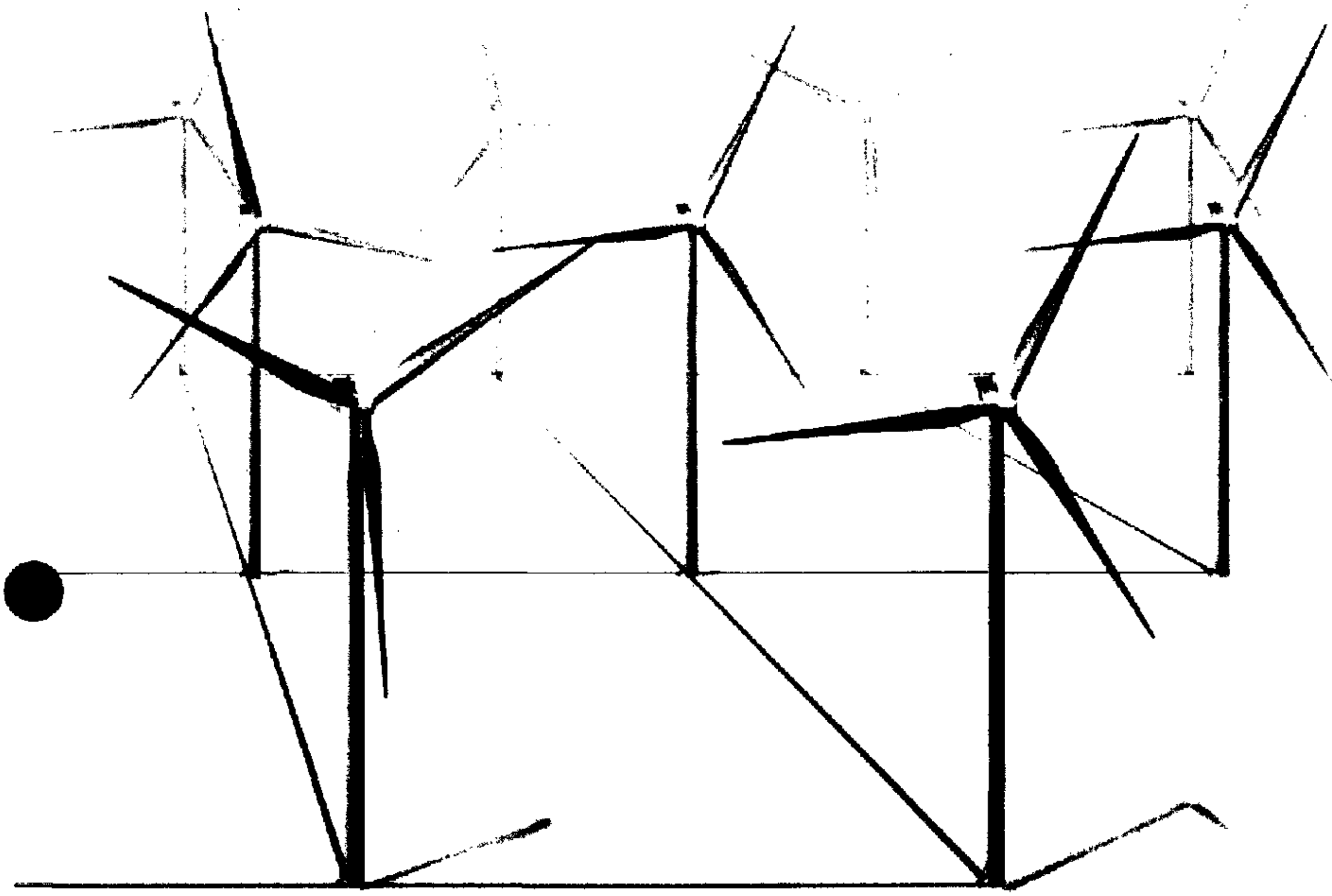
Mature technology, stable revenue
The V100-1.8 MW is based on a mature, reliable design platform. This enables the V100-1.8 MW to deliver high, stable revenue at low wind sites, where it hasn't previously been possible to harvest wind power so efficiently. Furthermore, the turbine has been designed around a large number of standard components that several suppliers can provide, improving overall reliability and high availability of the turbine.





Flexible grid integration and stable output
Vestas products, such as the V100-1.8 MW, are designed so that your wind park will be fully compliant with applicable grid codes at the point of common coupling. How this is achieved may differ from country to country, but generally, the Vestas advanced grid compliance system provides active and reactive power regulation, frequency regulation and fault ride-through capabilities to support grid levels and stability in the event of grid disturbances.

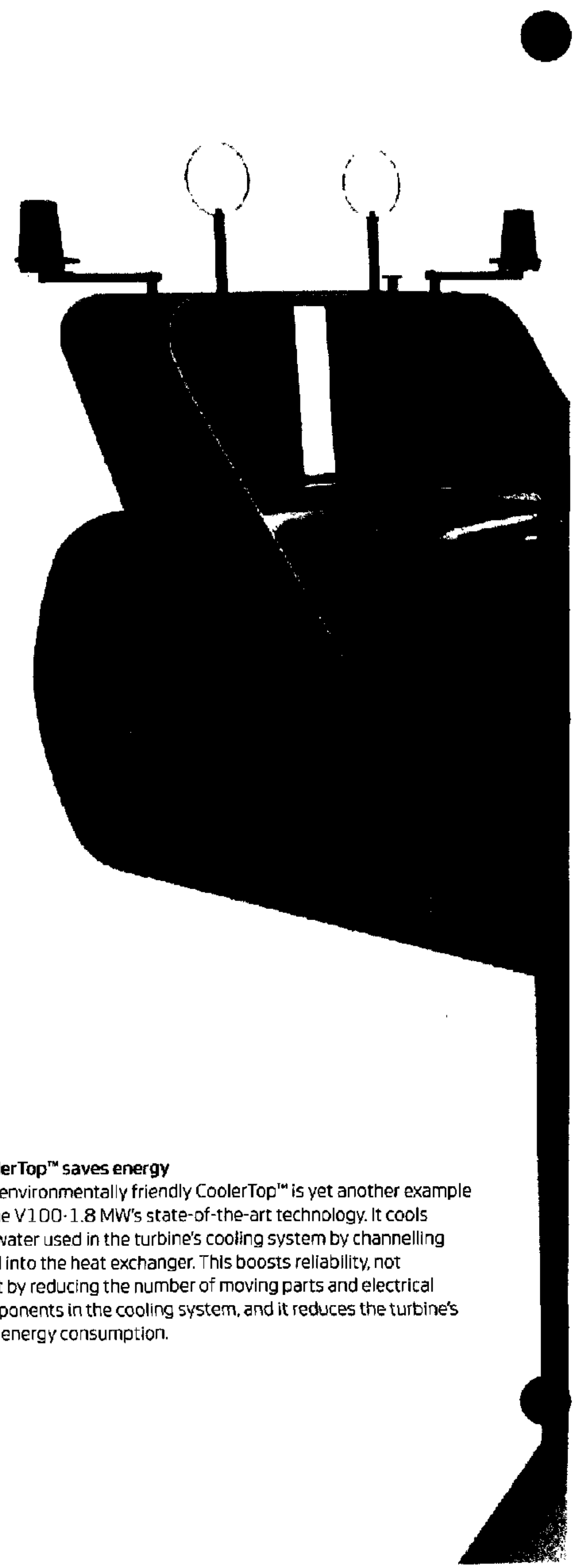
Enhanced safety and maintenance
The V100-1.8 MW is designed for reliability, safety and convenient maintenance. All rotating parts are shielded, and all the components are positioned to minimise service time and manpower, no matter what service task is involved.
The V100-1.8 MW offers a number of features that boost reliability and serviceability, including ingenious solutions for lubricating key components such as the blade-bearing system and the yaw system.



Can be installed almost anywhere
The V100-1.8 MW complies with all the standard limits for weight, width and height. It can be transported to most sites in the world without being subject to special fees and restrictions that can delay or increase the cost of wind power plant construction.

Next-generation software
The V100-1.8 MW is equipped with the latest turbine control and operation software, a state-of-the-art modular software platform developed to run the next generation of Vestas turbines.

Special options
The V100-1.8 MW is available with a number of special options that ensure compliance with local requirements. These options include:
- Condition monitoring system
- Switchgear
- Aviation markings on the blades
- Aviation lights
- Company logo
- Low temperature operation to -30°C
- Ice detection system



DESIGNED FOR A HIGH YIELD WIND HARVEST

Market-leading aerodynamics
The tried and tested blades on the V100-1.8 MW sweep an area of 7,850 m² and deliver an outstanding rotor-to-generator ratio. This adds up to higher capacity and yield, compared to other turbines in the 2 MW class.
The 49-metre blades have proven their worth since 2006, and have been subjected to static and dynamic testing, as well as being type-certified by Det Norske Veritas.

CoolerTop™ saves energy
The environmentally friendly CoolerTop™ is yet another example of the V100-1.8 MW's state-of-the-art technology. It cools the water used in the turbine's cooling system by channelling wind into the heat exchanger. This boosts reliability, not least by reducing the number of moving parts and electrical components in the cooling system, and it reduces the turbine's own energy consumption.

Verified component lifetime
At the Vestas Testing Centre and Technology R&D, engineering experts and technicians use state-of-the-art testing methods to ensure that all components and systems meet our standards for safety, performance and reliability throughout their 20-year service life. These tests push the components beyond their specifications. One method is known as Highly Accelerated Life Testing, where some of the testing is conducted in a HALT chamber. Extreme fluctuations in temperatures combined with heavy vibrations are just some of the stress tests the components are subjected to here. This enables Vestas to identify and address design flaws long before the turbines reach the market.

Surveillance 24/7/365
Our surveillance services are manned 24/7 all year round to provide real-time surveillance, remote troubleshooting and other services. These services can also detect potential errors and disruptions before they occur, as data from your turbines is gathered and analysed. This enables us to prepare a plan for preventative maintenance, saving you from unexpected production stops and costly downtime.

Service and maintenance
Vestas has service centres around the globe and we are able to cover your every need, from simple cleaning and planned maintenance to emergency call-outs and on-site inventories customised for your turbines.

Asset management and operation risk mitigation

[illegible] investment in a Vestas wind turbine.

AOM provides a number of advantages, such as [illegible] for service and maintenance, online monitoring, optimisation and troubleshooting, and a competitive insurance scheme. We even offer a full availability guarantee where Vestas pays compensation if the turbine fails to meet the agreed availability targets.

Project management for effective plants

[illegible] Vestas offers to take on project [illegible] More than 30 years of [illegible] and local expertise enable us to [illegible]

- Wind [illegible] studies
- Designing the wind power project
- Selecting wind turbine types
- Installing the wind farm
- Servicing and maintenance throughout the turbine's service life
- Monitoring and remote troubleshooting

TECHNICAL DATA FOR V100-1.8 MV

Power regulation pitch regulated with variable speed

Operating data

Rated power	1,800 kW
Cut-in wind speed	4 m/s
Rated wind speed	12 m/s
Cut-out wind speed	20 m/s
Wind Class - IEC	IEC S (IEC IIIA average wind and IEC IIA extreme wind)
Max. altitude	1,500 m
Operating temperature range	standard range -20°C to 40°C. low temperature option: -30°C to 40°C

Sound power
(at standard air density 1,225 kg/m³)

5 m/s	95 dB(A)
6 m/s	95 dB(A)
7 m/s	97.9 dB(A)
8 m/s	101.2 dB(A)
9 m/s	104.1 dB(A)
10 m/s	106.5 dB(A)
11 m/s	106.5 dB(A)

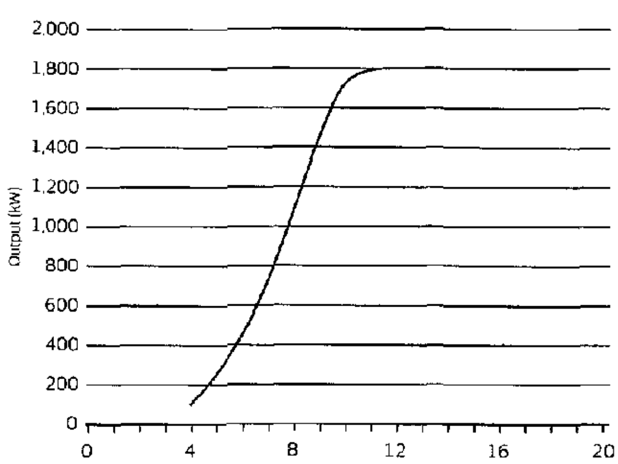
Rotor

Rotor diameter	100 m
Swept area	7,850 m²

Electrical

Frequency	50 Hz/60 Hz
Generator type	asynchronous with wound rotor, slip rings

Power curve V100-1.8 MW



Main dimensions

Blade

Length	49 m
Max. chord	3.9 m

Nacelle

Height for transport	4 m
Height installed	5.4 m
Cover height	3.5 m
Length	10.4 m
Width	3.4 m

Tower

Hub heights	80 and 95 m
Max. section length	24.6 m
Max. diameter	4.2 m

Hub

Max. diameter	3.3 m
Max. width	4 m
Length	4.2 m

Max. weight per unit for transportation	70 metric tonnes

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The world needs ever-greater supplies of clean, sustainable energy. Modem energy that promotes sustainable development and greater prosperity for all our planet's inhabitants. Vestas wind turbines are already generating more than 60 million MWh of electricity every year – enough to power all of Spain, for example – and we are ready to go even further. After more than 30 years in business, Vestas continues to pioneer the wind energy business, achieving breakthroughs that transform our entire industry.

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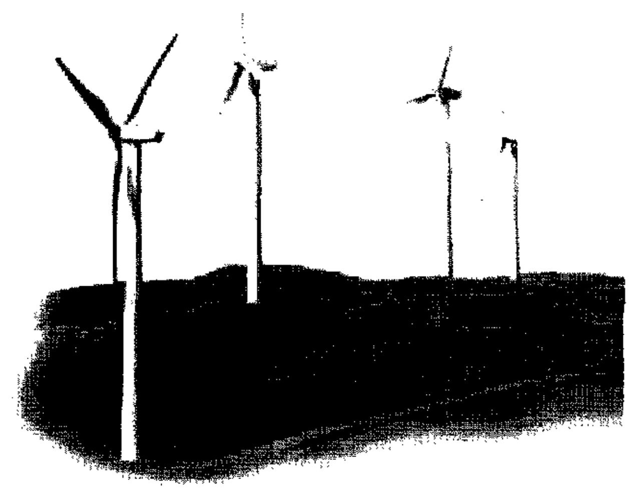
GE Energy

Technical Documentation Wind Turbine Generator Systems GE 1.6xle - 60 Hz

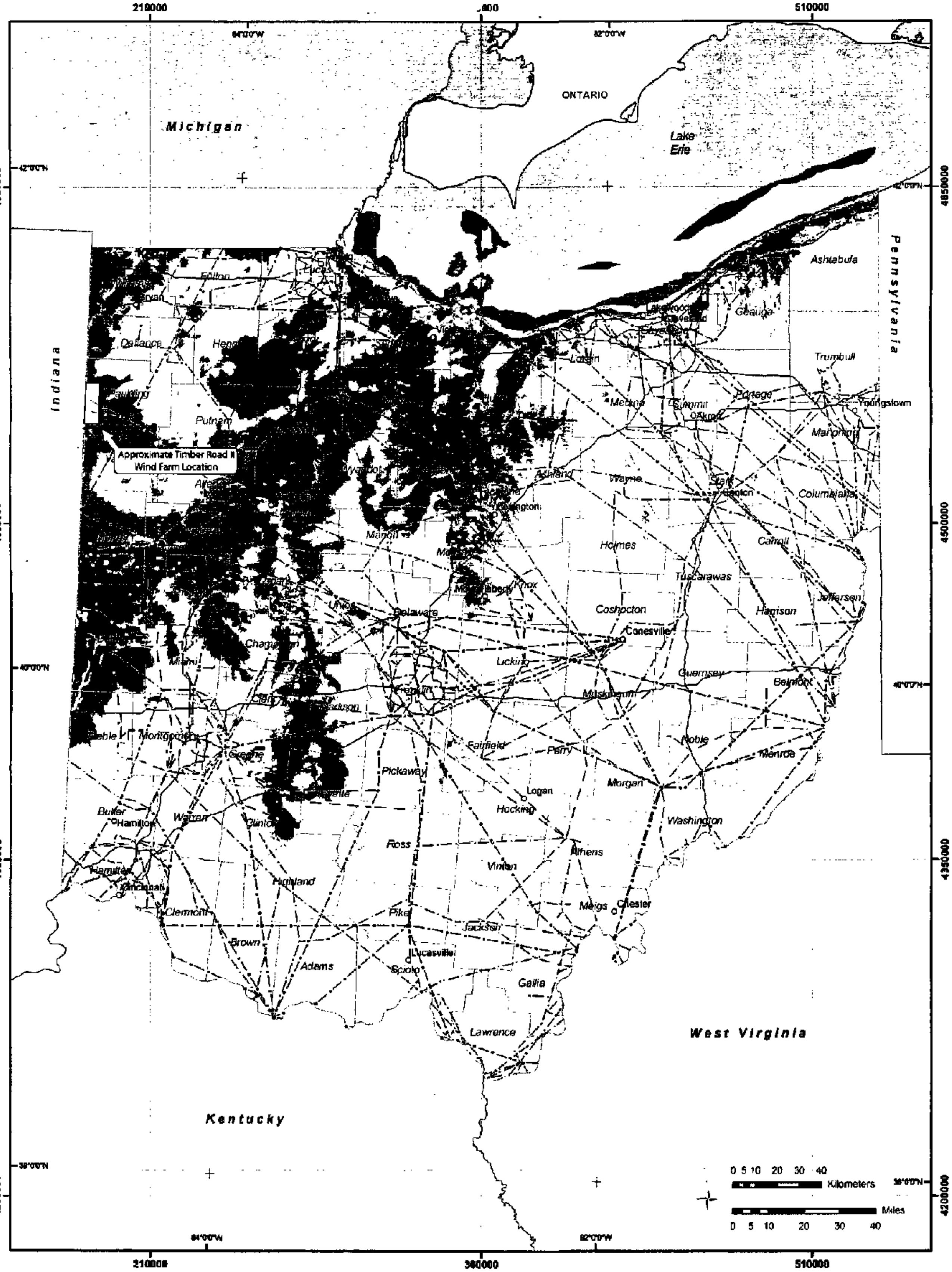


Technical Description and Data

GE imagination at work

EXHIBIT C

Wind Resource Map



Wind Resource of Ohio *Mean Annual Wind Speed at 70 Meters*

Features

- City
- Interstate Highway
- County Boundary
- Water Body

Generalized Transmission Line

Category

- Under 100 kV
- 100 kV-161 kV
- 230 kV-287 kV
- 345 kV
- 500 kV
- 735 kV +
- Step-Up
- DC Line

Mean Speed at 70 m

mph	m/s
< 12.3	< 5.5
12.3 - 13.4	5.5 - 6.0
13.4 - 14.5	6.0 - 6.5
14.5 - 15.7	6.5 - 7.0
15.7 - 16.8	7.0 - 7.5
16.8 - 17.9	7.5 - 8.0
17.9 - 19.0	8.0 - 8.5
19.0 - 20.1	8.5 - 9.0
20.1 - 21.3	9.0 - 9.5
> 21.3	> 9.5

AWS Truewind

Projection: Tranverse Mercator, UTM Zone 17 WGS84
Spatial Resolution of Wind Resource Data: 200m
This map was created by AWS Truewind using the MesoMap system and historical weather data. Although it is believed to represent an accurate overall picture of the wind energy resource, estimates at any location should be confirmed by measurement.
The transmission line information was obtained by AWS Truewind from the Global Energy Decisions Velocity Suite. AWS does not warrant the accuracy of the transmission line information.

EXHIBIT D

System Impact Study

PJM Generator Interconnection Request Queue #R49 Haviland-Milan(Ohio West Wind) 138kV Impact Study

539216
June 2009

R49 Haviland-Milan 138kV Impact Study Report

General

Horizon Wind Energy, LLC (Horizon) proposes to install a 150 MW generating facility comprised of 75-2.1 MW wind turbine generators connecting to the American Electric Power (AEP) Haviland - Milan 138 kV circuit. This project is number R49 in the PJM Generator Interconnection queue. The proposed location of the generating facilities and switching station is approximately four miles south of Payne, OH (See Exhibit 1). The projected in-service date is scheduled for October 31, 2010.

Attachment Facilities

The proposed generation project will be connected to the AEP Haviland - Milan 138 kV circuit via a new in-line switching station. The new station will consist of three (3) 138 kV circuit breakers configured in a ring-bus arrangement with 138 kV metering (See Exhibit 2). AEP will retain ownership of the proposed in-line station facilities. In addition, remote terminal relaying will need to be upgraded to coordinate with the new relays to be installed at the new station. It is understood that Horizon will be responsible for the all costs associated with this construction, as well as facilities associated with connecting their 150 MW generation to the in-line facilities.

It is expected that any right-of-way for line extensions, as well as a 250' x 250' (minimum) station site will be provided to AEP by Horizon. Note that the Horizon station facilities and any facilities outside the new station were not included in the cost estimate. These are assumed to be Horizon's responsibility.

The AEP construction scope includes:

- Construction of a new switching station connecting to the Haviland - Milan 138 kV circuit between Haviland and Tillman stations, including three (3) 138 kV circuit breakers, relays, 138 kV metering, SCADA, and associated equipment. (Network Upgrade #n1222)

  Estimated Cost (2009 Dollars): **$4,485,300**

- Replace line relaying with AEP standard package and upgrade the station remote terminal unit (RTU) at Milan station. (Network Upgrade #n1223)

  Estimated Cost (2009 Dollars): **$682,500**

- Replace line relaying with AEP standard package and upgrade the station remote terminal unit (RTU) at Haviland station. (Network Upgrade #n1224)

  Estimated Cost (2009 Dollars): **$721,000**

- Replace line relaying with AEP standard package and upgrade the station remote terminal unit (RTU) at Tillman station. (Network Upgrade #n1225)

  Estimated Cost (2009 Dollars): **$370,100**

Total Attachment Facilities Cost*: **$6,258,900**

*The estimates are preliminary in nature, as they were determined without the benefit of detailed engineering studies. Final estimates will require an on-site review and coordination to determine final construction requirements. It will take approximately fourteen (14) to eighteen (18) months after obtaining an executed ISA and CSA to construct the facilities as outlined above.

Local Impacts

The impact of the proposed generating facility on the AEP System was assessed for adherence with applicable reliability criteria. AEP planning criteria require that the transmission system meet single contingency performance criteria in accordance with the AEP FERC Form 715. Therefore, this criterion was used to assess the impact of the proposed facility on the AEP System. The Horizon project was studied as a 150 MW net capacity consistent with the *interconnection* application. The results are summarized below.

Normal System (2009 Summer Conditions)

- No problems identified.

Single Contingency (2009 Summer Conditions)

- Outage of the Haviland - R49 Ohio West 138 kV circuit overloads the Tillman 138/34.5 kV transformer to 101% of its summer rating.

Short Circuit Analysis

- No problems identified.

Stability Analysis

- Instability occurs for an outage of the Robison Park - R49 and East Lima – Haviland 138 kV lines (double-contingency scenario). In this scenario, both 138 kV outlets are outaged, and R49 is connected only to the underlying 69 kV network via the Haviland

138/69 kV Station. **Generation curtailment will be required following the first contingency (loss of either the Robison Park – R49 or East Lima – Haviland 138 kV circuit).**

Local Upgrades

To maintain appropriate levels of reliability and mitigate the single contingency problems resulting from the additional generation identified in this study, the following system improvements are required:

- To alleviate the overload on the Tillman 138/34.5kV transformer the existing transformer will be replaced with a 30 MVA unit that will require installation of a high-side circuit switcher and associated equipment. (Network Upgrade #n1226)

  Estimated Cost (2009 Dollars): **$1,856,600***

*The estimates are preliminary in nature, as they were determined without the benefit of detailed engineering studies. Final estimates will require an on-site review and coordination to determine final construction requirements. It will take approximately one year after obtaining the authorization to construct the facilities as outlined above.

Reactive Requirements

PJM requires a power factor correction to 95% lead/lag at the point of interconnection for wind generating facilities. It is expected that Horizon will adhere to this standard.

Network Impacts

The Queue Project #R49 was studied as a(n) 150 MW(Capacity=30 MW) injection into the Haviland – Milan 138 kV line in the AEP area. Project #R49 was evaluated for compliance with reliability criteria for summer peak conditions in 2012. Potential network impacts were as follows:

Generator Deliverability
(Single or N-1 contingencies for the Capacity portion only of the interconnection)

No problems were identified

Multiple Facility Contingency
(Double Circuit Tower Line, Line with Failed Breaker and Bus Fault contingencies for the full energy output)

No problems were identified

Short Circuit
No problems identified

Stability and Reactive Power Requirement
Background

This study concerns the stability assessment for the PJM generator interconnection request – Queue #R49 (Havilland-Milan 138 kV Tap). The R49 project consists on a new 150 MW wind farm facility. The developer specified the use of 72 units Suzlon 2.1 MW wound rotor induction generator.

The objective of the study was to determine the system stability for the contingencies around the R49 project as shown in Attachment #1.

All units and its control systems were updated according to the developer's specification; these updates are shown in Attachment #2 and Attachment #3 (Dynamic data format).

The topology of the system is shown in Attachment #4

Stability (AEP Stability Criteria)

Stability analysis was performed at 2013 summer peak load condition. The maximum generation output is considered. The range of contingencies evaluated was limited to that necessary to assess expected compliance with AEP criteria.

This study includes 74 contingencies conditions that includes 3-phase permanent fault with unsuccessful High-Speed-Recloser (HSR) for normal clearing time contingencies and single line to ground for delayed clearing time due to stuck breaker condition and line tripping without fault.

Result and Analysis

No stability problem was identified with the new transmission line upgrade. The swing angles do not exceed the transient stability criteria and the transient voltage and low voltage ride through criteria were also satisfactory for all contingencies scenarios.

Table-1 in Attachment #1 tabulates the clearing times for the all contingencies scenarios, also a brief description of the scenario is provided.

Whenever R49 wind farm plant is islanded with a load, we recommend the following values for trip settings at the interconnection point:

Voltage at the point of interconnection:
0.8 pu or lower for 2 seconds
1.11 pu or higher for 0.1 second

1.2 pu or higher for 0.02 second

Frequency at the point of interconnection:
57Hz or lower for 0.05 seconds
62Hz or higher for 0.05 second

Note: While the stability analysis has been performed at expected extreme system conditions, there is a potential that evaluation at a different level of generator MW and/or MVAR output at different system load levels and operating conditions would disclose unforeseen stability problems. The regional reliability analysis routinely performed to test all system changes will include one such evaluation. Any problems uncovered in that or other operating or planning studies will need to be resolved.

Moreover, when the proposed generating station is designed and plant specific dynamics data for the plant and its controls are available, and if it is different than the data provided for this study, a transient stability analysis at a variety of expected operating conditions using the more accurate data shall be performed to verify impact on the dynamic performance of the system. As more accurate or unit specific dynamics data for the proposed facility, as well as Plant layout become available, it must be forwarded to PJM.

Contribution to Previously Identified Overloads

(This project contributes to the following contingency overloads, i.e. "Network Impacts", identified for earlier generation or transmission interconnection projects in the PJM Queue)

None

New System Reinforcements

(Upgrades required to mitigate reliability criteria violations, i.e. Network Impacts, initially caused by the addition of this project generation)

None

Contribution to Previously Identified System Reinforcements

(Overloads initially caused by prior Queue positions with additional contribution to overloading by this project. This project may have a % allocation cost responsibility which will be calculated and reported for the Impact Study)

None

Delivery of Energy Portion of Interconnection Request

(PJM also studied the delivery of the energy portion of this interconnection request. Any problems identified below are likely to result in operational restrictions to the project under study. The developer can proceed with network upgrades to eliminate the operational restriction at their discretion by submitting a Merchant Transmission Interconnection request.
As a result of the aggregate energy resources in the area, the following violations were identified:)

None

Cost Allocation

The R49 project is responsible for 100% of the costs for the network upgrades listed under the Attachment Facilities section of the report estimated to cost **$6,258,900**. The R49 project is also 100% responsible for the upgrade listed under Local Upgrades estimated to cost **$1,856,600**.

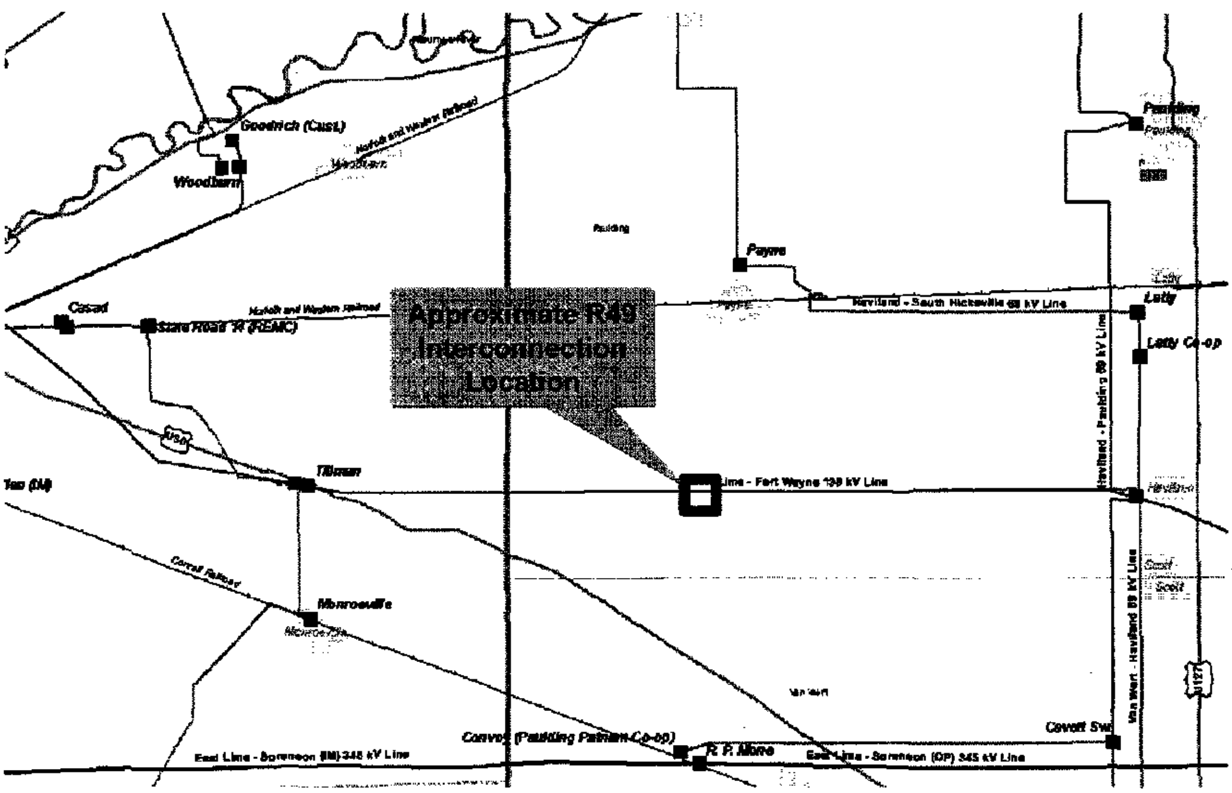


Exhibit 1: Approximate interconnection location of the proposed facilities.

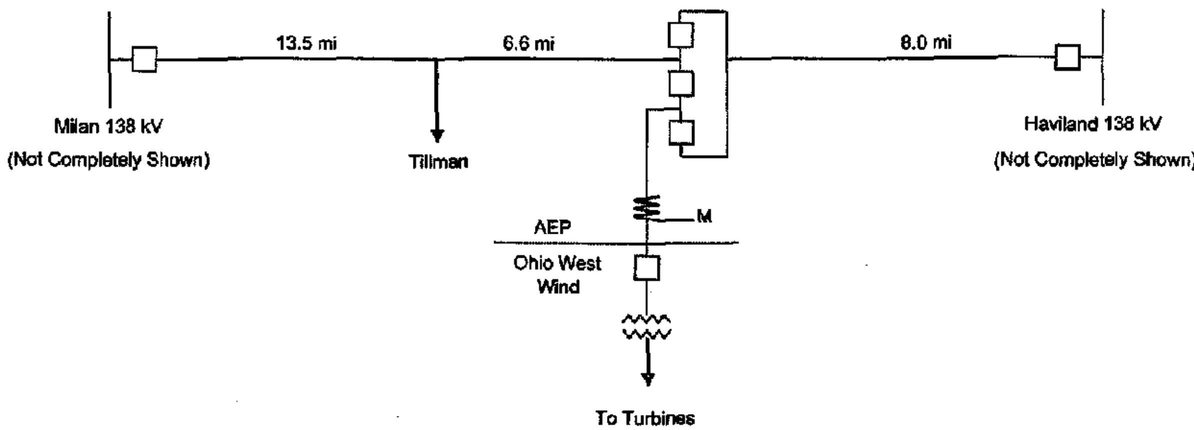


Exhibit 2: Simplified diagram of proposed 138 kV in-line switching substation.

Attachment #1

R49

2013 Light Load Stability Faults

BREAKER CLEARING TIMES (CYCLES)

Station	Primary (3ph/slg)	Stuck Breaker (total)	Line Open w/o Fault
345kV	4	25	
138kV	5	20	
69kV	63	93	

Table-1: Summary of the recommended maximum clearing time for the different case scenarios.

All cases stable

1a. 3ph @ R49 – Milan 138 kV line
1c. line-trip @ R49 – Milan 138 kV line

2a. 3ph @ Milan – Robison Park 138 kV line
2b. slg @ Milan – Robison Park 138 kV line, BF @ Milan
2c. line-trip @ Milan – Robison Park 138 kV line

3a. 3ph @ Robison Park – Lincoln 138 kV line 1
3b. slg @ Robison Park – Lincoln 138 kV line 1, BF @ Robison Park
Loss of: Robison_Park-Guardian and Robison_Park-Albion.
3c. line-trip @ Robison Park – Lincoln 138 kV line 1

4a. 3ph @ Robison Park – Lincoln 138 kV line 2 through Reed
4b. slg @ Robison Park – Lincoln 138 kV line 2 through Reed, BF @ Robison Park
Loss of: Robison_Park-Milan, Robison_Park-Auburn, Robison_Park-Lockwood.
4c. line-trip @ Robison Park – Lincoln 138 kV line 2 through Reed

---

5a. 3ph @ Robison Park – Industrial Park 138 kV line through Summit
5b. slg @ Robison Park – Industrial Park 138 kV line through Summit, BF @ Robison Park
Loss of: Robison_Park-Lincoln, Robison_Park-Guardian, Robison_Park-Albion
5c. line-trip @ Robison Park – Industrial Park 138 kV line through Summit

---

6a. 3ph @ Robison Park – Albion 138 kV line through Huntertown
6b. slg @ Robison Park – Albion 138 kV line through Huntertown, BF @ Robison Park
Loss of: Robison_Park-Lincoln, Robison_Park-Guardian, Robison_Park-Industrial Park
6c. line-trip @ Robison Park – Albion 138 kV line through Huntertown

---

7a. 3ph @ Robison Park – Auburn 138 kV line through County
7b. slg @ Robison Park – Auburn 138 kV line through County, BF @ Robison Park

Loss of: Robison_Park-Milan, Robison Park-Lincoln_2, Robison_Park-Lockwood
7c. line-trip @ Robison Park – Auburn 138 kV line through County

---

8a. 3ph @ Robison Park – Lockwood 138 kV line through Grabill
8b. slg @ Robison Park – Lockwood 138 kV line through Grabill, BF @ Robison Park
Loss of: Robison_Park-Milan, Robison Park-Lincoln_2, Robison_Park-Auburn
8c. line-trip @ Robison Park – Lockwood 138 kV line through Grabill

---

9a. 3ph @ R49 – Haviland 138 kV line
9c. line-trip @ R49 – Haviland 138 kV line

10a. 3ph @ Haviland - East Lima 138kV
10b. slg @ Haviland – East Lima 138 kV line, BF @ Haviland
Loss of: Haviland substation.
10c. line-trip @ Haviland – East Lima 138kV line,

11a. 3ph @ Haviland Transformer 138/69 kV line

12a. 3ph @ East Lima – West Lima 138 KV line
$12b_B$. slg @ East Lima – West Lima 138 kV line, BF @ East Lima
Loss of: East Lima 345/138kV transformer (2A&2B).
$12b_{B2}$. slg @ East Lima – West Lima 138 KV line, BF @ East Lima
Loss of: East Lima-Sterling.
12c. line-trip @ East Lima – West Lima 138 KV line

13a. 3ph @ East Lima – Thayer Road 138 KV line
$13b_{E2}$. slg @ East Lima – Thayer Road 138 kV line, BF @ East Lima
Loss of: East Lima-East_Leipsic.
13c. line-trip @ East Lima – Thayer Road 138 KV line

14a. 3ph @ East Lima – South Kenton 138 KV line
$14b_{E1}$. slg @ East Lima – South Kenton 138 kV line, BF @ East Lima
14c. line-trip @ East Lima – South Kenton 138 KV line

15a. 3ph @ East Lima – RockHill 138 KV line
$15b_D$. slg @ East Lima – RockHill 138 KV line, BF @ East Lima
Loss of: East Lima-Liberty
$15b_{D2}$. slg @ East Lima – RockHill 138 KV line, BF @ East Lima
Loss of: East Lima-Sterling
15c. line-trip @ East Lima – RockHill 138 KV line

16a. 3ph @ East Lima – Ford Lima 138 KV line
$16b_C$. slg @ East Lima – Ford Lima 138 KV line, BF @ East Lima
Loss of: East Lima 345/138kV transformer (1).
$16b_{C2}$. slg @ East Lima – Ford Lima 138 KV line, BF @ East Lima
Loss of: East Lima-Sterling
16c. line-trip @ East Lima – Ford Lima 138 KV line

17a. 3ph @ East Lima – East Leipsic 138 KV line
17c. line-trip @ East Lima – East Leipsic 138 KV line

18a. 3ph @ East Lima – North Findlay 138 KV line
$18b_{A}$. slg @ East Lima – North Findlay 138 KV line, BF @ East Lima
Loss of: East Lima-Haviland
$18b_{A1}$. slg @ East Lima – North Findlay 138 KV line, BF @ East Lima
Loss of: East Lima-South Kenton
18c. line-trip @ East Lima – North Findlay 138 KV line

19a. 3ph @ East Lima – New Liberty 138 KV line,
$19b_{D}$. slg @ East Lima –New Liberty 138 KV line, BF @ East Lima
Loss of: East Lima-RockHill
19_{D1}. slg @ East Lima – New Liberty 138 KV line, BF @ East Lima
Loss of: East Lima-South Kenton
19c. line-trip @ East Lima – New Liberty 138 KV line

20a. 3ph @ East Lima – Fostoria Central 345 KV line
20c. line-trip @ East Lima – Fostoria Central 345 KV line

21a. 3ph @ East Lima – South West Lima 345 KV line
21c. line-trip @ East Lima – South West Lima 345 KV line

22a. 3ph @ East Lima – Marysville 345 KV line
22c. line-trip @ East Lima – Marysville 345 KV line

23a. 3ph @ East Lima – R.P Mone 345 KV line
23c. line-trip @ East Lima – Marysville 345 KV line

24a. 3ph @ Robison Park – Argent 345 kV line
24c. line-trip @ Robison Park – Argent 345 kV line

25a. 3ph @ Robison Park – Collingwood 345 kV line
25c. line-trip @ Robison Park – Collingwood 345 kV line

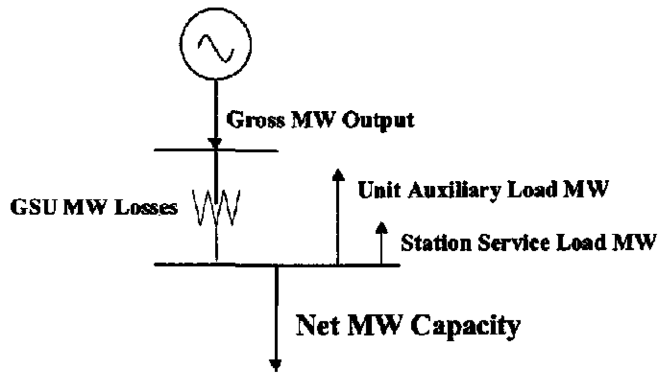
26a. 3ph @ Robison Park – Allen 345 kV line
26c. line-trip @ Robison Park – Allen 345 kV line

27a. 3ph @ Robison Park – Convoy 345 kV line
27c. line-trip @ Robison Park – Convoy 345 kV line

28a. 3ph @ Robison Park Transformer 345/138 kV

Attachment #2

Unit Capability Data



Net MW Capacity = (Gross MW Output - GSU MW Losses* – Unit Auxiliary Load MW - Station Service Load MW)

Queue Letter/Position/Unit ID: ______________________ R49

Primary Fuel Type: ______________________ Wind /Suzlon S88 2.1 MW

Maximum Summer (92° F ambient air temp.) Net MW Output**: ___ 151/2.1 per turbine

Maximum Summer (92° F ambient air temp.) Gross MW Output:____ 151/2.1 per turbine

Minimum Summer (92° F ambient air temp.) Gross MW Output: ______________ 0

Maximum Winter (30° F ambient air temp.) Gross MW Output: _____ 151/2.1 per turbine

Minimum Winter (30° F ambient air temp.) Gross MW Output: ______________ 0

Gross Reactive Power Capability at Maximum Gross MW Output – Please include Reactive Capability Curve (Leading and Lagging): ______________________N/A

Individual Unit Auxiliary Load at Maximum Summer MW Output (MW/MVAR): _N/A

Individual Unit Auxiliary Load at Minimum Summer MW Output (MW/MVAR): __N/A

Individual Unit Auxiliary Load at Maximum Winter MW Output (MW/MVAR): ___N/A

Individual Unit Auxiliary Load at Minimum Winter MW Output (MW/MVAR): ___N/A

Station Service Load (MW/MVAR): ______________________N/A

* GSU losses are expected to be minimal.

** Your project's declared MW, as first submitted in Attachment N, and later confirmed or modified by the Impact Study Agreement, should be based on either the 92° F Ambient Air Temperature rating of the unit(s) or, if less, the declared Capacity rating of your project.

Unit Generator Dynamics Data

Queue Letter/Position/Unit ID: ______ R49

MVA Base (upon which all reactances, resistance and inertia are calculated): ______ 2.283

Nominal Power Factor: ______ N/A

Terminal Voltage (kV): ______ 0.6

Unsaturated Reactances (on MVA Base)

- Direct Axis Synchronous Reactance, $X_{d(i)}$: ______ N/A
- Direct Axis Transient Reactance, X'd(i): ______ N/A
- Direct Axis Sub-transient Reactance, X"d(i): ______ N/A
- Quadrature Axis Synchronous Reactance, Xq(i): ______ N/A
- Quadrature Axis Transient Reactance, X'q(i): ______ N/A
- Quadrature Axis Sub-transient Reactance, X"q(i): ______ N/A
- Stator Leakage Reactance, Xl: ______ N/A
- Negative Sequence Reactance, X2(i): ______ N/A
- Zero Sequence Reactance, X0: ______ N/A

Saturated Sub-transient Reactance, X"d(v) (on MVA Base): ______ N/A

Armature Resistance, Ra (on MVA Base): ______ N/A

Time Constants (seconds)

- Direct Axis Transient Open Circuit, T'_{do}: ______ N/A
- Direct Axis Sub-transient Open Circuit, T''_{do}: ______ N/A
- Quadrature Axis Transient Open Circuit, T'_{qo}: ______ N/A
- Quadrature Axis Sub-transient Open Circuit, T''_{qo}: ______ N/A
- Inertia, H (kW-sec/kVA, on KVA Base): ______ N/A

Speed Damping, D: ______ N/A

Saturation Values at Per-Unit Voltage [S(1.0), S(1.2)]: ______ N/A

Units utilize a Generator model

Unit GSU Data

Queue Letter/Position/Unit ID:_______________________________ R49 (72 GSU)

Generator Step-up Transformer MVA Base: ______________________________2.5

Generator Step-up Transformer Impedance (R+jX, or %, on transformer MVA Base): _j0.0319

Generator Step-up Transformer Reactance-to-Resistance Ration (X/R): __________10/1

Generator Step-up Transformer Rating (MVA):____________________________2.5

Generator Step-up Transformer Low-side Voltage (kV):______________________0.6

Generator Step-up Transformer High-side Voltage (kV):_____________________34.5

Generator Step-up Transformer Off-nominal Turns Ratio:____________________N/A

Generator Step-up Transformer Number of Taps and Step Size: _______________N/A

Main Transformer Data

Queue Letter/Position/Unit ID:______________________R49 (1 Main Transformer)

Generator Step-up Transformer MVA Base: _____________________________ 100

Generator Step-up Transformer Impedance (R+jX, or %, on transformer MVA Base): __ 9.89%

Generator Step-up Transformer Reactance-to-Resistance Ration (X/R): __________40/1

Generator Step-up Transformer Rating (MVA):____________________________ 160

Generator Step-up Transformer H-side Voltage (kV): _______________________ 138

Generator Step-up Transformer X-side Voltage (kV): _______________________34.5

Generator Step-up Transformer Off-nominal Turns Ratio:____________________N/A

Generator Step-up Transformer Number of Taps and Step Size: _______________N/A

Attachment #3

All the control systems were updated according to the developer's specification; these updates are shown in Dynamic Data Format.

97689 'USRMDL' 1 'S88001' 1 1 11 79 4 32
20 0 1 1 1 1 1 1 1 1 1 0.0053 0.1042 5.0556 0.0066 0.1097 2.8763 4.1622 5.6849
71.3826 0.3 0.476 0.03 0.1697 0.0135 1.36 1.22 0.15 150.0 25.0 1850 150.0 25.0
1820 37.0 -2.0 88.0 0.10 10.0 -10.0 18.0 1.225 9999 9999 0 9999 9999 0
0.90 60.00 0.80 2.80 0.60 1.60 0.40 0.70 0.15 0.08 1.15 60.00 1.20 0.08 0.95 0.20
1.05 0.20 0.90 1.10 0.00 1.00 0.00 1.00 0.10 1.00 0.20 1.00 0.30 1.00 0.40 1.00
0.50 1.00 0.60 0.75 0.70 0.50 0.80 0.25 0.90 0.00 /R49_Suzlon

Attachment #4

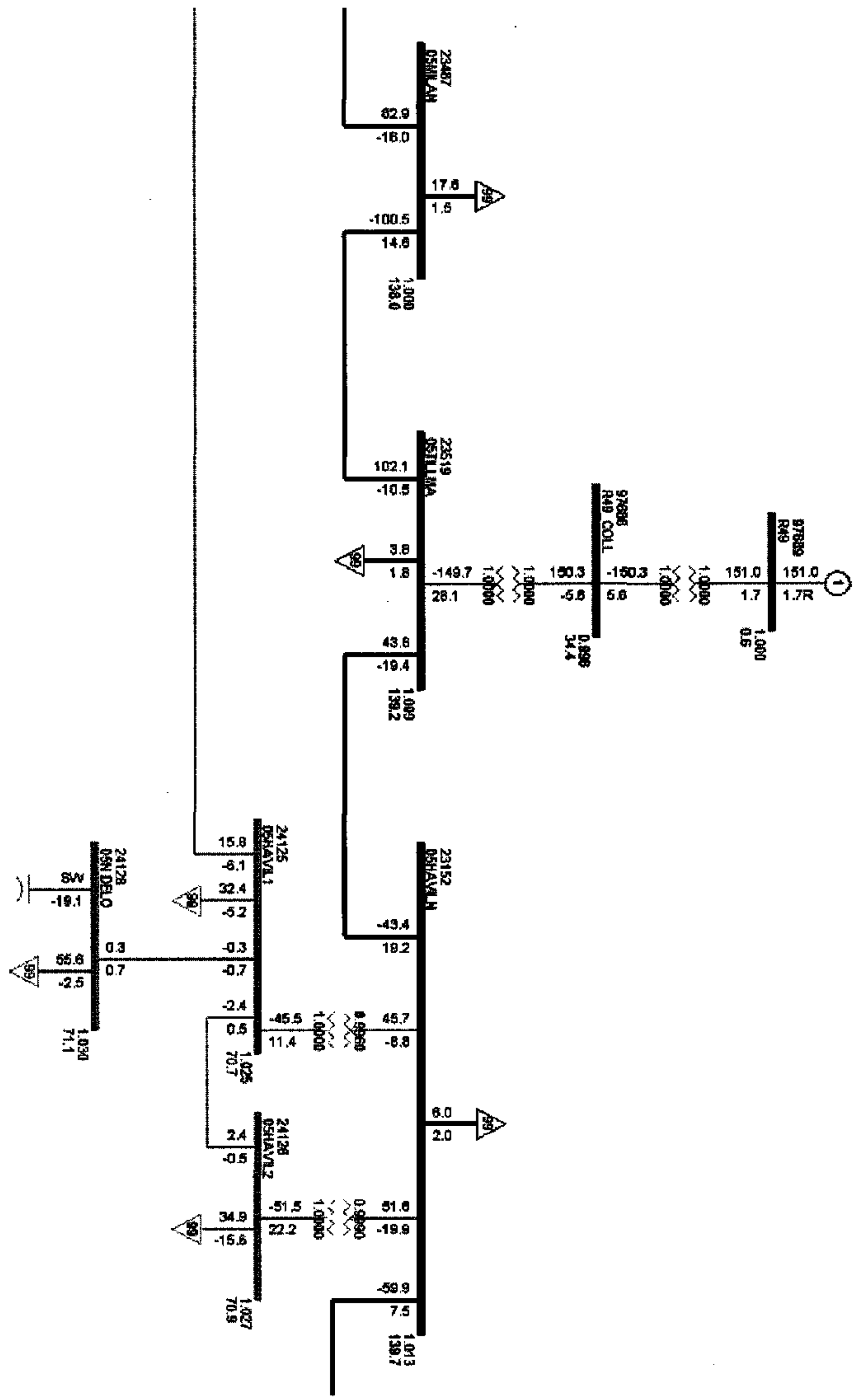


EXHIBIT E

Feasibility Study

#R49 – Haviland-Milan 138kV
Generation Interconnection

This analysis was completed to assess the reliability impact for a new generator interconnecting to the PJM system as a capacity resource.

Local Impacts

The impact of the proposed generating facility on the AEP System was assessed for adherence with applicable reliability criteria. AEP planning criteria require that the transmission system meet single contingency performance criteria in accordance with the AEP FERC Form 715. Therefore, this criterion was used to assess the impact of the proposed facility on the AEP System. The Horizon project was studied as a 150 MW net capacity consistent with the interconnection application. The results are summarized below.

Normal System (2009 Summer Conditions)

- No problems identified.

Single Contingency (2009 Summer Conditions)

- Outage of the Haviland - R49 Ohio West 138 kV circuit overloads the Tillman 138/34.5 kV transformer to 109% of its summer rating.

Short Circuit Analysis

- No problems identified.

Stability Analysis

- Stability studies were not performed as part of this Feasibility Study and are not normally performed as part of a Feasibility Study effort. The stability assessments are part of the System Impact Study. Based upon the results of this future System Impact Study, the extent of system upgrades could change and the associated costs could be significantly different.

Local Upgrades

To maintain appropriate levels of reliability and mitigate the single contingency problems resulting from the additional generation identified in this study, the following system improvements are required:

- Replace 138/34.5 kV transformer at Tillman Station with a 30 MVA unit. Install high-side circuit switcher and associated equipment.
  Estimated Cost (2007 Dollars): **$1,000,000**

Total Local Upgrades Cost*: **$1,000,000**

*The estimates are preliminary in nature, as they were determined without the benefit of detailed engineering studies. Final estimates will require an on-site review and coordination to determine final construction requirements. It will take approximately one year after obtaining the authorization to construct the facilities as outlined above.

Reactive Requirements

PJM requires a power factor correction to 95% lead/lag at the point of interconnection for wind generating facilities. It is expected that Horizon will adhere to this standard.

Network Impacts

The #R49 project proposes a total of 150 MW (30 MW Capacity) at a tap of the Haviland-Milan 138 kV line. Project #R49 was evaluated for compliance with reliability criteria for summer peak conditions in 2011. Potential network impacts were as follows:

Generator Deliverability
No problems were identified

Multiple Facility Contingency
No problems were identified

Short Circuit
No problems identified

Contribution to Previously Identified Overloads

No problems were identified

New System Reinforcements

None

Contribution to Previously Identified System Reinforcements

None

EXHIBIT F

Transportation Study

TRANSPORTATION STUDY

FOR

Timber Road II Wind Farm

Paulding County, Ohio

Owner:
Paulding II Wind Farm LLC
808 Travis Street
Suite 700
Houston, Texas 77002

Published: April 2010

Prepared By:

FISHERASSOCIATES

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Phone: 585-334-1310
www.fisherassoc.com

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I. Introduction

Fisher Associates, P.E., L.S., P.C. (FA) has been contracted by Paulding Wind II Farm LLC to complete a Transportation Study for the proposed Timber Road II Wind Farm. The project is located in Harrison and Benton Townships in Paulding County, Ohio as shown on the Site Location Map in Figure 1 and the Site Location Aerial Map in Figure 2. This report reviewed the existing local roadway conditions within the study area. The review revealed areas where modifications to the roadway system will be required to accommodate construction activities. Note that the proposed plan is one potential improvement plan, though there may be others that could be feasible.

A. Timber Road II Project Delivery Route

All component delivery traffic is currently assumed to enter the study area from the south on State Route 49 or from the north on County Highway 21. Note that there is the potential that components could come from various sources and directions. Based on the data collected in this study, components arriving on alternate roadways will necessitate improvements similar to those contained herein.

Roadways outside the study area will be evaluated by the hauling company delivering the turbine components prior to construction. This will occur as part of the Special Hauling Permit process. A Special Hauling Permit is required for vehicles and/or loads that exceed the legal maximum dimensions or weights specified by Special Hauling Permit Section of the Ohio Department of Transportation. The *Legal Dimensions and Weight Limits for Highway Vehicles* is included in Appendix B.

B. Construction Vehicles

Construction traffic will consist of standard construction equipment and specialized hauling trucks to deliver the turbine components. Standard construction traffic consists of gravel/dump trucks, concrete trucks, excavation equipment, conventional semi-trailers, transport/tool vehicles and employee vehicles. These standard construction vehicles should not require physical modifications to the roadways to accommodate their presence.

Delivery of the wind turbine components will utilize Over-Size/Over-Weight (OS/OW) trucks to bring the components from the manufacturer to the study area. The OS/OW trucks are special hauling vehicles with unique lengths, widths, heights, and weights depending on the component being transported. These trucks require particular clearances due to their size and turning radii. The actual vehicles used to deliver the turbines varies dependent on the transportation contractor. For this study a minimum inside radius of 150 feet has been used to model intersection modification scenarios. A 150-foot radius is a conservative design standard used when developing improvements for wind power component delivery. The following is a summary of typical wind turbine components with corresponding truck configurations:

Wind Turbine Part	Approx. Component Weight (lbs.)	Comp. Length (ft)	Comp. Height / Dia. (ft)	Comp. Width (ft)	Truck Description	Overall Length (ft)	Overall Height (ft.)	Overall Width (ft.)	Est. Gross Vehicle Wt. (lbs.)
Rotor Blade	14,800	160.8	12.8	7.2	5-Axle Double Drop Stretch	180	14	11'-6"	45,000
Two Blade cage	33,100	141.4	9.7	12.8	5-Axle Double Drop Stretch	180	14	13'-0"	45,000
Base Tower	92,500	48.0	14.1	-	6-Axle Stretch	108	16	13'-6"	150,000
Lower Mid Tower	135,300	56.7	13.3 dia.	--	6-Axle Stretch	113	16	13'-6"	165,000
Mid Tower	105,150	56.8	13.2 dia.	--	6-Axle Stretch	113	16	13'-6"	135,000
Upper Mid Tower	87,000	64.7	13.2 dia.	--	6-Axle Stretch	113	16	13'-6"	120,000
Top Tower	62,600	80.7	13.2 dia.	--	6-Axle Stretch	113	16	13'-6"	95,000
Nacelle	165,400	34.1	13.3	13.1	11-Axle Low Profile	160	16	13'-6"	200,000
Hub Assembly	33,250	13.8	10.8	13.1	8-Axle Stretch	102	15	14'-0"	75,000

All truck configurations are based on previous projects. The truck configurations will need to be finalized after components and hauling company have been selected.

This report determines potential impacts to the existing traffic capacity / patterns and roadway features due to the anticipated construction/delivery traffic. For each impact, proposed mitigation methods are identified to address specific deficiencies due to the additional traffic created during construction and due to the requirements of the OS/OW vehicles.

II. Traffic

This section summarizes the existing conditions and potential impacts to the traffic flow along the delivery routes.

A. Traffic Flow and Capacity

A review of the State and County routes in the study area indicates that all appear to be operating below vehicle capacity. Detailed capacity analysis was not completed for this study; however, field observation of the transportation network did not reveal any locations where traffic flow and/or capacity appeared to create undue delay for the traveling public.

The following table presents the existing available traffic data along several of the roadways that are currently proposed for construction traffic. Note that data was not available for all roadways.

Roadway Name	Lanes	Travel Lane Widths	Shoulder Widths	Surface Type	AADT
SR 49 (between US 24 & SR 111)	2	11'	1' (asphalt) 1' (gravel)	asphalt	2,100
SR 49 (between SR 111 & SR 613)	2	11'	1' (asphalt) 1' (gravel)	asphalt	2,490
SR 49 (between SR 613 & SR 114)	2	11'	1' (asphalt) 1' (gravel)	asphalt	1270
SR 49 (between SR 114 & US 30)	2	11'	1' (asphalt) 1' (gravel)	asphalt	1195
SR 111 (east of SR 49)	2	11.5'	1' (asphalt) 1' (gravel)	asphalt	1430
SR 111 (west of SR 49)	2	11'	1.5' (asphalt) 1' (gravel)	asphalt	710
SR 613	2	10'	1' (asphalt) 1' (gravel)	asphalt	1540
SR 500 (west of SR 49)	2	10'	1' (asphalt) 1' (gravel)	asphalt	550
SR 114 (west of SR 49)	2	11'	1.5' (asphalt) 1' (gravel)	asphalt	230
SR 114 (east of SR 49)	2	11'	1.5' (asphalt) 1' (gravel)	asphalt	540

* US = US Route, SR = State Route, CR = County Route, TR = Township Route
* AADT = Annual Average Daily Traffic.
* Traffic volumes for State routes obtained from the Ohio DOT Paulding County Annual Average Daily Traffic Survey Report dated 2009.

1. During Construction

There will be approximately 10 OS/OW trucks required for each turbine. Depending on the turbine selected for the project, there will be approximately 102-109 turbines. For impact calculation purposes, this study assumes 109 turbines will be required. This equates to a total 1090 OS/OW vehicle trips along with multiple standard construction equipment trips which could include the following:

- Gravel trucks with capacity of approximately 10 cubic yards (cy) per truck and an estimated gross weight of 75,000 pounds (lbs), for access road construction (currently the total length of the access roads is 150,300 feet long and 34 feet wide with gravel 15 inches deep; total of approximately 236,000 to 240,000 trips).
- Concrete trucks for construction of turbine foundations and transformer pads with capacity of approximately 10 cy per truck and an estimated gross weight of 96,000 lbs (total of approximately 40 trips per foundation depending on final design).
- Variety of conventional semi-trailers for delivery of reinforcing steel (two per turbine foundation) and small substation components and interconnection facility material (approximately 218 to 240 trucks).
- Pickup trucks for equipment and tools.
- Trucks and cars for transporting construction workers.

While OS/OW vehicles are traveling along study area and delivery route roadways, the existing traffic may experience minor delays as escort vehicles, flag persons, and/or temporary traffic signals slow or stop traffic to allow the safe passage of the OS/OW vehicles. As the existing traffic volumes are low, local traffic flow should not be significantly impacted by standard construction traffic or during OS/OW load transport.

2. Post Construction

The project will employ approximately 10 to 15 individuals, all of whom may drive separately to the Operation and Maintenance (O&M) building. Some of these personnel will need to visit each turbine location and return to the O&M building. Each turbine typically requires routine maintenance visits once every 3 months, but certain turbines or other project improvements may require periods of more frequent service visits should a problem arise. Such service visits typically involve 1 to 2 pick-up trucks.

Project personnel (or utility company personnel) may also need to service the project substation. Such servicing would likely be carried out on a similar quarterly basis (unless a problem arose) and would involve a similar number of maintenance vehicles.

Based on the preceding information, employee/maintenance traffic is not anticipated to have a significant impact on the local traffic patterns.

B. Projected Traffic Impacts & Proposed Mitigation

Traffic Flow and Capacity

Impact – During construction activities local traffic may experience minor delays due to slow moving vehicles and increased construction related traffic.

Mitigation – No areas appear to warrant immediate installation of measures to mitigate the minor delays that will be experienced by local traffic. The applicant should, in conjunction with the County, State, and local highway departments, establish a traffic/transportation notification protocol to respond to any locations that experience significant traffic flow or capacity issues. The following is a protocol that could be used for the project:

- Prior to construction the applicant will identify one or more construction managers as the primary traffic contact(s) for traffic/transportation concerns that may arise during the construction of the project.
- The Town, County, and State Highway departments will be notified of the primary traffic contact(s).
- All construction personnel will be instructed to watch for traffic/transportation concerns and to contact the primary traffic contact immediately following a traffic/transportation issue.
- The primary traffic contact will call the appropriate Town, County, or State Highway Department immediately following identification of a congestion problem.
- The applicant will consult with all town and county highway departments prior to construction to identify potential traffic congestion areas and to develop potential detours.
- If construction-related congestion occurs, the primary traffic contact will call the appropriate Town, County, or State Highway Department immediately and discuss the implementation of pre-determined detour routes.

III. Transportation Systems

The physical characteristics assessment completed as a part of the study included a review of the roadway widths, drainage structures, bridges, intersection geometry, and roadway alignments. Each bridge or drainage structure found in the field was inventoried for approximate location, type, size, and roadway width at the structure. The structure and road data is included in Figure 3 – Figure 4.

Figure 5 presents the roadways currently proposed for construction traffic. This Construction Route appears to best accommodate construction traffic based on the factors listed above. The following discussion presents the factors and any impacts and mitigation that should be addressed prior to construction.

A. Existing Roadway Conditions

1. Surface Type

Figure 3 presents the Roadway Type and Width. As depicted, the roadways within the study area are primarily paved. Portions of Routes 33, 60, 94, 1, 61, 52, 11 and 27 are stone/gravel/rubbilized pavement while portions of Routes 60, 49, 11 and 5 are grass / dirt. The paved roads in the study area appear to be in good condition and adequate to accommodate general construction activities.

Note that only small portions of the stone / gravel / rubbilized pavement section of Routes 33, 60, 94 and 1 are being considered for construction traffic. These road sections appear adequate for general construction at the time of this report and should be reviewed prior to construction to determine if additional gravel and compaction is necessary.

Small portions of the grass / dirt section of Routes 60 and 5 are being considered for construction traffic. These road sections will need to be improved to accommodate construction traffic.

2. Roadway Width

The approximate roadways widths are presented in Figure 3. A minimum width of 16-feet will be required to accommodate construction traffic. Within the study area, some of the roadways proposed for use by construction vehicles do not meet the minimum width requirement. The bridges in the study area are generally narrower than the roadways and over-width vehicles will likely need to cross the center line to traverse the bridges.

3. Intersections

As shown in the diagrams in Figures 6 - 31, all intersections being used by the OS/OW trucks will need improvements to accommodate the OS/OW vehicles. Figure 5 depicts the anticipated OS/OW travel routes. All turns at intersections will need improvements to accommodate the construction traffic.

Figures 6 - 31 examine each intersection traveled and details the improvements necessary to accommodate the OS/OW vehicles. There does not appear to be significant construction challenges (steep grades, existing structures, significant clearing, etc.) with any of the proposed improvements. Note that the intersections will need to be re-evaluated during final engineering once topographic mapping and final truck configurations are available to determine the optimal solution for each intersection.

4. Weight

The project area roads are not posted with weight limits. There are also no reported structures along these roadways that have posted weight limits.

5. Vertical Curvature

The profile of project roadways will be adequate to accommodate construction traffic with one potential exception. The turns off-from, on-to, and directly over Route 49 may require profile adjustments to accommodate the OS/OW vehicles. The Route 49 intersections will need to be reviewed during final design (after topographic survey is collected) to determine if the OS/OW vehicles will bottom-out at Route 49.

The component delivery transportation route is coming from both the north (US Route 24) and the south (US Route 30) due to the Norfolk Southern rail line traveling through the project area. The OS/OW vehicles will not be able to cross the railroad due to the steep slopes and sharp vertical curve.

6. Height

Based on the OS/OW truck configurations, any locations along the travel routes with a vertical clearance less than 16 feet will need to be adjusted to allow movement. There are no overhead bridges or structures that will prevent truck movement within the project area. Overhead wires are located throughout the project area and will need to be temporarily raised to accommodate construction traffic.

The applicant will coordinate and obtain permits from the utility companies in order to adjust the utility lines crossing the roadways. The actual heights and proposed modifications will be included in the route survey for the Special Hauling Permits from the State. These measurements and verifications will be performed at a later date by the company contracted to deliver project components.

B. Existing Drainage Structures / Bridges

Drainage structures with a span length of greater than 10 feet are considered bridges and referenced as such in this summary. Information regarding bridge structure type and history was obtained from the Ohio Department of Transportation Bridge Management System bridge inspection reports inventory for the SFNs indicated. Information regarding culverts was obtained through field inspection and evaluation.

1. Bridges

There are nine bridge structures that were reviewed for this study that are directly being impacted:

- SFN 6334709 – Township Route 33 over South Creek
- SFN 6334997 – Township Route 33 over North Creek
- SFN 6300227 – State Route 49 over West Fork Ditch
- SFN 6300324 – State Route 49 over South Creek
- SFN 6300251 – State Route 49 over Graham-Foster Ditch
- SFN 6333419 – County Route 17 over Flatrock Creek
- SFN 6634687 – Township Route 21 over South Creek
- SFN 6333362 – Township Route 21 over West Woods Ditch
- SFN 6334784 – Township Route 21 over Wildcat Creek

The locations of these bridges and all other bridges in the study area can be found in Figure 4. The bridges will all carry loads over water. The bridge reports were reviewed to determine if each could accommodate the OS/OW vehicles. The bridges are safe for legal loads, do not have posted weight restrictions, and also have sufficient horizontal and vertical clearances to accommodate the OS/OW trucks. During final design of the project improvements, and after the turbine manufacturer and haul company have been selected, the bridges that will be part of the delivery route will be reevaluated with the actual axle configuration and loadings to determine if improvements are necessary.

Note that the bridges listed here are currently the only bridges proposed to experience construction related traffic. If the transportation route changes then other bridges in the area will be evaluated. The following is a summary of the current bridge conditions:

SFN Number / Route	Sufficiency Rating	Bridge Roadway Width (ft)	Design Load/Year Rated	Operating Rating (tons)	Inventory Rating (tons)	Ohio % of Legal Load	General Appraisal
6334709 TR 33	62.8	19.5	Unknown 2009	35	21	100	5 Fair
6334997 TR 33	100.0	25'-0"	HS20-44 1979	45	36	150	6 Satisfactory
6300227 SR 49	99.7	44'-0"	HS20-44 1982	45	36	150	8 Very good
6300324 SR 49	99.5	40.0	HS20-44 1993	45	36	150	7 Good
6300251 SR 49	80.3	32'-0"	HS20-44 2002	25	20	150	5 Fair
6333419 CR 17	99.9	28'-0"	HS-20 1990	45	36	150	7 Good
6634687 TR 21	86.0	22.3	Unknown 1993	45	36	150	5 Good
6333362 TR 21	76.5	18'-5"	Unknown 1900	37	27	150	5 Fair
6334784 TR 21	100.0	24'-0"	HS-20 1979	45	36	150	6 Satisfactory

* The Sufficiency Rating is on a scale of 1 to 100 percent, where 100 percent would represent an entirely sufficient bridge and zero percent would represent an entirely insufficient bridge.

2. Culverts

The Culvert Type & Diameter map, Figures 4, present the locations of the drainage structures apparent in the field. It is assumed that any culvert with less than 2 feet of cover may be susceptible to damage during construction activities. These locations will be further analyzed during final engineering to determine if improvements are necessary prior to construction of the turbines.

C. Projected Physical Impacts & Proposed Mitigation

Roadway Type – Paved & Stone/Gravel

Impact – The paved and stone/gravel surface conditions generally appear adequate to accommodate construction activities. These roads should be monitored during construction for pot-holing and rubbilizing of the pavement to ensure they are safe for general construction and local roadway traffic. The amount, type, and weight of both general construction traffic (gravel/concrete trucks, semi-trailers, etc.) and OS/OW vehicles will likely damage the surface condition of the roadways in the study area.

Mitigation – After completion of construction activities, the applicant should repair the roadway surface to preconstruction conditions. A roadway condition video survey can be completed prior to construction to document the existing surface conditions. The applicant will need to repair the roadways using the appropriate treatment (oil & stone, hot or cold mix asphalt) to re-establish the preconstruction surface conditions.

Roadway Type – Grass

Impact – The grass roadways will not be adequate for construction traffic. The surface type will be too soft to accommodate the volume and weight of construction traffic.

Mitigation – The grass roadways will need to be replaced with gravel roadways. The gravel roadways will need to be similar to the turbine access roads being constructed for the project. Post-construction, and as approved by the local municipality, these roads can be left in place as an upgrade to better accommodate local traffic.

Roadway Width

Impact – Routes 11, 5, and portions of Routes 60 and 94 will need to be widened to accommodate construction traffic.

Mitigation – During construction, the roadway should be widened to a minimum of 16-feet. These roadways will need to be similar to the turbine access roads being constructed for the project. If there are ditches, driveways, or culverts along roadway they will be reestablished or extended as needed. If there are utility conflicts along the roadway they will be reestablished with the guidance of the utility company for final location. Post-construction, and as approved by the local municipality, these roads can be left in place as an upgrade to better accommodate local traffic.

Intersections

Impact – All intersections used by OS/OW vehicles will need radius improvements to accommodate construction activities (Figures 6 - 31). The intersection impacts include:

- Clearing and grubbing of existing vegetation
- Relocating traffic signs, fences, and utility poles
- Grading of the terrain to accommodate the improvement
- Extension of existing drainage pipes and/or culverts
- Re-establishment of ditch line (if necessary)
- Construction of a suitable roadway surface to carry the construction traffic (based on the existing geotechnical conditions)

Mitigation – Each public roadway intersection will require a detailed engineering plan to quantify and provide a solution for the impacts listed above. The intersection radii will generally need to be improved to 150-feet. This study provided a preliminary engineering solution that can be completed, based on observed field conditions, to accommodate the OS/OW vehicles. See Figures 6 - 31 for the preliminary recommendations. After construction of the project, the applicant should coordinate with the State, County, and local highway departments to determine if the radii improvements will need to be returned to preconstruction conditions or left for future use by the Town.

Weight

Impact – Drainage pipes/culverts along the construction route may have 2-feet or less of cover. These culverts may be crushed or deformed by construction activities causing construction delays, delays to local motorists, and damage to construction vehicles and/or turbine components.

Mitigation – Each pipe should be evaluated during final design of the roadway improvements to determine the amount of cover over the pipe and if improvements will be necessary to accommodate the construction activities. Improvements may include:

- Additional cover over pipes,
- Reinforce pipes with bracing,
- Use bridge jumpers to clear pipes,
- Use bridge plates to distribute vehicle loading,
- Replace pipes prior to construction,
- Replace pipes during

Impact – The bridges in the project area proposed for construction traffic are safe for legal axle loads and do not have posted weight restrictions. All have has sufficient horizontal and vertical clearances to accommodate the OS/OW trucks.

Mitigation – Based on the bridge study findings, it does not appear that the bridges will require mitigation for weight concerns. The bridges have a Sufficiency Rating from 62.8 - 100 and are rated for 100 - 150 percent of the Ohio Legal Load. The structures should be reviewed during final design of the project improvements to verify no additional mitigation will be required. Note that the Ohio Department of Transportation will be required to review and approve all bridges to be used for construction during the Special Hauling Permit application process.

Vertical Curvature

Impact – The Route 49 intersections within the study area may need minor profile adjustments to accommodate the OS/OW vehicles.

Mitigation – Gravel fill can be placed on the approaches to Route 49 to smooth out the transition onto the side roads. This work can be completed in conjunction with the turning radius improvements discussed above. Post-construction, the fill can be removed to restore the pre-construction conditions.

Height

Impact – Overhead wires that do not meet OS/OW vehicle clearances will need to be raised to accommodate OS/OW vehicles.

Mitigation – The applicant will be required to coordinate with the utility companies to obtain the necessary permits to raise wires. The utility companies will assist in the final solution at each location once final engineering plans and permit applications have been submitted. Solutions include permanently raising wires, temporarily raising wires for the duration of construction, or temporarily raising each wire as a vehicle passes under.

IV. Conclusion

This study has identified the transportation related impacts that may be experienced during construction of the Timber Road II Wind Farm. Mitigation measures have been provided to accommodate the construction traffic and minimize impacts to the traveling public. Final engineering design will be required prior to construction activities to ensure all transportation related impacts have been addressed to the satisfaction of the State and the local highway departments.

APPENDIX A

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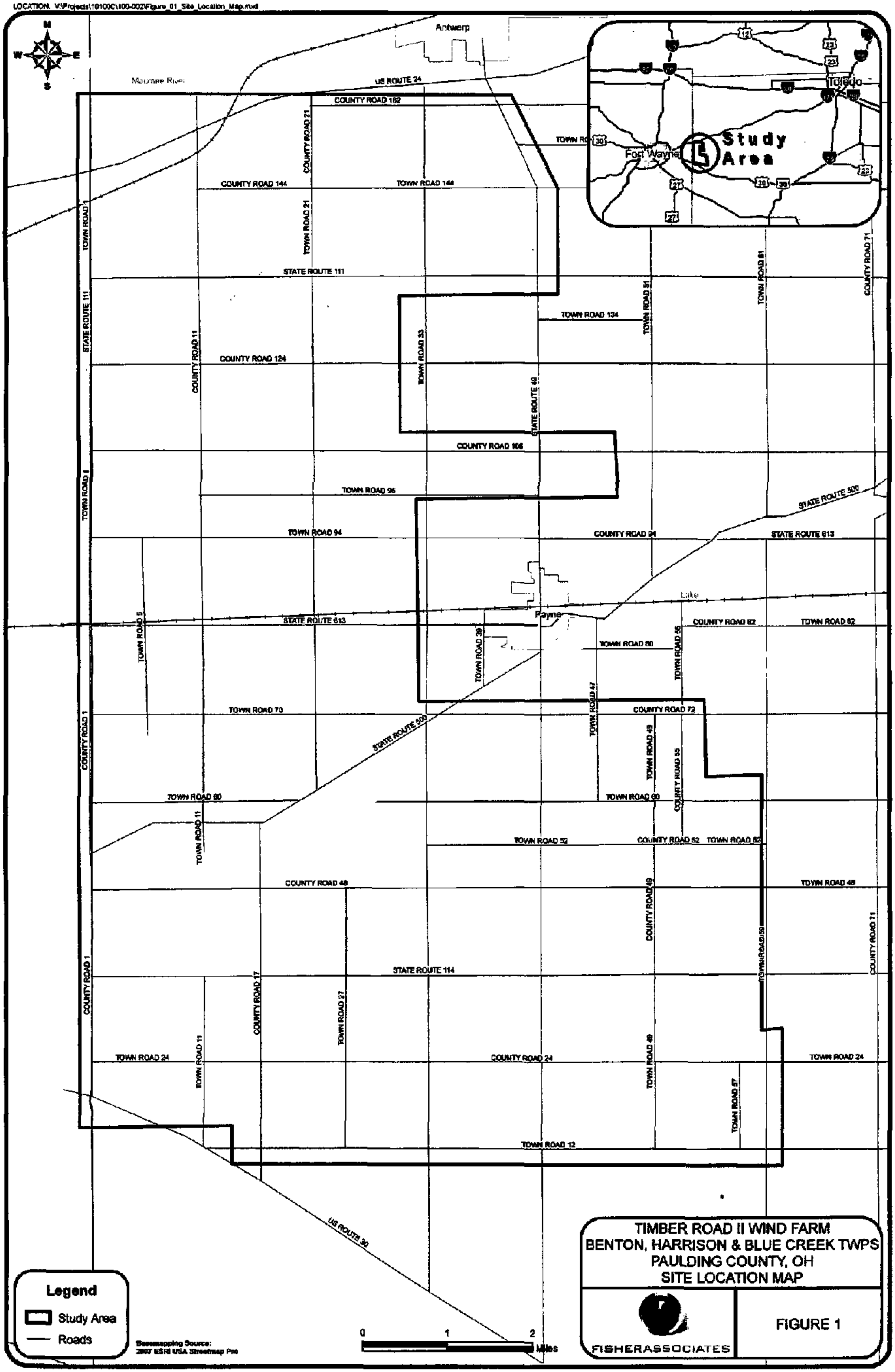

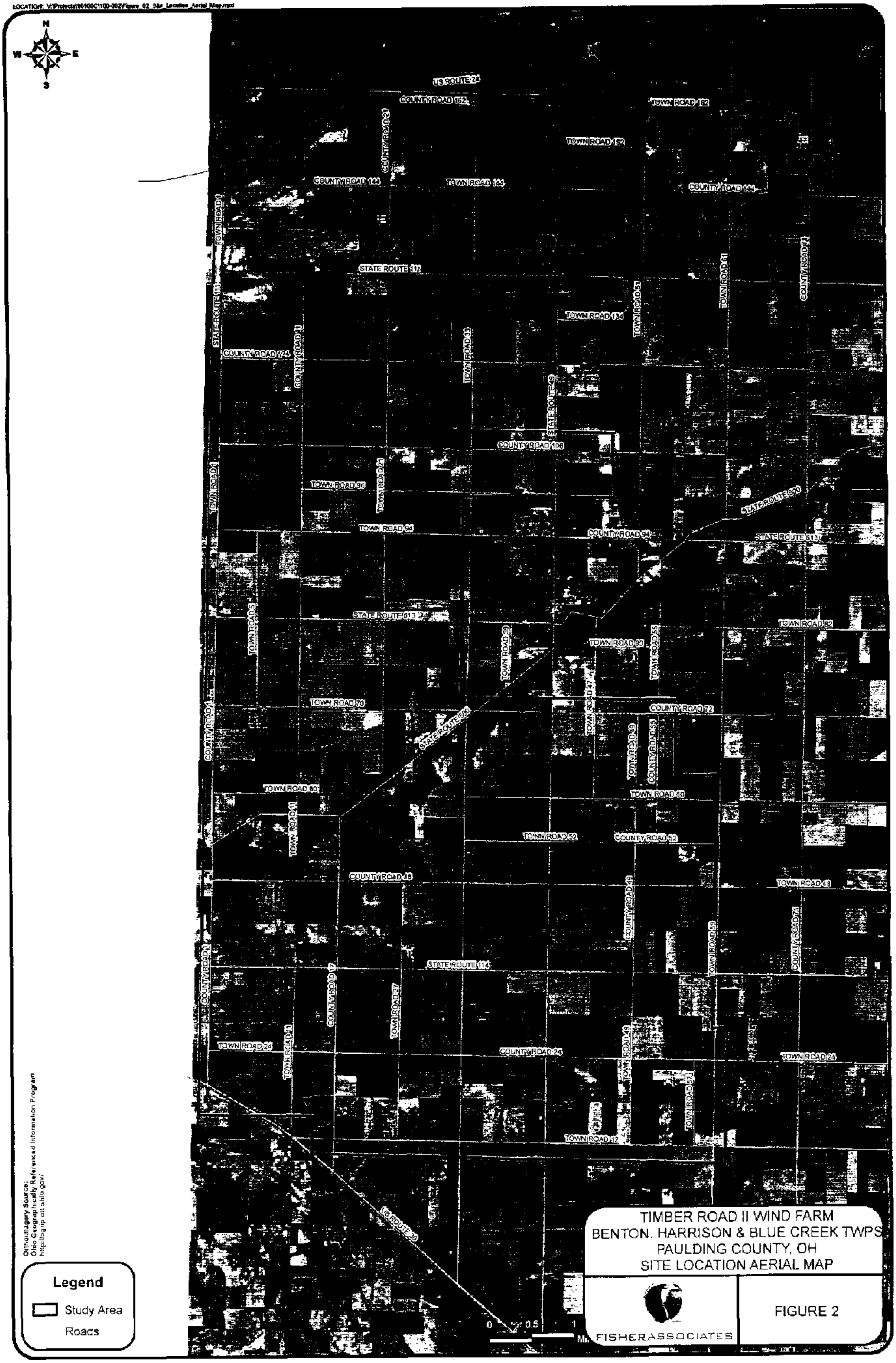
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Legend
Study Area
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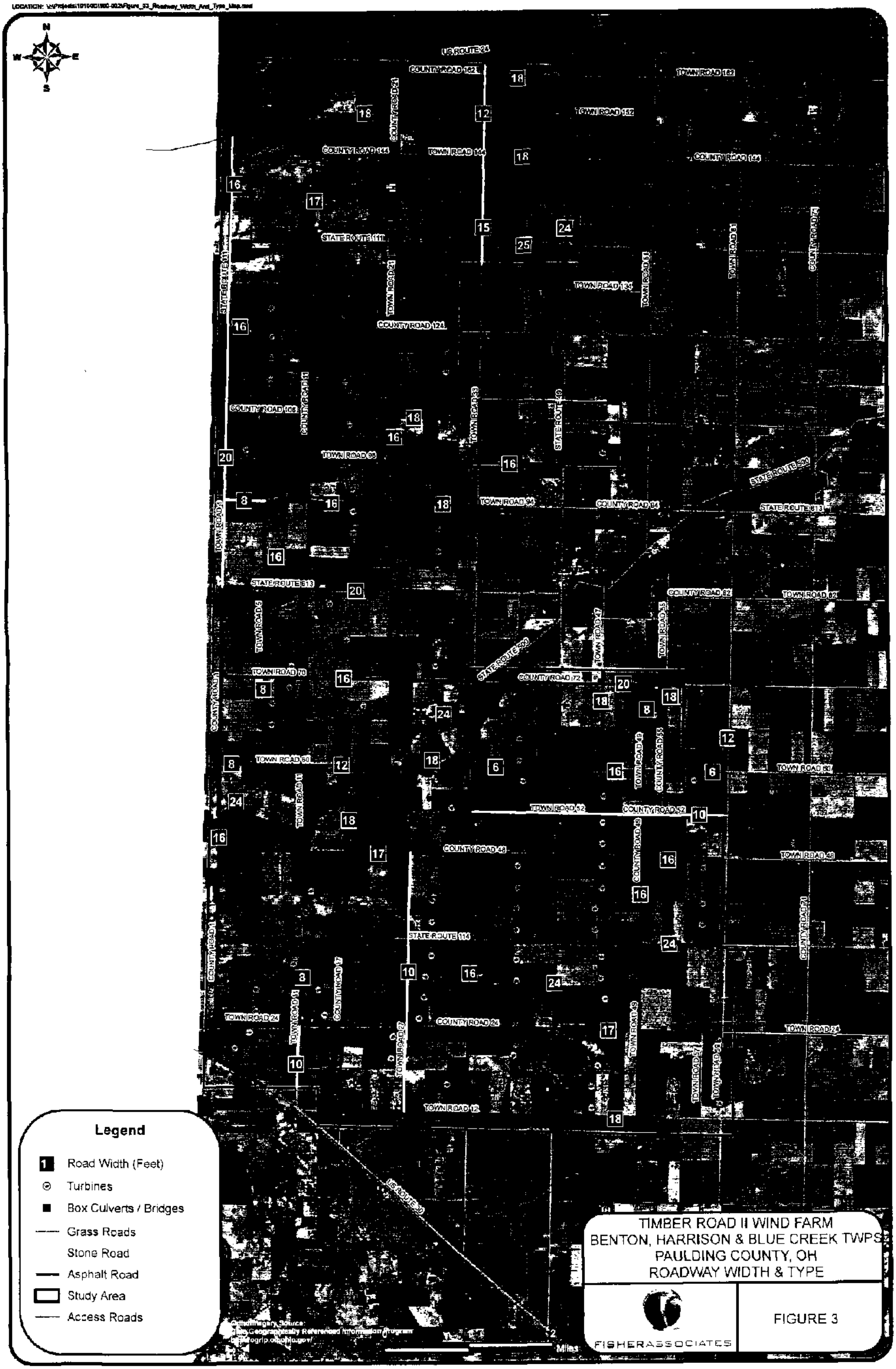
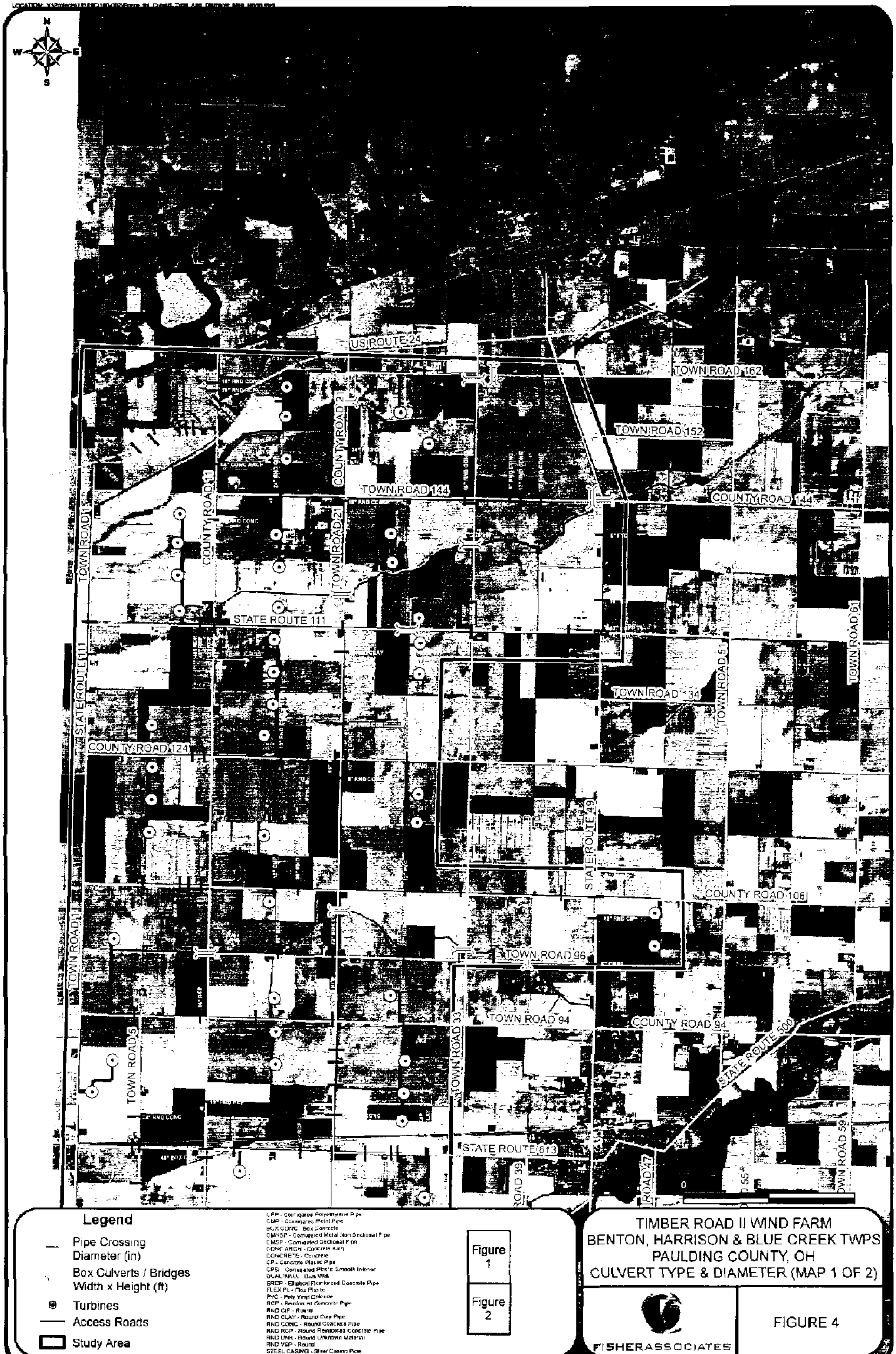
TIMBER ROAD II WIND FARM
BENTON, HARRISON & BLUE CREEK TWPS
PAULDING COUNTY, OH
SITE LOCATION AERIAL MAP
FISHERASSOCIATES
FIGURE 2

LOCATION: V:\Projects\10100\C\100-002\Figure_03_Roadway_Width_And_Type_Map.mxd





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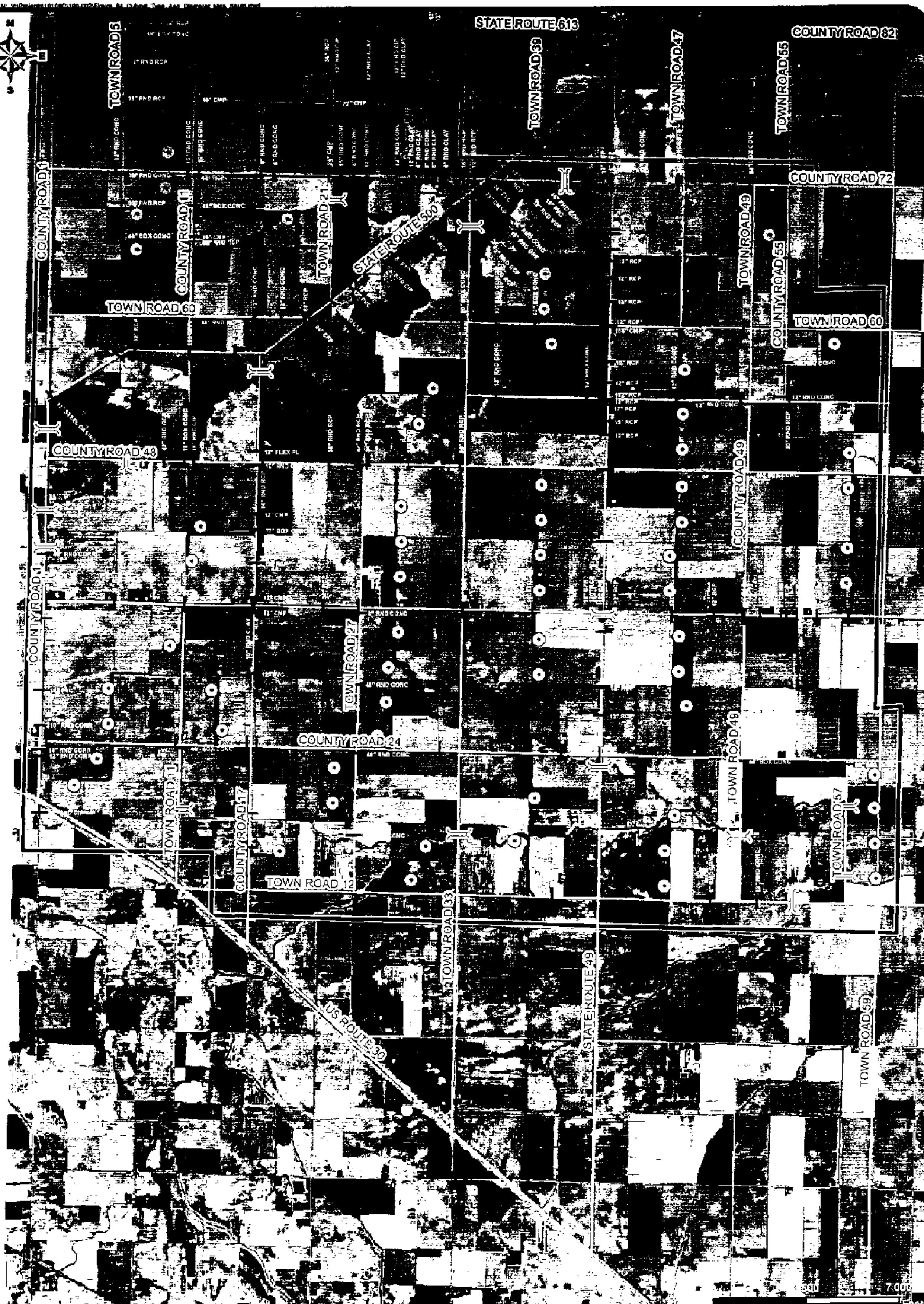
TOWN ROAD 33
STATE ROUTE 500
STATE ROUTE 613
ROAD 39
ROAD 47
ROAD 59
Legend
Pipe Crossing Diameter (in)
Box Culverts / Bridges Width x Height (ft)
Turbines
Access Roads
Study Area
CMP - Corrugated Metal Pipe
CMNSP - Corrugated Metal Non Sectional Pipe
CONCRETE - Concrete
ERCP - Elliptical Reinforced Concrete Pipe
RCP - Reinforced Concrete Pipe
RND CLAY - Round Clay Pipe
RND CONC - Round Concrete Pipe
RND RCP - Round Reinforced Concrete Pipe
RND VSP - Round
Figure 1
Figure 2
TIMBER ROAD II WIND FARM
BENTON, HARRISON & BLUE CREEK TWPS
PAULDING COUNTY, OH
CULVERT TYPE & DIAMETER (MAP 1 OF 2)
FISHERASSOCIATES
FIGURE 4



Legend

Pipe Crossing Diameter (in)
Box Culverts / Bridges Width x Height (ft)
Turbines
Access Roads
Study Area

CPP - Corrugated Polyethylene Pipe
CMP - Corrugated Metal Pipe
BOX CONC - Box Concrete
CMNSP - Corrugated Metal Non Sectional Pipe
CMSP - Corrugated Sectional Pipe
CONC ARCH - Concrete Arch
CONCRETE - Concrete
CP - Concrete Plastic Pipe
CPSI - Corrugated Plastic Smooth Interior
DUAL WALL - Dual Wall
ERCP - Elliptical Reinforced Concrete Pipe
FLEX PL - Flex Plastic
PVC - Poly Vinyl Chloride
RCP - Reinforced Concrete Pipe
RND CIP - Round
RND CLAY - Round Clay Pipe
RND CONC - Round Concrete Pipe
RND RCP - Round Reinforced Concrete Pipe
RND UNK - Round Unknown Material
RND VGP - Round
STEEL CASING - Steel Casing Pipe

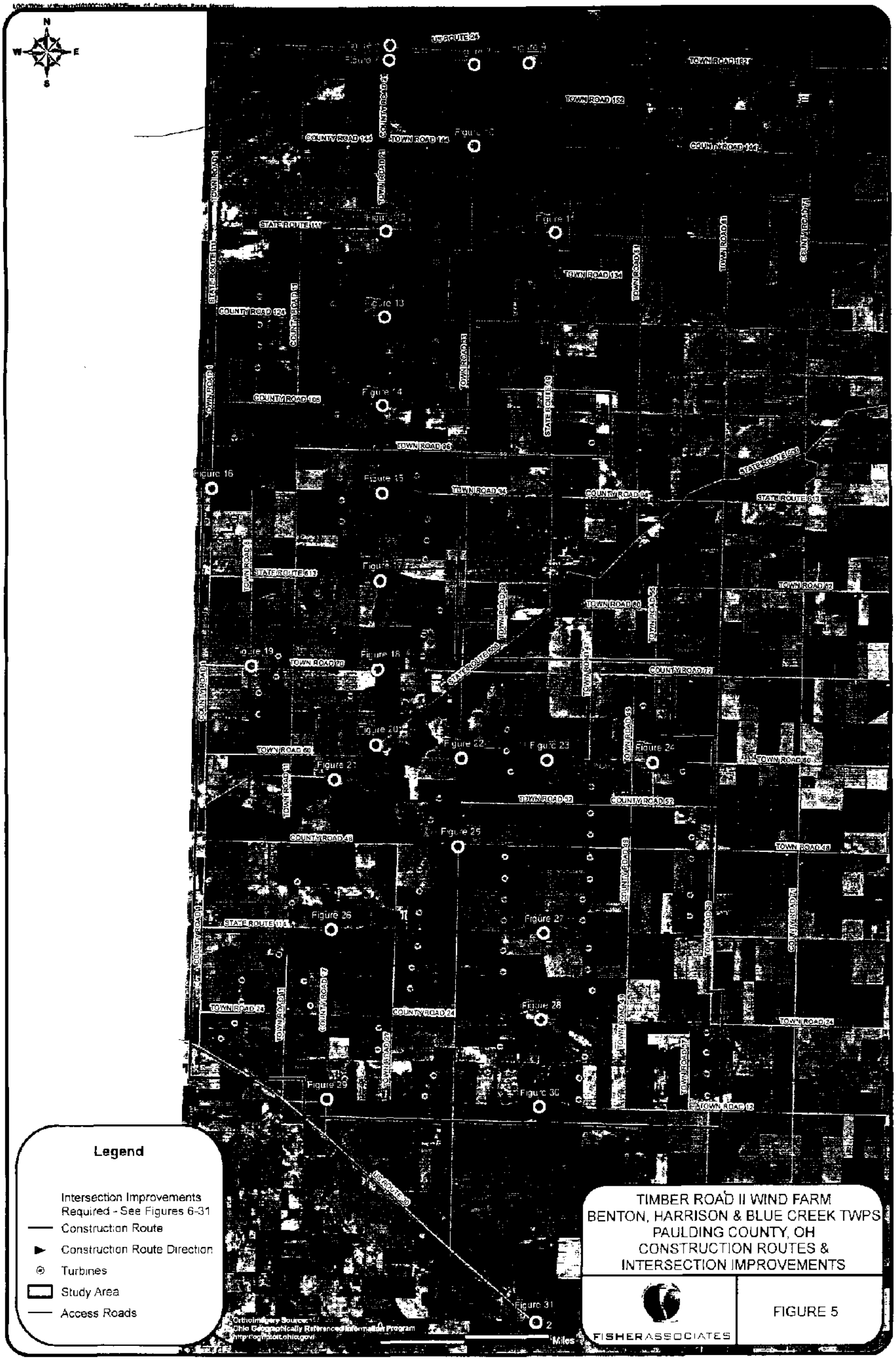
Figure 1

Figure 2

TIMBER ROAD II WIND FARM
BENTON, HARRISON & BLUE CREEK TWPS
PAULDING COUNTY, OH
CULVERT TYPE & DIAMETER (MAP 2 OF 2)

FISHERASSOCIATES

FIGURE 4



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Intersection Improvements Required - See Figures 6-31
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Construction Route Direction
Turbines
Study Area
Access Roads
Miles
TIMBER ROAD II WIND FARM
BENTON, HARRISON & BLUE CREEK TWPS
PAULDING COUNTY, OH
CONSTRUCTION ROUTES &
INTERSECTION IMPROVEMENTS
FISHER ASSOCIATES
FIGURE 5

FIGURE 6
US ROUTE 24 / COUNTY HWY 21

FISHER
135 Calkins Road, Rochester, NY 14623
Phone: 585-334-1310


COUNTY HWY 33
COUNTY HWY 162
9' LANE APPROACHING
92'±
97'±
LANE RECEIVING
TWP HWY 33
FIGURE 8


STATE ROUTE 49
TWP HWY 162
9' LANE APPROACHING
39'±
36'±
TWP HWY 162
TEMPORARY WIDENING
- REMOVE AND RESET TRAFFIC SIGNS
- CLEARING AND GRUBBING
- RELOCATE UTILITY POLE
- FILL AS REQUIRED WITH COMPACTED GRAVEL
STATE ROUTE 49
11' LANE RECEIVING
FISHER
135 Calkins Road, Rochester, NY 14623
Phone: 585-334-1310
FIGURE 9
STATE ROUTE 49 / TWP HWY 162

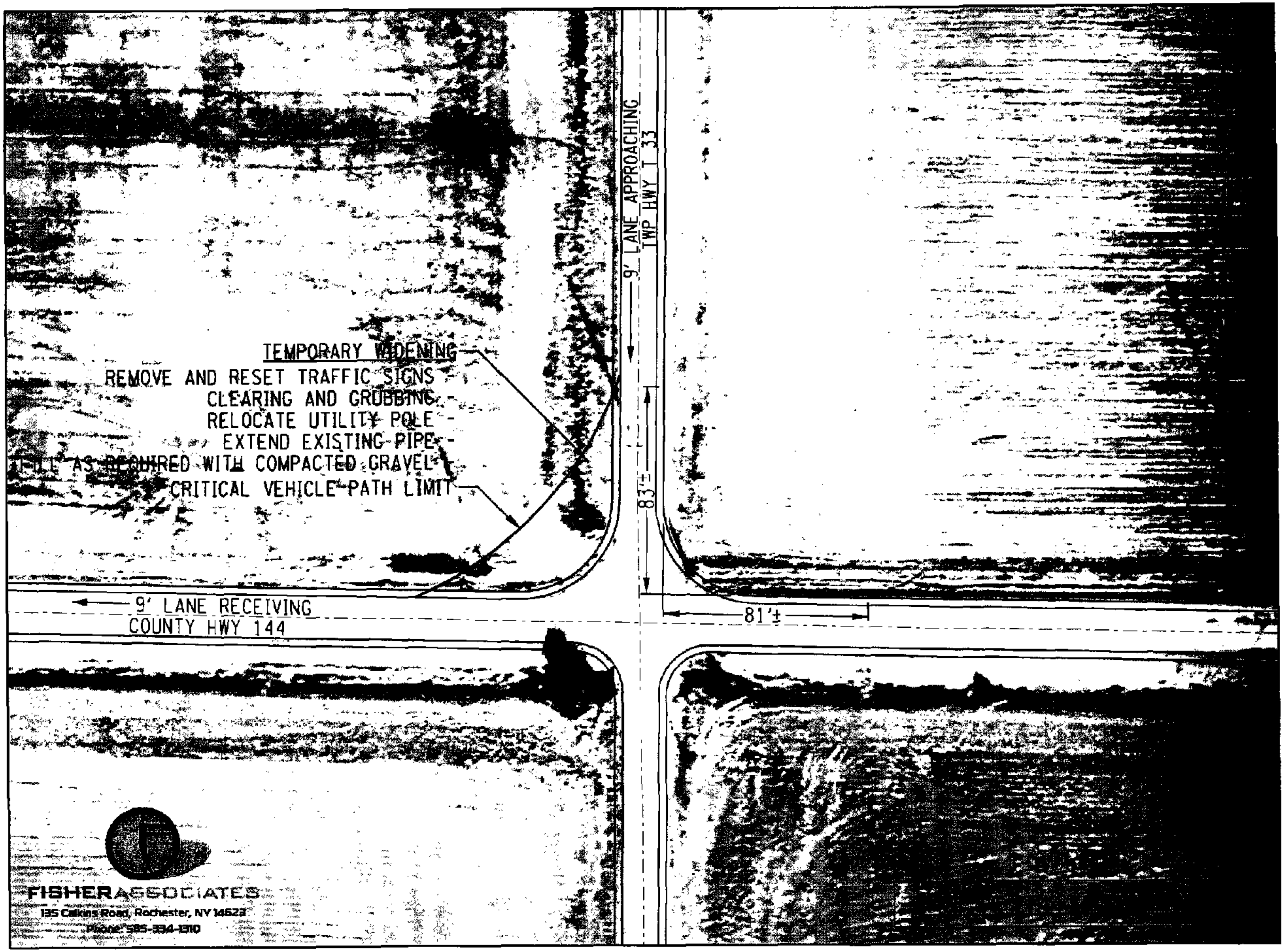
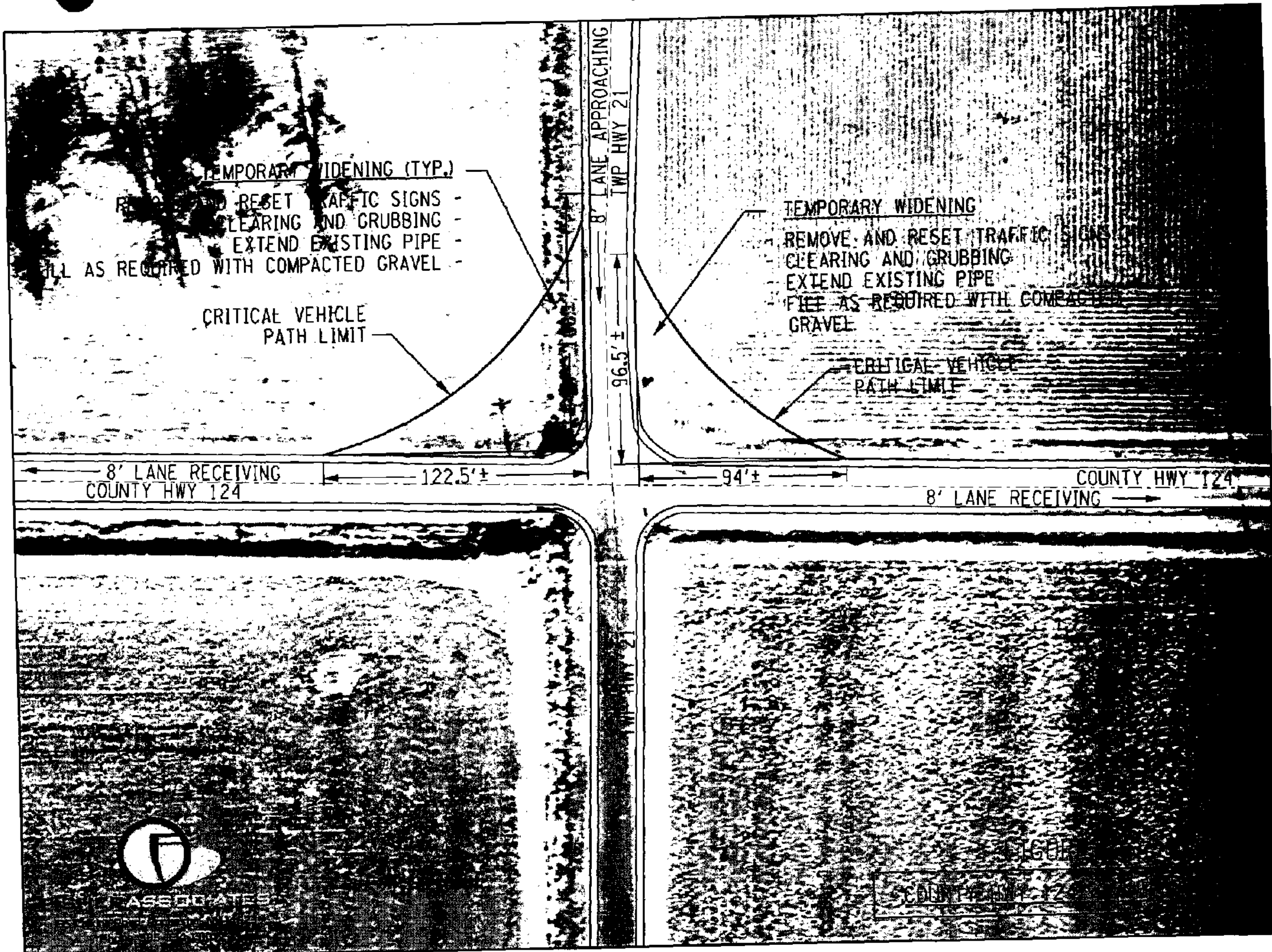
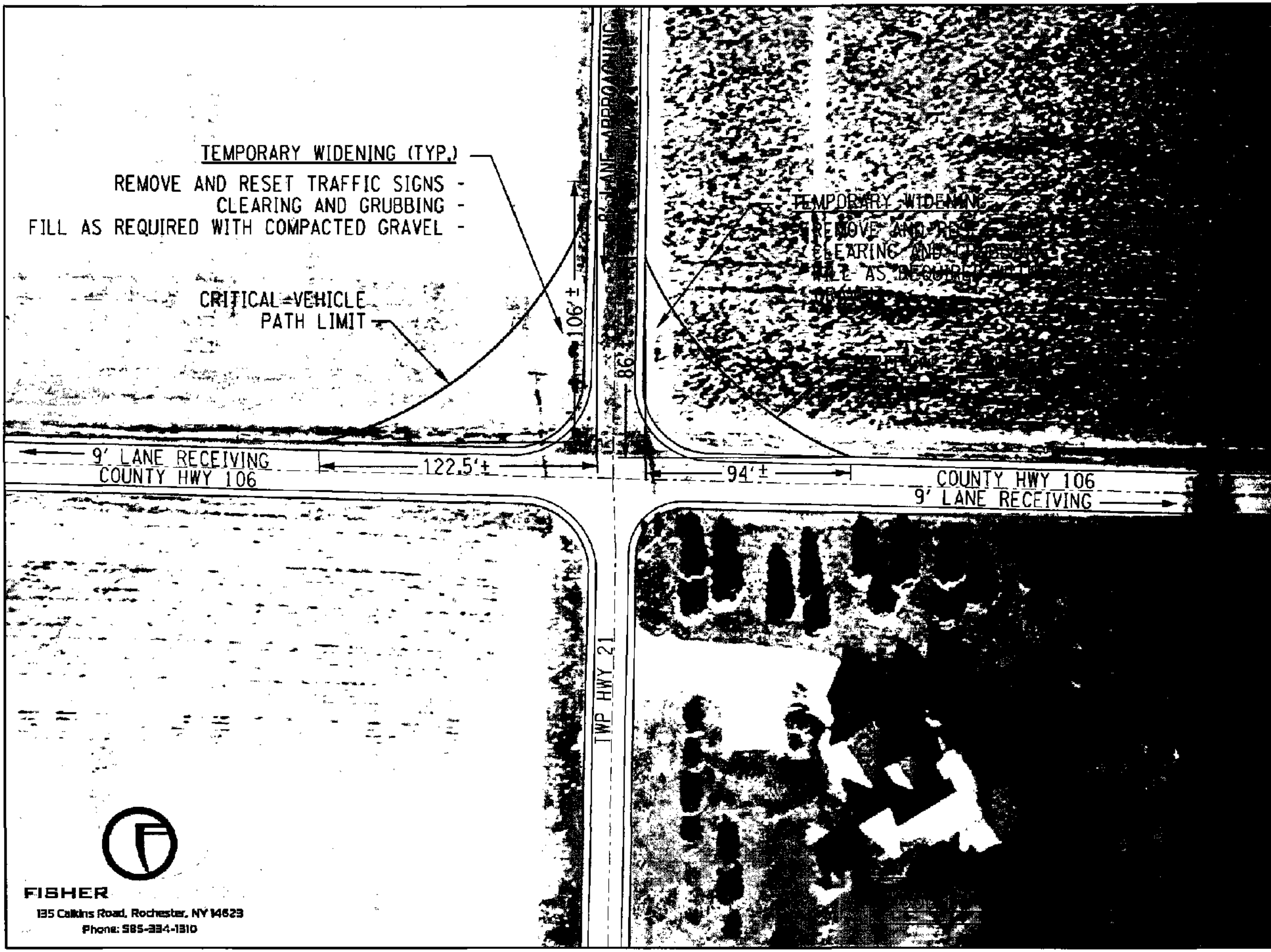

9' LANE APPROACHING
TWP HWY T 33
TEMPORARY WIDENING
REMOVE AND RESET TRAFFIC SIGNS
CLEARING AND GRUBBING
RELOCATE UTILITY POLE
EXTEND EXISTING PIPE
FILL AS REQUIRED WITH COMPACTED GRAVEL
CRITICAL VEHICLE PATH LIMIT
83'±
81'±
9' LANE RECEIVING
COUNTY HWY 144
FISHER ASSOCIATES
135 Calkins Road, Rochester, NY 14623
Phone: 585-334-1310

FIGURE 11
STATE ROUTE 111 / STATE ROU

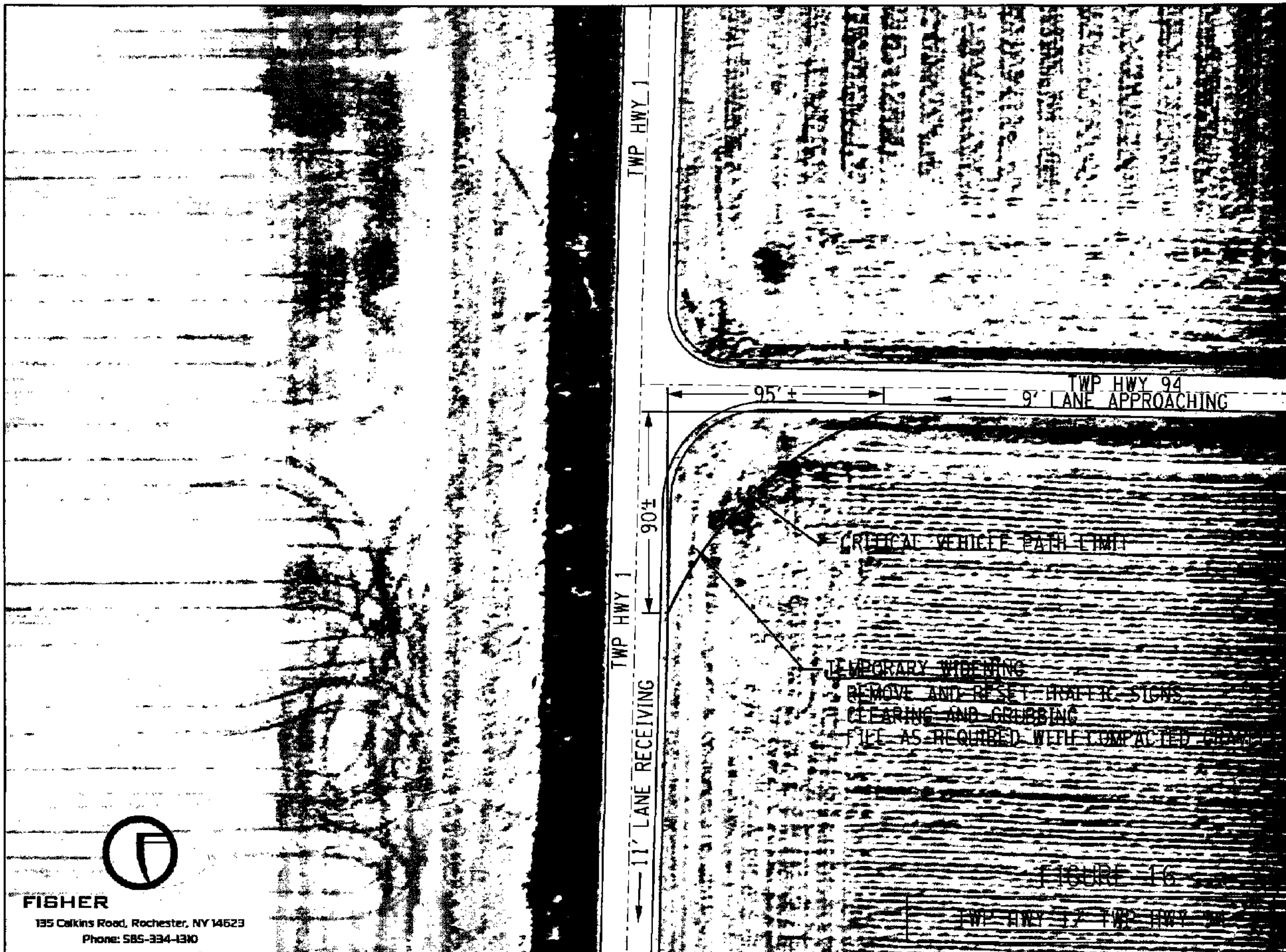
TWP HWY 21
STATE ROUTE 111
ATE ROU E 111
92±
12.5' LANE APPROACHING
87.5'±
TWP HWY 21
7.5' LANE RECEIVING



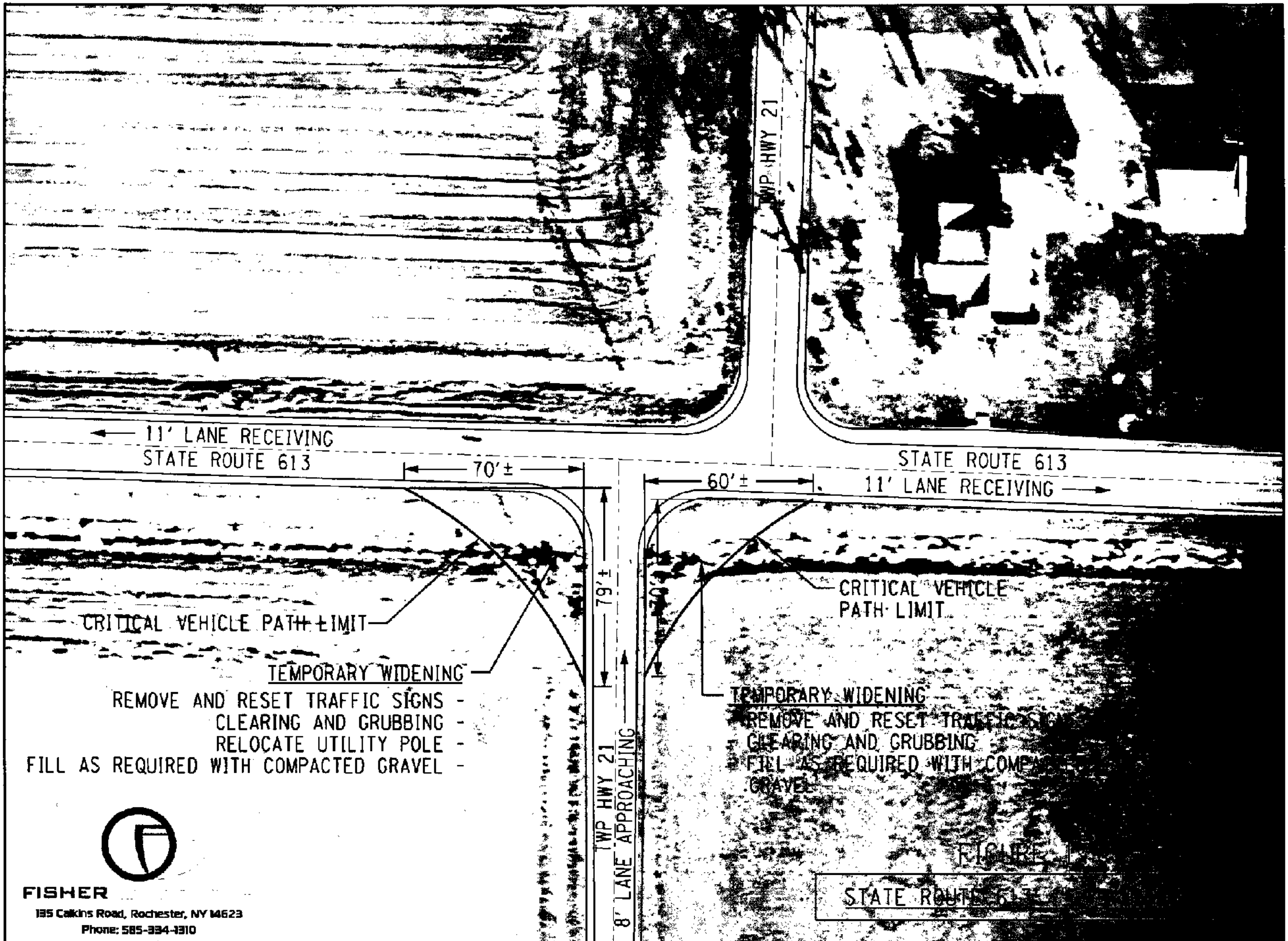
TEMPORARY WIDENING (TYP.)
RESET TRAFFIC SIGNS
CLEARING AND GRUBBING
EXTEND EXISTING PIPE
AS REQUIRED WITH COMPACTED GRAVEL
CRITICAL VEHICLE
PATH LIMIT
8' LANE APPROACHING
TWP HWY 21
96.5'±
TEMPORARY WIDENING
REMOVE AND RESET TRAFFIC SIGNS
CLEARING AND GRUBBING
EXTEND EXISTING PIPE
AS REQUIRED WITH COMPACTED
GRAVEL
CRITICAL VEHICLE
PATH LIMIT
8' LANE RECEIVING
COUNTY HWY 124
122.5'±
94'±
COUNTY HWY 124
8' LANE RECEIVING
ASSOCIATES


TEMPORARY WIDENING (TYP.)
REMOVE AND RESET TRAFFIC SIGNS -
CLEARING AND GRUBBING -
FILL AS REQUIRED WITH COMPACTED GRAVEL -
CRITICAL VEHICLE
PATH LIMIT
106'±
98'
122.5'±
94'±
9' LANE RECEIVING
COUNTY HWY 106
COUNTY HWY 106
9' LANE RECEIVING
TWP HWY 21
TEMPORARY WIDENING
FISHER
135 Calkins Road, Rochester, NY 14623
Phone: 585-334-1310

TEMPORARY WIDENING (TYP.)
REMOVE AND RESET TRAFFIC SIGNS
CLEARING AND GRUBBING
EXTEND EXISTING PIPE
FILL AS REQUIRED WITH COMPACTED GRAVEL
CRITICAL VEHICLE PATH LIMIT
8' LANE APPROACHING
TWP HWY 21
TEMPORARY WIDENING
REMOVE AND RESET TRAFFIC SIGNS
CLEARING AND GRUBBING
RELOCATE UTILITY POLE
FILL AS REQUIRED WITH COMPACTED GRAVEL
CRITICAL VEHICLE PATH LIMIT
86'±
9' LANE RECEIVING
TWP HWY 94
122.5'±
94'±
TWP HWY 94
9' LANE RECEIVING
TWP HWY 21



TWP HWY 1
TWP HWY 94
9' LANE APPROACHING
95'±
90'±
11' LANE RECEIVING
CRITICAL VEHICLE PATH LIMIT
TEMPORARY WIDENING
REMOVE AND RESET TRAFFIC SIGNS
CLEARING AND GRUBBING
FILL AS REQUIRED WITH COMPACTED
FIGURE 16
TWP HWY 1 / TWP HWY 94
FISHER
135 Calkins Road, Rochester, NY 14623
Phone: 585-334-1310



TWP HWY 21
11' LANE RECEIVING
STATE ROUTE 613
70'±
60'±
STATE ROUTE 613
11' LANE RECEIVING
79'±
70'±
CRITICAL VEHICLE PATH LIMIT
CRITICAL VEHICLE PATH LIMIT
TEMPORARY WIDENING
REMOVE AND RESET TRAFFIC SIGNS -
CLEARING AND GRUBBING -
RELOCATE UTILITY POLE -
FILL AS REQUIRED WITH COMPACTED GRAVEL -
TWP HWY 21
8' LANE APPROACHING
TEMPORARY WIDENING
REMOVE AND RESET
CLEARING AND GRUBBING
FILL AS REQUIRED WITH
GRAVEL
FISHER
135 Calkins Road, Rochester, NY 14623
Phone: 585-334-1310

TWP HWY 21
7' LANE RECEIVING
TWP HWY 70
75'±
60'±
TWP HWY 70
7' LANE RECEIVING
92'±
70'±
CRITICAL VEHICLE PATH LIMIT
CRITICAL VEHICLE
PATH LIMIT
TEMPORARY WIDENING
REMOVE AND RESET TRAFFIC SIGNS -
CLEARING AND GRUBBING -
EXTEND EXISTING PIPES -
RELOCATE UTILITY POLE -
TWP HWY 21
6' LANE APPROACHING
TEMPORARY WIDENING
- CLEARING AND GRUBBING
- EXTEND EXISTING PIPES
- RELOCATE UTILITY POLE
- FILL AS REQUIRED WITH COMPACTED
GRAVEL
FIGURE


TWP HWY 5
TWP HWY 70
7' LANE APPROACHING
TWP HWY 70
60' ±
6' LANE RECEIVING
TWP HWY 5
FISHER ASSOCIATES
135 Calkins Road, Rochester, NY 14623
Phone: 585-334-1310

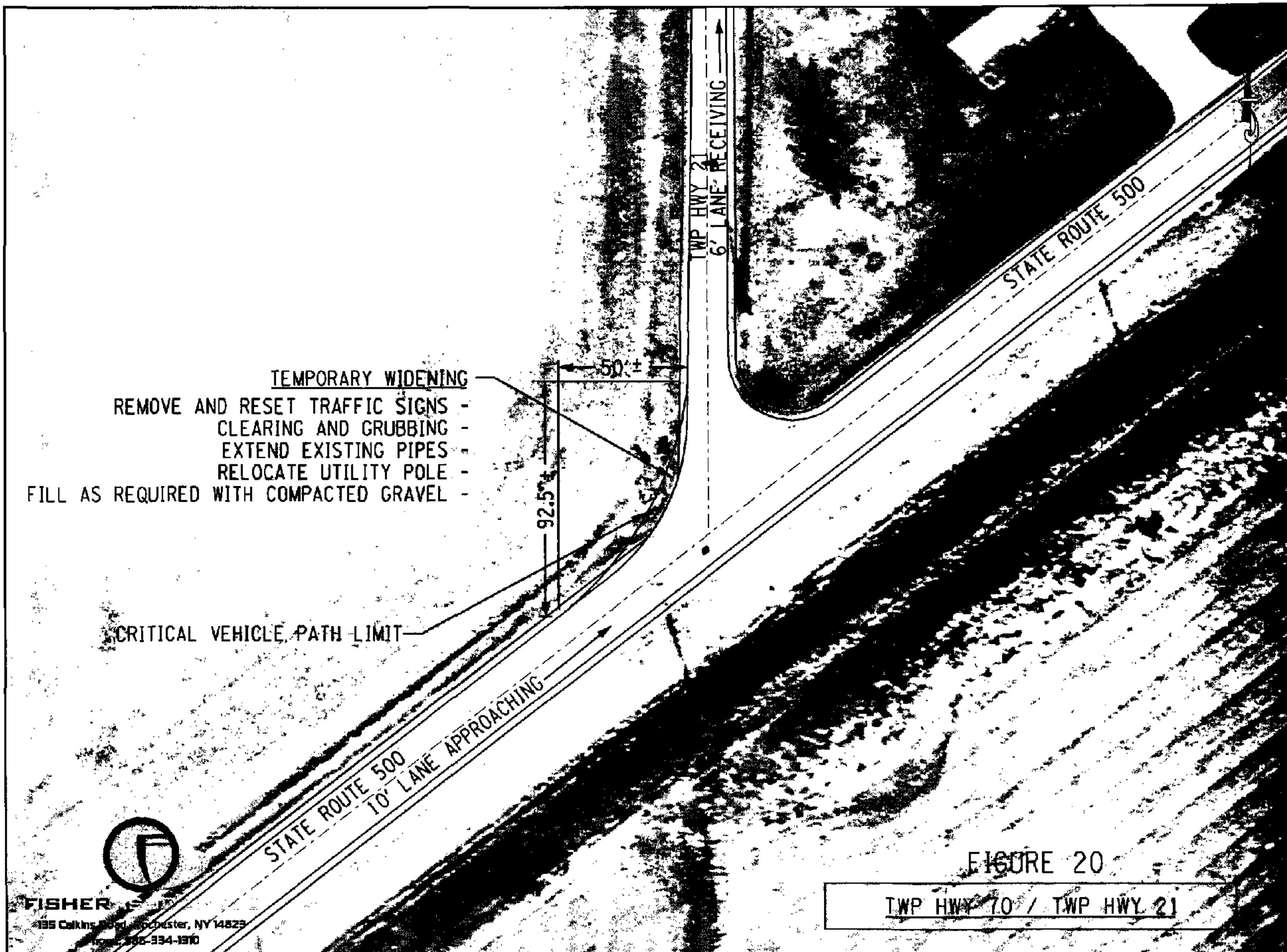


FIGURE 20

TWP HWY 10 / TWP HWY 21

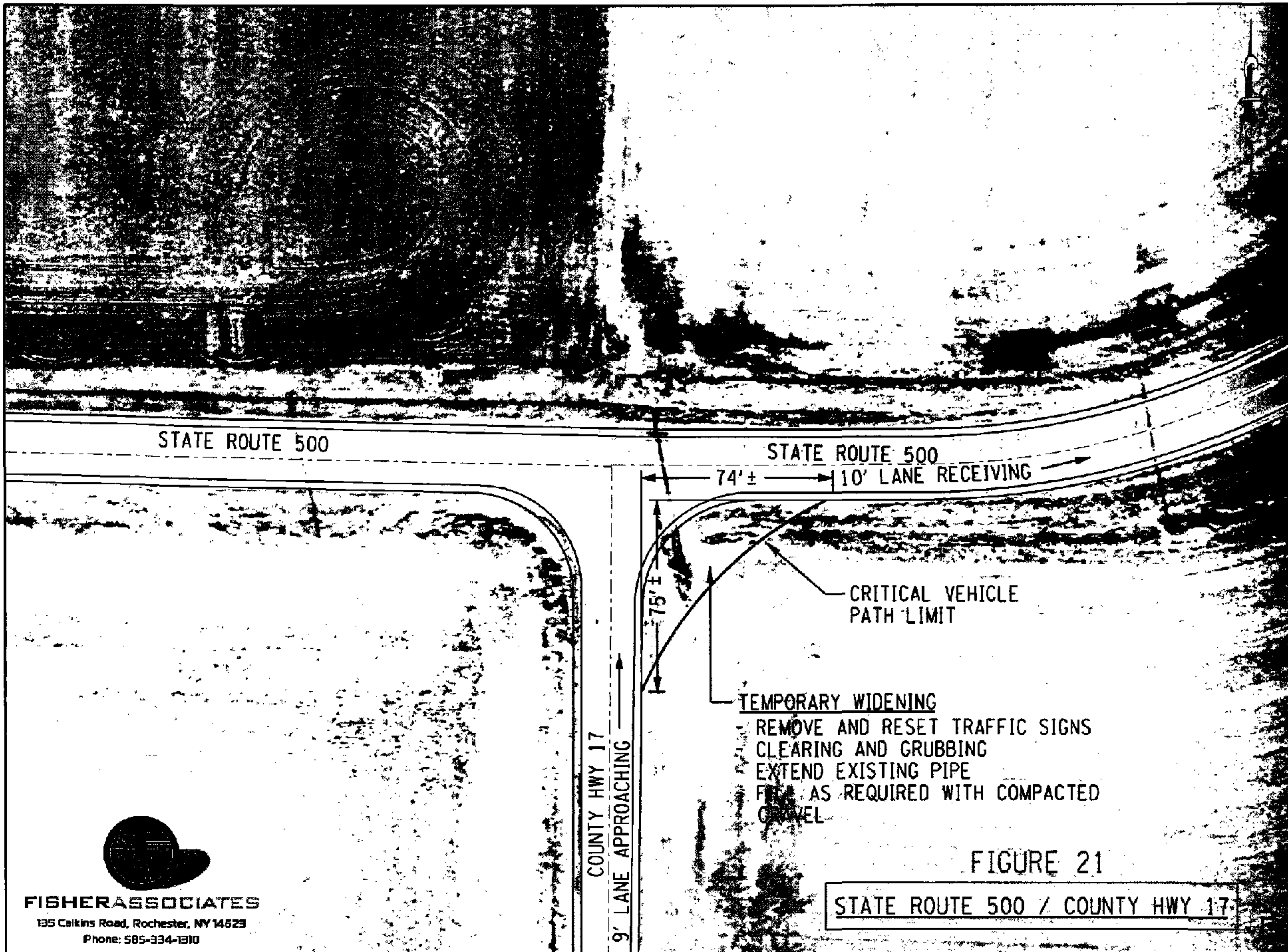


FIGURE 21

STATE ROUTE 500 / COUNTY HWY 17

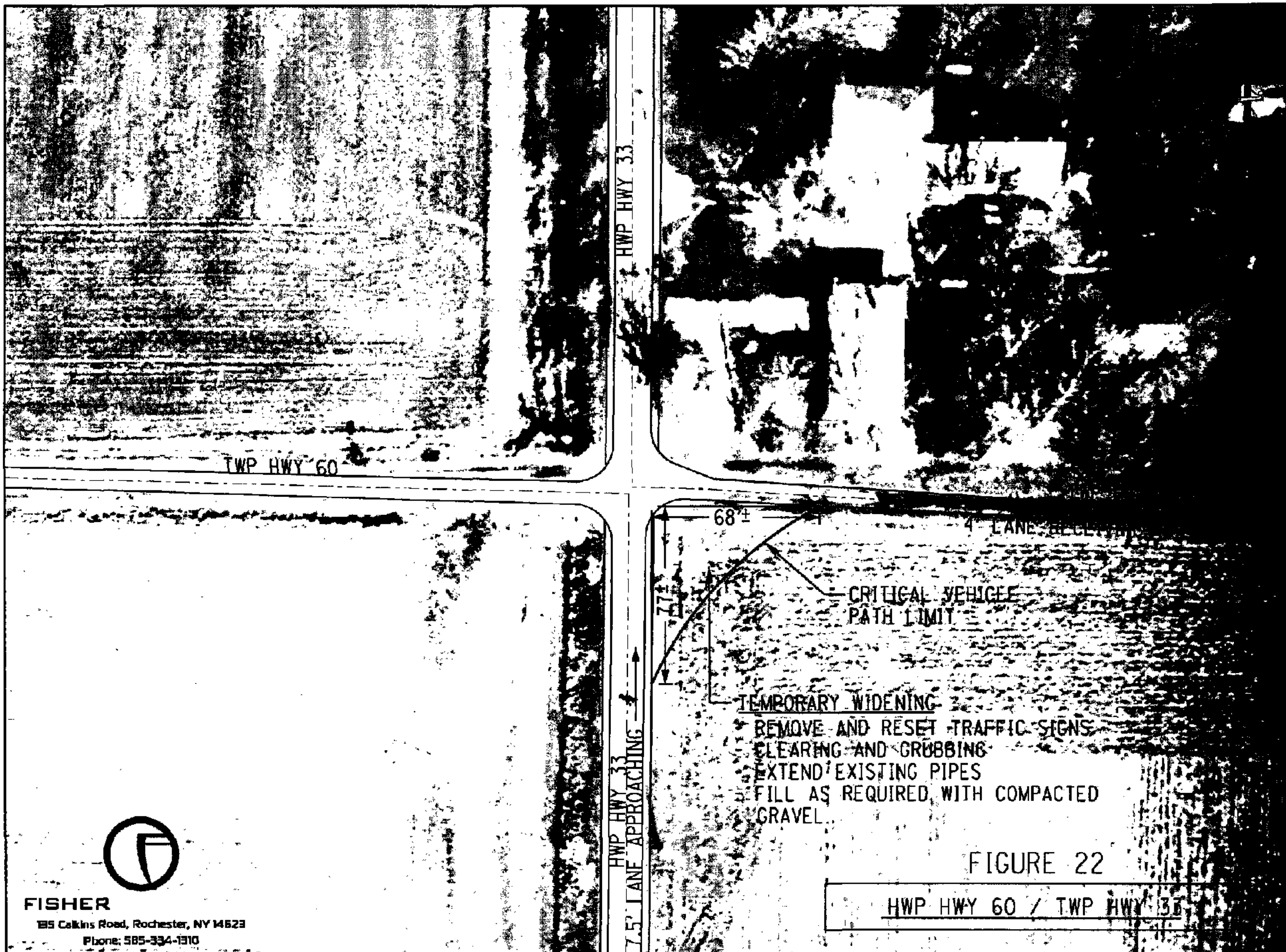
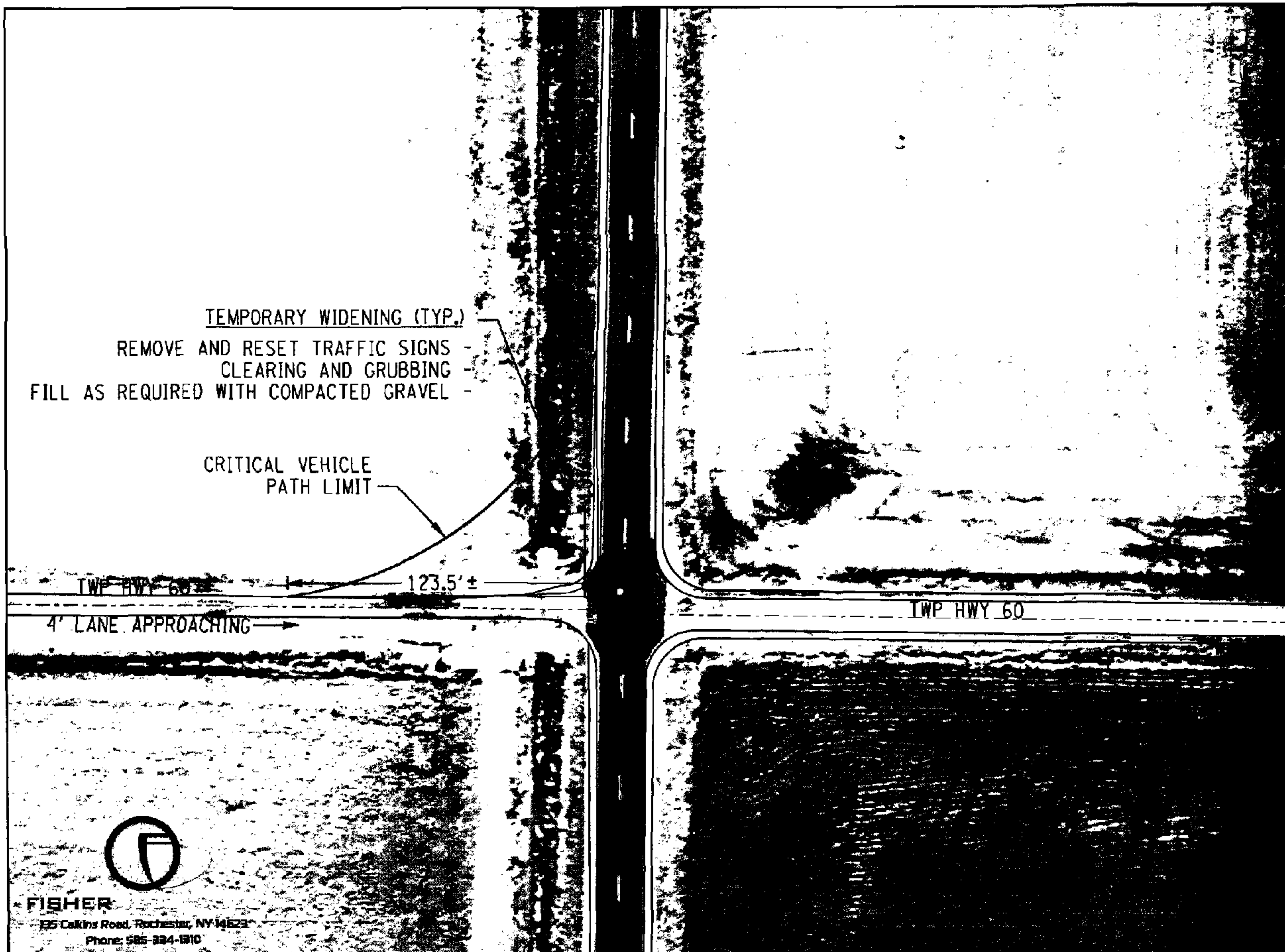


FIGURE 22

HWP HWY 60 / TWP HWY 33

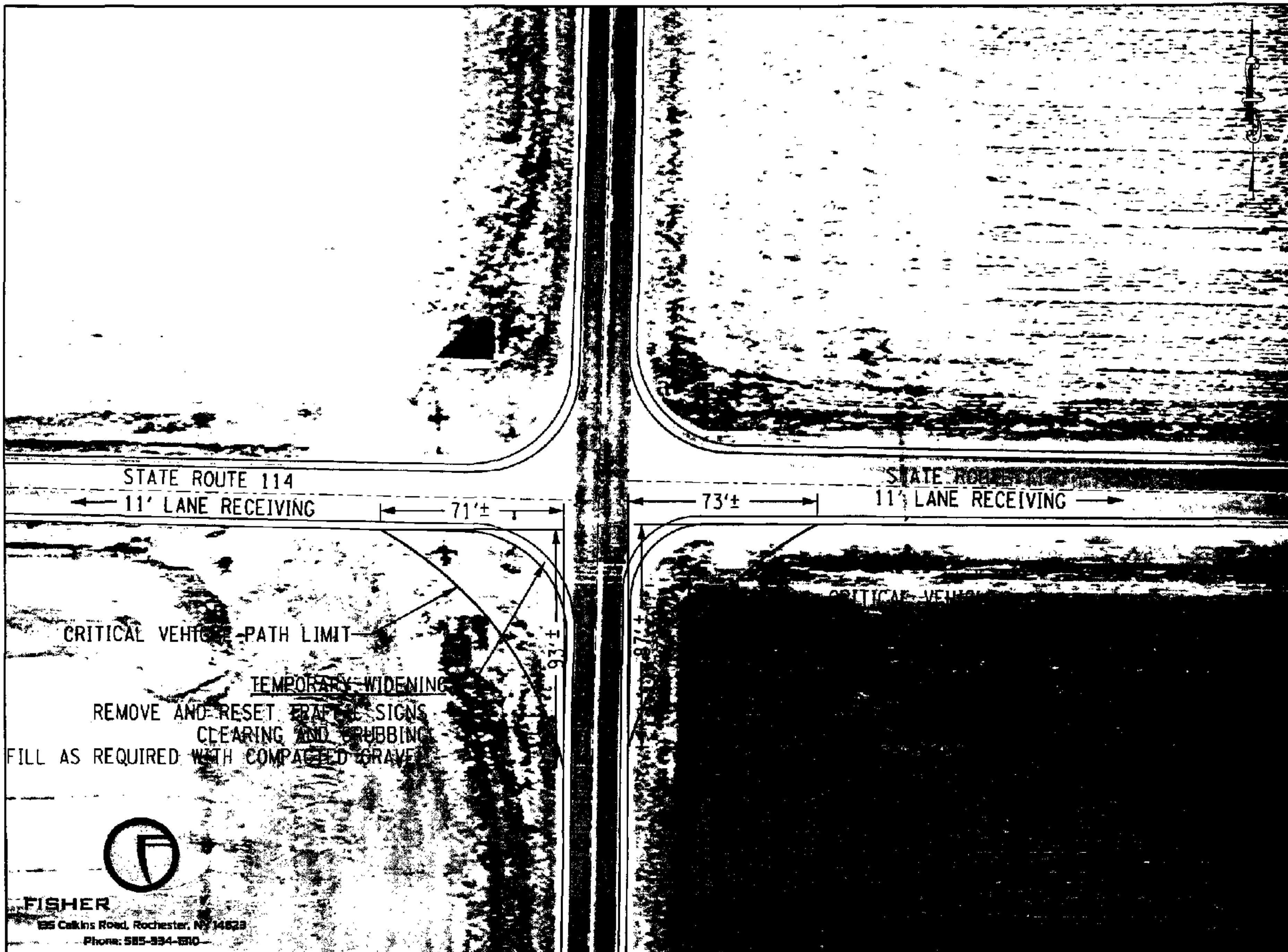


TEMPORARY WIDENING (TYP.)
REMOVE AND RESET TRAFFIC SIGNS -
CLEARING AND GRUBBING -
FILL AS REQUIRED WITH COMPACTED GRAVEL -
CRITICAL VEHICLE
PATH LIMIT
123.5' ±
TWP HWY 60
4' LANE APPROACHING
TWP HWY 60
FISHER
135 Calkins Road, Rochester, NY 14623
Phone: 585-334-1310


TEMPORARY WIDENING (TYP.)
REMOVE AND RESET
FILL AS REQUIRED WITH COMPACTED GRAVEL
CRITICAL VEHICLE
PATH LIMIT
COUNTY HWY 55
10' LANE RECEIVING
TWP HWY 60
7' LANE APPROACHING
127' ±
COUNTY HWY 55
FIGURE 24
COUNTY HWY 55 / TWP HWY 60


TWP HWY 33
8' LANE RECEIVING
TWP HWY 48
8' LANE APPROACHING
108.5'±
CLEARING
EXTEND
PIPE
POLE
GRAVEL
FISHER
135 Calkins Road, Rochester, NY 14623
Phone: 585-334-1310

TEMPORARY WIDENING
- REMOVE AND RESET TRAFFIC SIGNS
- CLEARING AND GRUBBING
- EXTEND EXISTING PIPE
- FILL AS REQUIRED WITH COMPACTED GRAVEL
CRITICAL VEHICLE PATH LIMIT
80'
COUNTY HWY 17
9' LANE RECEIVING
STATE ROUTE
COUNTY HWY 17
FISHER


STATE ROUTE 114
11' LANE RECEIVING
71'±
73'±
11' LANE RECEIVING
93'±
87'±
CRITICAL VEHICLE PATH LIMIT
TEMPORARY WIDENING
REMOVE AND RESET TRAFFIC SIGNS
CLEARING AND GRUBBING
FILL AS REQUIRED WITH COMPACTED GRAVEL
FISHER
135 Calkins Road, Rochester, NY 14623
Phone: 585-334-1310

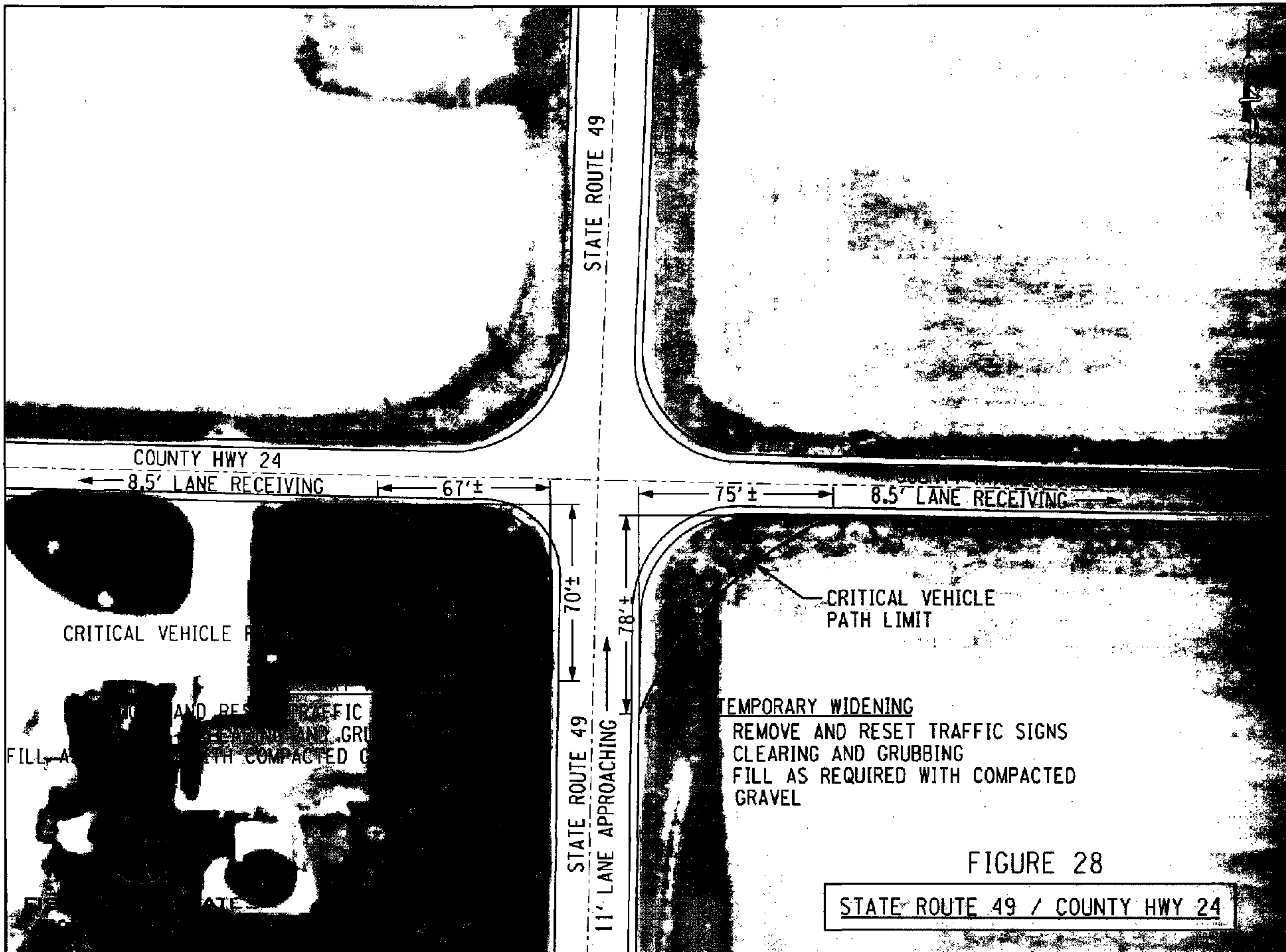
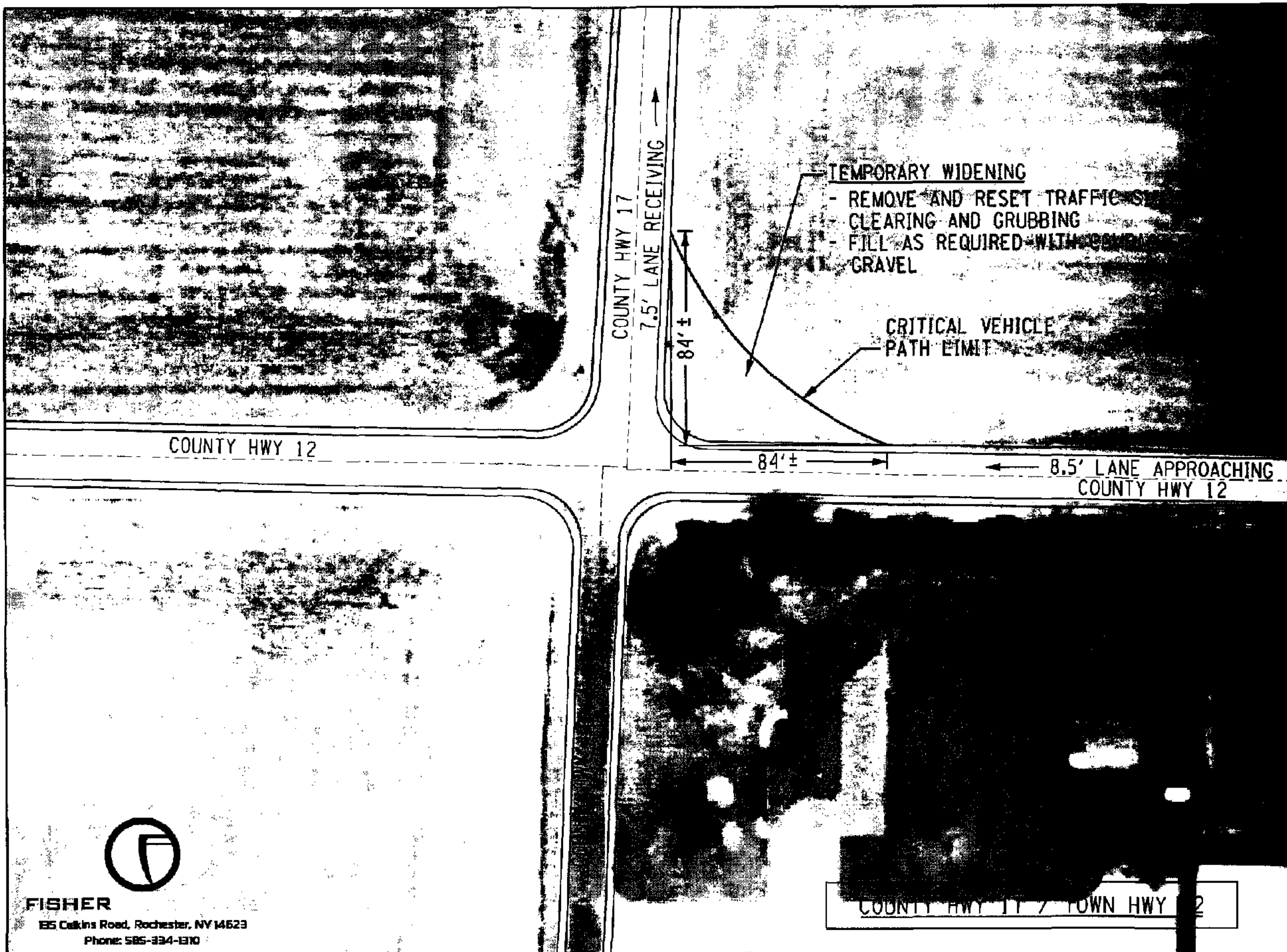


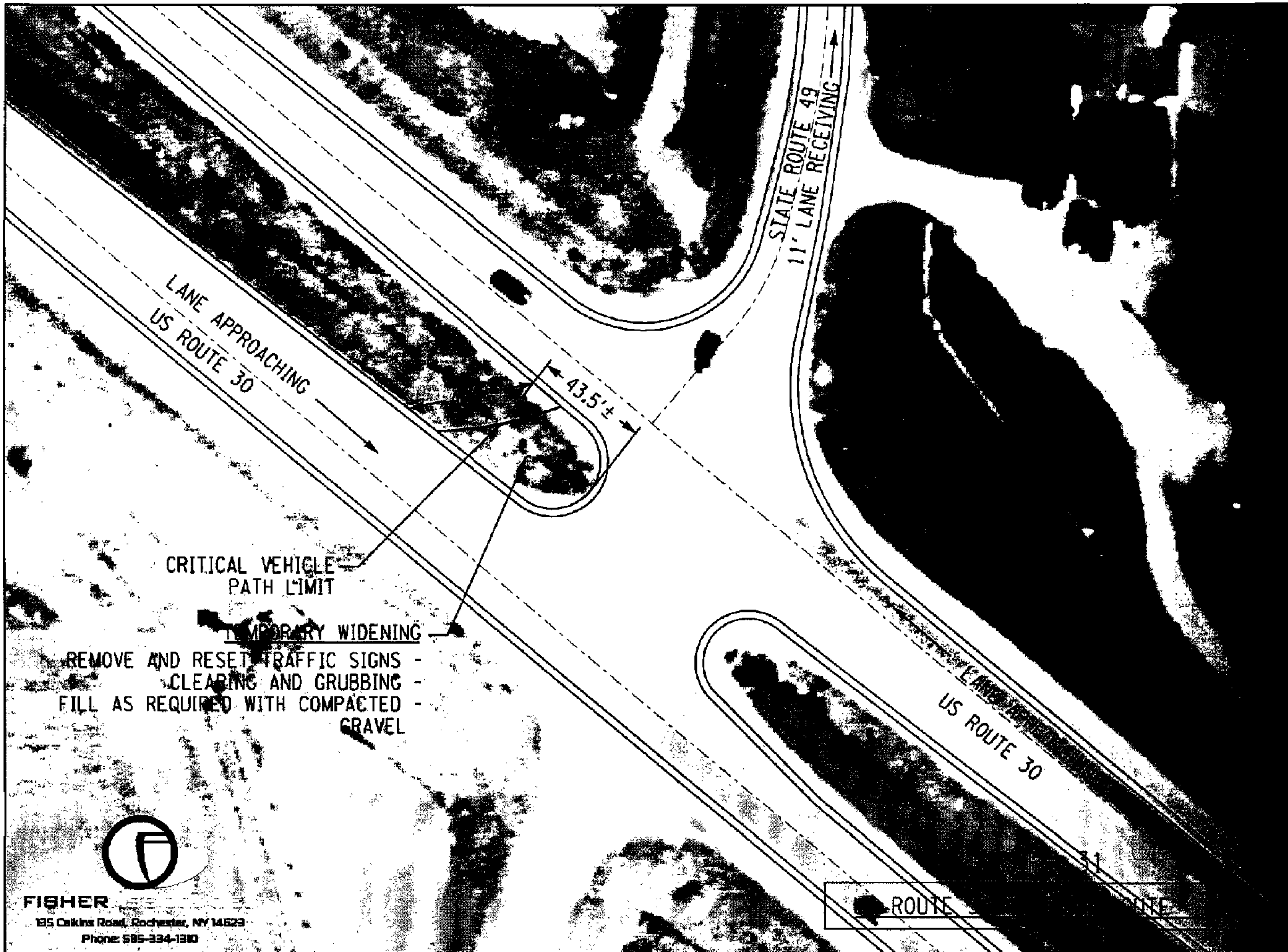
FIGURE 28

STATE ROUTE 49 / COUNTY HWY 24



COUNTY HWY 17
7.5' LANE RECEIVING
TEMPORARY WIDENING
- REMOVE AND RESET TRAFFIC
- CLEARING AND GRUBBING
- FILL AS REQUIRED WITH
GRAVEL
CRITICAL VEHICLE
PATH LIMIT
84'±
84'±
COUNTY HWY 12
8.5' LANE APPROACHING
COUNTY HWY 12
COUNTY HWY 17 / TOWN HWY
FISHER
185 Calkins Road, Rochester, NY 14623
Phone: 585-334-1310


STATE ROUTE 49
COUNTY HWY 12
8.5' LANE RECEIVING
78'±
70'±
COUNTY HWY 12
8.5' LANE RECEIVING
75.5'±
68.5'±
CRITICAL VEHICLE
CRITICAL VEHICLE PATH LIMIT
TEMPORARY WIDENING
REMOVE AND RESET TRAFFIC SIGNS -
CLEARING AND GRUBBING -
FILL AS REQUIRED WITH COMPACTED GRAVEL -
- CLEARING AND GRUBBING
- FILL AS REQUIRED WITH COMPACTED
GRAVEL
STATE ROUTE 49
11' LANE APPROACHING
FISHER ASSOCIATES
STATE ROUTE 49 /


STATE ROUTE 49
11' LANE RECEIVING
LANE APPROACHING
US ROUTE 30
43.5'±
CRITICAL VEHICLE
PATH LIMIT
TEMPORARY WIDENING
REMOVE AND RESET TRAFFIC SIGNS -
CLEARING AND GRUBBING -
FILL AS REQUIRED WITH COMPACTED -
GRAVEL
US ROUTE 30
ROUTE
FISHER
135 Calkins Road, Rochester, NY 14623
Phone: 585-334-1310

APPENDIX B

Ohio Department of Transportation
Office of Highway Management

Special Hauling Permit Section
(614) 351-2300
1610 West Broad Street
Columbus, OH 43223

www.dot.state.oh.us/permits/

LEGAL DIMENSION and WEIGHT LIMITS for HIGHWAY VEHICLES

(As per Ohio Revised Code, Sections 5577.04, 5577.05)

PENALTIES for VIOLATION

(As per Ohio Revised Code, Section 5577.99)

Ted Strickland
Governor

Jolene M. Molitoris
Director

MAXIMUM OVERALL DIMENSIONS

(including any loads)

Width of municipal passenger bus	8'-8"
Width of passenger bus operated over freeways	8'-6"
Width of traction engine	11'-0"
Width of recreational vehicles	8'-6"
Width of all other vehicles	8'-6"
Length of muncipal passenger bus	66'-0"
Length of all other passenger bus type vehicles	45'-0"
Length of semitrailer used in a commercial tractor-semitrailer combination	53'-0"
Length of semitrailer or full trailer used in a commercial tractor-semitrailer-trailer combination	28'-6"
Length of saddlemount vehicle transporter operated on all Interstate, US and State routes	97'-0"
Length of saddlemount vehicle transporter operated on other roadways	75'-0"
Length of any other combination	65'-0"
Length of recreational vehicles	45'-0'
Length of all other vehicles	40'-0"
Length of automobile or boat transporter (plus load overhang of 3'-0" in front and 4'-0" in rear)	65'-0"
Length of stinger-steered automobile or boat transporter (plus load overhang of 3'-0" in front and 4'-0" in rear)	75'-0"
Height of all vehicles	13'-6"

Sec. 5577.05:

(A) No vehicle shall be operated upon the public highways, streets, bridges, and culverts within the state, whose dimensions exceed those specified in this section.

(B) No such vehicle shall have a width in excess of:

(1) 8'-8" for passenger bus type vehicles operated exclusively within municipal corporations;

(2) 8'-6", excluding such safety devices as are required by law, for passenger bus type vehicles operated over freeways, and such other state roads with minimum pavement widths of twenty-two feet, except those roads or portions thereof over which operation of 8'-6" buses is prohibited by order of the director of transportation;

(3) 11' for traction engines;

(4) 8'-6" for recreational vehicles, excluding safety devices and retracted awnings and other appurtenances of 6" or less in width and except that the director may prohibit the operation of 8'-6" recreational vehicles on designated state highways or portions of highways;

(5) 8'-6", including load, for all other vehicles, except that the director may prohibit the operation of 8'-6" vehicles on such state highways or portions thereof as the director designates.

(C) No such vehicle shall have a length in excess of:

(1) 66' for passenger bus type vehicles and articulated passenger bus type vehicles operated by a regional transit authority pursuant to sections 306.30 to 306.54 of the Revised Code;

(2) 45' for all other passenger bus type vehicles;

(3) 53' for any semitrailer when operated in a commercial tractor-semitrailer combination, with or without load, except that the director may prohibit the operation of any such commercial tractor-semitrailer combination on such state highways or portions thereof as the director designates.

(4) 28'-6" for any semitrailer or trailer when operated in a commercial tractor-semitrailer-trailer or commercial tractor-semitrailer-semitrailer combination, except that the director may prohibit the operation of any such commercial tractor-semitrailer-trailer or commercial tractor-semitrailer-semitrailer combination on such state highways or portions thereof as the director designates;

(5) (a) 97' for drive-away saddlemount vehicle transporter combinations and drive-away saddlemount with fullmount vehicle transporter combinations, when operated on all Interstate, US and State routes, including reasonable access travel on all other roadway for a distance not to exceed one road mile; not to exceed three saddlemounted vehicles, but which may include one fullmount.

(b) 75" for drive-away saddlemount vehicle transporter combinations and drive-away saddlemount with fullmount vehicle transporter combinations, when operated on all roadways not designated as an Interstate, US and State routes, other than roadways within one road mile of any Interstate, US and State routes, not to exceed three saddlemounted vehciles, but which may include one fullmount.

(6) 65' for any other combination of vehicles coupled together, with or without load, except as provided in divisions (C)(3) and (4), and in division (E) of this section;

(7) 45' for recreational vehicles;

(8) 40' for all other vehicles except trailers and semitrailers, with or without load.

MAXIMUM OVERALL DIMENSIONS (continued)

(D) No such vehicle shall have a height in excess of 13'-6", with or without load.

(E) An automobile transporter or boat transporter shall be allowed a length of 65' and a stinger-steered automobile transporter or stinger-steered boat transporter shall be allowed a length of 75', except that the load thereon may extend no more than 4' beyond the rear of such vehicles and may extend no more than 3' beyond the front of such vehicles, and except further that the director may prohibit the operation of a stinger-steered automobile transporter, stinger-steered boat transporter, or a B-train assembly on any state highway or portion thereof that the director designates.

(F) The widths prescribed in division (B) of this section shall not include side mirrors, turn signal lamps, marker lamps, handholds for cab entry and egress, flexible fender extensions, mud flaps, splash and spray suppressant devices, and load-induced tire bulge.

The width prescribed in division (B)(5) of this section shall not include automatic covering devices , tarp and tarp hardware, and tiedown assemblies, provided these safety devices do not extend more than three inches from each side of the vehicle.

The lengths prescribed in divisions (C)(2) to (7) of this section shall not include safety devices, bumpers attached to the front or rear of such bus or combination, B-train assembly used between the first and second semitrailer of a commercial tractor-semitrailer-semitrailer combination, energy conservation devices as provided in any regulations adopted by the secretary of the United States department of transportation, or any noncargo-carrying refrigeration equipment attached to the front of trailers and semitrailers. In special cases, vehicles whose dimensions exceed those prescribed by this section may operate in accordance with rules adopted by the director.

(G) This section does not apply to fire engines, fire trucks, or other vehicles or apparatus belonging to any municipal corporation or to the volunteer fire department of any municipal corporation or used by such department in the discharge of its functions. This section does not apply to vehicles and pole trailers used in the transportation of wooden and metal poles, nor to the transportation of pipes or well-drilling equipment, nor to farm machinery and equipment. The owner or operator of any vehicle, machinery, or equipment not specifically enumerated in this section but the dimensions of which exceed the dimensions provided by this section, when operating the same on the highways and streets of this state, shall comply with the rules of the director governing such movement, which the director may adopt. Sections 119.01 to 119.13 of the Revised Code apply to any rules the director adopts under this section, or the amendment or rescission thereof, and any person adversely affected shall have the same right of appeal as provided in those sections.

This section does not require the state, a municipal corporation, county, township, or any railroad or other private corporation to provide sufficient vertical clearance to permit the operation of such vehicle, or to make any changes in or about existing structures now crossing streets, roads, and other public thoroughfares in this state.

(H) As used in this section, "recreational vehicle" has the same meaning as in section 4501.01 of the Revised Code.

MAXIMUM WEIGHTS

Sec. 5577.04 Maximum axle load, wheel load, gross weights, for pneumatic tired vehicles.

(A) The maximum wheel load of any one wheel of any vehicle, trackless trolley, load, object, or structure operated or moved upon improved public highways, streets, bridges, or culverts shall not exceed six hundred fifty pounds per inch width of pneumatic tire, measured as prescribed by section 5577.03 of the Revised Code.

(B) The weight of vehicle and load imposed upon a road surface that is part of the interstate system by vehicles with pneumatic tires shall not exceed any of the following weight limitations:

(1) On any one axle, twenty thousand pounds;

(2) On any tandem axle, thirty-four thousand pounds;

(3) On any two or more consecutive axles, the maximum weight as determined by application of the formula provided in division (C) of this section.

(C) For purposes of division (B)(3) of this section, the maximum gross weight on any two or more consecutive axles shall be determined by application of the following formula:

$$W = 500((LN/N-1) + 12N + 36).$$

In this formula, W equals the overall gross weight on any group of two or more consecutive axles to the nearest five hundred pounds, L equals the distance in rounded whole feet between the extreme of any group of two or more consecutive axles, and N equals the number of axles in the group under consideration. However, two consecutive sets of tandem axles may carry a gross load of thirty-four thousand pounds each, provided the overall distance between the first and last axles of such consecutive sets of tandem axles is thirty-six feet or more.

(D) Except as provided in division (I) of this section, the weight of vehicle and load imposed upon a road surface that is not part of the interstate system by vehicles with pneumatic tires shall not exceed any of the following weight limitations:

(1) On any one axle, twenty thousand pounds;

(2) On any two successive axles:

(a) Spaced four feet or less apart, and weighed simultaneously, twenty-four thousand pounds;

(b) Spaced more than four feet apart, and weighed simultaneously, thirty-four thousand pounds, plus one thousand pounds per foot or fraction thereof, over four feet, not to exceed forty thousand pounds.

(3) On any three successive load-bearing axles designed to equalize the load between such axles and spaced so that each such axle of the three-axle group is more than four feet from the next axle in the three-axle group and so that the spacing between the first axle and the third axle of the three-axle group is no more than nine feet, and with such load-bearing three-axle group weighed simultaneously as a unit:

(a) Forty-eight thousand pounds, with the total weight of vehicle and load not exceeding thirty-eight thousand pounds plus an additional nine hundred pounds for each foot of spacing between the front axle and the rearmost axle of the vehicle;

(b) As an alternative to division (D)(3)(a) of this section, forty-two thousand five hundred pounds, if part of a six-axle vehicle combination with at least twenty feet of spacing between the front axle and rearmost axle, with the total weight of vehicle and load not exceeding fifty-four thousand pounds plus an additional six hundred pounds for each foot of spacing between the front axle and the rearmost axle of the vehicle.

(4) The total weight of vehicle and load utilizing any combination of axles, other than as provided for three-axle groups in division (D) of this section, shall not exceed thirty-eight thousand pounds plus an additional nine hundred pounds for each foot of spacing between the front axle and rearmost axle of the vehicle.

(E) Notwithstanding divisions (B) and (D) of this section, the maximum overall gross weight of vehicle and load imposed upon the road surface shall not exceed eighty thousand pounds.

(F) Notwithstanding any other provision of law, when a vehicle is towing another vehicle, such drawbar or other connection shall be of a length such as will limit the spacing between nearest axles of the respective vehicles to a distance not in excess of twelve feet and six inches.

(G) As used in division (B) of this section, "tandem axle" means two or more consecutive axles whose centers may be included between parallel transverse vertical planes spaced more than forty inches but not more than ninety-six inches apart, extending across the full width of the vehicle.

(H) This section does not apply to passenger bus type vehicles operated by a regional transit authority pursuant to sections 306.30 to 306.54 of the Revised Code.

(I) Either division (B) or (D) of this section applies to the weight of a vehicle and its load imposed upon any road surface that is not a part of the interstate system by vehicles with pneumatic tires. As between divisions (B) and (D) of this section, only the division that yields the highest total gross vehicle weight limit shall be applied to any such vehicle. Once that division is determined, only the limits contained in the subdivisions of that division shall apply to that vehicle.

FEDERAL BRIDGE FORMULA DEFINITIONS

The following definitions are used in conjunction with the federal bridge formula table.

GROSS WEIGHT: The weight of a vehicle combination without load plus the weight of any load thereon. The maximum overall gross weight of vehicle and load imposed upon the road surface shall not exceed eighty thousand pounds.

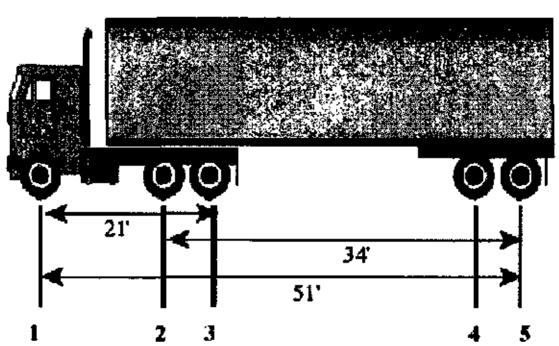
SINGLE AXLE WEIGHT: The total weight imposed upon the road surface by all wheels whose centers may be included between two parallel transverse vertical planes forty inches apart, extended across the full width of the vehicle. The maximum single axle weight shall not exceed twenty thousand pounds.

TANDEM AXLE WEIGHT: The total weight imposed upon the road surface by two or more consecutive axles whose centers may be included between parallel transverse vertical planes spaced more than forty inches but not more than ninety-six inches apart, extending across the full width of the vehicle. The maximum tandem axle weight shall not exceed thirty-four thousand pounds.

CONSECUTIVE AXLE WEIGHT: Any consecutive two or more axles may not exceed the weight as computed by the formula even though the single axles, tandem axles, and gross weights are within the legal requirements.

CHECKING A VEHICLE

This illustration of a tractor-semitrailer combination is used to illustrate a bridge formula check. Before beginning to check your vehicle, be sure that single axle 1 does not exceed 20,000 lbs., tandem axles 2-3 and 4-5 do not exceed 34,000 lbs. each and that the gross vehicle weight does not exceed 80,000 lbs. If these weight requirements are satisfactory, the following combinations should be checked as follows:



Axle 1 is 12,000 lbs.
Axle 2,3,4 and 5 are 17,000 lbs. each
and show a spacing violation

Check axles 1 through 3 using the illustration.
W (actual weight)
= 12,000 + 17,000 + 17,000 = 46,000 lbs.
N = 3 axles;
L = 21 feet
W = maximum

$$= 500 \left[\frac{L(N)}{(N-1)} + 12(N) + 36 \right]$$

$$= 500 \left[\frac{(1 \text{ X } 3)}{(3-1)} + (12 \text{ X } 3) + 36 \right]$$

= 51,500 lbs.

The actual weight of axles 1 through 3 of the illustrated combination is 46,000 lbs. so the bridge formula requirement is satisfied.

To use the Bridge Formula Table to obtain the maximum load allowed on axles 1 through 3, read down the left column (Distance in feet between ...axles) to L = 21 and across the number of axles to the right to N = 3 (axles).
Now check axles 1 through 5 using the illustration and table.
W (actual weight)
= 12,000 + 17,000 + 17,000
+ 17,000 + 17,000 = 80,000 lbs.
N = 5 axles; L = 51 feet
W maximum from the table for L of 51 feet and N of 5 (axles) = 80,000 lbs.
This axle spacing is satisfactory.

Now check axles 2 through 5 using the illustration and table.
W (actual weight)
= 17,000 + 17,000 + 17,000 + 17,000
= 68,000 lbs.
N = 4 axles; L = 34 feet
W maximum from the table for L = 34 feet and N = 4 (axles) = 64,500 lbs.
This means the illustration shows a violation; the actual weight of 68,000 lbs. exceeds the maximum allowable weight of 64,500 lbs. for the given axle spacing. To correct the situation, some load must be removed from the vehicle or the 34-foot axle spacing must be increased.

EXCEPTION TO FORMULA

There is one exception to the use of the formula and table: two consecutive sets of tandem axles may carry a gross load of 34,000 pounds each providing the overall distance between the first and last axles of such consecutive sets of tandem axles is 36 feet of more. For example, a 5-axle tractor-semitrailer may be used to haul a full 34,000 lbs. on the tandem of the tractor (axles 2 and 3) and the tandem of the trailer (axles 4 and 5) providing there is a spacing of 36 or more feet between axles 2 and 5. A spacing of 36 feet or more for axles 2 through 5 is satisfactory for an actual W of 68,000 lbs. even though the formula or table computes W maximum to be 66,000 to 67,500 lbs. for spacing of 36 to 38 feet.

FEDERAL BRIDGE FORMULA TABLE

Permissible Gross Loads for Vehicles in Regular Operation

Based on weight formula: **W = 500 [(L(N) / (N-1)) + 12(N) + 36]**

W = the maximum weight in pounds that can be carried on a group of two or more axles to the nearest 500 pounds

L = spacing in feet between the outer axles of any two or more consecutive axles

N = number of axles being considered

Distance in feet between the extremes of any group of 2 or more consecutive axles	Maximum load in pounds carried on any group of 2 or more consecutive axles					
	2 axles	3 axles	4 axles	5 axles	6 axles	7 axles
4	34,000	----------	----------	----------	----------	----------
5	34,000	----------	----------	----------	----------	----------
6	34,000	----------	----------	----------	----------	----------
7	34,000	----------	----------	----------	----------	----------
8 and less	34,000	34,000	----------	----------	----------	----------
More than 8	38,000	42,000	----------	----------	----------	----------
9	39,000	42,500	----------	----------	----------	----------
10	40,000	43,500	----------	----------	----------	----------
11	----------	44,000	----------	----------	----------	----------
12	----------	45,000	50,000	----------	----------	----------
13	----------	45,500	50,500	----------	----------	----------
14	----------	46,500	51,500	----------	----------	----------
15	----------	47,000	52,000	----------	----------	----------
16	----------	48,000	52,500	58,000	----------	----------
17	----------	48,500	53,500	58,500	----------	----------
18	----------	49,500	54,000	59,000	----------	----------
19	----------	50,000	54,500	60,000	----------	----------
20	----------	51,000	55,500	60,500	66,000	----------
21	----------	51,500	56,000	61,000	66,500	----------
22	----------	52,500	56,500	61,500	67,000	----------
23	----------	53,000	57,500	62,500	68,000	----------
24	----------	54,000	58,000	63,000	68,500	74,000
25	----------	54,500	58,500	63,500	69,000	74,500
26	----------	55,500	59,500	64,000	69,500	75,000
27	----------	56,000	60,000	65,000	70,000	75,500
28	----------	57,000	60,500	65,500	71,000	76,500
29	----------	57,500	61,500	66,000	71,500	77,000
30	----------	58,500	62,000	66,500	72,000	77,500
31	----------	59,000	62,500	67,500	72,500	78,000
32	----------	60,000	63,500	68,000	73,000	78,500
33	----------	----------	64,000	68,500	74,000	79,000
34	----------	----------	64,500	69,000	74,500	80,000
35	----------	----------	65,500	70,000	75,000	----------
36	----------	***Exception***	***66,000***	70,500	75,500	----------
37	----------	***23 U.S.C.***	***66,500***	71,000	76,000	----------
38	----------	***127***	***67,500***	71,500	77,000	----------
39	----------	----------	68,000	72,500	77,500	----------
40	----------	----------	68,500	73,000	78,000	----------
41	----------	----------	69,500	73,500	78,500	----------
42	----------	----------	70,000	74,000	79,000	----------
43	----------	----------	70,500	75,000	80,000	----------
44	----------	----------	71,500	75,500	----------	----------
45	----------	----------	72,000	76,000	----------	----------
46	----------	----------	72,500	76,500	----------	----------
47	----------	----------	73,500	77,500	----------	----------
48	----------	----------	74,000	78,000	----------	----------
49	----------	----------	74,500	78,500	----------	----------
50	----------	----------	75,500	79,000	----------	----------
51	----------	----------	76,000	80,000	----------	----------
52	----------	----------	76,500	----------	----------	----------
53	----------	----------	77,500	----------	----------	----------
54	----------	----------	78,000	----------	----------	----------
55	----------	----------	78,500	----------	----------	----------
56	----------	----------	79,500	----------	----------	----------
57	----------	----------	80,000	----------	----------	----------

Maximum Gross Weight allowed in State of Ohio is 80,000 pounds.

NON-INTERSTATE BRIDGE FORMULA

5577.04 Ohio Revised Code

Paragraph D

Maximum Allowable Load
for Various Distances
Center to Center of Extreme Axles (in feet)

Feet	Table A Pounds	Table B Pounds	Feet	Table A Pounds	Table B Pounds	Feet	Table A Pounds	Table B Pounds
3	24,000	X	18	54,200	X	34	68,600	74,400
4	24,000	X	19	55,100	X	35	69,500	75,000
4.5	35,000	X	20	56,000	66,000	36	70,400	75,600
5	35,000	X	21	56,900	66,600	37	71,300	76,200
6	36,000	X	22	57,800	67,200	38	72,200	76,800
7	37,000	X	23	58,700	67,800	39	73,100	77,400
8	38,000	X	24	59,600	68,400	40	74,000	78,000
9	39,000	X	25	60,500	69,000	41	74,900	78,600
10	40,000	X	26	61,400	69,600	42	75,800	79,200
11	47,900	X	27	62,300	70,200	43	76,700	79,800
12	48,800	X	28	63,200	70,800	44	77,600	80,000
13	49,700	X	29	64,100	71,400	45	78,500	80,000
14	50,600	X	30	65,000	72,000	46	79,400	80,000
15	51,500	X	31	65,900	72,600	47	80,000	80,000
16	52,400	X	32	66,800	73,200	48	80,000	80,000
17	53,300	X	33	67,700	73,800			

5577.15 APPLICATION OF SIZE AND WEIGHT PROVISIONS OF CHAPTER.

(A) The size and weight provisions of this chapter do not apply to a person who is engaged in the initial towing or removal of a wrecked or disabled motor vehicle from the site of an emergency on a public highway where the vehicle became wrecked or disabled to the nearest site where the vehicle can be brought into conformance with the requirements of this chapter or to the nearest qualified repair facility.

(B) Any subsequent towing of a wrecked or disabled vehicle shall comply with the size and weight provisions of this chapter.

(C) No court shall impose any penalty prescribed in section 5577.99 of the Revised Code or the civil liability established in section 5577.12 of the Revised Code upon a person towing or removing a vehicle in the manner described in division (A) of this section.

4511.04 EXCEPTION TO TRAFFIC RULES.

(A) Sections 4511.01 to 4511.18, 4511.20 to 4511.78, 4511.99, and 4513.01 to 4513.37 of the Revised Code do not apply to persons, teams, motor vehicles, and other equipment while actually engaged in work upon the surface of a highway within an area designated by traffic control devices, but apply to such persons and vehicles when traveling to or from such work.

(B) The driver of a highway maintenance vehicle owned by this state or any political subdivision of this state, while the driver is engaged in the performance of official duties upon a street or highway, provided the highway maintenance vehicle is equipped with flashing lights and such other markings as are required by law and such lights are in operation when the driver and vehicle are so engaged, shall be exempt from criminal prosecution for violations of sections 4511.22, 4511.25, 4511.26, 4511.27, 4511.28, 4511.30, 4511.31, 4511.33, 4511.35, 4511.66, 4513.02, and 5577.01 to 5577.09 of the Revised Code.

(C)(1) This section does not exempt a driver of a highway maintenance vehicle from civil liability arising from a violation of section 4511.22, 4511.25, 4511.26, 4511.27, 4511.28, 4511.30, 4511.31, 4511.33, 4511.35, 4511.66, or 4513.02 or sections 5577.01 to 5577.09 of the Revised Code.

(2) This section does not exempt the driver of a vehicle that is engaged in the transport of highway maintenance equipment from criminal liability for a violation of sections 5577.01 to 5577.09 of the Revised Code.

(D) As used in this section, "highway maintenance vehicle" means a vehicle used in snow and ice removal or road surface maintenance, including a snow plow, traffic line striper, road sweeper, mowing machine, asphalt distributing vehicle, or other such vehicle designed for use in specific highway maintenance activities.

SEC 5577.99 PENALTIES

(A) Whoever violates the weight provisions of sections 5577.01 to 5577.07 or the weight provisions in regard to highways under section 5577.04 of the Revised Code shall be fined eighty dollars for the first two thousand pounds, or fraction thereof, of overload; for overloads in excess of two thousand pounds, but not in excess of five thousand pounds, such person shall be fined one hundred dollars, and in addition thereto one dollar per one hundred pounds of overload; for overloads in excess of five thousand pounds, but not in excess of ten thousand pounds, such person shall be fined one hundred thirty dollars and in addition thereto two dollars per one hundred pounds of overload, or imprisoned not more than thirty days, or both. For all overloads in excess of ten thousand pounds such person shall be fined one hundred sixty dollars, and in addition thereto three dollars per one hundred pounds of overload, or imprisoned not more than thirty days, or both. Whoever violates the weight provisions of vehicle and load relating to gross load limits shall be fined not less than one hundred dollars. No penalty prescribed in this division shall be imposed on any vehicle combination if the overload on any axle does not exceed one thousand pounds, and if the immediately preceding or following axle, excepting the front axle of the vehicle combination, is underloaded by the same or a greater amount. For purposes of this division, two axles on one vehicle less than eight feet apart, shall be considered as one axle.

(B) Whoever violates the weight provisions of section 5577.071 or 5577.08 or the weight provisions in regard to bridges under section 5577.09, and whoever exceeds the carrying capacity specified under section 5591.42 of the Revised Code, shall be fined eighty dollars for the first two thousand pounds, or fraction thereof, of overload; for overloads in excess of two thousand pounds, but not in excess of five thousand pounds, the person shall be fined one hundred dollars, and in addition thereto one dollar per one hundred pounds of overload; for overloads in excess of five thousand pounds, but not in excess of ten thousand pounds, the person shall be fined one hundred thirty dollars, and in addition thereto two dollars per one hundred pounds of overload, or imprisoned not more than thirty days, or both. For all overloads in excess of ten thousand pounds, the person shall be fined one hundred sixty dollars, and in addition thereto three dollars per one hundred pounds of overload, or imprisoned not more than thirty days, or both.

Notwithstanding any other provision of the Revised Code that specifies a procedure for the distribution of fines, all fines collected pursuant to division (B) of this section shall be paid into the treasury of the county and credited to any fund for the maintenance and repair of roads, highways, bridges, or culverts.

(C) Whoever violates any other provision of sections 5577.01 to 5577.09 of the Revised Code is guilty of a minor misdemeanor on a first offense; on a second or subsequent offense, such person is guilty of a misdemeanor of the fourth degree.

(D) Whoever violates section 5577.10 of the Revised Code shall be fined not more than five thousand dollars or imprisoned for not less than thirty days nor more than six months, or both.

(E) Whoever violates section 5577.11 of the Revised Code shall be fined not more than twenty-five dollars.

FISHERASSOCIATES
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EXHIBIT G

Groundwater, Hydrogeology, and Geotechnical Report

• Hull & associates, inc.

April 1, 2010

Ms. Erin Bowser
Horizon Wind Energy
129 E. Market Street
Suite 1200
Indianapolis, Indiana 46204

RE: Groundwater Hydrogeology and Geotechnical Desktop Document Review Summary Report for the Timber Road II Wind Power Facility Located in Paulding County, Ohio
HZN003.100.0001.DOC

Dear Ms. Bowser:

Hull & Associates, Inc. (Hull) is pleased to provide Paulding Wind Farm II LLC (Client) with this Desktop Document Review of readily available geologic, hydrogeologic, and geotechnical information for the proposed Timber Road Wind II Power Facility located in Harrison and Benton Townships in Paulding County, Ohio. The Client is pursuing the development of a wind-powered electric generation facility that includes construction of up to 109 wind turbine generators at various locations. Each of the turbines will also be associated with an access road and an electrical collection system.

For the purpose of this summary report, the following definitions have been used when describing the project: [Please note, for consistency purposes the Ohio Power Siting Board's OAC rules (Chapter 4906-17) have been used to define the Project Area and Facility.]

- **Project Area** (pursuant to rule 4906-17-01(B)(1)) is all components of the wind-powered electric generation facility, plus associated setbacks. Based on Ohio Administrative Code (OAC) rule 4906-17-08(C)(1)(c), each of the turbine Sites will have an established setback to the nearest habitable residential structure located on adjacent properties at the time of the certification application.

- **Facility** (pursuant to rule 4906-17-01(B)(2)) is all the turbines, collection lines, access roads, any associated substations, and all other associated equipment.

- The **Project Boundary** was established by the Client and is composed of county and township roads that entirely surround the Project Area.

PROJECT APPROACH

The Desktop Review was completed to gather the applicable geologic, hydrogeological, and geotechnical information specified in the Ohio Power Siting Board's current OAC rules (Chapter 4906-17) concerning the preparation of a certificate application to site a wind-powered electric generation facility. The information was gathered by completing a literature search of existing and readily available documents related to the hydrogeological and geotechnical conditions of the area within the Project Boundary. This information was then reviewed to develop a generalized understanding of the suitability of conditions within the Project Boundary for the proposed construction within the Project Area. The information summarized below was obtained from available on-line databases and/or documents maintained or produced by the following federal, state and/or local agencies:

1. Federal Emergency Management Administration (FEMA);
2. Ohio Department of Agriculture (ODA);
3. Ohio Department of Natural Resources (ODNR);
4. Ohio Environmental Protection Agency (Ohio EPA);
5. Ohio Department of Transportation District 1 and the Office of Geotechnical Engineering (ODOT);
6. Ohio State University, Agricultural Extension Office;
7. Paulding County Engineer and Health Department;
8. United States Department of Agriculture (USDA) Soil Conservation Service Soil Survey of Paulding County; and
9. United States Geological Survey (USGS).

No environmental studies or structural evaluations were performed as part of this scope of work, and therefore no recommendations relative to environmental or structural issues are included in the report.

FACILITY LOCATION

As shown on Figure 1 and as previously stated, the Facility is located near the Village of Payne, Paulding County within Harrison and Benton Townships. The currently proposed Project Boundary is shown on Figure 1, as well as on all of the subsequent figures discussed below.

INFORMATION REVIEW AND ANALYSIS

The following provides a summary of the information reviewed and its applicability to the proposed project.

Geology and Seismology

The area within the Project Boundary lies entirely within the glaciated Maumee Lake Plains Region of the Huron-Erie Lake Plains Section of the Central Lowland Physiographic Province. The Region is characterized as a flat-lying Ice-Age lake basin containing beach ridges, bars, dunes, deltas, and clay flats. The Region formerly contained the Black Swamp, which was a regional wetland extending southwest from present-day western Lake Erie through northwest Ohio into extreme northeastern Indiana. The Black Swamp consisted of extensive areas of swamps and marshes, with some higher dry ground interspersed. Low physiographic relief (less than 5 feet) is generally present in the region, which has been slightly dissected by modern streams. Surface elevations in the Maumee Lake Plains Region range from approximately 570 to 800 feet above mean sea level (USGS elevation) (ODGS, 1998).

The majority of surficial unconsolidated deposits within the Project Boundary consist of glacial till in the form of wave planed ground moraine. These ground moraine deposits are predominantly comprised of clays and silts with variable amounts of sand, gravel, and larger grain sizes. Ground moraine deposits were laid over the region during the Illinoian and Wisconsinan glacial periods. The relatively flat surficial topography within the Project Boundary is the result of the ground moraine having been planed by waves in glacial lakes following their deposition. Surficial lacustrine deposits of sand, silt, or clay, are present throughout the Project Area. Two beach ridges are noted within the Project Boundary, which were deposited along the shores of former glacial lakes, and predominantly consist of grain sizes ranging from fine sand to coarse gravel and cobble. One such ridge is present at the southern boundary of the Project Area along U.S. Route 30 and extends into Van Wert County. This ridge is oriented northwest-southeast and runs along the highway for approximately 3,200 feet in the Project Area, having a maximum width of about 1,000 feet. Another similarly oriented ridge extends across the Indiana state line approximately one mile into the Project Area, terminating near State Route (SR) 500, with a maximum width of about 2,000 feet. Alluvial deposits have also been noted along the flood plain of Flatrock Creek, which flows from southwest to northeast across the Project Area. (Pavey *et. al.*, 1999).

Measured elevations within the Project Boundary range between approximately 730 and 780 feet above mean sea level (USGS elevation), and in general, elevations increase from north to south across the Project Boundary area. The lowest elevation of approximately 730 was recorded in North Creek, near the northern edge of the Project Boundary, and the highest elevation of nearly 780 was on the previously discussed beach ridge along U.S. Route 30 near the southwestern corner of the Project Boundary area.

Four bedrock units underlie the Project Area. The Salina Group, of Upper and Lower Silurian age, is the oldest of the four units and is present across the southernmost portion of the Project Area. The Salina Group consists of a sequence of dolomite, anhydrite, gypsum, salt, and shale. The bedrock unit above the Salina Group and to the north is the Detroit River Group, which is of Middle and Lower Devonian age. The Detroit River Group consists of three formations, in descending order: the Lucas and Amherstburg Dolomites and the Sylvania Sandstone. The Middle Devonian Dundee Limestone is the unit above the Detroit River Group, extending in general from west to east across the central portion of the Project Area. The uppermost bedrock unit within the Project Boundary is the undivided Ten Mile Creek Dolomite and Silica Formation of Middle Devonian age. The unit consists predominantly of dolomite, limestone, and shale (Slucher *et. al.* 2006). The approximated bedrock topographic surface is shown on Figure 2. In six water wells that have been documented within the Project Area, bedrock has been encountered at depths ranging between 27 and 47 feet below existing ground surface (Raab, 1986). The bedrock topography within the Project Boundary is relatively flat, with bedrock elevations increasing from nearly 700 feet (USGS elevation) in the northern portion of the Project Boundary to just over 730 feet in the southern portion, as shown on Figure 2. The contoured bedrock surface indicates a pre-glacial valley trending from southeast to northwest in the east-central portion of the Project Boundary. A comparison of surface elevations (shown on Figure 1) with inferred bedrock elevations (shown on Figure 2) shows a thickness of unconsolidated materials above bedrock that generally ranges between approximately 25 and 50 feet, however the depth to bedrock may be as little as approximately 20 feet in some areas along stream channels including portions of Flatrock Creek and Blue Creek. The maximum depth to bedrock occurs at the beach ridge along U.S. Route 30 in the southwestern portion of the area within the Project Boundary, at approximately 55 feet.

Generalized geologic cross-sections are included as Figure 3 and illustrate the typical geologic setting along north-south (A-A') and east-west (B-B') transects across the Project Area. The cross-sections were prepared using data compiled from sources including, but not limited to, ODNR well logs and bedrock topographic maps, pursuant to rule 4906-17-05(A)(4).

There are no known or probable karst areas within the Project Boundary, according to information obtained from the ODNR Division of Geological Survey. The nearest documented karst or probable karst areas are located approximately 59 miles to the south-southeast outside of the Project Boundary in south-central Shelby County (ODGS, 1999).

A review of geologic structural and seismic information was conducted for the Project Area. Documented structural features and earthquake epicenters located within Ohio and Indiana are shown on Figure 4. The review indicates that there are no known structural features or earthquake epicenters documented within the Project Boundary. The nearest known structural feature is the Fort Wayne Rift, located more than five miles south and southeast of the southwest corner of the Project Boundary. Other structural features including faults and fault systems near the Project Boundary include the Anna-Champaign Fault, situated about 26 miles south-southeast at its closest proximity, and the Bowling Green Fault System, located approximately 50 miles east of the Project Boundary (ODGS, 2007).

Recorded seismic information for the region does not show any earthquake epicenters within Paulding County. The closest documented earthquake epicenter to the Project Area occurred in north-central Mercer County, Ohio, located approximately 22 miles south-southeast of the Project Boundary. The epicenter of the highest magnitude earthquake recorded in Ohio was near the Village of Anna, located in north-central Shelby County, approximately 44 miles southeast of the Project Boundary. The earthquake occurred in 1937 and had a magnitude of 5.4 (Hansen, 2007). A review of recorded seismic data from the Indiana Geological Survey did not indicate the presence of any earthquake epicenters in the vicinity of the Project Boundary (Kirby, 2006).

Hydrology and Hydrogeology

The Project Boundary lies within the Maumee River Drainage Basin. In general, surface water flow within the Project Boundary is toward the east-northeast, and water bodies include several small streams, ditches, and ponds. Flatrock Creek is the largest stream within the Project Boundary, and flows from the southwest to northeast across the central portion of the Project Area. Wildcat Creek is a tributary of Flatrock Creek, flowing from west to east through the north-central portion of the Project Area, converging with Flatrock Creek just east of the Project Boundary. A pair of small streams, known as North Creek and South Creek, flow from west to east through the northern portion of the Project Area. Blue Creek enters the Project Area from the southern boundary, and then flows to the east across the southernmost portion of the Project Area. Numerous man-made ditches, which flow into the previously listed streams, are present throughout the Project Area.

The Project Area was reviewed for the presence of any areas designated as a 100-year flood plain. Flood plain information for the Project Area was obtained from the ODNR and FEMA, and is shown on Figure 1. The area along Flatrock Creek, extending from southwest to northeast across the Project Area, is designated as a 100-year flood plain having a width ranging from approximately 500 to 1,250 feet. A 100-year floodplain area was also established for an approximate 3.1-mile length of Wildcat Creek contained within the Project Boundary. The width of the Wildcat Creek floodplain ranges from approximately 200 to 400 feet. There are no other areas within the Project Boundary designated as a 100-year flood plain. Several Ohio counties are undergoing a Map Modernization program to convert the National Flood Insurance Program maps to a digital format. At this time the digital conversion for the Paulding County map has been deferred.

The principal groundwater source within the Project Boundary is the limestone bedrock aquifer. Groundwater yields of up to 500 gallons per minute (gpm) have reportedly been obtained at depths greater than 300 feet below existing ground surface. Agricultural and domestic supplies of about 10 to 15 gpm can reportedly be developed at depths of less than 90 feet. Wells are often completed at shallower depths in an attempt to obtain sulfur-free water (Raab, 1986). Alluvial deposits along Flatrock Creek are included in the Auglaize River alluvial aquifer, which is capable of producing between 5 and 25 gpm. The surficial lacustrine deposits in the Project Area, collectively referred to as the Lake Maumee lacustrine aquifer, may yield up to 5 gpm. Aquifers underlying the Project Area are shown on Figure 5.

With the exception of the Village of Payne, which lies in the east-central portion of the Project Boundary, the Project Boundary encompasses a rural area. The Village of Payne operates a community public water system serving approximately 1,250 residents. The system uses two wells that pump approximately 230,000 gallons of water per day from the Silurian-age carbonate aquifer. The aquifer is covered by approximately 38 feet of low-permeability unconsolidated materials. The top of the aquifer is approximately 38 to 48 feet below ground surface (Ohio EPA, 2002). Figure 5 shows the estimated one-year and five-year time-of-travel areas from the system's wells based on Ohio EPA guidance. These two time-of-travel areas comprise the drinking source water protection area (SWPA).

SWPAs are areas defined and approved by the Ohio EPA for the purpose of protecting drinking water resources. Environmental regulatory programs within the Ohio EPA, as well as other regulatory agencies such as the Ohio Bureau of Underground Storage Regulations (BUSTR), have adopted regulations that restrict specific activities within SWPAs. These activities include concentrated animal feeding operations, sanitary, industrial or residual waste landfills, land application of biosolids, and voluntary brownfield cleanups. The restrictions typically apply to SWPAs relying on groundwater as their drinking water source. Hull has reviewed the range of programs which have adopted rules related to the presence of SWPAs (http://www.epa.state.oh.us/ddagw/Documents/regstable.pdf), and we conclude that construction of the proposed wind turbine facility should not constitute an activity that would be restricted within either a surface water or groundwater SWPA.

In general, property owners located within the Project Boundary that are not supplied potable water from the Village of Payne's system utilize private wells for their potable water supply. Water well locations are shown on Figure 5, which was compiled from well location information provided by ODNR, Ohio EPA, and the Paulding County Health Department. Hull has not reviewed specific information such as depth, boring logs, treatment systems, or construction associated with any of the wells depicted on the figure, nor has there been an attempt to verify whether these private wells were completed within the carbonate aquifer, the lacustrine aquifer or some other aquifer.

Well Survey

Well surveys have been mailed to the property owners within the Project Boundary. Reponses expected to take 4 to 6 weeks will be compiled and provided to the Client as a separate letter report with attachments.

Soil Survey

The USDA Soil Conservation Service Soil Survey of Paulding County was reviewed (USDA, 1993). Soil surveys furnish surface soil maps and provide general descriptions and potentials of the soil to support specific uses, and can be used to compare the suitability of large areas for general land uses. Surface soils within the Project Boundary are comprised mostly of Hoytville silty clay, Hoytville silty clay loam, Latty silty clay and Nappanee silty clay loam. A soils map (Figure 6) for the Project Boundary is included. The soil survey information suggests the Hoytville and Latty silty clays are poorly drained, have a low to moderately high capacity to transmit water (0.01 to 0.20 inches/hour), with the depth to water table being zero to 12 inches. The Hoytville silty clay loams are very poorly drained and have a low to moderately high capacity to transmit water (0.01 to 0.20 inches/hour), with the depth to water table being zero to 12 inches. The Nappanee silty clay loams are somewhat poorly drained and have a moderately low to moderately high capacity to transmit water (0.06 to 0.2 inches/hour), with the depth to water table being 12 to 24 inches. The soil survey indicates that these soils do not frequently flood, however the Hoytville silty clays, Hoytville silty clay loams and Latty silty clays frequently pond surface water runoff.

Underground and Surface Mines

Information obtained from the ODNR, Division of Geological Survey and phone discussions with the Paulding County Engineer's Offices indicated that there is no information available that suggests that underground or surface mines are located within the Project Boundary. Soil survey information provided by the USDA indicates that there are no former gravel pits or quarries known to be located within the Project Boundary. Figure 4 illustrates that no known abandoned mines shafts or probable abandoned mines are located within the Project Boundary.

PROJECT BOUNDARY RECONNAISSANCE

In addition to the desktop study, Hull completed a limited field reconnaissance on March 15, 2010 at representative points within the Project Boundary to observe geotechnical-related conditions including topography, surface geologic features and surface water conditions. Photographs from the site reconnaissance are presented in Appendix A to illustrate general conditions within the Project Boundary. The areas within proximity of the Project Boundary predominantly consist of agricultural fields with no visible geotechnical-related site constraints for the proposed construction. The area within the Project Boundary appears to be adequately drained. Nominal amounts of standing water were observed in localized areas within surface water ditches and farm fields, but it should be noted that the area within the Project Boundary received 0.81 inches of rainfall in the five days prior to the field reconnaissance (NOAA Station #336465 at Paulding, Ohio, data obtained from the Midwest Regional Climate Center). On the basis of these data, Hull determined that the observed areas of standing water were ephemeral.

Construction of gravel access roads will be necessary to access all turbine locations from the Township and County roads. Several of the Township roads are currently dirt roads with grassy vegetation or gravel roads. These roads may need to be improved to provide access to turbine locations. No information was available from ODOT or the County Engineer's office concerning rockfalls or landslides within the Project Boundary. Based on a review of the existing topography of the Project Boundary and the visual observations completed by Hull during the reconnaissance, it is anticipated that the potential for rockfalls and landslides is very low. In addition, Hull did not observe any sink holes or depressions within the Project Boundary.

AGENCY INTERVIEWS

Hull contacted ODOT District 1 in order to review geotechnical boring logs from historic projects that were located near and within the Project Boundary. The projects included the roadway soil profile reports for portions of SR 24 that is currently under construction, as well as structural soil profiles for bridges and abutments over South Creek and North Creek, however, these are outside the Project Boundary. The soil profile drawings did not suggest that non-conventional foundation design or subgrade improvements to gravel access roads would be necessary for the proposed roadway construction.

Hull contacted the Paulding County Engineer's Office regarding their knowledge and experience of previous construction projects, subsurface conditions, and maintenance history in the vicinity of the Project Boundary, and to ask about permits that may be necessary for construction. Mr. Chad Moore of the Paulding County Engineer's office, indicated that based on his experience and the general description of the proposed project as provided by Hull, significant geotechnical constraints for the planned construction are not anticipated. Mr. Moore indicated that the expectation is that only typical construction permits would be necessary.

PRELIMINARY CONSTRUCTION CONSIDERATIONS

Based on our experience with earthwork in the region, conventional, shallow foundations may be able to support the turbines and the substation. However, this assumption will need to be confirmed by a detailed geotechnical exploration and evaluation for each turbine-site (e.g., each turbine and associated access road locations) and the substation location. If it is determined that shallow foundations are not suitable for structural support, extended foundation systems (such as driven H-piles or auger cast piles) may be necessary to bear in suitable material or on bedrock. Additionally, other suitable foundation types may be utilized according to their compatibility with the geotechnical parameters of the specified turbine-site and substation location.

The geotechnical engineer, or a designated representative, should examine foundation designs and compatibility with the supporting soils and approve the work prior to placement of foundation components.

Based on the information collected to date, it is anticipated that there will be no construction concerns related to the access roads. However, this assumption will need to be confirmed by a detailed geotechnical exploration and evaluation of each access road location when considering site-specific subgrade conditions at the time of construction, anticipated vehicle loads/volume, grading plans, etc.

Adequate surface water run-off drainage should be established at each turbine-site, access road and the substation location to minimize any increase in the moisture content of the subgrade material. Positive drainage of each turbine-site, access road and substation location should be created by gently sloping the surface toward existing or proposed drainage swales. Surface water runoff should be properly controlled and drained away from the work area. It should be noted that the subgrade soils are subject to shrinking and swelling with variation in seasonal moisture content and consideration should be given during constructability reviews to determine how best to deal with potential moisture fluctuations.

The contractors should be prepared to deal with any seepage or surface water that may *accumulate in excavations. Site dewatering may be required during construction if excavations* extend below the water table, or significant precipitation events occur when the foundation excavations are exposed. The contractor should be able to minimize the amount of excavation exposed at one time, especially when precipitation is forecasted. Fluctuations in the groundwater level may occur seasonally and due to variations in rainfall, construction activity, surface runoff, and other factors. Since such variation is anticipated, we recommend that design drawings and specifications accommodate such possibilities and that construction planning be based on the assumption that such variation can occur.

The foundations and excavations are to be designed by the Client's structural designer. The contractor should be solely responsible for constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom. All excavations should comply with applicable local, state, and federal safety regulations including the current Occupational Safety and Health Administration (OSHA) Excavation and Trench Safety Standards (29 CFR Part 1926).

Based on a review of the soil survey information and our experience with earthwork in northwestern Ohio, the soils should be suitable for grading, compaction, and drainage when each turbine-site is prepared as discussed in this report and the guidance provided in the Geotechnical Exploration Report for each individual turbine location. Due to the anticipated depth of bedrock, bedrock blasting will probably not be necessary; however, this assumption must be confirmed with geotechnical test borings prior to construction.

Additional considerations relative to site preparation, suitability of fill materials, fill placement and weather limitations are presented in Appendix B for reference. These considerations are provided as general guidelines and the contractor is responsible for selecting and implementing the most appropriate construction techniques (e.g., construction means, methods, sequences or procedures, and safety precautions or programs) for each site-specific condition(s).

SUMMARY

Based on the information reviewed to date and the field reconnaissance, it does not appear that the local geology and/or hydrogeology will be prohibitive regarding construction of the proposed wind turbines, access roads, interconnects and substation. In addition, based on Hull's knowledge of typical wind turbine foundation construction, it does not appear that the construction of the proposed wind turbines will have a significant impact on the local geology and/or hydrogeology of the Project Boundary. Therefore, based on the information presented herein and the associated analysis, construction of the wind turbines, or other project components, are not anticipated to result in any significant negative impact to drinking water wells within the Project Boundary.

It is Hull's understanding that there is a minimum setback distance which will be established from each turbine to the nearest residential structure. Although the exact location of each potable use well cannot be determined with the information obtained to date, it is assumed that the potable wells are located in close proximity to each property owners' residence. Therefore, based on the information presented herein and the associated analysis, construction of the wind turbines, or other project components, are not anticipated to result in any significant negative impact to the property owners' wells.

Based on the information reviewed and the field reconnaissance, it appears that the primary geotechnical issue for the Facilities, access roads and substation location that should be considered during construction is the poor drainage of the surface soils within the Project Boundary. As previously discussed, adequate surface water run-off drainage should be established at each Facility, access road and substation location to minimize any increase in the moisture content of the subgrade material. Surface water run-off drainage can be managed by implementing techniques such as surface water swales, drainage berms, etc.

Site-specific geotechnical information should be obtained by the Client prior to design of the turbine foundations, and prior to preparation of construction specifications and design plans. This may require, but not be limited to, completion of geotechnical explorations to further evaluate the *in situ* materials at each Facility component. A generalized scope of work template for the geotechnical explorations has been provided in Appendix C, which can be used to prepare detailed Requests for Proposals for the individual Facilities.

The conclusions included in this Desktop Review are based on general summaries available through the resources previously listed. There may be anomalies in the hydrogeology or geotechnical conditions of a specific Facility component that cannot be resolved at the scale of the publicly available data used in this study. As noted previously, site-specific geotechnical information should be obtained prior to final turbine foundation design.

STANDARD OF CARE

Hull has performed its services using that degree of care and skill ordinarily exercised under similar conditions by reputable members of its profession practicing in the same or similar locality at the time of service. No other warranty, expressed or implied, is made or intended by our proposal or by our oral or written reports. The work does not attempt to evaluate past or present compliance with federal, state, or local environmental or land use laws or regulations. Conclusions presented by Hull regarding the area within the Project Boundary are consistent with the Scope of Work, level of effort specified, and investigative techniques employed. Reports, opinions, letters, and other documents do not evaluate the presence or absence of any condition not specifically analyzed and reported. Hull makes no guarantees regarding the completeness or accuracy of any information obtained from public or private files or information provided by subcontractors.

If you have any questions regarding the summary and conclusions presented in this Desktop Document Review Summary Report, please do not hesitate to contact either of the undersigned at your convenience.

Sincerely,

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Project Manager
(440) 232-9945

Hugh F. Crowell, PWS
Ecology & Wetlands Practice Leader
(614) 793-8777

Attachments

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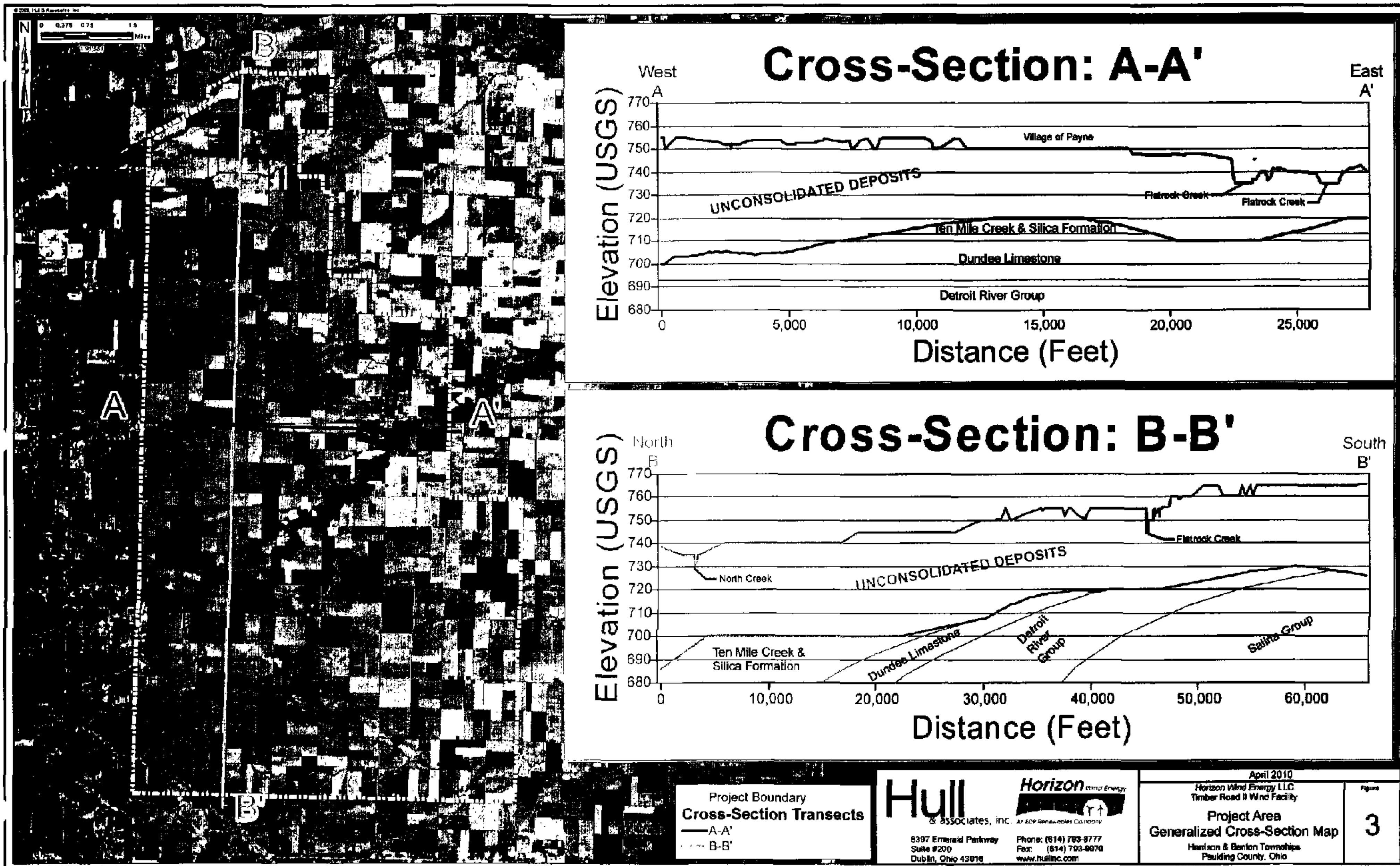
Technology: 2006 Ohio Aerial Photography; Microsoft Live Aerial Imagery Service: Indiana Aerial Image; Streetmap USA: Transportation (road & rail); US Atlas: Civil Townships and Counties.

FIGURES


Cross-Section: A-A'
West
A
East
A'
Village of Payne
UNCONSOLIDATED DEPOSITS
Flatrock Creek
Flatrock Creek
Ten Mile Creek & Silica Formation
Dundee Limestone
Detroit River Group
Elevation (USGS)
Distance (Feet)
Cross-Section: B-B'
North
B
South
B'
North Creek
Flatrock Creek
UNCONSOLIDATED DEPOSITS
Ten Mile Creek &
Silica Formation
Dundee Limestone
Detroit River Group
Salina Group
Elevation (USGS)
Distance (Feet)
Project Boundary
Cross-Section Transects
A-A'
B-B'
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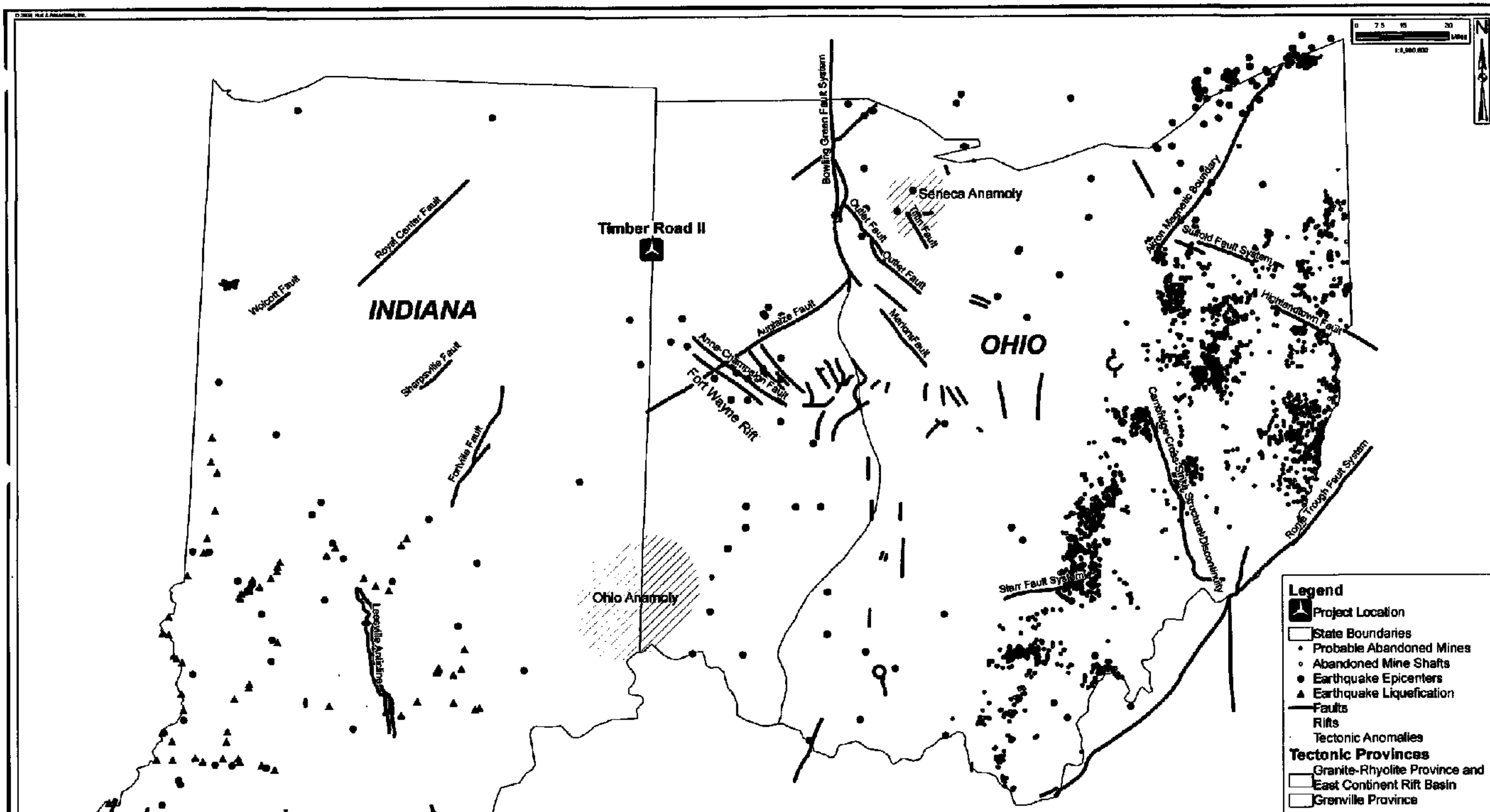
April 2010
Horizon Wind Energy LLC
Timber Road II Wind Facility
Project Area
Generalized Cross-Section Map
Harrison & Benton Townships
Paulding County, Ohio
Figure
3



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Horizon Wind Energy
An EDP Renewables Company

April 2010

Horizon Wind Energy LLC
Timber Road II Wind Facility

State Geophysical Map

Harrison & Benton Townships
Paulding County, Ohio

Figure
4

APPENDIX A

Photographs from March 15, 2010 Site Reconnaissance

PHOTO 1: Looking north from Allison Road toward turbine locations 56, 57, and 58.

PHOTO 2: Facing south from Wiegel Road toward turbine locations 82 and 83.

Hull 3401 Glendale Avenue, Suite #300, Toledo, Ohio 43614 Phone: (419) 385-2018 Fax: (419) 385-5487 www.hullinc.com © 2010, Hull & Associates, Inc.	Horizon Wind Energy, LLC Timber Road II Wind Farm Project Site Photographs Harrison & Benton Townships, Paulding County, Ohio	Date: April 2010 Project Number: HZN003 File Name: HZN003.100.0001.XLS

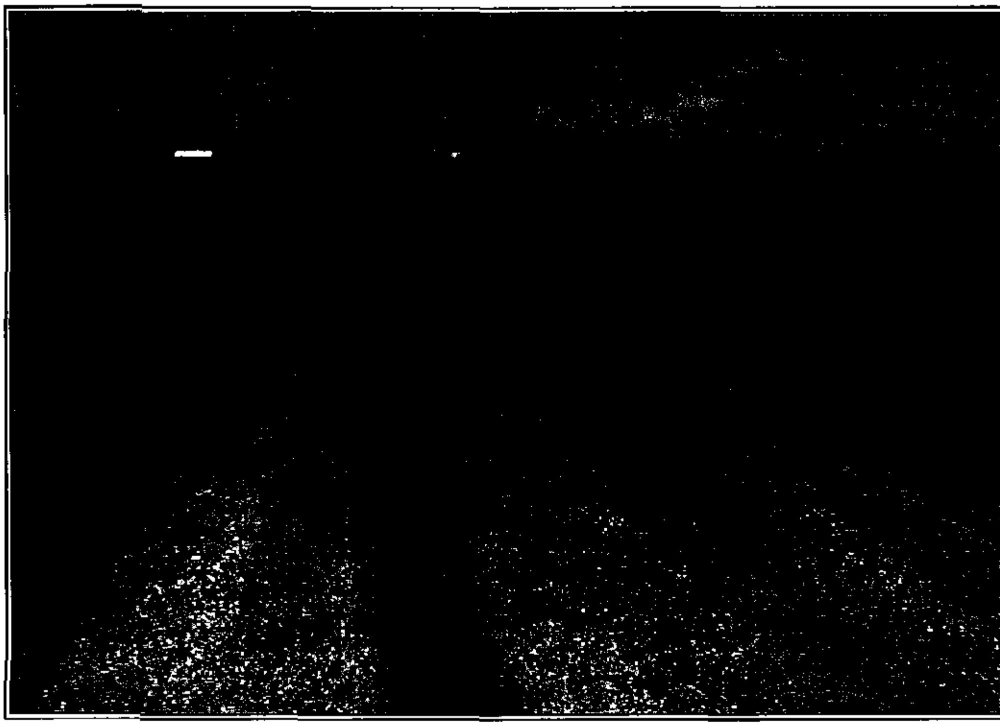

PHOTO 3: Pavement condition of Wiegel Road.

PHOTO 4: Gravel township road.

APPENDIX B

General Earthwork Recommendations

APPENDIX B
GENERAL EARTHWORK RECOMMENDATIONS

Earthwork is most efficiently accomplished using large, heavy-duty equipment, unimpeded by obstacles. Consequently, it is preferable to complete as much of this work as is possible prior to initiating other phases of construction, such as footing excavation and installation of underground utilities. The following are general recommendations concerning earthwork construction and may not be applicable to site-specific conditions. Furthermore, the contractor is responsible in selecting and implementing the most appropriate construction techniques (e.g., construction means, methods, sequences or procedures, or for safety precautions or programs) for each site-specific condition(s).

1. Stripping, clearing and grubbing

In areas where fill is to be placed to support structures, drive and parking areas, the following is proposed:

Strip and remove all sod, topsoil, and organic contaminated soils.

Remove all trees and shrubs, designated to be cleared, inclusive of grubbing roots of larger trees.

Remove all trash, debris, rubble, existing random fill, soil softened by standing water, and any other soft soil as determined necessary by the geotechnical engineer. The fill placement should begin on firm, relatively unyielding foundation material.

The fill foundation should be stripped and cleared beyond the limits of the structure by a distance equal to not less than the thickness of the fill below the structure foundation plus 10 feet. For drives and parking areas, the fill foundation should be stripped and cleared for a distance of at least 5 feet beyond the limits of the pavement.

2. Fill Material – Composition

Material satisfactory for use as fill includes clayey silt and silty (lean) clay soils or sand and gravel, free of topsoil, organic or other decomposable matter, rocks having a major dimension greater than 6 inches, or frozen soil.

Soils having a maximum dry density of less than 90 pounds per cubic foot as determined by the moisture-density relationship are not considered suitable for use as fill.

Soils described as SILT (USCS ML, MH or ODOT A-4B) are considered questionably suitable for use as fill material because the stability of these materials is very sensitive to increases in moisture. These soils should not be placed within three feet of the top of the subgrade.

3. **Fill Material – Moisture**

Predominately fine grained fill materials clayey silts and silty (lean) clays are recommended to contain moisture not exceeding two percent above optimum moisture as determined by the moisture-density relationship, or less if found to be needed to obtain stability below the compaction equipment. This provides the best assurance of establishing not only adequate density for ultimate support of construction but also provides stability of the compacted soil under the dynamic loading induced by the heavy weight construction equipment during placement.

Predominately sand and gravel fill material is not as sensitive to moisture content with regards to stability. Therefore, we recommend no specified limitation, as long as specified density and stability can be established.

4. **Moisture Adjustment**

If the moisture content of the material from the fill source or native subgrade is not appropriate to establish density, moisture adjustment of the material will be required.

If the moisture content of the fill being placed or the native subgrade is too high, appropriate adjustment entails spreading and exposing to the sun and wind for drying and using equipment such as a disc and/or a grader. This may not be feasible during wet seasonal conditions. Wet soils will pump and may cause excessive rutting under heaving equipment traffic. Therefore, improvements to the subgrade may be achieved by undercutting and replacing with suitable granular subbase (possibly in combination with a non-woven geotextile or biaxial geogrid) or stabilization with lime or cement. The most appropriate subgrade improvement technique should be determined at the time of construction.

If the moisture content of the fill is too low, a water truck with a sprinkler bar may be required. After sprinkling, the soil should be thoroughly mixed with a disc and/or a grader.

5. **Equipment**

Equipment to compact the fill should be heavy duty. For example:

Fine-grained materials (clayey silts and lean clays) may be efficiently compacted using a sheepsfoot roller comparable to a caterpillar 815 self-propelled roller.

Coarse-grained materials (sand and gravel) having little or no silt and clay sizes may be efficiently compacted using a heavy, self propelled, vibratory smooth wheel roller.

Coarse-grained materials having about 10% or more silt and clay sizes may be efficiently compacted using a sheepsfoot roller comparable to a caterpillar 815 self-propelled sheepsfoot roller.

6. **Lift Thickness**

Fill should be placed in horizontal layers, 8-inch loose thickness, compacted uniformly to approximately 6-inch thickness.

If equipment is used which is lighter weight than recommended above, lift thickness should be appropriately thinner.

7. Fill Density

In areas to support pavements and building construction, the fill and backfill should be compacted to the density requirements as recommended in the main body of the report.

8. Season of Earthwork

Weather conditions are very important to efficiency in working soils. Generally earthwork is accomplished most efficiently between May and November. Cold periods may hamper moisture adjustment. If the temperature is below 32 degrees Fahrenheit (°F) for prolonged periods, frozen material on the fill surface must be removed before subsequent lifts may be placed. Also, densification of fill is more difficult when air temperatures are below freezing. Granular material, such as bank run sand and gravel is somewhat less sensitive to weather conditions but is not immune from difficulties that may be presented by precipitation and low temperatures.

9. Trench Backfill

Trench backfill should be controlled compacted fill, placed in accordance with recommendations presented above and as engineered for thermal properties in collection systems

It is recommended that suitable granular material be used to backfill trenches that traverse beneath buildings, drives, or parking areas.

10. Proof Rolling

Upon completion of stripping, clearing, and grubbing; the areas planned to support pavement or building floor slab shall be proof rolled in accordance with ODOT Item 204 to identify any soft, weak, loose, or excessively wet subgrade conditions. At a minimum, the proof rolling should be completed with a minimum 20-ton loaded tandem axle dump truck. The vehicle should pass in each of two perpendicular directions covering the proposed work area. Any observed unsuitable materials should be undercut and replaced with suitable fill as directed by the geotechnical engineer.

11. General

All fill should be placed and compacted under continuous observation and testing by a soils technician under the general guidance of the geotechnical engineer.

APPENDIX C

Generalized Geotechnical Exploration Work Plan

APPENDIX C
GENERALIZED GEOTECHNICAL EXPLORATION WORK PLAN

A geotechnical engineer licensed by the State of Ohio shall prepare a proposal for a geotechnical site exploration in general accordance with the suggested scope of work provided below. The geotechnical engineer shall be qualified in geotechnical investigations within the region. The geotechnical exploration program suggested below (e.g., boring frequency, location and depth) should be adjusted by the geotechnical engineer based on their experience and to allow for specific geological, topographic, and drainage conditions of the site.

PROJECT DESCRIPTION

A geotechnical exploration will be performed at the proposed Project Boundary in Paulding County, Ohio. The project involves planned construction of wind turbine generators at various locations (Sites) for the Timber Road Wind Farm Project. Upon completion of the geotechnical exploration suitable foundation systems will be reviewed that will work with the Site conditions as determined by the geotechnical exploration and design preferences provided by the Client. The foundation types that will be considered include spread footings, P&H foundations, and pile supported foundations.

The purpose of the geotechnical exploration is to obtain geologic information and to determine relevant engineering properties of the Site soils. A review of generalized geologic references, including ODNR Well Logs and ODNR Groundwater Resource Maps, suggest the Project Boundary is underlain by lacustrine and ground moraine deposits with dolomite, limestone, and shale bedrock depths ranging from 25 to 50 feet below existing ground surface.

PROPOSED SCOPE OF WORK

Reconnaissance, Planning and Boring Layout
The following will be conducted as part of this task:

1. A review of pertinent, readily available subsurface geotechnical information for the Site that is provided to the Geotechnical Engineer will be performed.

2. A site visit will be performed to lay out the borings and clear underground utilities at the boring locations. The landowner will be consulted to provide the geotechnical engineer with information and the locations of all private utilities at the site. The geotechnical engineer will be responsible for locating the boring, which should be surveyed and staked on the site prior to drilling.

3. The Ohio Utility Protection Service (OUPS) and Ohio Oil & Gas Producers Underground Protection Service (OGPUPS) will be notified a minimum of 48-hours prior to the commencement of drilling services.

Drilling and Sampling
After the geotechnical engineer has reviewed all available desktop information, they will determine the number of borings to be drilled at turbine locations. In addition, borings will be taken at the proposed substation locations. The borings will extend to the proposed depth or competent bedrock, whichever is encountered first.

For all borings, the following will be performed:

1. Split-barrel sampling of soil will be performed in accordance with American Society for Testing and Materials (ASTM) D 1586 for each boring in increments of 2.5 feet to the depth of 10 feet and at five-foot intervals below 10 feet to the depth of the borings. In all the borings, Standard Penetration Test (SPT) data will be developed and representative samples preserved.

2. It is anticipated that the drilling will be accessible with and performed by a truck-mounted drilling rig. Provisions shall be made by the Geotechnical Engineer based on the time of year the fieldwork will occur in using an ATV drill rig if the borings can not be accessed with a truck-mounted drilling rig.

3. Water observations in the boreholes will be recorded during and at the completion of drilling.

4. All borings will be backfilled at the completion of drilling with bentonite chips and drill cuttings.

Geotechnical Laboratory Testing

A laboratory testing program will be established by the geotechnical engineer based on the observations made during the drilling activities and experience. The following laboratory tests shall be performed on samples retained during the drilling activities:

1. All samples will be classified in the laboratory based on the visual-manual examination (ASTM D 2488) Soil Classification System and the laboratory test results. Formal boring logs will be prepared using the field logs and the laboratory classifications.

2. Laboratory testing will include moisture content, particle-size analyses and Atterberg limits of a limited number of samples considered to be representative of the foundation materials encountered by the borings. Unconfined compression and consolidation tests will be performed if low strength and/or highly compressible cohesive soils are encountered as deemed necessary by the geotechnical engineer.

3. All laboratory testing will be performed in accordance with ASTM or other specified standards.

Geotechnical Exploration Report

The geotechnical engineer will prepare a Geotechnical Exploration Report that will include the findings, conclusions and recommendations concerning proposed geotechnical related design-construction considerations and foundation design recommendations. The report shall also include an Appendix, which will include a boring location plan, a legend of the boring log terminology, the boring logs, and the results of any laboratory tests. Three (3) copies of the report will be presented by the Geotechnical Engineer.

EXHIBIT H

Economic Impact Assessment

ASSESSING THE ECONOMIC IMPACTS OF TIMBER ROAD II WIND FARM

An Evaluation of Potential Impacts on the Local Economy

PAULDING COUNTY, OHIO

PREPARED FOR

HORIZON WIND ENERGY, LLC

BY

CAMIROS

411 S. WELLS STREET
CHICAGO, ILLINOIS 60607

March 26, 2010

ACKNOWLEDGEMENTS

This report was prepared by Jacques Gourguechon, AICP, principal with the planning firm of Camiros, Ltd. for Horizon Wind Energy, LLC. Questions regarding this report should be directed to Mr. Gourguechon at *jgourgue@camiros.com* or by phoning Camiros, Ltd. at (312) 922-9211. Mr. Gourguechon's resume is attached as *Appendix A* to this report.

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ASSESSING THE ECONOMIC IMPACTS OF TIMBER ROAD II WIND FARM

An Evaluation of Potential Impacts on the Local Economy

As part of the planning process for this project, Horizon Wind Energy, LLC engaged Camiros, Ltd. to evaluate the economic impacts of constructing and operating the proposed *Timber Road II Wind Farm* on the local economy. For the purposes of this study, the local economy includes the Ohio counties of Paulding, Defiance, Putnam and Van Wert and the Indiana counties of Allen and Adams. Specifically, Camiros was asked to analyze and quantify impacts in three economic components: employment, total dollars injected into the local economy, and land lease revenue that will accrue to participating land owners resulting from the construction of the proposed 150 megawatt wind farm.

The analysis concludes that the project will result in a positive economic benefit to the local economy, including the creation of new jobs as well as an increase in spending in the local economy. The project will also increase property tax revenues to local governments and confer land lease payments to participating land owners, as well as participants in Horizon Wind Energy, LLC's "neighbor payment program."

To research the economic impact of the proposed wind farm, Camiros employed a number of techniques. Local economic impacts were estimated based on data provided by Horizon Wind Energy, LLC using data from similar completed projects. In addition, local economic impacts were estimated using an input-output model designed by the U.S. Department of Energy specifically for wind energy facilities based on data from existing wind farm projects around the United States.

The economic analysis is based on reasonable assumptions of future expenditure patterns for constructing and operating the proposed wind farm. Findings from the analysis should not be taken as precise projections of future performance. Rather, the values included in this report provide insight into the likely economic impact of the project.

Summary of Findings

- **Total Economic Benefit to the Local Economy.** *Total local benefit* refers to the sum of economic activity, or the overall value of production, including new jobs, total wages and salaries for those new jobs, new dollars injected into the local economy through local spending on goods and services, and payments to participating land owners. During the construction phase of the project, the proposed Timber Road II Wind Farm will generate approximately $54 million in total local benefit. Once complete, the project will continue to generate approximately $5.6 million annually in total local benefit.

- **Employment Benefits to the Local Economy.** During the construction phase of the project, the proposed wind farm will add an estimated 420 new full-time jobs to the local economy. These new jobs will generate approximately $19.8 million in wages and salaries.

  It is estimated that of these 420 new jobs, approximately 236 will directly support the construction of the wind farm. In addition, 73 jobs are expected to be added to the local economy through the indirect impacts associated with the project, and 111 jobs are expected to be added to the local economy through induced impacts created by the project. Direct, indirect and induced impacts are described in further detail later in this report.

  During the operations and management (O&M) phase of the project, approximately 43 new jobs will be added to the local economy. It is estimated that of these 43 new jobs, approximately 23 jobs will directly support the operation of the wind farm. These 23 new jobs will generate approximately $1,000,000 in earnings. Six additional new jobs are expected to be added to the local economy through indirect impacts associated with the project, and 14 additional jobs are expected to be created through induced impacts of the project.

- **Land Lease Revenues.** Land lease revenue associated with the project will generate an approximately $1.1 million annually in increased income for participating property owners. There will be additional yearly payments totaling $320,000 under the "neighbor payment program" (NPP), which provides payments to those who live near a turbine or group of turbines and who choose to participate in the program.

- **Property Tax Revenues.** The construction of the proposed Timber Road II Wind Farm will increase tax revenues to local governments that tax the area covered by the proposed wind farm subject to the State of Ohio formula for assessing wind turbines.

I. INTRODUCTION

There are several kinds of natural resources used for energy production. The major types of energy used today are derived from fossil fuels, and include coal, oil, and natural gas. Alternatives to this type of energy production are referred to as "clean energy" and include wind energy, solar power and hydropower. Wind energy is currently the most prevalent pollution-free source of power and has none of the emissions associated with the production of fossil-fuel types of energy. The United States now leads the world in the production in wind energy, followed by Germany, Spain, India and China.

Horizon Wind Energy, LLC is currently developing plans and seeking zoning approval for the construction of the proposed Timber Road II Wind Farm to be located upon approximately 15,000 acres in southwest Paulding County, Ohio. If approved, the project will construct from 83 to 100 wind turbines with a total nameplate capacity of 150 megawatts. The project is expected to be constructed over an eight month period beginning in April, 2011.

Total investment in the wind farm project will be approximately $327 million, through development, engineering and construction. During construction, the project will result in the employment of 420 workers, a substantial portion of which will be hired from within the six-county region, herein referred to as the *local economy*[1]. Total estimated construction labor costs are approximately $13.4 million.

Total yearly costs for the O&M phase of the project will be approximately $7.5 million. Approximately 23 new jobs are directly related to operating and managing the wind farm. Estimated annual labor costs for operations are $1,000,000.

The Local Economy

This economic analysis focuses on the anticipated impact of the project on local economy. The proposed wind farm is located in rural Paulding County, adjacent to the Indiana state line. It is expected that economic activity created by the project will reach beyond Paulding County into the surrounding rural counties and nearby population centers. The project will draw new employees and derive its necessary goods and services primarily from the surrounding area.

[1] For the purposes of this analysis, the "local economy" shall be the whole area of Paulding, Defiance, Van Wert and Putnam County, Ohio and Allen and Adams County, Indiana.

Paulding County, the site of the proposed wind farm, is bounded by the rural Ohio counties of Defiance to the north, Putnam to the east and Van Wert to the south. Adams County, Indiana to the west is also rural in character. Allen County, Indiana, immediately to the west of the Timber Road II Wind Farm, is more urban with the City of Fort Wayne as its major population center. For the purposes of this analysis, these six counties make up the *local economy*. See <u>*Figure 1: Six County Local Economy*</u>.

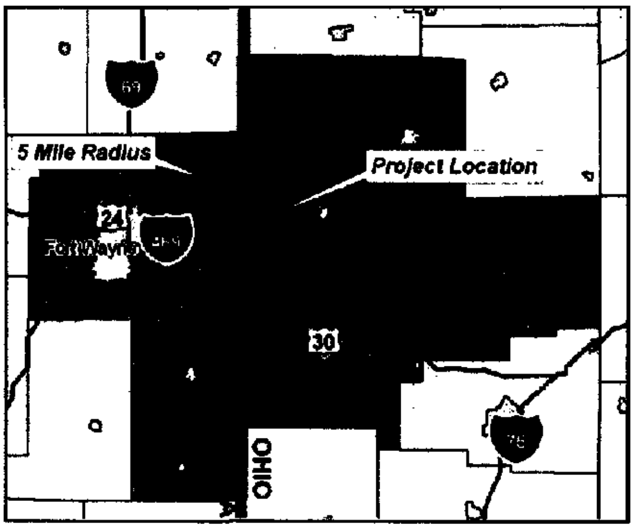

Figure 1: Six County Local Economy

II. SOCIOECONOMIC PROFILE

Population Trends

The population of the local economy in 2000 was approximately 489,652. As of 2008, the U.S. Census Bureau estimates that the population increased 3.2 percent to 505,342. The majority of this population is located within Allen County, for which Fort Wayne, 40 miles to the west of the Project Area, is the major population center. The remaining five counties are predominantly rural, each having populations of less than 40,000 in 2008. Since 2000, Allen County, Indiana has experienced a 5.6 percent growth in population, while Paulding, Defiance, Putnam and Van Wert Counties experienced population losses ranging from one to six percent. Adams County, Indiana experienced a 1.1 percent growth in population during this period. See *Figure 2: Local Economy Population Trends*.

Figure 2: Local Economy Population Trends

County	1990 Population	2000 Population	2008 Est. Population	% Change 2000-08
Paulding County, Ohio	20,490	20,293	19,096	-5.9%
Defiance County, Ohio	39,350	39,500	38,637	-2.2%
Putnam County, Ohio	33,820	34,726	34,353	-1.1%
Van Wert County, Ohio	30,460	29,659	28,748	-3.1%
Allen County, Indiana	300,836	331,849	350,523	5.6%
Adams County, Indiana	31,095	33,625	33,985	1.1%
Local Economy Total	**456,051**	**489,652**	**505,342**	**3.2%**

Source: Ohio Department of Development, Indiana Business Research Center, U.S. Census Bureau, 2010.

The Ohio Administrative Code (OAC) requires that 10-year population change estimates be prepared for communities that are located within a five-mile radius of a proposed wind farm. *Communities* are defined as incorporated municipalities and/or townships. There are seven incorporated municipalities and seventeen townships that are fully or partially within five miles of the proposed wind farm. Because local level population projections are not conducted for interim years at this geography, projections for these communities were created using the methodology prescribed by the U.S. Census Bureau. Straight line population projections were made based on 2000 U.S. Census data, for which an average annual rate of change was calculated and interpolated at five year intervals to the year 2020. Population projections were generated using this methodology for the years 2010, 2015 and 2020. See *Figure 3: Population Projections*, below.

As *Figure 3* illustrates, five of the seven municipalities within a five-mile radius of the wind farm are projected to experience a loss in population by 2020. These five municipalities are located in Paulding and Van Wert Counties, Ohio. In contrast, the Indiana municipalities of Woodburn and Monroeville, both in Allen County, are projected to experience population gains by 2020.

Figure 3: Population Projections

Municipalities Within Five Miles of Project Area	**2000 Pop.**	**2008 Pop.**	**Est. 2010 Pop.**	**Est. 2015 Pop.**	**Est. 2020 Pop.**	**% Chg 2000-2020**
Village of Payne, (Paulding Co.) Ohio	1,166	1,152	1,098	1,090	1,082	-7.2%
Village of Antwerp, (Paulding Co.) Ohio	1,740	1,636	1,628	1,567	1,509	-13.3%
Village of Haviland, (Paulding Co.) Ohio	180	165	162	154	146	-19.1%
Village of Scott, (Paulding Co.) Ohio	118	112	110	107	103	-12.6%
Village of Convoy, (Van Wert Co.) Ohio	1,110	1,050	1,035	1,000	966	-13.0%
Town of Monroeville, (Allen Co.) Indiana	1,236	1,273	1,283	1,307	1,331	7.7%
City of Woodburn, (Allen Co.) Indiana	1,579	1,633	1,641	1,676	1,712	8.4%
Total Population	7,129	7,021	6,957	6,900	6,849	-3.9%
Townships Within Five Miles of Project Area	**2000 Pop.**	**2008 Pop.**	**Est. 2010 Pop.**	**Est. 2015 Pop.**	**Est. 2020 Pop.**	**% Chg 2000-2020**
Benton Twp, (Paulding Co.) Ohio	1,035	983	981	950	920	-11.1%
Blue Creek Twp, (Paulding Co.) Ohio	804	786	790	779	768	-4.5%
Carryall Twp, (Paulding Co.) Ohio	3,046	2,844	2,830	2,713	2,600	-14.6%
Crane Twp, (Paulding Co.) Ohio	1,530	1,426	1,424	1,364	1,306	-14.7%
Harrison Twp, (Paulding Co.) Ohio	1,566	1,481	1,480	1,430	1,381	-11.8%
Paulding Twp, (Paulding Co.) Ohio	4,008	3,741	3,726	3,571	3,422	-14.6%
Tully Twp, (Van Wert Co.) Ohio	2,119	2,072	2,059	2,030	2,002	-5.5%
Union Twp, (Van Wert Co.) Ohio	1,009	1,028	1,032	1,044	1,056	4.7%
Union Twp, (Adams Co.) Indiana	975	1,001	1,007	1,024	1,041	6.8%
Jackson Twp, (Allen Co.) Indiana	520	1,118	1,463	2,515	4,322	731.1%
Jefferson Twp, (Allen Co.) Indiana	1,992	2,901	3,241	4,165	5,353	168.7%
Madison Twp, (Allen Co.) Indiana	1,832	2,802	3,184	4,238	5,640	207.9%
Maumee Twp, (Allen Co.), Indiana	2,619	3,362	3,354	3,949	4,469	77.5%
Monroe Twp, (Allen Co.) Indiana	1,989	2,632	2,846	3,421	4,112	106.7%
Milan Twp, (Allen Co.) Indiana	3,549	4,747	5,154	6,241	7,558	113.0%
Scipio Twp, (Allen Co.), Indiana	414	785	853	1,331	2,076	401.5%
Springfield Twp, (Allen Co.), Indiana	3,697	4,841	4,975	5,937	7,085	91.7%
Total Population	32,704	38,550	40,399	46,701	55,293	43.4%

Source: U.S. Census Bureau, Camiros, Ltd. 2010.

Townships are projected to follow very different trends depending on which side of the Ohio-Indiana border they are located. All six of the townships in Paulding County within five miles of the Project Area are projected to lose four to fifteen percent of their population by 2020. In contrast, all of the townships in Allen and Adams County, Indiana are expected to add population by 2020.

Employment

According to the U.S. Bureau of Labor Statistics, 256,129 people are currently in the labor force of the local economy. Of this total, there are approximately 228,434 employed and 27,695 unemployed persons as of December, 2009. The average unemployment rate rose from 9.3 percent in December 2008 to 12.1 percent in December 2009. Van Wert and Defiance Counties have the highest current unemployment rate, at 13.6 and 12.8 percent, respectively, followed closely by Paulding County with a December 2009 unemployment rate of 12.7 percent. See *Figure 4: Civilian Labor Force Estimates*, below.

Figure 4: Civilian Labor Force Estimates

County	Labor Force	Employed	Unemployed	Unemployment Rate December 2008	Unemployment Rate December 2009
Paulding County, Ohio	11,266	9,836	1,430	9.6%	12.7%
Defiance County, Ohio	21,307	18,578	2,729	9.6%	12.8%
Putnam County, Ohio	18,857	16,792	2,065	7.6%	11.0%
Van Wert County, Ohio	16,041	13,864	2,177	9.9%	13.6%
Allen County, Indiana	174,083	156,593	17,490	8.1%	10.0%
Adams County, Indiana	14,575	12,771	1,804	10.9%	12.4%
Local Economy Total	**256,129**	**228,434**	**27,695**	**9.3%**	**12.1%**
State of Ohio	*5,881,796*	*5,253,268*	*628,528*	*7.8%*	*10.7%*
State of Indiana	*3,078,943*	*2,782,030*	*296,913*	*7.9%*	*9.6%*

Source: U.S. Bureau of Labor Statistics, March 2010

The average unemployment rate within the local economy is currently 1.4 percent higher than the state average for Ohio and 2.5 percent higher than the state average for the Indiana, suggesting a particular need for new jobs in the region. As such, economic development and the creation of new jobs continue to be an important economic priority.

III. REGIONAL DEVELOPMENT IMPACTS

The six-county region which makes up the local economy is predominantly rural in nature. As previously described, the population has grown just 3.2 percent since 2000. This growth has occurred almost exclusively in Allen and Adams County, Indiana. The four Ohio counties have lost population over the same period. As is common with rural areas, this trend of migration toward urban areas is expected to continue. The regional impacts of the proposed wind farm on future development, including the anticipated impacts to housing demand, commercial and industrial development, and regional transportation, and land use compatibility are described in further detail below.

Housing

As previously shown in *Figure 3: Population Projections*, the population of townships within five miles of the proposed wind farm is projected to increase from 32,704 in 2000 to approximately 55,293 by 2020. This growth is projected to take place primarily in Allen County, Indiana. The eight Ohio townships are projected to experience a net loss in population of approximately 1,661 people by 2020.

Given the population growth estimates, an average housing vacancy rate of eight percent within the region, and a local unemployment rate of approximately twelve percent, it is unlikely that demand for housing will increase due to the construction or operation of the proposed wind farm. While the project will result in a substantial increase in temporary jobs during the construction phase of the project, these jobs are short term in nature and will not have an impact on demand for new housing development over the long term. Permanent jobs created as a result of the project are far more limited in number, and will not have an appreciable effect on housing demand within the region.

Commercial and Industrial Development

The construction and operation of the proposed wind farm will have a significant positive impact on commercial and industrial development within the region. The positive impacts on commercial activity are described in detail in Section IV of this report.

In terms of industrial development, wind power projects typically require a substantial number of inputs from outside the local area, as is the case with the proposed wind farm. There is a substantial amount of growth potential in renewable energy production and the manufacturing sectors that support it within Ohio, according a 2004 report by to the Renewable Energy Policy Project (REPP) entitled "*Wind Turbine Development: Location of Manufacturing Activity.*" This benefit would include job creation in the manufacturing sector, including those companies already involved in wind infrastructure production.

REPP assessed the location of manufacturing activity related to wind turbine development. It measured the number of potential employees at existing companies capable of manufacturing turbine parts. Ohio ranked second in the nation behind California in the number of employees at companies with the potential for wind farm infrastructure manufacturing (2004). This report estimates existing firms in Ohio with the technical potential to become involved in wind turbine development have approximately 80,500 employees, and there exists potential for approximately 11,500 new jobs in the wind farm component industry. Currently, manufacturers in Ohio are already producing wind turbine components including blade extenders, brakes, cooling systems, gear boxes, pitch drives, power electronics, rotor blades, tower flange and bolts, and yaw drives.

Transportation

The Project Area is served by a network of Interstate, U.S. and State routes, and local roads. This existing roadway network provides access to the Fort Wayne, Indiana metropolitan area as well as smaller, nearby communities including Paulding, Antwerp, Defiance, Lima and Van Wert, Ohio and Woodburn and Monroeville, Indiana.

There are three interstate highways serving the region, the nearest being I-69/469 near Fort Wayne. See *Figure 1: Six County Local Economy*. Interstate 90/80 and I-75 also serve the region. The Project Area is also served by U.S. Routes 127, 30 and 24, and State Routes 49, 111, 114, 613 and 500. Given the limited population and the existence of alternate routes around the proposed project site, temporary road closures during the construction phase are not expected to create any significant adverse impacts on the vehicular transportation network.

Two rail lines are located in the vicinity of the proposed wind farm. The first is the Maumee & Western Railroad (MAW), which runs north of the site through Defiance County. The other, the Norfolk Southern (NS) is an east-west route that runs through the Project Area. This provides the area with freight access to and from various regional locations. Neither the construction nor operation of the proposed facility is expected to create any significant adverse impacts on the railroad network.

There are three airports located within 20 miles of the proposed wind farm. Nearest the facility is the Paulding Airport, a 29-acre, privately-owned airport located north of the Village of Paulding, which is located approximately seven miles east of the proposed wind farm. The other is the Defiance County Regional Airport, which is a publicly-owned, 314-acre airport located outside the Village of Defiance, approximately 20 miles to the northeast. These airports are used predominantly for private recreational travel. Approximately 20 miles west of the proposed wind farm is the Fort Wayne International Airport. Neither the construction nor operation of the proposed facility is expected to create any significant adverse impacts on these airports or the existing air travel network.

Regional Plan Compatibility

The State of Ohio does not mandate comprehensive planning and no adopted land use plans currently exist for Paulding, Defiance, Putnam or Van Wert Counties. Allen County, Indiana has a comprehensive land use plan which was adopted in 2007. Future land use designations for the township areas nearest the proposed wind farm in Allen County are for agricultural use. The proposed wind farm will not have an impact on the land use plan. Adams County, Indiana has a comprehensive land use plan, which was adopted in February, 2010. Future land use designations for Union Township in Adams County are also agricultural in nature. All of the townships within five miles of the proposed wind farm have zoning regulations in place. The proposed facility will be compatible with the existing agricultural land uses and zoning within the Project Area.

IV. Measuring Economic Impact

Wind farms across the country have had a positive economic impact on the communities where they are located. They represent large capital investments that drive various sectors of the local economy and have a positive impact on local employment and local government revenues. Wind farms also provide significant benefits to property owners who lease land for the turbines.

This analysis addresses the anticipated economic impact that the proposed wind farm will have on the local economy, as defined in Section I of this report. The projected economic impact was analyzed separately for the construction phase and operations phase of the project. The economic impacts measured are new jobs and wages, new dollars injected into the local economy through total local spending on goods and services, and land lease payments to participating land owners.

Calculating Economic Benefits

Wind farms and other economic investments that bring new dollars and jobs to a locale are typically measured using three components of economic impact. They are *direct, indirect* and *induced impacts.* Variables that determine the extent of these impacts include project size and duration, construction and operating costs, and the availability of local goods and services. Direct, indirect, and induced impacts are defined as follows:

Direct impacts are immediate impacts created by expenditures that are directly applied to the project. In constructing a wind farm, a *direct impact* refers to such things as the money spent on labor, including site crews, contractors, maintenance workers, consultants and engineers. It also includes the money spent to pay those working at the turbine and blade manufacturing plants, the purchase and delivery of construction materials, property taxes, other direct purchases and lease payments. Of course, not all these direct impacts will occur in the local economy but those that do become the *local share.* Local share is made up of the impacts that originate in the local economy.

Indirect impacts refer to the secondary benefits that result from the increase in economic activity that occurs when businesses other than those directly working on the project support businesses that are. When a vendor receives payment for goods or services related to the project, the vendor is then able to pay others who support his/her own business. Examples of *indirect impacts* include including bank financing, accountants, equipment, fuel suppliers, and so on. In this case, the indirect impacts are comprised of the spending on vendors who provide supplies and secondary services to those who are working directly on the project either building the wind farm or operating it after it is complete and online.

Induced impacts reflect increases in household spending as household income increases due to the additional economic activity created by the project. Induced impacts result when people and firms spend money for their personal needs, not project needs as is the case of direct and indirect spending. This spending results from the additional income accruing to households that in turn leads to greater spending on such things as food, clothing, housing, day care, medical services, and insurance. Those who gain by this type of spending have more money to spend on their own needs as dollars recycle through the economy.

Together, the interrelationship of the direct impacts, indirect impacts and induced impacts gives a significant boost to the local economy. The three measures reflect the total economic impact that a capital investment can be expected to have on the local economy. New jobs will be created and suppliers will see higher sales. The local economy will benefit and these new workers and suppliers will spend newly earned dollars on daily necessities and major purchases.

Methodology

The purpose of the economic analysis is to identify the direct, indirect, and induced economic impacts associated with construction and operation of the proposed wind farm. Typically, input-output models are used to track the various types of economic benefit that will accrue to a local economy. The approximation of economic benefit is based upon project-specific data, including estimated capital costs, project location, size of project, among others.

Members of the Camiros, Ltd. staff interviewed representatives of Horizon Wind Energy, LLC to determine the amount of spending and employment expected for the proposed Timber Road II Wind Farm. Research studies and contacts with the U.S. Department of Energy/National Renewable Energy Laboratory (NREL) helped determine how economic projections anticipated from the proposed wind farm compared to completed wind farm projects around the country. Using this information, an input-output model with data specific to the local economy was developed to estimate the economic impacts of the proposed project. The model looks at both the construction phase of the project and the ongoing operations phase of the project.

The model used for this analysis is called the *Job and Economic Development Impact* (JEDI) *Wind Model*. The JEDI Wind Model is specifically designed for wind power generation projects. The model was developed in 2002 for the National Renewable Energy Laboratory (NREL), under the auspices of the U.S. Department of Energy's "*Wind Powering America*" project and has been updated several times in an effort to provide current industry data and facilitate a more accurate description of local impacts. Originally developed with state-specific parameters, subsequent refinements make it possible to analyze impacts on regional and county level economies.

The input values come from past experience constructing wind farms and the budget values that Horizon Wind Energy, LLC has established for the proposed wind farm. Output values result from a combination of factors. These include the amount of direct and indirect impacts, the population of the local economy which sets the general amount of the local share, state specific multipliers, and expenditure patterns taken from the JEDI Wind Model data base.

Camiros staff received data from Horizon Wind Energy, LLC to confirm the size, turbine locations, and cost factors for the construction and operation of the proposed wind farm. Where required input data was not available locally, values were taken from the JEDI model's national database. These JEDI values are based on averages of existing operating wind farms as measured by the NREL.

As stated above, spending and economic impact from the proposed wind farm will have a positive economic benefit on the local economy. What is most important to host communities is the share of the economic benefits that will accrue to and recycle through that local economy. Projections of local share are set forth in the sections of this report that follow.

V. Economic Impact on the Local Economy

New Jobs in the Local Economy

Jobs created by the proposed Timber Road II Wind Farm will include workers who will be directly employed to construct and subsequently operate and maintain the wind farm. Other jobs will also be created that play a supportive role. The increased wealth from jobs and spending will have a ripple effect in the local economy thereby creating the need for additional jobs in the local economy, as the wages of the locally-based workers go toward the support of households and local businesses.

According to Horizon Wind Energy, LLC, the construction and operation of a wind farm requires a portion of workers to have highly specialized skills, which creates the opportunity for high-paying jobs. Generally, two to three managers are required for every ten crew members on a wind farm project, but this can vary based on the stage of development. Managers are expected to earn a base wage of approximately $44 per hour, or $88,000 per year. Field crews, or technicians, are expected to earn approximately $20 per hour, or $40,000 per year. (These figures are estimates and may be subject to change, based on benefits and number of hours worked per year, etc.)

It is the policy of Horizon Wind Energy, LLC to maximize the number of local workers, subject to the nature of the construction process. Project managers estimate that an average of approximately 55 to 66 percent of workers, including managers, technicians and administrative staff, are expected to be hired from within the local economy. The remaining workers, those who have specialized skills at constructing wind farms, will come from other locations.

The proposed wind farm will take approximately eight months to construct, beginning in April, 2011. The size of the construction crew is variable based on weather conditions, number of hours worked per week and the stage of construction. Over the construction period, there are generally three phases. The first phase is project startup that typically calls for smaller construction crews. The second phase is the peak phase of construction, where the full complement of employees is working at the site. The third phase completes the construction of the wind farm and again calls for a reduced number of construction workers.

Local Economic Impact: Construction Phase

Jobs, wages, and salaries. It is estimated that during the construction phase of the project, a total of 420 full-time jobs will be created within the local economy, generating $19.8 million in wages and salaries. Approximately 236 of these new jobs will be in those industries that directly support the project. Earnings from those jobs are expected to total $13.4 million. Another 73 jobs and $2.8 million in earnings are expected to be generated by indirect impacts, which result from the inter-industry economic activity created by the project. The induced impacts, which result from changes in local household spending, are projected to bring another 111 jobs and approximately $3.6 million in wages and salaries to the local economy.

Local expenditures. During the construction phase of the project, the proposed wind farm is expected to generate a total of $34.1 million in local expenditures. Approximately $21.1 million of this will be in direct local expenditures. Based on the availability of local goods and services, the indirect impacts on supportive businesses are expected to generate another $5.1 million. Induced impacts will generate approximately $7.9 million in local spending. This includes money expended by employees and others connected to the project for normal cost of living, including spending on groceries, clothing and the like.

The total estimated impact of wages and salaries, combined with local expenditures, is anticipated to have a *total local benefit* of approximately $53.9 million during the eight month construction phase of the project. *Figure 5: Benefits to the Local Economy During Construction Phase*, shows the estimates of the total benefits to the local economy during the construction phase of the project.

Figure 5: Benefits to the Local Economy during Construction Phase

Impact Type	Jobs	Salaries	Expenditures	Benefits
Direct Impacts	236	$13,400,000	$21,100,000	$34,500,000
Indirect Impacts	73	$2,800,000	$5,100,000	$7,900,000
Induced Impacts	111	$3,600,000	$7,900,000	$11,500,000
Total Impacts	**420**	**$19,800,000**	**$34,100,000**	**$53,900,000**

Source: JEDI Wind, Horizon Wind Energy, LLC and Camiros, Ltd.
Note: Amounts rounded to the nearest hundred thousand dollars.

Local Economic Impact: Operations and Management Phase

The proposed wind farm is expected to have a thirty-year life expectancy, and during that time will be producing positive economic impacts from wages and salaries, material purchases, local property taxes and payments to cooperating property owners. A proportion of that spending and employment will come from the local area and will provide continuing benefits to the local economy.

Jobs, wages, and salaries. Wages and salaries from new jobs will continue to add to the local economy during the operation of the proposed Timber Road II Wind Farm once the wind farm is completed and online. Operations and maintenance of the proposed wind farm will create approximately 43 new full-time jobs in the local economy, generating approximately $1,600,000 in wages and salaries. Of these 43 new full-time jobs, approximately 23 of these employees will *directly* support the operations of the wind farm, and earnings from those jobs will total $1,000,000. Six jobs and $200,000 in earnings are expected to be generated by the *indirect* impacts of the operations of the wind farm, which result from the inter-industry economic activity created by the project. The *induced* impacts, which result in changes in household spending, will bring another 14 jobs and $400,000 in earnings to the local economy.

Local expenditures. During the operations and management phase of the project, the proposed wind farm is expected to generate approximately $4,000,000 in total local expenditures. This includes approximately $2,500,000 generated annually in *direct* expenditures. The *indirect* impacts of spending on supportive businesses are expected to include $500,000. *Induced* impacts will include $1,000,000 in local spending annually within the local economy.

As shown in *Figure 6: Annual Benefits to the Local Economy During Operations Phase*, the *total local benefit* will be approximately $5.6 million each year the wind farm is in operation.

Figure 6: Annual Benefits to the Local Economy during Operations Phase

Impact Type	Jobs	Salaries	Expenditures	Benefit
Direct Impacts	23	$1,000,000	$2,500,000	$3,500,000
Indirect Impacts	6	$200,000	$500,000	$700,000
Induced Impacts	14	$400,000	$1,000,000	$1,400,000
Total Impacts	**43**	**$1,600,000**	**$4,000,000**	**$5,600,000**

Source: JEDI Wind, Horizon Wind Energy, LLC and Camiros, Ltd.
Note: Amounts rounded to the nearest hundred thousand dollars.

Land Lease Payments

Each of the turbines in the wind farm will be leased from individual property owners who will have turbine sites and access drives to those sites on their land. Total lease payments to property owners will be approximately $1.1 million per year. Lease payments escalate with the Consumer Price Index (CPI) or two percent annually, whichever is greater.

Horizon Wind Energy, LLC estimates there will be approximately 200 households participating in the "Neighbor Payments Program" (NPP), which will pay out approximately $1,000 per occupied residence and $40 per acre. The program is expected to pay $320,000 in the first year of the program and every year thereafter, with an escalator based on the CPI or two percent annually, whichever is greater.

Like other expenditures, a portion of these lease payments will cycle through the local economy at relatively the same rate as will the wages and purchase of materials as property owners make choices on what and where to spend this extra money. These dollars will recycle in the local economy just as other dollar inputs and are reflected in the total local benefit.

Property Tax Revenue

The proposed wind farm will have a significant positive impact on the local tax base, including local school districts and other taxing districts that service the area where the proposed wind farm is to be located. Taxing districts within the Project Area include Paulding County, Harrison Township, Benton Township, Wayne Trace School District, Antwerp Local School District and several other local taxing districts.

Agreements regarding tax or payment in lieu of taxes are pending in the State of Ohio, so no value is available to report in this analysis. It is important to note that the proposed wind farm will make few, if any, demands on local government services. Therefore, payments made to local governments will be net positive gains and represent an important economic benefit to the local area.

VI. Conclusion

This analysis concludes that the proposed Timber Road II Wind Farm will have a significant positive effect on economic development within the local economy. This project will result in the creation of 420 temporary and permanent jobs into the local economy, helping meet the goal of providing employment opportunities for residents of these counties. Local governments will see net gains in revenue due for a period of thirty years due to the wind farm and land owners will receive revenue from land lease payments and the neighbor payment program. In addition, local businesses will have a new basic industry generating demand for goods and services.

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Appendix A

Resume for:

Mr. Jacuques Gourguechon, AICP
Camiros, Ltd.

JACQUES A. GOURGUECHON, AICP
Principal Consultant

EDUCATION

Master of Science, City and Regional Planning, Illinois Institute of Technology, 1971
Bachelor of Arts, Economics, Michigan State University, 1968

PROFESSIONAL AFFILIATIONS

American Institute of Certified Planners
American Planning Association, Past Member Executive Board; Illinois Chapter President
Lambda Alpha International Honorary Land Economics Society

CIVIC AFFILIATIONS

Open Lands Project - Board of Directors
James Jordan Boys and Girls Club - Board of Managers
Evanston Historic Preservation Commission - Past Chairman
Main Street Neighborhood Association – Past Board of Directors
Lake Michigan Federation
National Trust for Historic Preservation
Landmarks Preservation Council of Illinois

EXPERIENCE

Founding Principal, Camiros, Ltd. 1975 - Present
Senior Associate - Barton Aschman Associates 1969-1975

TEACHING EXPERIENCE

- Senior Fellow-Chaddick Institute for Metropolitan Development at DePaul University
- Adjunct Assistant Professor –Collage of Architecture at Illinois Institute of Technology

Guest lecturer at the following institutions:

- Illinois Institute of Technology
- University of Illinois
- Northwestern University - Traffic Institute
- DePaul University
- University of New Orleans
- Institute for Rural Affairs- Western Illinois University

RANGE OF PLANNING AND ZONING EXPERIENCE

Community Planning: Work involving comprehensive planning, land use analysis and evaluation, transportation analysis, and growth management has been performed for over 40 governmental units. Work included the development of objectives, planning background studies, analysis of highest and best use, and development of alternate plans and concepts. Governmental units represented include Lake Forest, the Barrington area, Bartlett, Franklin Park, Batavia, Half Day and Lincolnshire, Illinois, Winnebago, County, Illinois Delaware County/Muncie and Indianapolis, Indiana, Milwaukee, Wisconsin, and Urbandale and Ft Dodge, Iowa.

Policy Analysis: Work has involved attention to citizen participation and conflict resolution concerning controversial issues affecting cities, villages, and private clients. Our rigorous techniques, when used with the application of planning analysis techniques, have proven highly effective in finding solutions to specific land-use and zoning problems. Work of this type has been completed for Naperville, Lincolnshire, Palatine, and Franklin Park, Illinois and the State of Minnesota as well as large scale developers.

Land-Use Control, Zoning Consultation and Expert Testimony: Work in this area includes the preparation and refinement of zoning codes and other development regulations and analysis of development trends. This work is often connected to the preparation of plans or is a follow up to problem-solving assignments. Mr. Gourguechon has had primary responsibility for the analysis and comprehensive revision of zoning ordinances in Norfolk, Virginia, Peoria, Park Ridge, North Aurora and Evanston, Illinois New Orleans, Louisiana and Phoenix, Arizona. Work assignments have also involved specialized land-use and environmental controls to augment traditional zoning. Of particular interest are corridor control codes and overlay zones for historic preservation and environmental conservation. Mr. Gourguechon has also been called upon to evaluate zoning and other planning related codes as an expert witness before several courts, Zoning Boards of Appeals, and Planning Commissions.

Economic Development, Development Feasibility Analysis and Commercial Market Research. Work in this area of Mr. Gourguechon's practice has involved research and strategic planning for economic growth and development for cities and neighborhoods as well as project level planning involving physical, economic, and financial feasibility analysis. Public clients include Chicago's Economic Development Commission, the Cities of Urbandale and Newton, Iowa, the Cities of Evanston, Lockport, and Rockford, Illinois, and neighborhood associations in Oak Park, Chicago, and Schaumburg, Illinois. Mr. Gourguechon has undertaken market research and surveys for numerous projects to assist clients in establishing development programs and to provide evaluative data to public clients as a foundation for plan preparation and project approval actions. Commercial market studies have been completed for private clients such as Greenberg Associates, Chicago, Illinois, Hyde Park Development Corporation, Chicago, Dalham Corporation, Louisville, Kentucky, Dayton-Hudson Properties, Inc., Minneapolis, Minnesota and Greenfield Associates, Phoenix, Arizona. Market studies in support of planning and public sector economic development activities have been completed for communities such as Chicago, Evanston, Kankakee, Lockport and Schaumburg, Illinois.

Technical Studies, Impact Analysis, Urban Design, Housing, and Demographic Analysis: Work of this type includes housing studies for Kane County, Batavia, and Barrington, Illinois, ecological analysis for the DuKane Valley Council and the Barrington Area Council of Governments, rehabilitation analysis for North Chicago and private rehabilitation corporations, beautification study for Half Day and Franklin Park, Illinois, and site analysis and design for numerous private and public clients.

Regional and Area Wide Planning: Regional plans and studies have been prepared for the State of Minnesota, the Steubenville, Ohio-Weirton, West Virginia SMSA, the Barrington Area Council of Governments, the Southeastern McHenry County Intercommunity Planning Council, and Cuba, Ela and Vernon Townships in Lake County, Illinois.

Land Planning and Development Services: This involves site analysis, development programming, site design and assistance in gaining zoning and plat approval for development projects. The work includes analysis and development of site plans, use impact analyses, and guidance and representation of developers through public hearing procedures required in the plan approval process. Clients have included private developers working in a number of Chicago suburban communities, cities outside of the Chicago Metropolitan area and within the City of Chicago as well. Developers who have been represented include Metropolitan Structures, Urban Investment Development Corporation, and the Dayton-Hudson Corporation.

PUBLICATIONS

"Frameworks for State and Regional Land-use and Environmental Planning" (co-authored)

"Delphi Weekend; A Unique Experience in Deriving Community Objectives," prepared for ASPO National Planning Conference, Chicago, Illinois.

AWARDS

Citation for Citizen Action awarded by Environmental Monthly in its Fourth Annual Honor Awards Program, "for making environmental excellence a basic condition in pursuit of corporate goals," as reflected in the planning program for the Barrington, Illinois area.

National Association of Regional Councils

Omicron Delta Epsilon, Honorary Economics Fraternity

APA National Planning Award, Focus Kansas City, a Strategic Plan.

EXHIBIT I

Wildlife Baseline Studies

Wildlife Baseline Studies for the Timber Road Phase II Wind Resource Area Paulding County, Ohio

Final Report
September 2, 2008 – August 19, 2009

Prepared for:

Horizon Wind Energy

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Prepared by:

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WEST, Inc.

April 29, 2010

EXECUTIVE SUMMARY

Horizon Wind Energy has proposed a wind-energy facility in Paulding County, Ohio. The Timber Road Phase II will have a target capacity of 150 megawatts (MW) and be comprised of a maximum of 109 turbines. Future developments are planned for the surrounding Timber Road Study Area; however, details about these future projects are currently unknown. Horizon Wind Energy contracted Western Ecosystems Technology, Inc. to conduct surveys and monitor wildlife resources in the Timber Road Wind Resource Area to estimate the impacts of project construction and operations on wildlife. The following document contains results for fixed-point bird use surveys, sandhill crane migration surveys, raptor nest surveys, habitat mapping, and incidental wildlife observations. The results of the acoustic bat surveys will be presented in a separate final report. Surveys at the Timber Road Study Area were designed to meet Horizon Environmental Standards, and exceeded the recommendations of the Ohio Department of Natural Resources.

The principal objectives of the study were to (1) provide site specific bird and bat resource and use data that would be useful in evaluating potential impacts from the proposed wind-energy facility, (2) provide information that could be used in project planning and design of the facility to minimize impacts to birds and bats, and (3) recommend further studies or potential mitigation measures, if warranted.

The objective of the fixed-point bird use surveys was to estimate the seasonal, spatial, and temporal use of the study area by birds, particularly raptors. Fixed-point surveys were conducted from September 2, 2008, through August 19, 2009 at points established throughout the Timber Road Wind Resource Area. A total of 618 twenty-minute fixed-point surveys were completed and 68 bird species were identified.

Sixty-eight unique species were observed over the course of all fixed-point bird use surveys, with a mean number of large bird species of 1.18 species/800-meter plot/20-minute survey and 2.39 small species/100-meter plot/20-minute survey. More unique species were observed during the spring (53 species), followed by summer (42), fall (31), and winter (16). The mean number of species per survey for large birds and for small birds was higher in the summer (1.58 and 3.91 species/survey, respectively) and spring (1.45 and 3.60, respectively) compared to the fall (1.31 and 1.75, respectively) and winter (0.64 and 0.77, respectively). A total of 12,867 individual bird observations within 4,264 separate groups were recorded during the fixed-point surveys. Cumulatively, regardless of bird size, five species (7.4% of all species) composed approximately 67.0% of the observations: European starling, red-winged blackbird, horned lark, Lapland longspur and common grackle. All other species comprised less than 5% of the observations. The most abundant large bird species was killdeer (463 individuals in 332 groups) and Canada goose (386 individuals in 41 groups). A total of 218 individual raptors were recorded within the study area, representing eight species.

Waterbird use was highest in the spring (0.09 birds/800-meter plot/20-minute survey), primarily due to groups of great blue heron. Waterfowl use was highest during the winter (1.14 birds/800-meter plot/20-min survey), primarily due to large groups of Canada geese. Raptor use was highest during the summer (0.42 birds/800-meter plot/20-minute survey) and lowest during the

spring (0.26). The most common raptors observed in the study area were red-tailed hawk, northern harrier, and American kestrel. Northern harriers had the highest use of any raptor in fall (0.15), American kestrels had highest use in winter (0.18) and red-tailed hawk and American kestrel had the highest use in spring (0.10 and 0.10 birds/800-meter plot/20-minute survey, respectively). Passerine use ranged from 21.64 birds/100-meter plot/20-minute survey in fall to 3.73 in winter; although the focus was within a 100 meter viewshed and is not directly comparable to the other bird types.

A relative exposure index was calculated for each bird species. This index is only based on initial flight height observations and relative abundance (defined as the use estimate) and does not account for other possible collision risk factors such as foraging or courtship behavior. Exposure indices are intended to rank the exposure of risk between species observed and are not intended to be a measure of actual exposure or risk for an individual species. Canada goose, followed by turkey vulture had an exposure index higher than any other species observed at the Timber Road Study Area. The red-tailed hawk was the raptor species with the highest exposure index compared to other raptors observed during surveys. Based on observations within 100 m, the chimney swift had a higher exposure risk than other passerines observed.

Levels of bird use varied within the study area by point. For all large bird species combined, use was highest at point 18A (8.20 birds/20-minute survey). Bird use at other points ranged from 0.60 to 6.75 birds/20-minute survey. The high mean use estimates for point 18A was largely comprised of waterfowl (6.40 birds/20-min survey). The landcover surrounding Point 18A was similar to the other point count locations within the Timber Road Phase II and study area. Raptor use was highest at point 6B with 1.07 birds/20-min survey, while use at other points ranged from zero to 1.00. Point 6B is comprised of 23 acres (4.7%) of woodlots, 2.3 acres (0.5%) shelterbelts and 3.6 (0.7%) unmowed planted grasslands. Passerine use, focused within 100m, was highest at point 15A (70.3 birds/20-min survey), and ranged from 3.10 to 57.9 at other points.

Flight paths for waterbirds, waterfowl, shorebirds, raptors, and vultures were digitized to determine if any flyways or concentration areas were present. No obvious flyways or concentration areas were observed. No strong association with topographic or habitat features within the Timber Road Phase II or Study Area were noted for raptors or other large birds. Although some differences in bird use were detected among survey points, the differences are not large enough to suggest that any portions of the Timber Road Wind Resource Area, other than the 0.5 mile buffer around Flatrock Creek, should be avoided when siting turbines.

A total of eight sensitive species were recorded during fixed-point surveys. Two state-listed endangered species, northern harrier (44 individuals) and sandhill crane (one individuals), and two state-listed threatened species, bald eagle (one individual) and dark-eyed junco (one individual) were observed during fixed point surveys at the Timber Road Phase II or Study Area. Three Ohio species of special interest were recorded during fixed-point surveys, including blue grosbeak (two individuals), Wilson's snipe (two individuals) and western meadowlark (one individual). Bobolink (42 individuals), an Ohio state species of concern, was also recorded during fixed-point surveys.