APPLICATION FOR SPECIAL LAND USE PERMIT AND SITE PLAN APPROVAL

Meridian Wind Park – Jonesfield Township

B&V PROJECT NO. 198674

PREPARED FOR

DTE

DTE Electric Company

12 AUGUST 2020

BLACK & VEATCH

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1.0 Applicant Information

This application for a special land use permit and site plan approval (hereinafter referred to as "Application") for a wind turbine generators project (WTG Project) consisting of 26 primary wind turbine generator towers (WTG towers) and 1 alternate and related accessory uses (access roads, collection lines, collection substation) is submitted on behalf DTE Electric Company (DTE), a Michigan electric utility company, by Matthew Wagner, DTE's Manager of Renewable Energy Development. The company's business address is One Energy Plaza, Detroit, Michigan 48226.

Communications relating to this application should be sent in care of Jason Hannath, DTE Site Manager for the Meridian Wind Park project at RERPS@DTEEnergy.com.

DTE makes this application on behalf of itself as the holder of rights under the terms of wind energy development easements, and the owners of the land who have granted DTE these rights. Legal descriptions of the land that is the subject of this application are included in Appendix A.

2.0 Project Description

The Meridian Wind Park is a proposed 225 MW wind energy project consisting of a maximum of 77 WTG towers and related infrastructure installed over approximately 29,500 acres of land in northwest Saginaw County (Jonesfield Township) and southeast Midland County (Porter and Mt. Haley Townships). Figure 2-1 depicts the general location of the overall project.

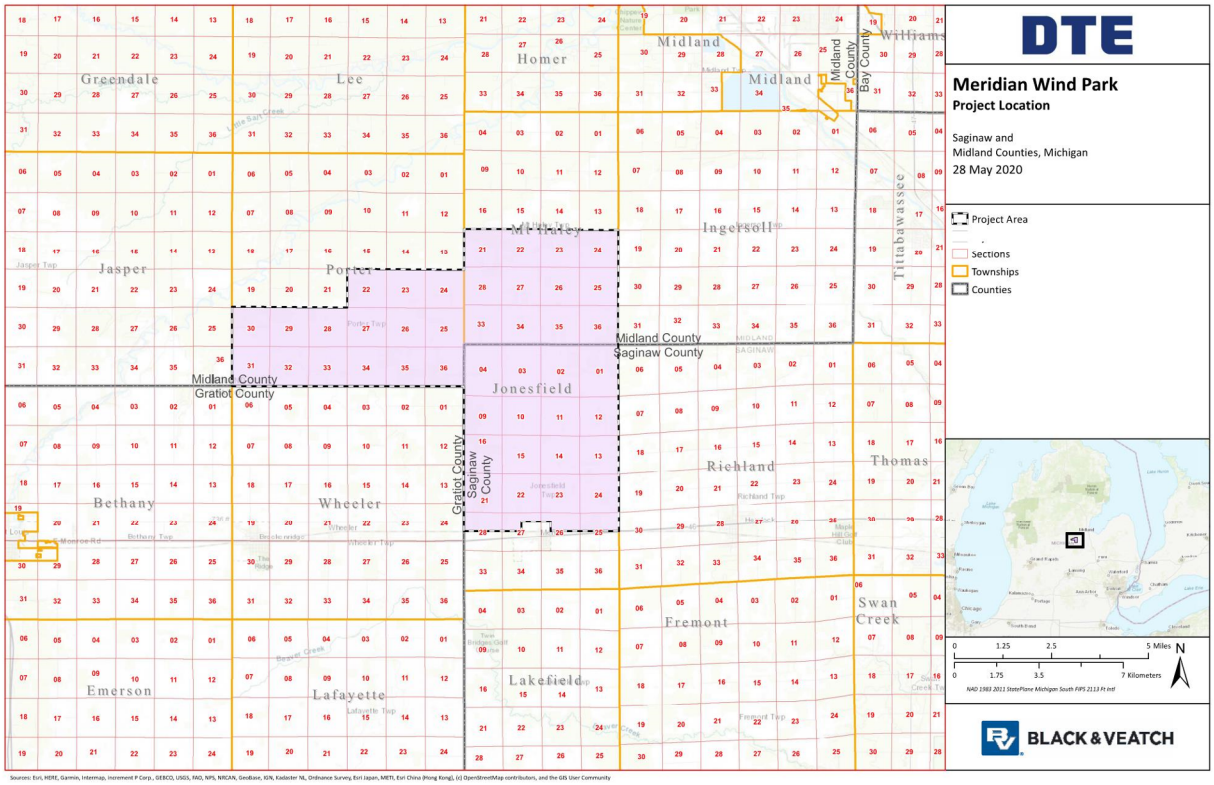


Figure 2-1 Site Location Map

The WTG Project proposed in Jonesfield Township consists of 27 WTG towers (26 primary sites and 1 alternate site) in the locations depicted on Figure 2-2. The WTG tower designated as an alternate (T-65) may be installed if one of the primary sites is discovered to have presently unknown development constraints that would make the site unsuitable for installation of a WTG tower.

The majority of the land proposed to be included in this project is zoned A-1, Agricultural, with the balance zoned A-2, Agricultural and Rural Residential. "Wind turbine generators" is a special land use in the A-1 and A-2 zoning districts.

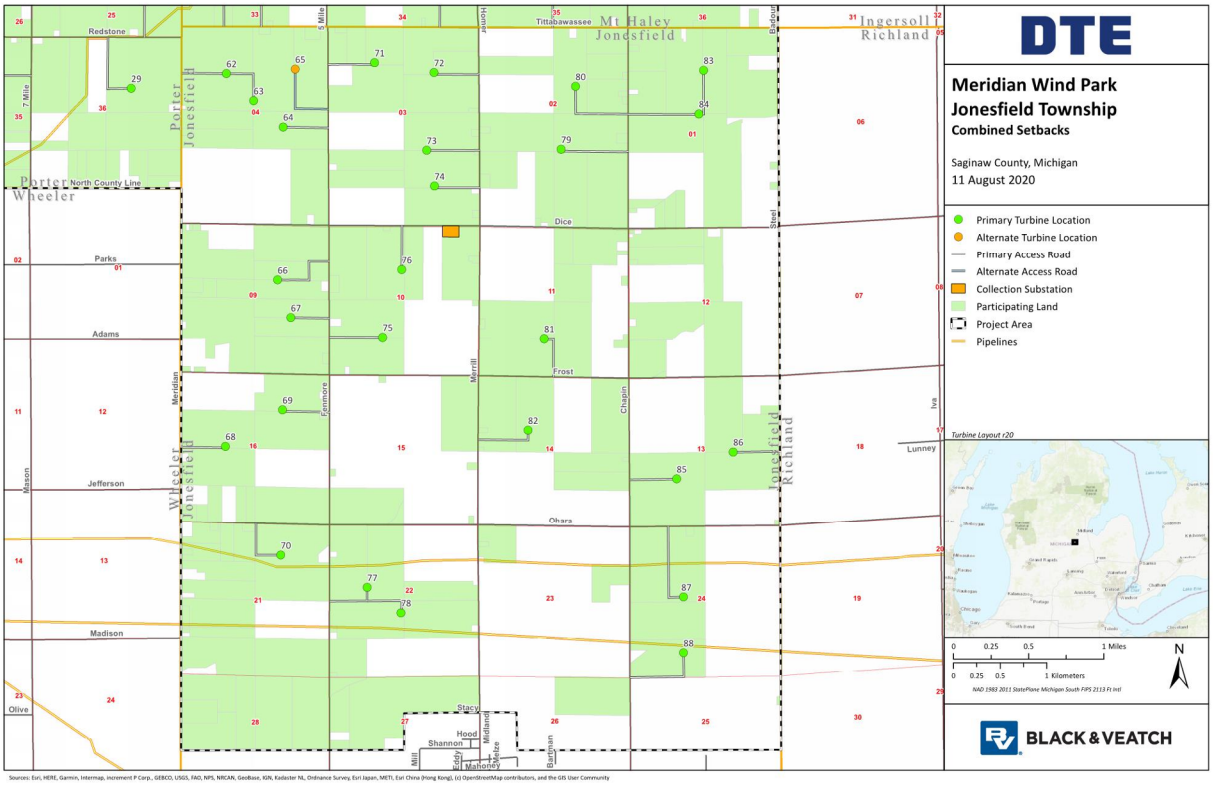


Figure 2-2 General Project Area and Site Layout

2.1 WTG Tower Specifications

The WTG tower models selected for installation in Jonesfield Township are the GE Energy 2.82-127 and the Vestas V136 3.6 MW. Tables 2-1 and 2-2 summarize the technical specifications of these WTG tower models.

Table 2-1 GE 2.82-127 Summary Specification

Rated Power	2,820 kW	**Rotor Orientation**	Upwind
Hub Height	290 ft	**Rotor Speed**	4.4 – 15.7 rpm
Total Height	499 ft	**Rated Wind Speed**	25 mph
Number of Rotor Blades	3	**Cut-in Wind Speed**	7 mph
Rotor Diameter	417 ft	**Cut-out Wind Speed**	67 mph
Swept Area	3.14 acres		

Table 2-2 Vestas V136 3.6 MW Summary Specification

Rated Power	3,600 kW	**Rotor Orientation**	Upwind
Hub Height	269 ft	**Rotor Speed**	6.9 – 14.0 rpm
Total Height	492 ft	**Rated Wind Speed**	25 mph
Number of Rotor Blades	3	**Cut-in Wind Speed**	7 mph
Rotor Diameter	446 ft	**Cut-out Wind Speed**	50 mph
Swept Area	3.6 acres		

Both WTG tower models are three-bladed, upwind, horizontal axis machines employing active blade pitch angle and yaw direction control to regulate power output and maintain the WTG tower position facing into the wind. Maximum output is regulated by the combination of pitch regulation and variable speed operation. GE and Vestas WTG towers include automatic overspeed control measures, a redundant braking system, and independent blade pitch to ensure that uncontrolled rotation does not occur.

Other WTG tower components are the rotor and nacelle. The rotor is attached to a nacelle, which is mounted on a tubular steel tower. The rotor consists of three blades oriented upwind of the tower bolted to a cast iron hub, which contains an internal electrically-driven pitch system for each blade. The hub is bolted to the main shaft of the WTG tower. The pitch system operates as the primary WTG tower brake and includes a battery backup.

The nacelle contains the main shaft, multi-stage gearbox, doubly-fed asynchronous generator, mechanical brake, active yaw components, controllers, wind sensors, and lightning suppression components. The nacelle and tower are completely enclosed and contain all the necessary components and operating systems for each WTG to function independently.

2.2 Visual Appearance and Security

The proposed WTG towers will be painted a non-reflective white color (consistent with other WTG towers in the region) and the nacelle and rotors mounted on a non-climbable tubular base. No lettering, brand logos, advertisements, or graphics will be allowed on the WTG tower structures (tower, hub, or blades).

Figure 2-3 below shows the typical appearance of the GE Energy 2.82-127 WTG tower, and Figure 2-4 shows the typical appearance of the Vestas V136 3.6 MW WTG tower.

Source: https://www.ge.com/renewableenergy/wind-energy/onshore-wind/2mw-platform

Figure 2-3 Typical Appearance of GE 2.82-127 WTG Tower

Source: https://www.vestas.com/en/products/4%20mw%20platform/v136%20_3_45_mw#!firstorder

Figure 2-4 Typical Appearance of Vestas V136 3.6 MW WTG Tower

2.3 Accessory Uses and Structures

Each WTG tower will include a ground-mounted transformer at the tower base and be served by an unpaved access road approximately 16 feet in width that connects to a public road right-of-way. The proposed locations of the WTG towers and access road improvements have been coordinated with landowners to maximize the owner's beneficial use of the balance of his or her land.

Underground electric collection systems will be installed at a depth that will accommodate continued agricultural activity, typically 4 feet or more below grade. Collection lines traverse from WTG tower to WTG tower, gathering the generated electricity, and terminating at the collection substation.

The collection substation consists of electrical breakers, transformer, and electric control house surrounded by security fencing. The collection substation is not tied into the local electric distribution system; it functions solely to support the transfer of electricity generated by the WTG towers to the electric grid.

2.4 Anticipated Construction Schedule

Construction of the project is anticipated to start as early as the third quarter of 2020 and conclude in the fourth quarter of 2021, with land restoration ongoing through 2022. Key milestones for the project will consist of various construction activities followed by project startup and commissioning and are listed below:

- Tree removal and grubbing potentially initiated fall 2020.
- Access road construction potentially initiated in fall 2020 or spring 2021 following approval of Jonesfield Township and Saginaw County agencies, as required.
- WTG tower foundation construction potentially initiated in spring 2021 depending on final approval from the Jonesfield Township, as required.
- Collector system cabling installation begins in fall 2020 pending Jonesfield Township and Saginaw County approvals and continuing through November 2021.
- Collector substation completion expected in October 2021.
- WTG tower delivery and erection begins in June and continues through October 2021.
- Completion of construction expected by November 4, 2021.
- Site restoration will be ongoing through summer 2022.
- Startup and commissioning is expected to begin by the end of December 2021.
- Commercial operation is planned by December 22, 2021.

Approval of this application does not allow DTE to construct improvements that require additional federal, state, or county permits, approvals, or notifications. Upon approval of this application, however, DTE would begin construction of improvements that are not subject to other federal, state, or county permits, approvals, or notifications, such as WTG tower foundations.

3.0 Site Plan

By letter dated May 15, 2019, DTE committed to exceeding Jonesfield Township's minimum requirements relating to the siting and operation of WTG towers and a WTG Project. (A copy of DTE's letter is included in Appendix B.) Accordingly, the layout depicted on the site plans included in Appendix C reflects the application of the following additional setbacks and siting parameters:

- An average of two to three WTG towers per standard one-square mile township section.
- WTG towers spaced about 1,000 feet apart so each has unimpeded access to the wind resource when there is more than one WTG tower in a section.
- WTG towers no closer than 1.5 times the height of the tower, including the top of the blade in its vertical position, to the edge of public road rights-of-way.
- WTG towers no closer than 1.5 times the height of the tower, including the top of the blade in its vertical position, to project boundaries.
- WTG towers no closer than 1,320 feet to residential buildings (not including barns and storage buildings) on properties outside the WTG project boundaries, and no closer than 1,000 feet to residential buildings on properties within the project boundaries.
- WTG towers placed no closer than 1,320 feet to boundary of the Village of Merrill.
- WTG towers and access roads sited along common property lines or fence rows within the project site to minimize the impact on farming operations, and in locations that consider landowner input.

The layout also complies with recommended setbacks from natural habitats. For example, based on best practices recommended by WEST, the project wildlife consultant, proposed WTG tower sites are generally 330 feet from permanent stream habitat and other natural habitat over 50 acres. Where feasible, WTG towers are sited more than 657 feet from medium and high-quality bat habitat.

Figure 3-1 depicts the land area under agreement that is potentially available for siting WTG towers after all setback constraints have been factored in. Collectively, the setback constraints reduce the land area under agreement that is potentially available for WTG tower siting in Jonesfield Township to 6.8 percent of the land area north of M-46 and the Village of Merrill.

DTE Energy
Meridian Wind Park
Project Layout Siting Constraints
July 29, 2020
Jonesfield Township

Setback/Constraint	Setback Requirement[1]	DTE Commitment[2]	Setback Distance Applied	
Structures				
Residential Buildings - Building Wall (Outside WTG Project site)	*not specified*	1,320 ft	1,320	ft
Residential Buildings - Building Wall (Inside WTG Project site	*not specified*	1,000 ft	1,000	ft
Uninhabitable Structures or Trees[3]	*not specified*	*not specified*	150	ft
Project Property Line Boundaries	1 x TH	1.5x TH	750	ft
Environmental/Wetlands[4]				
Forest and Forested Corridors	per consultant recommendation	per consultant recommendation	329	ft
Bat Habitat	per consultant recommendation	per consultant recommendation	657	ft
Indiana Bat Known Locations	per consultant recommendation	per consultant recommendation	13,200	ft
NWI Wetlands Over 1 Acre Near Other Natural Habitat	per consultant recommendation	per consultant recommendation	329	ft
Other Natural Habitat Over 50 Acres	per consultant recommendation	per consultant recommendation	329	ft
Other NWI Wetlands	per consultant recommendation	per consultant recommendation	33	ft
Grasslands Over 50 Acres	per consultant recommendation	per consultant recommendation	1,313	ft
Rivers / Streams	per consultant recommendation	per consultant recommendation	329	ft
Drainage Easement/Irrigation Ditches	*not specified*	*not specified*	WTG tower structure outside easement area	
FEMA 100 Year Floodplain	*not specified*	*not specified*	150	ft
Road Rights-of-Way	1 X TH	1.5x TH	750	ft
Railroad Easements	*not specified*	*not specified*	550	ft
Overhead Utilities	*not specified*	*not specified*	550	ft
Underground Utilities	*not specified*	*not specified*	200	ft
Cities/Villages Boundary	*not specified*	1,320 feet	1,320	ft
Airports Local to Site	Per FAA and MDOT guidelines	Per FAA and MDOT guidelines	NA	
Microwaves Beam Paths	Outside WCFZ	Outside WCFZ	245	ft
Maximum WTG Tower Height	*not specified*	500 feet	500	ft
Minimum Blade Ground Clearance	20 feet	20 feet	*82/46*	ft
Other Turbines	*not specified*	*typical spacing of 1,000 feet*	*based on wind speeds*	
Sound				
Residential Building Outside WTG Project site	*not specified*	45 dB(A)	45 dB(A)	
WTG Project Site Property Line	60 dB(A)	55 dB(A)	55 dB(A)	
Shadow Flicker Limit	*not specified*	30 hours per year	NA	

HH = hub height
TH = total height (including tip of blade)
WCFZ = Worst Case Fresnel Zone

1 - Jonesfield Township Zoning Ordinance Section 612(I)
2 - Letter to Jonesfield Township (Jonesfield Re_ Wind Park Design Parameters [05.15.2019])
3 - Black & Veatch recommendation of 0.5HH minimum setback from uninhabitable structures or trees to minimize impacts
4 - Consultant environmental recommendations are applied to the project as a whole, but reviewed and adjusted per turbine location. Note that no Indiana bat known locations were identified for this project.

Figure 3-1 Setbacks Applied to Meridian Wind Project

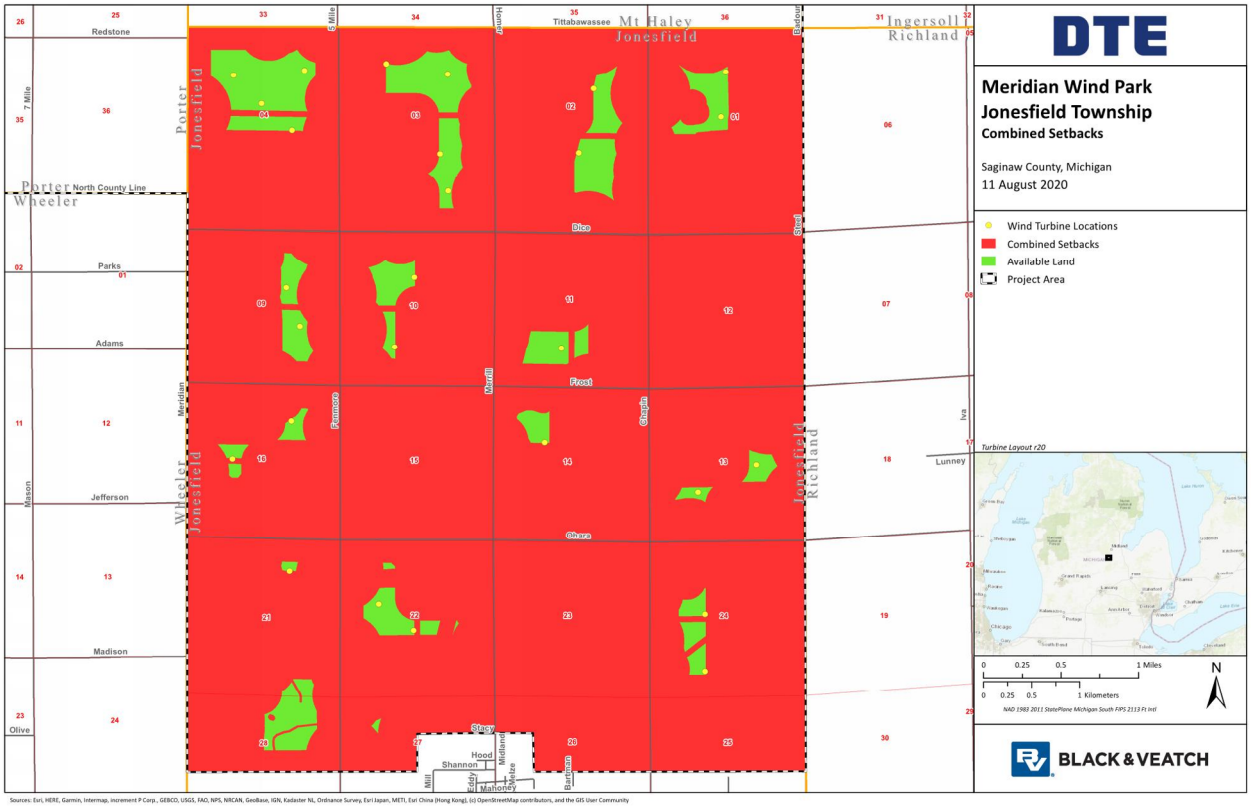


Figure 3-2 Composite Siting Constraints (Setbacks)

The survey drawings included in Appendix C overlay ALTA standard survey data on aerial photographs of the land to show the features specified in Zoning Ordinance Subsection 907(3)(C), such as exterior property line boundaries of the property subject to the application, zoning districts, road rights-of-way, easements, existing proposed buildings and structures, including WTG towers , access roads, and the collection substation, as well as natural features, including wetlands, watercourses, ponds, wooded areas, and topography.

Because actual site conditions may differ from what is known based on preliminary engineering studies and surveys, the locations of WTG towers and the access roads servicing the tower sites shown on the site plans included in Appendix C are preliminary and subject to adjustments based on field conditions. DTE would request that any deviations from the approved site plan, as shown on an as-built survey filed with the township zoning administrator, be deemed an “acceptable deviation from approved site plan” under Zoning Ordinance Subsections 907(3)(F) and (H).

4.0 Special Land Use Requirements

Zoning Ordinance Section 612 specifies the standards, requirements, and conditions for special land uses. Per Section 611(e), the Section 612 standards and additional requirements for uses take precedence over otherwise applicable district regulations. The specific standards and requirements for the land use "wind turbine generators" are listed under Section 612(l).

4.1 Land Area, Width and Setback Requirements

Section 612(l) requires a WTG Project to provide a minimum of 5 acres per WTG tower. The total Jonesfield Township land area over which DTE has easement rights is 7,319 acres, which, assuming a total of 26 WTG tower sites, equates to roughly 282 acres of land under easement per WTG tower. The minimum width of all land included in the WTG Project site is at least 150 feet.

DTE has committed to exceeding the township's minimum setback requirement (1 times the height of a WTG tower, including the top of the blade in its vertical position) from road rights-of-way and the WTG Project boundary lines, and has laid the site out to maintain WTG tower setbacks of no less than the following:

- 1.5 times the height of the tower, including the top of the blade in its vertical position, to the edge of public road rights-of-way.
- 1.5 times the height of the tower, including the top of the blade in its vertical position, at WTG Project property lines
- 1,320 feet to residential buildings (not including barns and storage buildings) on properties outside the WTG Project boundaries.
- 1,000 feet to residential buildings on properties within the WTG Project boundaries.
- 1,320 feet to any boundary of the Village of Merrill.

4.2 Tower Security

Zoning Ordinance Section 612(l), Other Requirements 1, requires WTG towers to be secured to prohibit access by unauthorized persons, and permits the Planning Commission to require a security fence. Here, requiring security fencing at the base of WTG towers would not enhance security. Access doors at the base of the WTG towers are locked at all times and access restricted to authorized personnel only. Requiring security fencing would present a risk of interference with farm operations and agricultural activities, something that the site layout seeks to avoid to the extent practicable.

4.3 Sound

Though Section 621(l), Other Requirements 2, limits sound levels from a WTG Project to 60 decibels as a measured at a project boundary line, DTE has committed to limiting sound levels to no more than 55 dB(A) Leq (1-hour) at a project boundary line and 45 dB(A) Leq (1-hour) at residences on property abutting a project boundary.

The sound model used to predict future sound levels incorporates a number of assumptions that ensure conservative estimation of sound pressure levels and potential impacts at project boundary lines and residences on property abutting a project boundary, as follows:

- Each WTG tower is an omnidirectional sound pressure level point source (i.e., sound is emitted in all directions spherically from the WTG tower in the model) located at hub height.
- Terrain/topography is based on the most current GIS data available.
- Ground is assumed to be acoustically "mixed" (G = 0.5), a conservative assumption for most of the year since the ground within the wind park is mainly cultivated farmland, which is usually considered "porous" ground.
- All receptors (residences) are downwind from all sound sources; the downwind calculation assumes a wind speed of approximately 2 to 11 mph at a height of approximately 10 to 36 feet above the ground.
- ISO 9613 calculations representative of atmospheric conditions causing downward refraction of sound waves; i.e., a moderate temperature inversion such as would be present on a clear, calm night.
- Shielding/attenuation effects of interceding barriers (such as residences) and foliage are not included in the model.

The predicted sound levels resulting from the operation of the Jonesfield Township portion of the Meridian Wind Park are shown in Figure 4-1. Applying conservative, worst-case assumptions, the acoustical model predicts sound levels at 21 receptors potentially higher than 45 dB(A) Leq 1-hour. Operational controls such as noise-reduced operation will be employed where needed to achieve a 45 dB(A) Leq 1-hour level at residences outside the project boundary. Since modeling results are inherently conservative, operational controls will be evaluated and applied during final commissioning and will be detailed in the post-construction sound level study determining final compliance.

A copy of the sound pressure level modeling report is included in Appendix D. A list of receptor locations conservatively warranting continued monitoring for compliance with township standards is included in Appendix D.

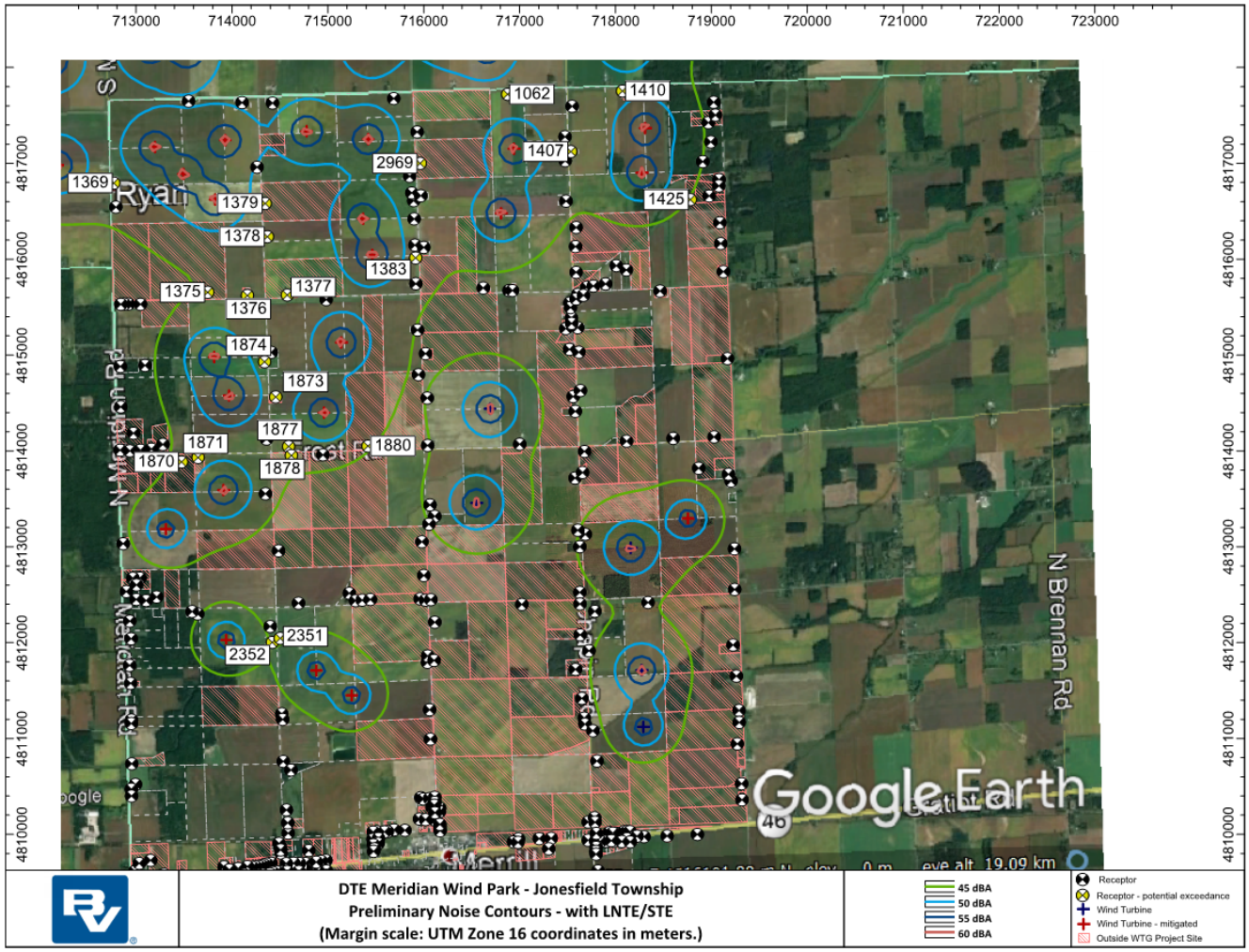


Figure 4-1 Jonesfield Township – Predicted Sound Levels

4.4 Vibration

Zoning Ordinance Section 612(l), Other Requirements 3, requires a WTG Project to not cause human-detectable vibrations at a project boundary. Acoustical characteristics were evaluated in terms of low frequency sound emissions. The WTG Project sound emissions are expected to result in low frequency sound levels that do not exceed published guidelines related to building vibration. The WTG tower models proposed for installation in Jonesfield Township are not expected to produce human-detectable vibrations at the WTG Project boundary and therefore will comply with this requirement.

4.5 Minimum Ground Clearance

Zoning Ordinance Section 612(l), Other Requirements 4, requires a minimum of 20 feet of clearance between grade and the WTG tower blade point. Per manufacturer specifications, the GE WTG tower model proposed for installation in Jonesfield Township has a minimum ground clearance of 82 feet, and the Vestas model has a minimum ground clearance of 46 feet.

4.6 Lighting

Zoning Ordinance Section 612(l), Other Requirements 5, provides that if WTG towers are to be lighted, the applicant must apply to the FAA for lighting that (a) is at the lowest intensity allowed; (b) avoid strobe lighting or other intermittent white lighting fixtures; (c) may utilize a green or red top light that does not pulsate or blink; and (d) comply with minimum FAA requirements. The applicant is also required to submit a written FAA report verifying its light requirements.

WTG tower obstruction lighting will be submitted to the FAA for review, and will be provided as approved by all agencies having jurisdiction. Because approved WTG tower coordinates and heights may have bearing on the final lighting plan, DTE would request that the Planning Commission consider approving its application conditioned on DTE filing the required report prior to issuance of a building permit for tower erection.

5.0 Shadow Flicker

Though the Jonesfield Township Zoning Ordinance does not include regulations governing shadow flicker, DTE committed by letter dated May 15, 2019, to limiting shadow flicker at residential buildings to no more than 30 hours in a year.

Using modeling software that estimates shadow flicker using worst-case assumptions and historical sunshine data, of the 405 residential buildings analyzed, it is estimated that over a typical year in Jonesfield Township, 30 residential buildings may experience 30 hours or more of shadow flicker, 126 residential buildings are likely to experience less than 30 hours of shadow flicker, and 249 residential buildings are predicted to experience no shadow flicker.

The extent to which shadow flicker may fall upon residential buildings in excess of 30 hours per year will depend on whether existing vegetation and structures – which are not factored into the shadow flicker model – block the shadow cast by the WTG tower, and will also depend on future weather events. Where natural and man-made barriers to shadow flicker do not fully mitigate potential issues, additional mitigation measures, such as curtailment of WTG tower operations during defined periods, will be applied so that all WTG towers operate in compliance with the 30-hour per year limit.

Figure 5-1 below illustrates the predicted worst-case shadow flicker pattern. A copy of the shadow flicker analysis is included in Appendix E.

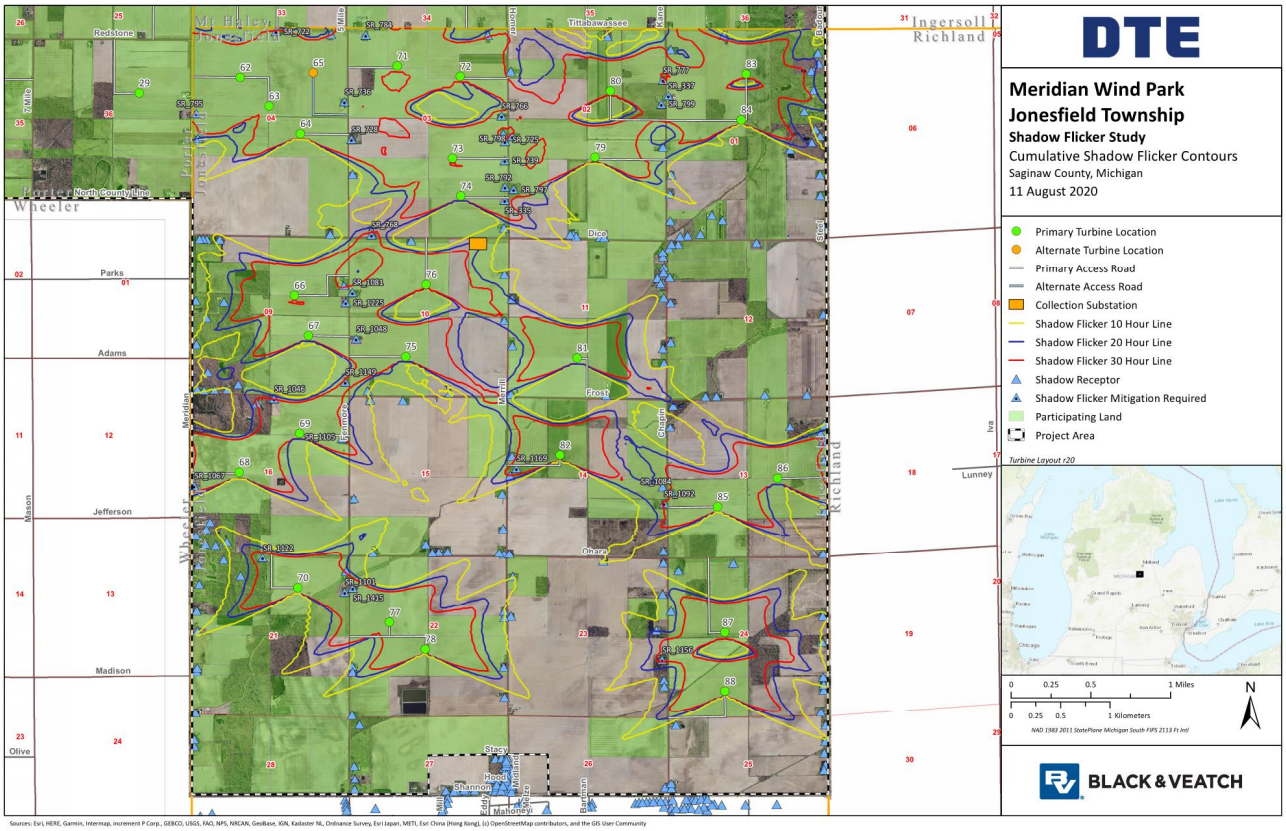


Figure 5-1 Shadow Flicker Modeling Results

6.0 Decommissioning

DTE is committed to decommissioning inoperable WTG towers and WTG towers that are no longer used for energy generation. DTE's standard utility easement for wind energy development requires decommissioning and site restoration upon termination of the easement with a landowner. Additionally, DTE will provide advance notice of any decommissioning activities and seek township input on decommissioning activities.

DTE has obtained an estimate of decommissioning costs based on an anticipated decommissioning plan. A copy of the estimate is included in Appendix F. To secure decommissioning, DTE will provide a corporate performance guarantee and surety bond based on its decommissioning cost estimates.

7.0 Special Land Use Standards

Zoning Ordinance Section 602(c) requires the applicant to submit a written statement describing how the proposed land use will comply with the general standards for special land use approval listed under Section 606. The following list addresses each of the Section 606 approval standards.

a. *The property subject to the application is located in a zoning district where the proposed special land use may be established.*

   The proposed WTG Project will be located on land zoned A-1, Agricultural and A-2, Agricultural and Rural Residential. Per Zoning Ordinance Section 504.1 and Section 504.2, wind turbine generators are a category of use permitted as a special land use in these zoning districts.

b. *The special use, as proposed, complies with the specific standards applicable to that special use as listed under the regulations for that zoning district.*

   As detailed in the above narrative, the site plans included in Appendix C, and other analyses attached as appendices to this application, the proposed WTG Project meets or exceeds the specific standards applicable to the use under Section 612(l).

c. *The proposed special use will be consistent with the intent and purpose of the Township Master Plan, as well as the intent and purpose of the zoning district in which the proposed use will be located.*

   The Merrill-Jonesfield Community Master Plan dated August 2014 includes the Agricultural Land Development and Open Space Goal of maintaining a rural residential community characterized by productive farmland and attractive open space areas, and the objectives of (i) encouraging preservation of agricultural lands and existing farming operations, (ii) preserving natural features and open space, and (iii) encouraging placement of land uses in manner that is compatible with existing natural features and the Future Land Use Map.

   The General Development Plan identifies the following relevant major concepts as the basis for the Future Land Use Plan:

   - Jonesfield Township remaining a predominantly rural residential and agricultural community with farmlands and natural features continuing to dominate the character of the community.
   - In all future development, township natural features, farmlands, and open spaces areas retained to the greatest extent possible in all future development.
   - Discourage the conversion of the township's most productive farmlands to non-agricultural uses.
   - Future development that, in all cases, does not create demands for public services that exceed the Township's capabilities to provide such services.

The proposed WTG Project Site falls within areas of Jonesfield Township that the Future Land Use designates for long-term Agricultural Use or Agriculture and Residential Use.

- The Agricultural Use designation applies to lands intended predominantly for use as agriculture, farm dwellings, conservation and recreational areas, and other uses that are compatible with a rural setting, with current farmland and other large tracts of land intended to be conserved for agricultural pursuits and related purposes. This designation anticipates non-farm uses co-existing with agriculture.
- The Agriculture and Residential Use designation applies to land intended for agriculture and low density residential development on lots one acre or greater that are mainly located along the Township's western boundary, its northeast corner, and south of M-46.

The proposed WTG Project is consistent with the Township's agricultural land use policies and future land use plan. A typical WTG tower site, together with its access road, occupies on average one acre of land (turbine base, ring, and access road), thus minimally impacts land available for agriculture. In total, the proposed WTG tower sites and access roads will occupy less than 6.8 percent of the 7,319 acres of Jonesfield Township land area under agreement that comprises the WTG Project site, and the density of WTG towers across the site averages 282 acres per tower. Additionally, the proposed WTG tower sites are generally located at the edges of fields and fence rows to avoid interfering with farming operations where practicable, and are set back appropriate distances from natural features and habitats. For these reasons, Jonesfield Township will remain a predominantly rural residential and agricultural community post-construction, and its farmlands and natural features will continue to dominate the character of the community, as this project is laid out to retain township natural features, farmlands, and open spaces to the greatest extent possible given the siting constraints discussed in this application.

These conclusions are consistent with the position of administrators of the state farmland protective program. The Michigan Farmland Preservation Program has consistently determined that wind energy development is compatible with state goals to promote the retention of land in agricultural production. The Michigan Department of Agriculture and Rural Development rules have permitted WTG towers to be placed on land under a farmland development rights agreement based on its determination that WTG towers are an improvement consistent with continuing farm operations.

DTE's siting and operating practices –which are intended to mitigate the effects of shadow flicker generally and maintain sound levels consistent with ambient levels in a rural, agricultural environment – make its proposed project one that is also

compatible with low-density rural residential environments such as those found in Jonesfield Township.

For the same reasons, the proposed WTG Project is consistent with the intent and purposes of the A-1 and A-2 zoning districts in which it would be located. The A-1 district, like the Agriculture future land use designation, is intended to preserve and promote the use of land for food and fiber production, and related uses. The A-2 district, like the Agricultural and Rural Residential future land use designation, is intended to permit a controlled mixture of residential and agricultural uses in a rural environment, along with encouraging low-density residential development on individual lots. Thus, the factors showing consistency with Township planning goals, objectives, and future land use plan show the same with respect to the intents and purposes of the A-1 and A-2 zoning districts.

d. *The proposed special use will not result in material burden on police and fire services, nor on other public services and facilities.*

DTE's proposed WTG Project will not result in any material burden on police and fire services. WTG towers are non-climbable and locked to prevent unauthorized access, so active policing of the facility by local law enforcement will not be necessary.

WTG towers are outfitted with fire suppression systems that are designed to operate as the first line of defense in the unlikely case of a fire, and their operation is monitored remotely by DTE personnel on a continuous basis. In the unusual case of a WTG tower blade being damaged, the impact has been limited to the land at the base of the tower and within standard setback zones. There have been no instances in Michigan of such incidences resulting in any damage to property or persons.

WTG towers do not require connection to a potable water supply or sanitary sewage disposal.

e. *The proposed special use will not diminish the opportunity for adjacent property owners to use and develop their properties as zoned.*

The site plans and proposed operational conditions for this WTG Project are intended to ensure that the project will not diminish the opportunity for adjacent property owners to use and develop their properties. WTG towers will be set back from public road rights-of-way and WTG Project boundary lines a distance that industry standards and a decade of experience with wind energy development confirm is sufficient to protect those adjacent owners from detrimental impacts that might impact their use and development of their properties, and that exceeds Township zoning requirements.

f. *The proposed special use will be designed, constructed, operated, and maintained so as not to negatively impact the character of land uses in the surrounding area.*

Sound levels associated with the proposed WTG towers will be within the limits that DTE has committed to maintaining, levels that are similar to what exists under periodically under ambient, pre-development conditions. Additionally, though not

required by the Jonesfield Zoning Ordinance, DTE has committed to limiting shadow flicker to no more than 30 hours per year through operational controls where shadow flicker is not negated by environmental factors such as prevailing weather patterns, and intervening buildings, structures, and trees.

g. *The proposed special use will not involve uses, activities, process, materials, or equipment that will create a nuisance for properties in the vicinity by reason of traffic, noise, smoke, fumes, glare, odors, or the accumulation of scrap or waste materials.*

WTG towers and WTG Projects as a whole generate minimal traffic. Scheduled maintenance occurs twice per year, but WTG tower maintenance is performed on a more frequent basis as needed. On average, it is anticipated that technicians may make one trip per month to inspect each tower.

DTE has committed to limiting sound levels associated with individual WTG towers to less than 60 dB(A) at WTG Project boundary as required by the Zoning Ordinance. The 45 dB(A) Leq 1-hour limit applied to residential buildings outside the WTG Project boundaries and 55 dB(A) Leq 1-hour limit applied at WTG Project boundaries are levels that compare favorably to other ordinary background sounds typical of rural and residential environments such as rustling corn, rainfall, insects, the hum of refrigerators, or a residential air-conditioning unit, and much less than other typical sounds such as riding lawn mowers, tractors, weed eaters, and chainsaws.

Additionally, a sound level of 45 dB(A) at the exterior wall of a dwelling does not take into account how cold-climate buildings reduce sound levels. For example, a building with closed windows reduces sound levels by 27 dB(A), while a building with open windows reduces sound levels by 17 dB(A). The net result is that a 45 dB(A) sound pressure level outside a building wall dropping to 23 to 33 dB(A) indoors depending on whether windows are closed or open. To put these numbers into perspective, the typical sound pressure level inside a library is 35 to 40 dB(A).

WTG towers do not generate smoke, fumes, glare or odors. Scrap material or waste material accumulation is not a by-product of WTG tower operations.

DTE requires chemical lubricants consumed in the operation of a WTG tower and used in the maintenance of mechanical components to be handled in strict compliance with all applicable laws and regulations. All waste disposal will take place off-site.

Appendix A

Appendix A. Legal Descriptions for Land Area Under Agreement

Appendix A will be submitted under separate cover.

Appendix B

Appendix B. DTE Setback Commitments Letter

May 15, 2019

Jonesfield Township
217 Eddy Street, P.O. Box 117
Merrill, Michigan 48637
c/o Larry Tibbits, Supervisor

Re: Wind Park Design Parameters

Dear Supervisor Tibbits:

We understand that on May 7, 2019, the voters residing in the zoning jurisdiction of Jonesfield Township rejected a zoning ordinance amendment relating to utility-scale wind energy development adopted by the Township Board on August 20, 2019. We are writing to assure you that the voters apparent preference for less restrictive zoning regulations will not cause DTE to change its basic approach to siting wind turbines.

As a developer and operator of wind parks, DTE understands how to develop and operate wind energy facilities that are compatible with agricultural activities and respectful of nearby residences. Be assured that any plan for a wind energy facility in Jonesfield Township will reflect the following design parameters:

1. An average of two to three wind turbines per standard one-square mile township section. Where there is more than one turbine in a section, the turbines will be spaced about 1,000 feet apart so each has unimpeded access to the wind resource.

2. A maximum wind turbine height of 500 feet, as measured from grade to the tip of the rotor blade in its most vertical position.[1]

3. Wind turbines placed no closer than 1.5 times tip height to a public road.

4. Wind turbines and access roads sited along common participating property lines or fence rows so the installation minimizes impact on farming operations. If an adjoining landowner is not participating in the project, the turbine will be sited 1.5 times tip height from the non-participating property line.

5. Wind turbines placed no closer than 1,320 feet to residential buildings on non-participating parcels, and no closer than 1,000 feet to residential buildings on participating parcels. (Residential buildings do not include barns and other storage buildings.)

[1] FAA "No Hazard Determinations" and MDOT Tall Structures permits are required irrespective of local zoning requirements. Aviation safety lighting is also determined by FAA rules.

6. Wind turbines placed no closer than 1,320 feet to boundary of a village, such as the Village of Merrill.

7. Underground electric collection systems installed at a depth that will accommodate continued agricultural activity, typically 4 feet below grade.

8. Shadow flicker at residential buildings managed through operational controls paired with other mitigation measures as necessary after consultation with the landowner, and limited to no more than 30 hours in a year based on conservative shadow flicker modelling assumptions.

9. Sound pressure levels limited to no more than 55 dBA Leq (1-hour) at non-participating property lines and 45 dBA Leq (1-hour) at residences on non-participating parcels, based on conservative sound modelling assumptions.[2]

DTE is committed to decommissioning inoperable wind turbines and wind turbines that are no longer used for energy generation. DTE's standard utility easement for wind energy development (the agreement between DTE and landowners participating in the project) provides for the decommissioning and site restoration upon termination of its easement with a landowner. Additionally, DTE will provide advance notice of any decommissioning activities and seek Township input on any decommissioning plans.

As we do in all communities, as a project progresses through its various stages of development, we will work closely with you and the community to ensure you remain informed. This process, of, course. will include submission of special land use permit application and site plan, per the requirements of Section 611 and 612(l), and a site plan pursuant to Section 907(1)(B).

If you have questions, please do not hesitate to contact our site manager Jason Hannath at (440) 477-4438, or me at (313) 235-5575.

Sincerely,

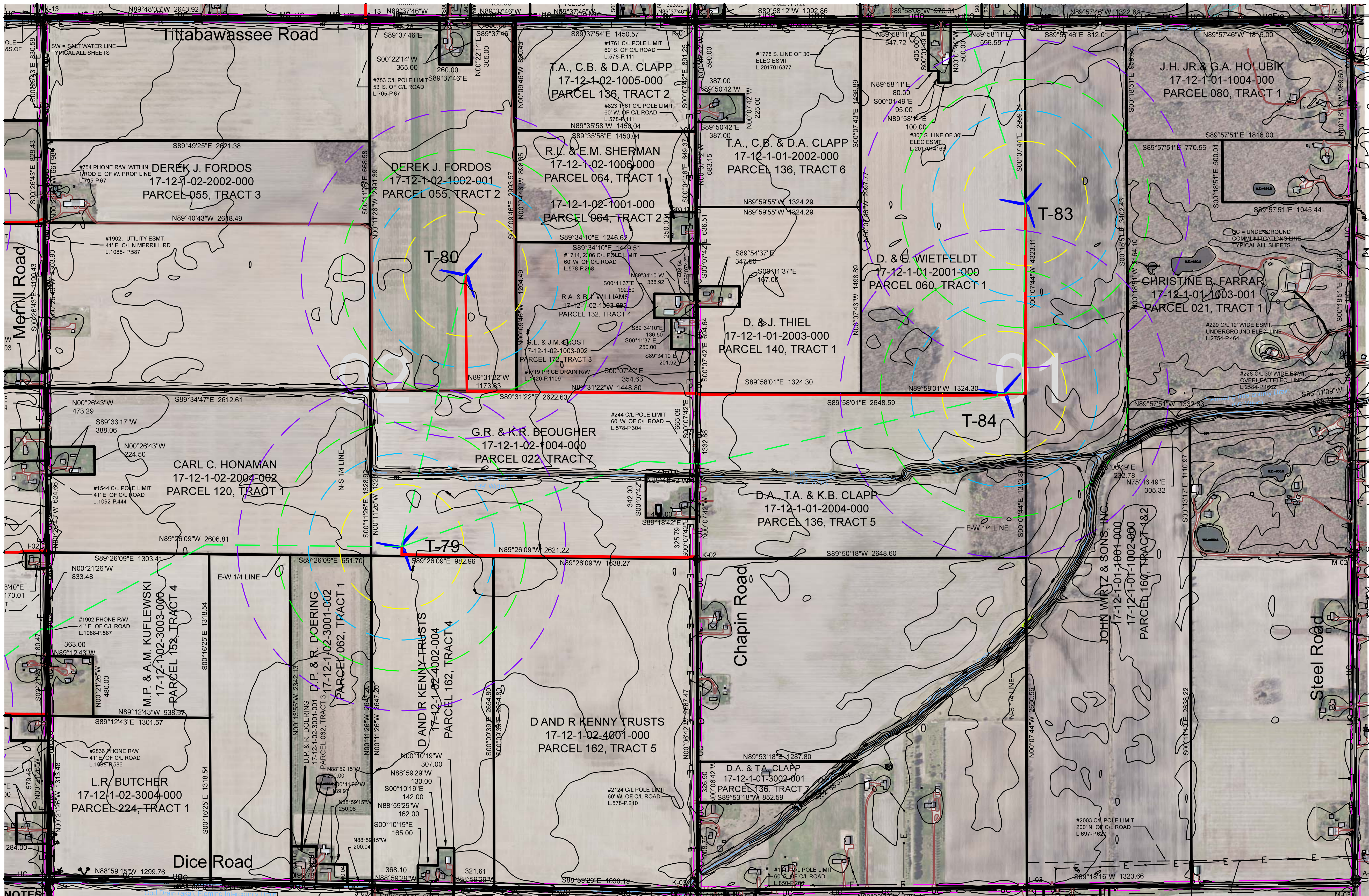
Matt Wagner

Manager, Renewable Energy Development

[2] When the sound dampening effect of the wall of a residence is factored in, interior sound levels generally drop by 17 dBA (open windows) to 27 dBA (closed windows).

Appendix C

Appendix C. Site Plan Drawings



NOTES:

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SITE NOTES:
THE LOCATION OF WIND TURBINES, COLLECTION LINES, AND ACCESS ROADS ARE SUBJECT TO FIELD ENGINEERING ADJUSTMENTS DUE TO LATENT CONDITIONS AND MAY BE MODIFIED THROUGH FINAL ENGINEERING; DTE WOULD REQUEST THAT ANY DEVIATIONS FROM THE APPROVED SITE PLAN, AS SHOWN ON AN AS-BUILT SURVEY FILED WITH THE TOWNSHIP ZONING ADMINISTRATOR, BE DEEMED AN APPROVED DEVIATION UNDER ZONING ORDINANCE SECTION 907(3)(F) AND (H).

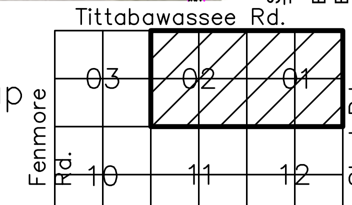
Legend

SECTION CORNER	DRAIN CENTERLINE	ROAD R.O.W. LINE	OVERHEAD ELECTRIC
UTILITY POLE	PR. CRANE PATH	DRAIN R.O.W. LINE	WETLANDS
BOUNDARY LINE	PR. COLLECTION LINE	NO PERMANENT A.G. CONST.	DRIVEWAYS
EASEMENT	PR. ACCESS ROAD	NO CONSTRUCTION	FENCE LINE
	TELEPHONE		GAS LINE

SITE PLAN

Vicinity Map
No Scale

*See Sheet J4 for Jonesfield Twp. Turbine Setback Details



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DTE WIND ENERGY PROJECT

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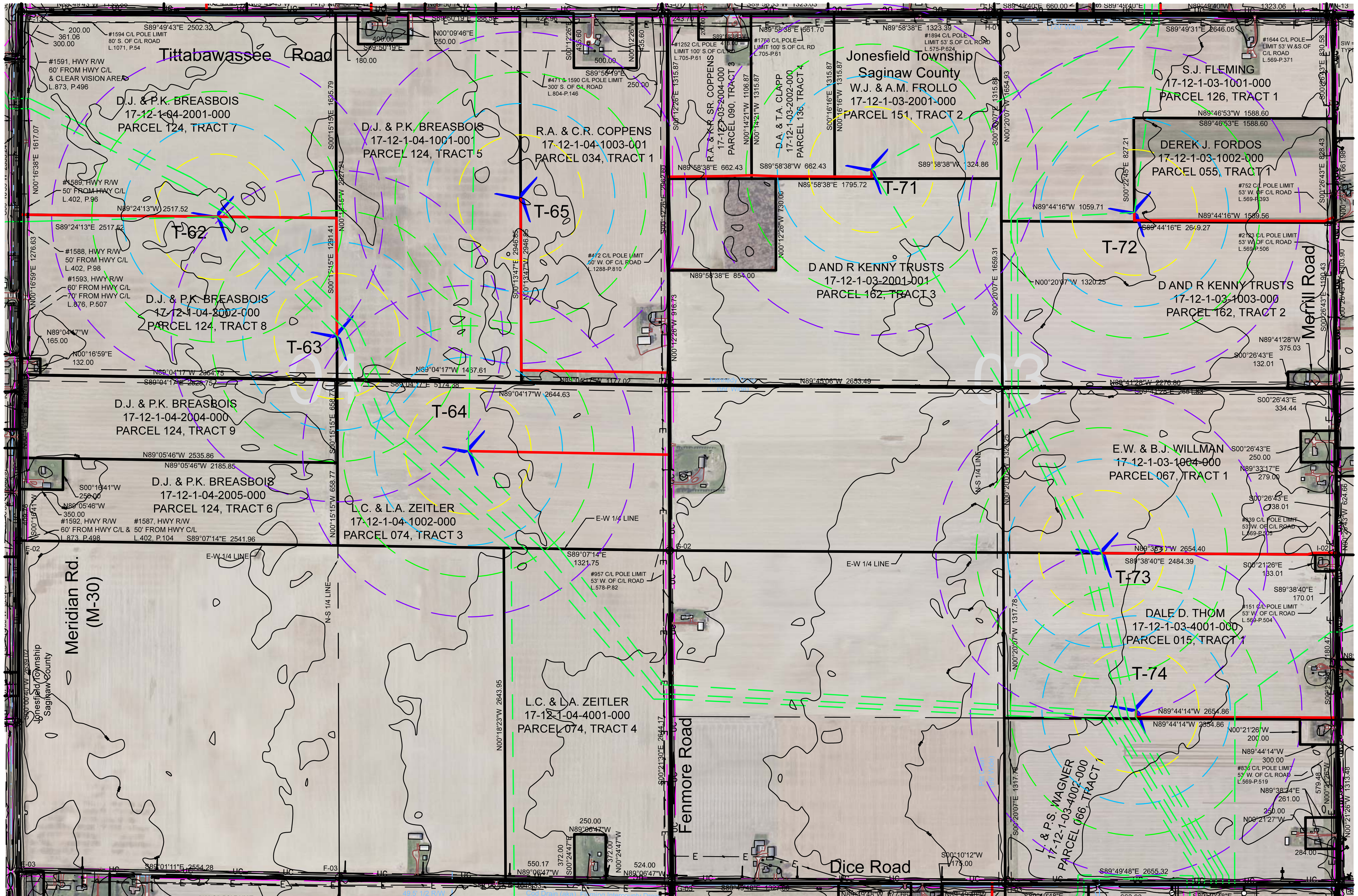

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EASEMENT	PR. ACCESS ROAD	NO CONSTRUCTION
	TELEPHONE	

E	OVERHEAD ELECTRIC
	WETLANDS
	DRIVEWAYS
X	FENCE LINE
G	GAS LINE

SITE PLAN

Vicinity Map
No Scale

Tittabawassee Rd. — 04, 03, 02 — 09, 10, 11 — Meridian Rd. — Chapin Rd.

*See Sheet J4 for Jonesfield Twp. Turbine Setback Details

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(IN FEET)
1 inch = 800 ft.
0 400 800 1600

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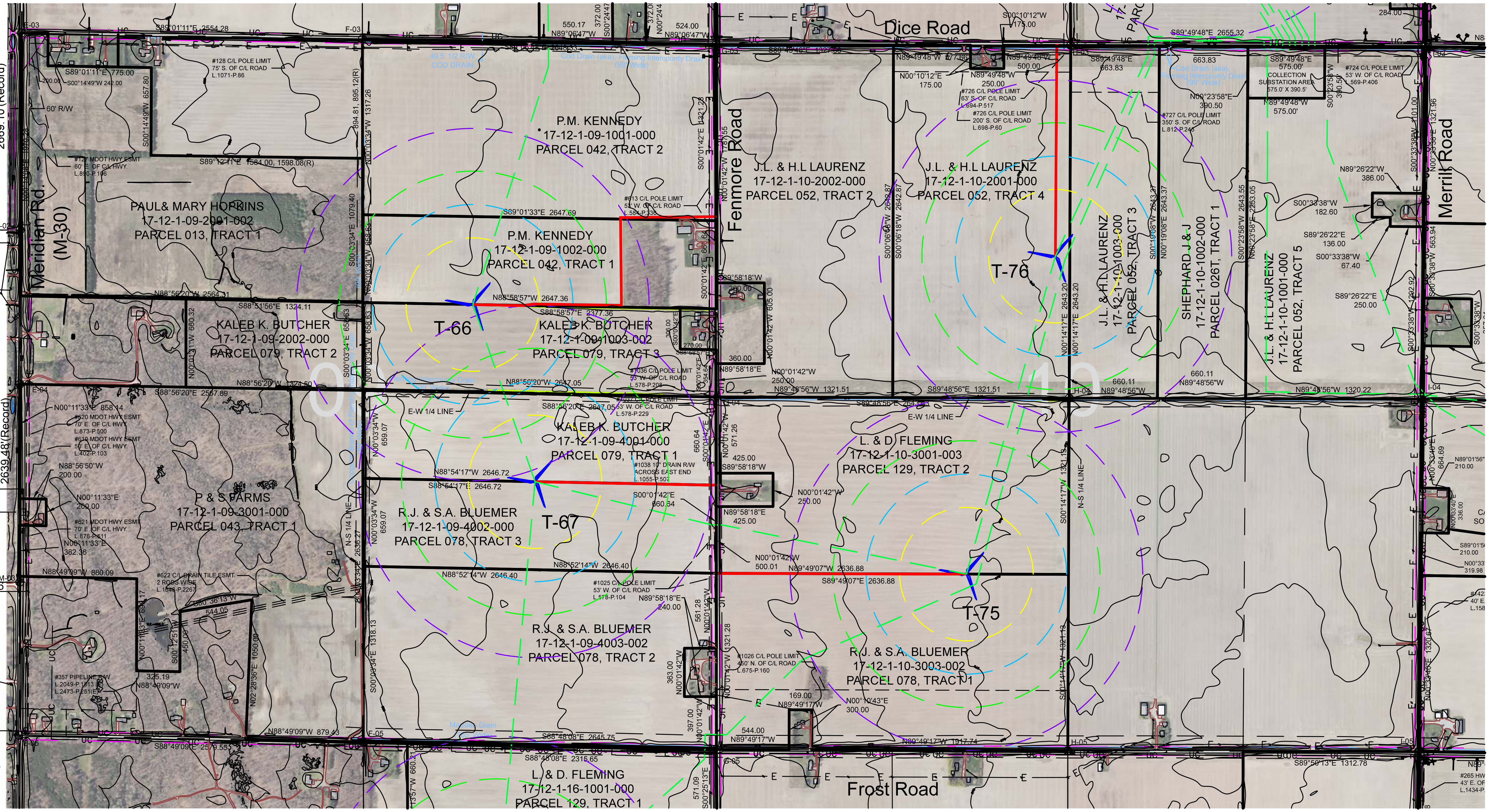

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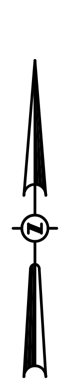

GRAPHIC SCALE

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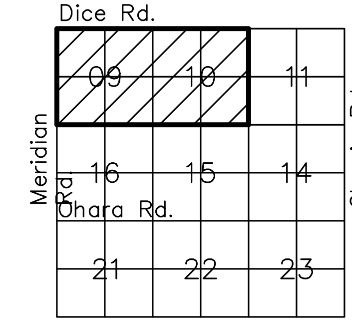

Vicinity Map
No Scale

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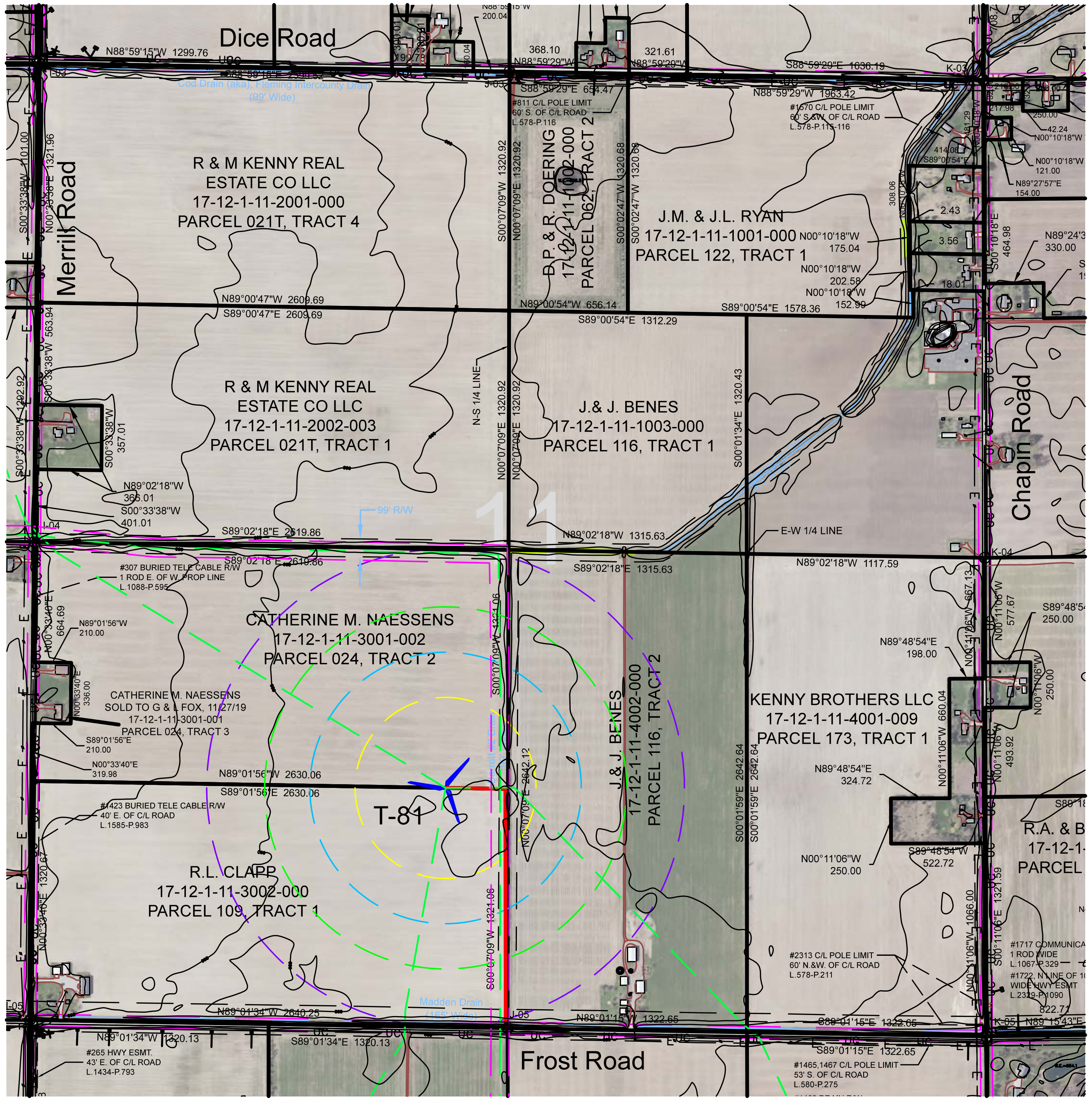

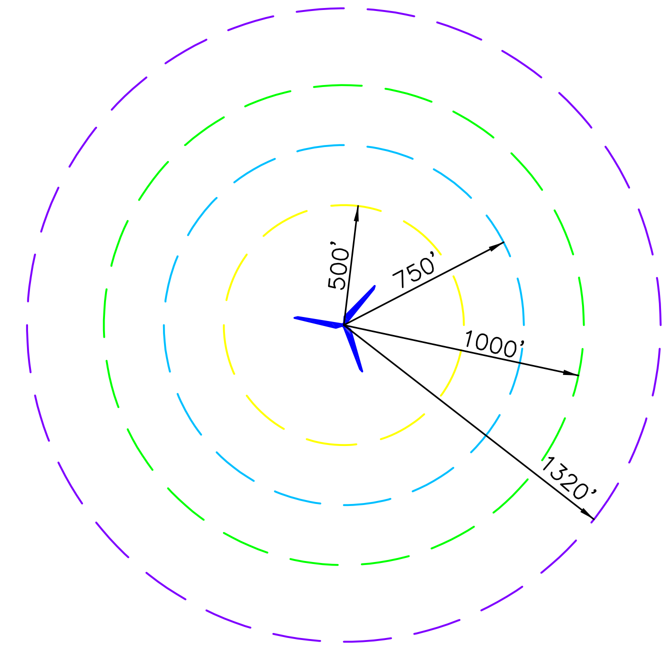

JONESFIELD TWP. TURBINE SETBACKS
1X TURBINE HEIGHT = 500' FROM PROJECT BOUNDARY
1.5X HEIGHT = 750' FROM ROAD (R.O.W.)
1.5X HEIGHT = 750' FROM PROJECT BOUNDARY
1320' FROM NON-PARTICIPATING RESIDENCES
1000' FROM PARTICIPATING RESIDENCES
1320' FROM VILLAGE LIMITS

SITE PLAN

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ROAD R.O.W. LINE	T TELEPHONE
DRAIN R.O.W. LINE	E OVERHEAD ELECTRIC
NO PERMANENT A.G. CONST.	G GAS LINE
NO CONSTRUCTION	WETLANDS
UNDERGROUND	DRIVEWAYS
UC COMMUNICATION LINE	X FENCE LINE

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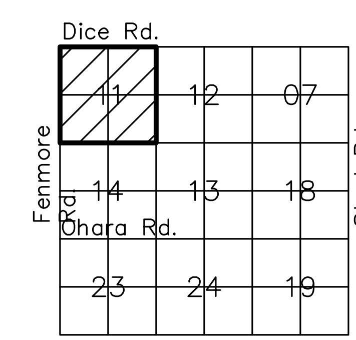

Vicinity Map
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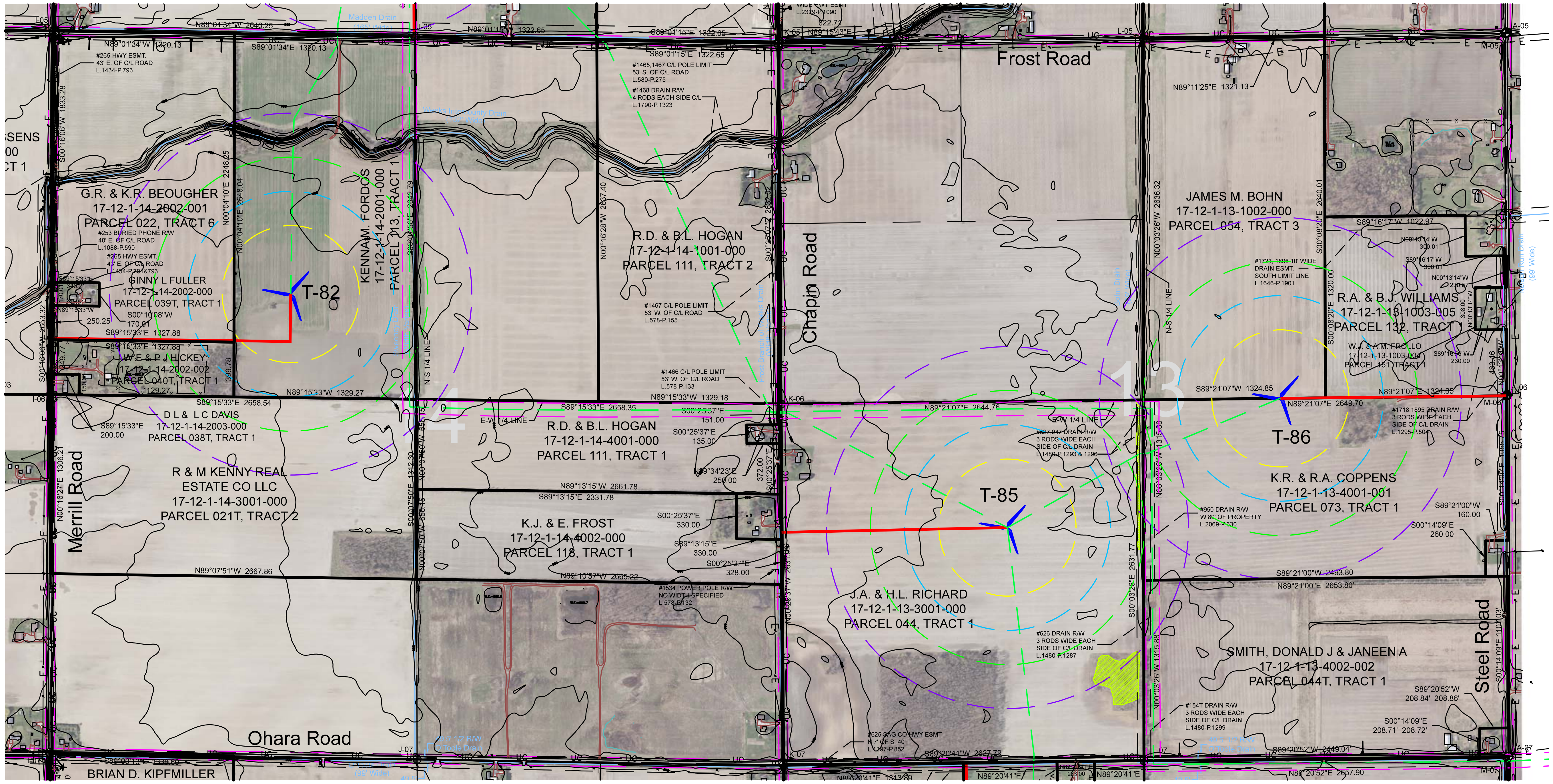

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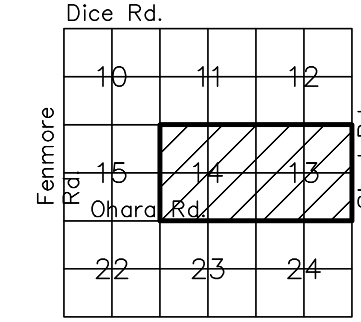

Vicinity Map
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ALTA/ACSM LAND TITLE SURVEY

PREPARED UNDER THE SUPERVISION OF:
Jeremy R. Rosenbrock, P.S.
Professional Surveyor No. 47873

PROJECT LOG	
1st draft	03/10/20
1ST Mt. Haley draft to PF	06/01/20
rev. ecsmt /fe. drive color, setback legend Roadway to C/L	06/02/20
Jonesfield 1st draft	06/12/20
Porter Twp MJ ALTA comments	06/29/20
Porter Site Plan	07/17/20
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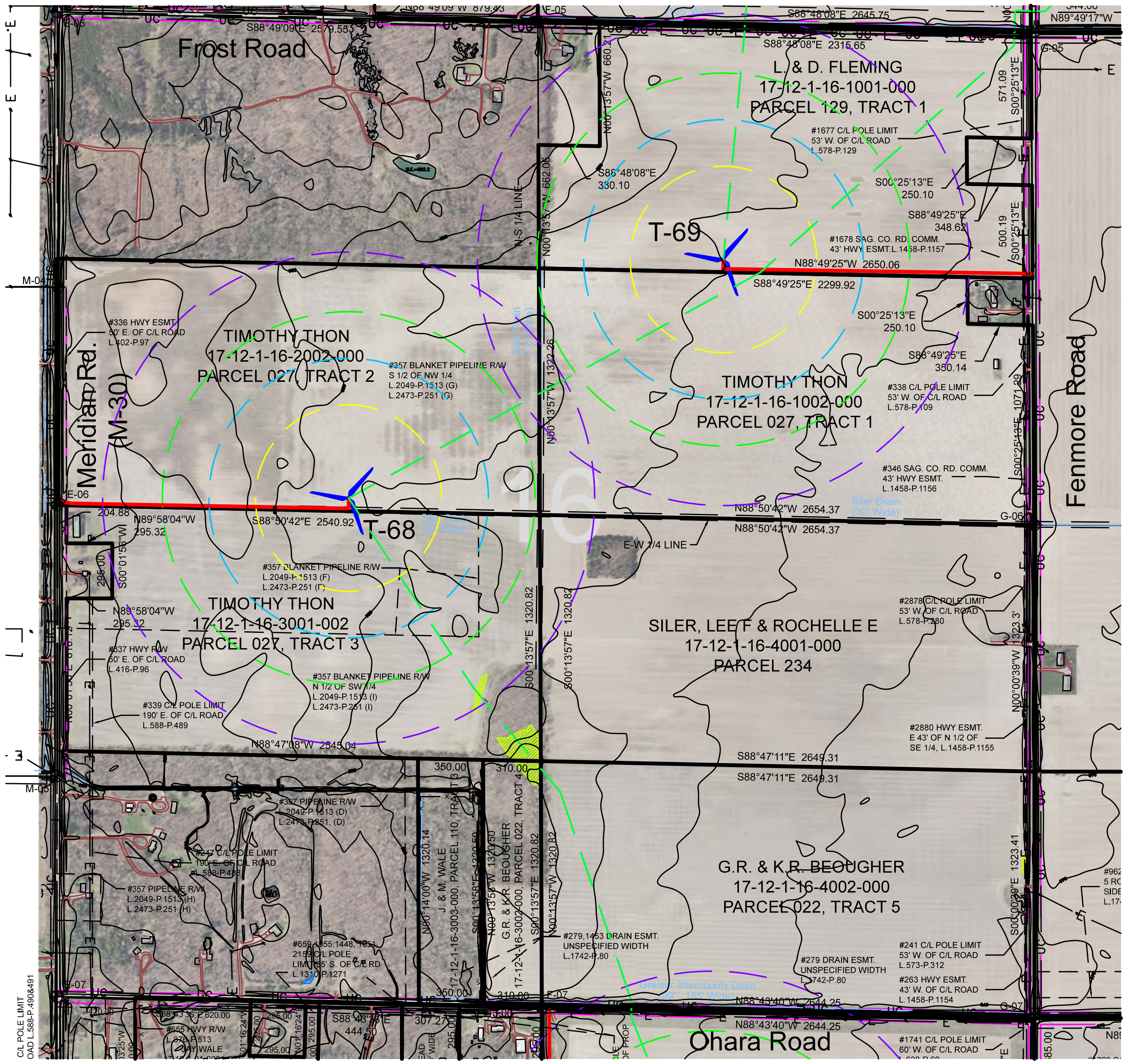

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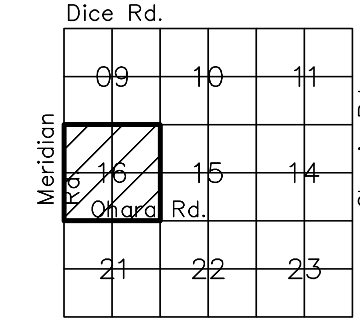

Vicinity Map
No Scale

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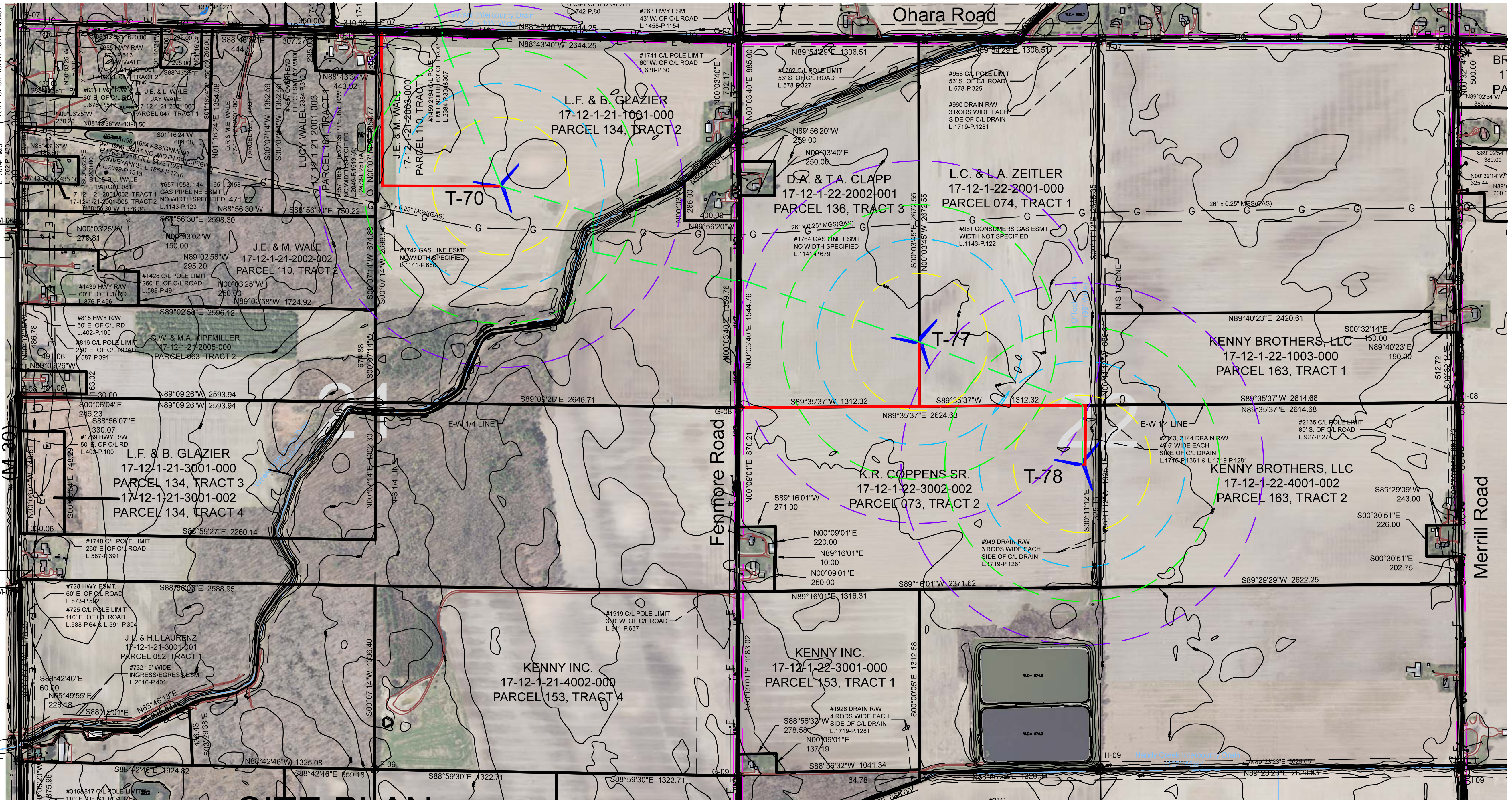

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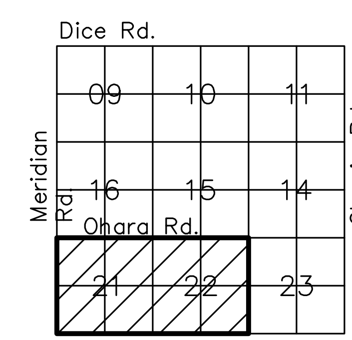

Vicinity Map
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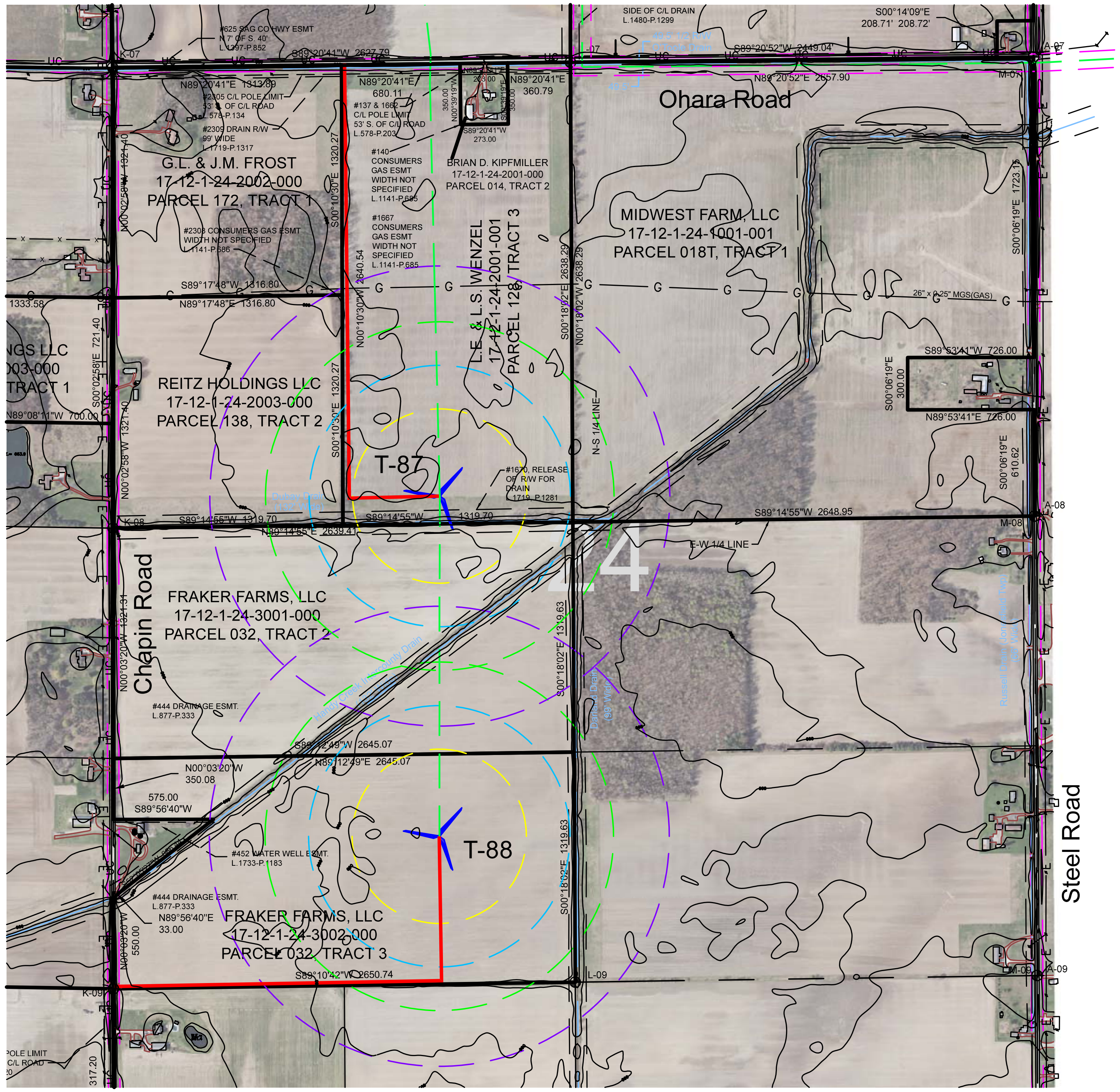

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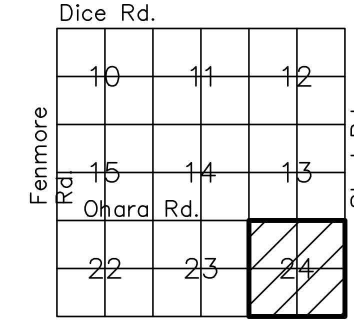

Vicinity Map
No Scale

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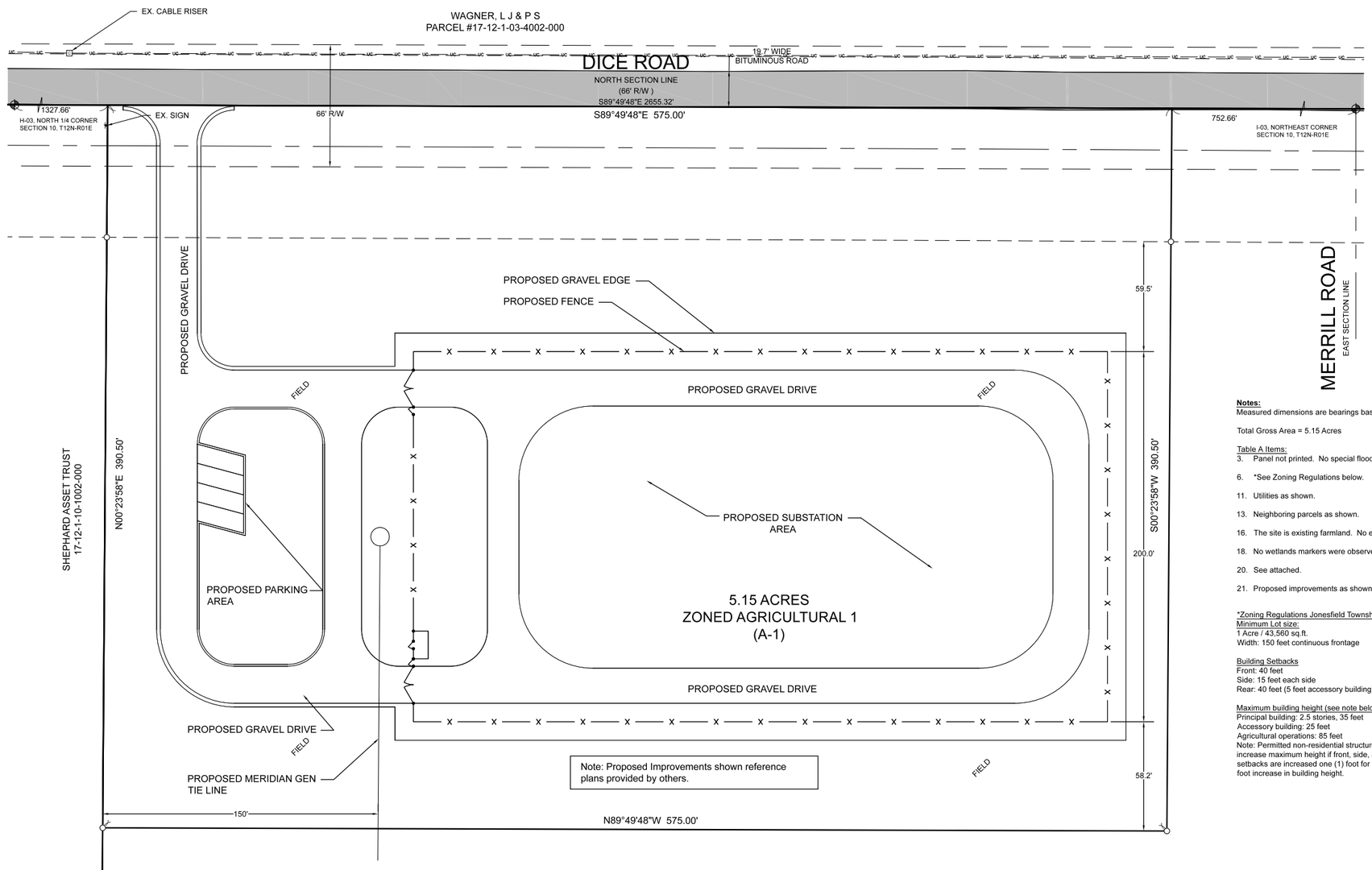
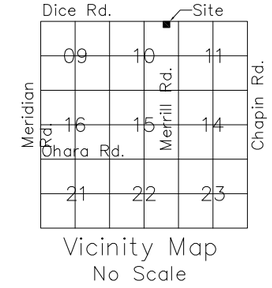


PROPOSED SITE PLAN



Vicinity Map
No Scale

LEGEND	
⊕	MONUMENT / SECTION CORNER
○	SET PROPERTY IRON
●	FOUND PROPERTY IRON
C	EXISTING CABLE RISER
	EXISTING SIGN
	EXISTING BITUMINOUS PAVEMENT
uc uc	EXISTING UNDERGROUND COMMUNICATIONS

Notes:
Measured dimensions are bearings based on the Michigan State Plane Coordinate System, South Zone.

Total Gross Area = 5.15 Acres

Table A Items:
3. Panel not printed. No special flood hazard areas.
6. *See Zoning Regulations below.
11. Utilities as shown.
13. Neighboring parcels as shown.
16. The site is existing farmland. No evidence of earthmoving or construction.
18. No wetlands markers were observed.
20. See attached.
21. Proposed improvements as shown.

*Zoning Regulations Jonesfield Township Zoning Ordinance 001-2007:
Minimum Lot size:
1 Acre / 43,560 sq.ft.
Width: 150 feet continuous frontage

Building Setbacks
Front: 40 feet
Side: 15 feet each side
Rear: 40 feet (5 feet accessory building)

Maximum building height (see note below):
Principal building: 2.5 stories, 35 feet
Accessory building: 25 feet
Agricultural operations: 85 feet
Note: Permitted non-residential structures may increase maximum height if front, side, and rear setbacks are increased one (1) foot for each one (1) foot increase in building height.

LAURENZ, J L & H J TRUSTS
PARENT PARCEL #17-12-1-10-1001-000
PARCEL 052, TRACT 5

Dated July 23, 2020:
Stewart Title Guaranty Company ID: 052 (1/24/2020), Part of Tract 5, Commitment No. 20000030026-111:
Land in the Northeast 1/4 of Section 10, T12N - R01E, Jonesfield Township, Saginaw County, Michigan Records.

Legal Description:
Part of the East 1/2 of the Northeast 1/4 of Section 10, T12N-R01E, Jonesfield Township, Saginaw County, Michigan Described as Commencing at the Northeast Corner of said Section 10; Thence along the North Section Line, N89°49'48"W, 752.66' to the Point of Beginning; Thence S00°23'58"W, 390.50'; Thence parallel with the North Section Line, N89°49'48"W, 575.00' to the East 1/8 Line; Thence along the East 1/8 Line, N00°23'58"E, 390.50' to the North Section Line; Thence along the North Section Line, S89°49'48"E, 575.00' to the Point of Beginning. Containing 5.15 acres, more or less, and is subject to any and all easements and/or rights of way whether used, implied or of record.

Schedule B-II (Specific Exceptions): N/A

Note: Consumers Power Esmt. for Parent Parcel #724 C/L Pole Limit
53' W. of C/L Merrill Road L.569-P.406 (outside of project area)

CERTIFICATION

To (DTE Electric Company) and (Stewart Title Guaranty Company):
This is to certify that this map or plat and the survey on which it is based were made in accordance with the 2016 Minimum Standard Detail Requirements for ALTA/ACSM Land Title Surveys, jointly established and adopted by ALTA and NSPS, and includes items 3, 6, 11, 13, 16, 18, 20 & 21 of Table A thereof. The fieldwork was completed on 07/08/2020.
Date of Plat or Map: 07/23/2020

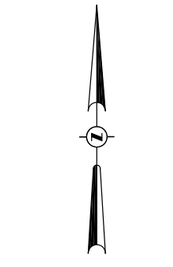
JEREMY R. ROSENBROCK, PS #47973

FLOOD PLAIN INFORMATION

Jonesfield Township
Saginaw County, Michigan
Map Number: 26145C0050D
Effective Date: 10/16/1997
Flood Zone: Panel not printed. No special flood hazard areas.

UTILITY NOTE

The utility locations as hereon shown are based on field observations and a careful review of municipal and utility records. However, it is not possible to determine the precise size, location, depth, pressure, or any other characteristics of underground utilities, tanks or septic fields without excavation. Therefore, we cannot guarantee the accuracy or completeness of the buried utility information hereon shown. The Contractor shall call MISS DIG (811) a minimum of three working days prior to any excavation. It shall be the responsibility of the Contractor to verify these utility locations prior to construction and make every effort to protect and/or relocate them as required. The Contractor shall notify the Engineer/Surveyor as soon as possible in the event a discrepancy is found.



PREPARED UNDER THE SUPERVISION OF:
Jeremy R. Rosenbrock, P.S.
Professional Surveyor No. 47973

MERIDIAN WIND PARK PHASE 1
SUBSTATION PARCEL
SECTION 10, T12N-R01E
JONESFIELD TOWNSHIP
SAGINAW COUNTY, MICHIGAN

ALTA/ACSM LAND TITLE SURVEY

PROJECT LOG
DRAFT 7/9/20
REVISED 7/23/20
REV2 7/29/20

989-495-9227
ROSENBROCK LAND SURVEYING, INC.
"Finding accurate paths for your future"
1026 W. Midland Road
Auburn, MI 48611

DTE ELECTRIC COMPANY
ONE ENERGY PLAZA
DETROIT, MICHIGAN 48226

CAD FILE #: 19-010
PLOT SCALE: 1 : 1
PROJ MGR: JRR
DESIGN BY:
DRAWN BY: PGC
CHECKED BY:
SCALE: 1" = 30'
SHEET: 2 OF 2

19—010

SV2

Appendix D

Appendix D. Environmental Sound Level Assessment Memo

DRAFT

ACOUSTICAL REPORT – JONESFIELD TOWNSHIP

Meridian Wind Park

B&V PROJECT NO. 198674

PREPARED FOR

DTE Electric Company

5 AUGUST 2020

BLACK & VEATCH

Table of Contents

LIST OF TABLES

LIST OF FIGURES

1.0 Introduction

Black & Veatch is providing project development services for a new wind park in Saginaw and Midland counties, Michigan. The wind park is expected to include 77 wind turbines spanning Jonesfield, Mt. Haley, and Porter Townships. This report focuses on the 26 wind turbine locations and the 1 alternate location proposed in Jonesfield Township, and will discuss the regulatory requirements, ambient sound level survey results, and the results of the project acoustical model.

2.0 Regulatory Summary

The proposed Meridian Wind Park must comply with sound level limits set forth in Jonesfield, Mt. Haley, and Porter Township ordinances. The following sections summarize the requirements in Jonesfield Township.

2.1 JONESFIELD TOWNSHIP

Section 612(l) of the Jonesfield Township Zoning Ordinance limits sound levels generated by a wind turbine to 60 decibels at the boundaries of a wind turbine generator project. DTE, however, has committed to limiting sound levels to 55 dBA L_{eq} (1-hour) at property lines outside the Project site, and 45 dBA L_{eq} (1-hour) at residences located outside the Project site, and to model predicted sound levels using an acoustical model that incorporates conservative assumptions.

3.0 Ambient Sound Level Survey

An ambient sound level survey of the proposed Meridian Wind Park was completed 15 October 2018 through 17 October 2018 in Midland and Saginaw County, Michigan. Three measurement locations were selected within the area of the proposed project site to measure and monitor the ambient acoustical environment. One measurement location was selected in each township, representative of the expected worst-case receptors based on the then current turbine arrangement. The survey was completed to quantify and qualify the existing acoustical environment at the site in support of the permitting process.

3.1 SURVEY PROCEDURE

The ambient sound level survey was completed in accordance with relevant portions of general industry standards including ANSI S1.13, ANSI S12.9, ANSI S12.18, ASTM E1014, and ISO 1996. All sound levels were measured using Type 1 or Type 2 sound level meters that met the requirements of ANSI S1.4. The sound level meters were capable of determining specific average and statistical sound levels over a specified duration. The microphones were equipped with windscreens provided by the manufacturer. All equipment was laboratory calibrated within twelve months prior to the survey and the calibrations are traceable to the National Institute of Standards and Technology (NIST). (See Appendix B).

In order to effectively quantify and qualify the existing sound levels, the ambient survey included both continuous sound level monitoring and short-term sound level measurements. Ambient sound levels were measured at locations corresponding to receptors (residential

buildings) identified prior to and during the ambient sound level survey. The exact survey locations were identified at the time of the survey and were selected to capture acoustical environments representative of the nearby receptors.

3.1.1 Continuous Monitoring

Continuous sound monitors were placed at three monitoring locations for at least 38 hours. The measurement periods included at least two (2) evening and nighttime periods between 7:00 p.m. on 15 October 2018 and 10:00 a.m. on 17 October 2018. The continuous sound monitors were locked and secured within a case in the public right-of-way (ROW). They were unmanned, but periodically inspected by Black & Veatch professionals to ensure continuous operation. The microphone was placed approximately 5 feet above the ground.

3.1.2 Short-Term Monitoring

Attended short-term monitoring was conducted at a continuous sound monitoring location not equipped to record octave band sound level data, and one additional location in order to further quantify the existing acoustical environment near the existing Gratiot Wind Park to the southwest. These measurements were attended and performed by Black & Veatch acoustical professionals.

3.2 SOUND MEASUREMENT LOCATIONS

The sound measurement locations (SMLs) listed in Table 1 (shown in Figure 2) were selected to correspond to receptors (i.e., residences) that will be within close proximity of project wind turbines, with at least one receptor located within each affected township. Continuous sound level monitoring was completed at SML1, SML2, and SML3. The additional measurement location (SML4) was added to determine the existing wind farm sound levels to the southwest of the proposed project site. Wind speed data from nearby MBS International Airport is included for informational purposes in Appendix C.

Table 1 – Sound Measurement Locations

SOUND MEASUREMENT LOCATION	LAT/LONG	SITE DESCRIPTION	CONTINUOUS MONITORING	SHORT-TERM MONITORING
SML1	N 43.502287 W -84.389520	Country Road – Porter Township	X	X
SML2	N 43.454885 W -84.350469	Country Road – Jonesfield Township	X	N/A
SML3	N 43.507124 W -84.350726	Country Road – Mt. Haley Township	X	X
SML4	N43.466186 W -84.419672	Country Road in Porter Township near existing Gratiot wind park.	N/A	X

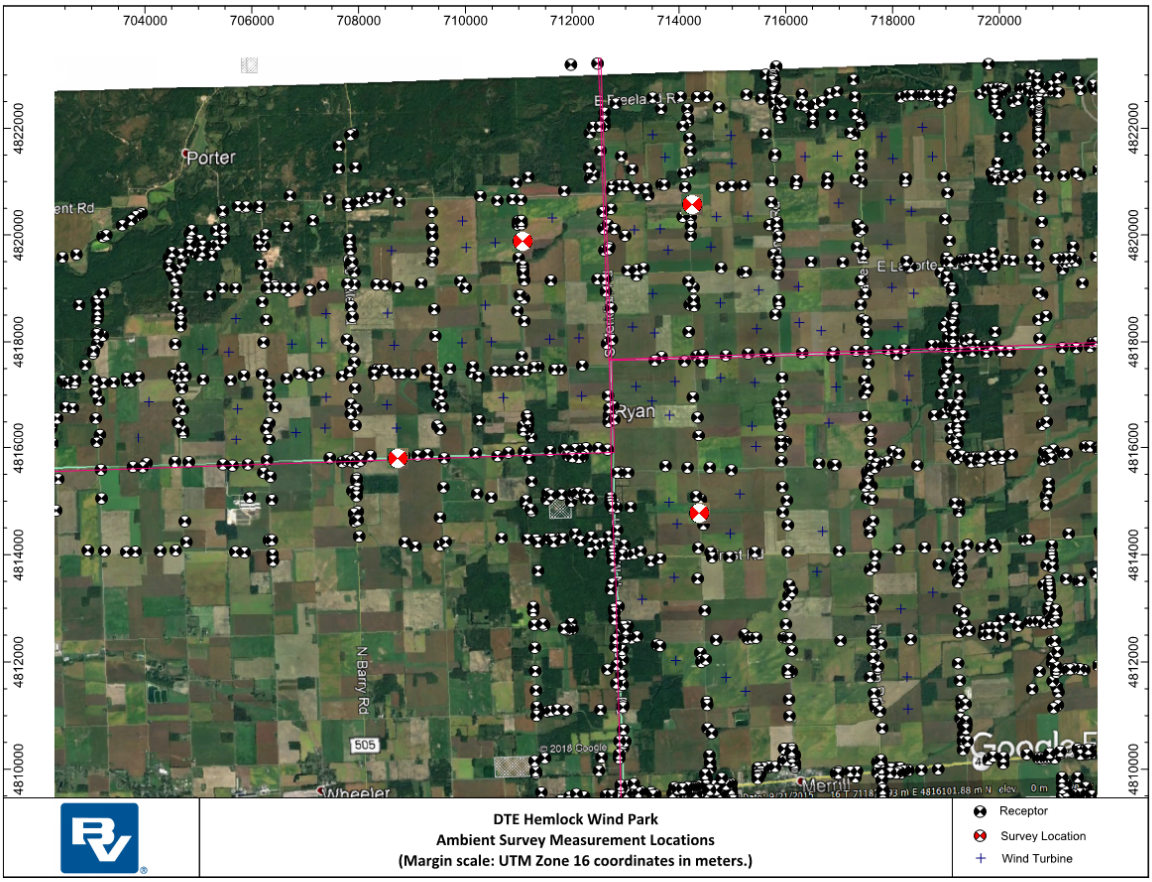


Figure 1 - Sound Measurement Locations

3.3 SURVEY RESULTS

3.3.1 Sound Measurement Location 1

An acoustical monitor was placed at SML1 to collect ambient measurements during daytime and evening hours. Average wind speeds measured intermittently at microphone height during the survey ranged from 3 to 9 mph. The noticeable sound sources were wind in grass, birds and insects, distant traffic and farm equipment. Background L_{90} sound levels ranged from 28 dBA[1] to 48 dBA and are shown in Figure 3. Short-term measurements are shown in Figure 4.

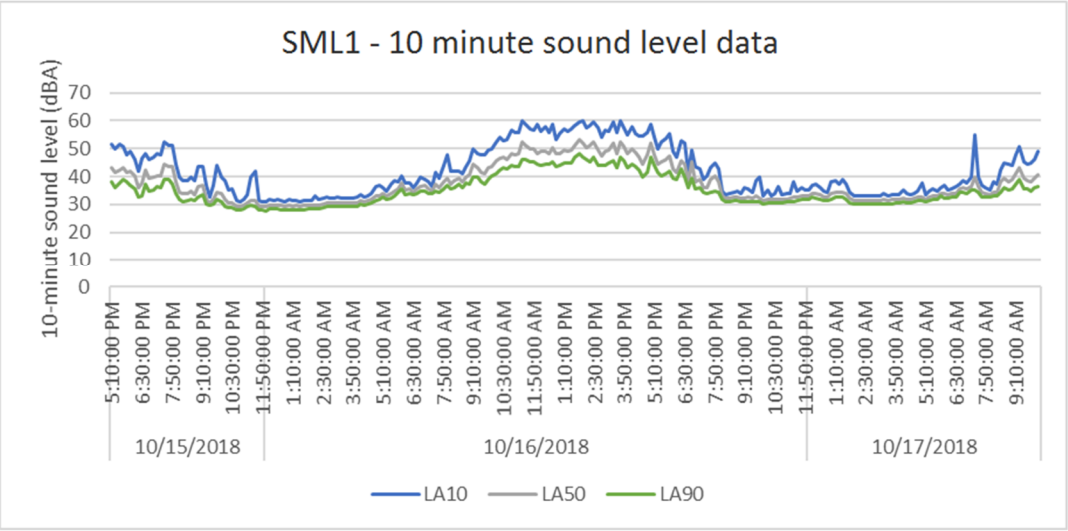


Figure 2 - SML1 continuous sound level data

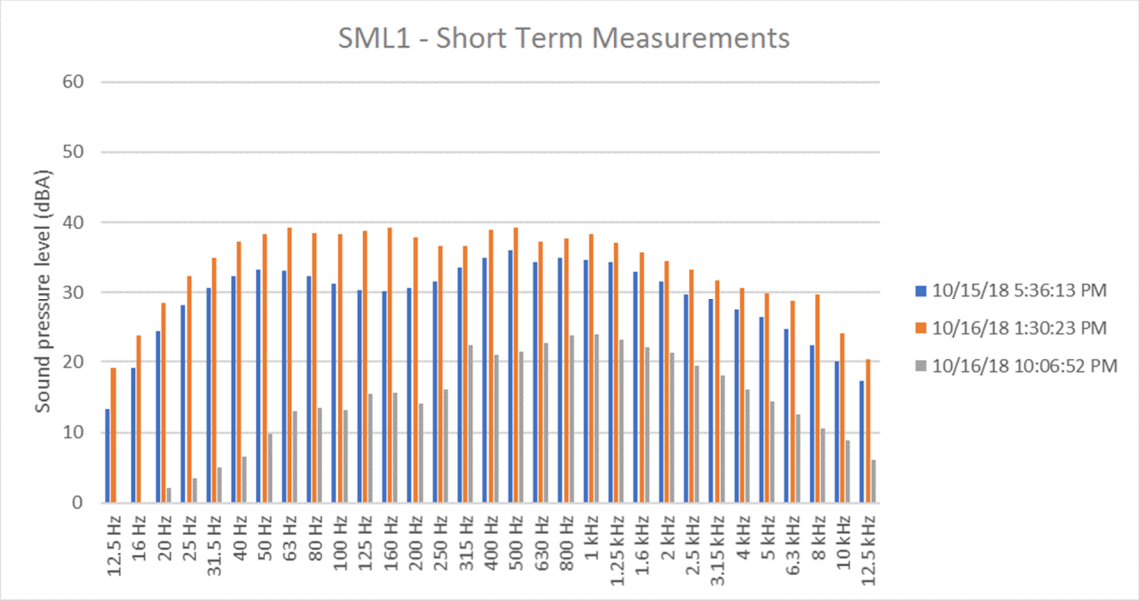


Figure 3 - SML1 short term L_{eq} measurement data

[1] Sound levels under 30 dBA may have been impacted by equipment electrical noise floor of ≤20 dBA

3.3.2 Sound Measurement Location 2

An acoustical monitor was placed at SML2 to collect ambient measurements during daytime and evening hours. Average wind speeds measured intermittently at microphone height during the survey ranged from 2 to 14 mph. The perceived sound sources were wind in grass and crops, distant traffic, and faint sound from the Gratiot Wind Park. Background L_{90} sound levels ranged from 20 dBA[2] to 51 dBA as shown in Figure 5.

The acoustical monitor at SML2 collected one-third octave band data through the survey. 10-minute excerpts of that measured data are included in Figure 6, for comparison to short-term measurements at other locations.

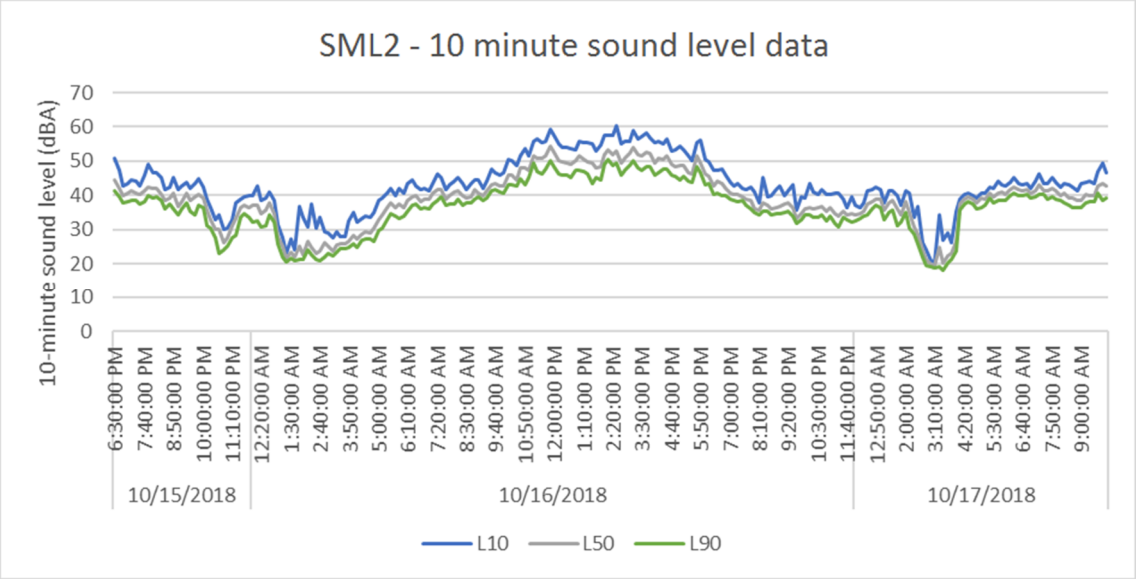


Figure 4 - SML2 continuous sound level data

[2] Sound levels under 27 dBA may have been impacted by equipment electrical noise floor of ≤17 dBA.

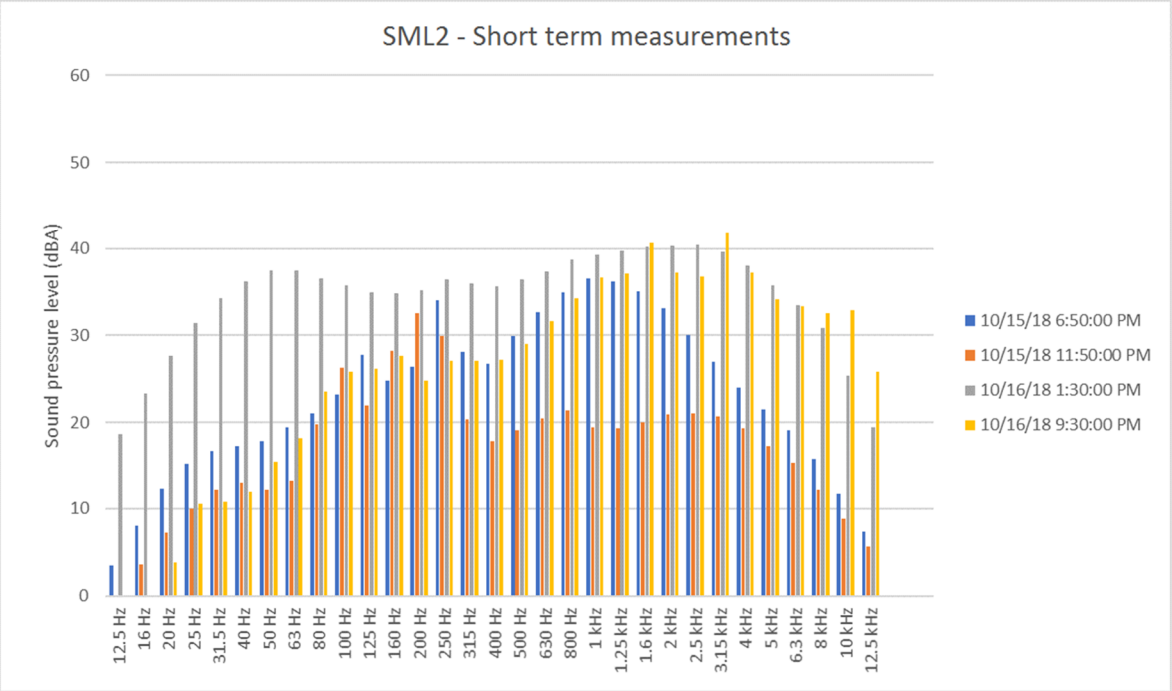


Figure 5 - SML2 L_{eq} spectrum measurement data

3.3.3 Sound Measurement Location 3

An acoustical monitor was placed at SML3 to collect ambient measurements during daytime and evening hours. Average wind speeds measured intermittently at microphone height during the survey ranged from 2 to 8 mph. The noticeable sound sources were wind in grass and crops, faint sound from pole-mounted electrical equipment nearby, distant traffic, and trickling water from drain tiles and a culvert near road. Background L_{90} sound levels ranged from 20 dBA[3] to 51 dBA as shown in Figure 7. Short-term measurements are shown in Figure 8.

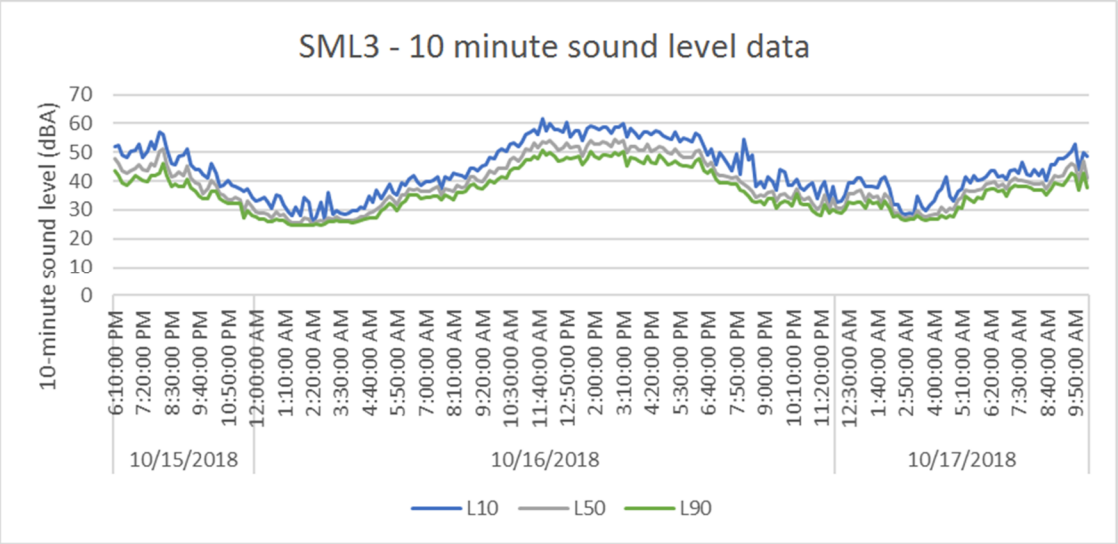


Figure 6 - SML3 continuous sound level data

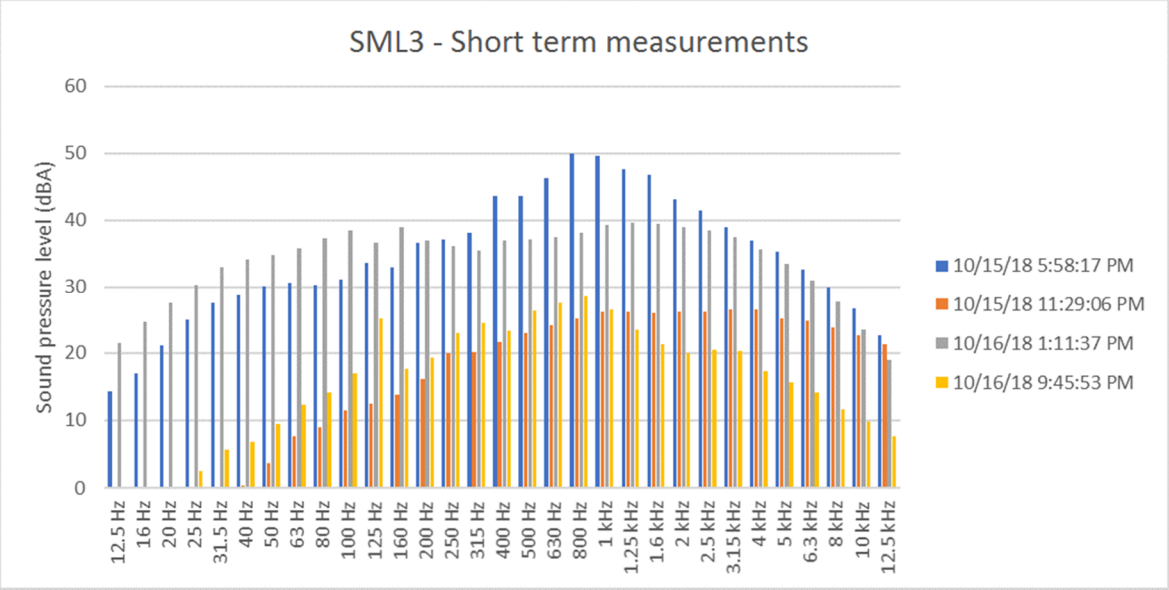


Figure 7 - SML3 short term L_{eq} measurement data

[3] Sound levels under 29 dBA may have been impacted by equipment electrical noise floor of ≤19 dBA.

3.3.4 Sound Measurement Location 4

Short term measurements were conducted at SML4 to quantify the ambient acoustical environment near the edge of the proposed wind park, and to measure the impact of neighboring Gratiot Wind Park to the southwest. Average wind speeds during the measurements ranged from 4 to 17 mph. The noticeable sound sources were wind turbines in Gratiot Wind Park, wind in trees, crops, powerlines, and occasional distant traffic. Results of the short term measurements are shown in Figure 9.

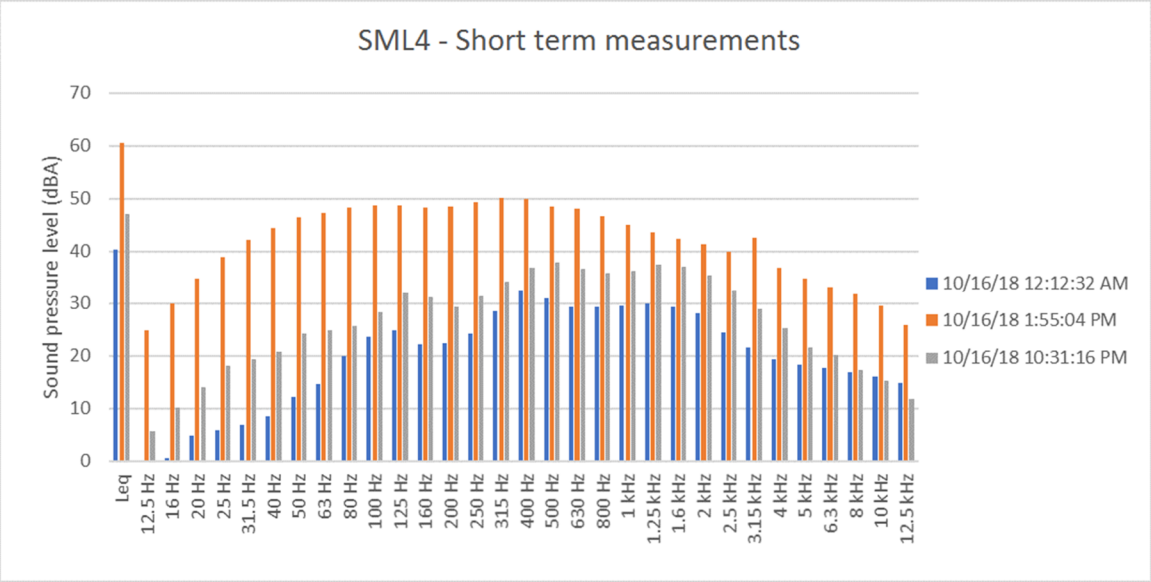


Figure 8 - SML4 short term L_{eq} measurement data

4.0 Acoustical Model

The environmental sound levels resulting from the operation of 77 Meridian Wind Park WTGs were predicted using commercial acoustical modeling software (DataKustik CadnaA version 2020 MR 1) that implements ISO 9613 calculation methodologies.

4.1 SOUND SOURCES

Two types of turbines are expected to be implemented in the Wind Park, 67 of which will be 1.2 MW GE 2.82-127 turbines, the remaining ten will be 3.6 MW Vestas V136. Vendor provided sound power level data was included in the acoustical model, with an additional 2 dB added as required by Mt. Haley township regulations. The additional 2 dB was included for turbines in Jonesfield and Porter townships as a conservative sound modeling assumption, accounting for any fluctuations in steady-state turbine sound levels. Overall modeled sound power level, after the 2-dB addition, is 110 dBA for the Vestas turbines and 112 dBA for the GE turbines.

Vendor supplied mitigation is available for both turbine types. For GE turbines, a low noise trailing edge (LNTE) blade option reduces overall sound power level (after the additional 2 dB required by local regulations) to 110.5 dBA. The Vestas serrated trailing edge (STE) blade reduces overall sound power level (including 2 dB required by local regulations) to 108 dBA. Sound modelling for Jonesfield Township assumes that all GE wind turbines in the township are supplied with LNTE blades.

Each WTG is assumed to be an omnidirectional point source located at hub height. Hub height for the GE 2.82-127 turbines is 89 meters, and 82 meters for the Vestas V136 turbines. Sound sources other than the Meridian WTGs were not included in the acoustical model.

4.2 RECEPTORS

Over 1500 receptors, including residences, schools, hospitals, churches, and public libraries, were included in the acoustical model based on data provided by the project team.

4.3 SOUND PROPAGATION

The following assumptions were included in the acoustical model, which yield conservative results in terms of sound propagation (i.e., including a safety margin for actual operation):

- Terrain / topography based on the most current GIS data available.
- Ground is assumed to be acoustically “mixed” (G = 0.5); this is a conservative assumption for most of the year since the ground within the wind park is mainly cultivated farmland, which is usually considered “porous” ground.
- The acoustical model considers all receptors to be downwind from all sound sources, which is a conservative assumption. The downwind calculation assumes a wind speed of 1 to 5 m/s (approximately 2 to 11 mph) at 3 to 11 m (approximately 10 to 36 ft) above the ground.

- ISO 9613 calculations are representative of atmospheric conditions causing downward refraction of sound waves, i.e., a moderate temperature inversion such as would be present on a clear, calm night.
- Shielding / attenuation effects of interceding barriers (such as residential buildings) and foliage were not included in the acoustical model.

4.4 MODELING RESULTS

The predicted sound levels resulting from the operation of the Meridian Wind Park at residential buildings in Jonesfield Township are shown in Figure 9. The sound model, assuming worse-case conditions, predicts sound levels at 21 receptors potentially higher than a 1-hour L_{eq} of 45 dBA. Operational controls such as noise-reduced operation will be employed where needed to meet township regulations. Since modeling results are inherently conservative, operational controls will be evaluated and applied during final commissioning and will be detailed in the post-construction sound level study determining final compliance. A list of receptor locations conservatively warranting continued monitoring for compliance with township standards is included in Appendix A.

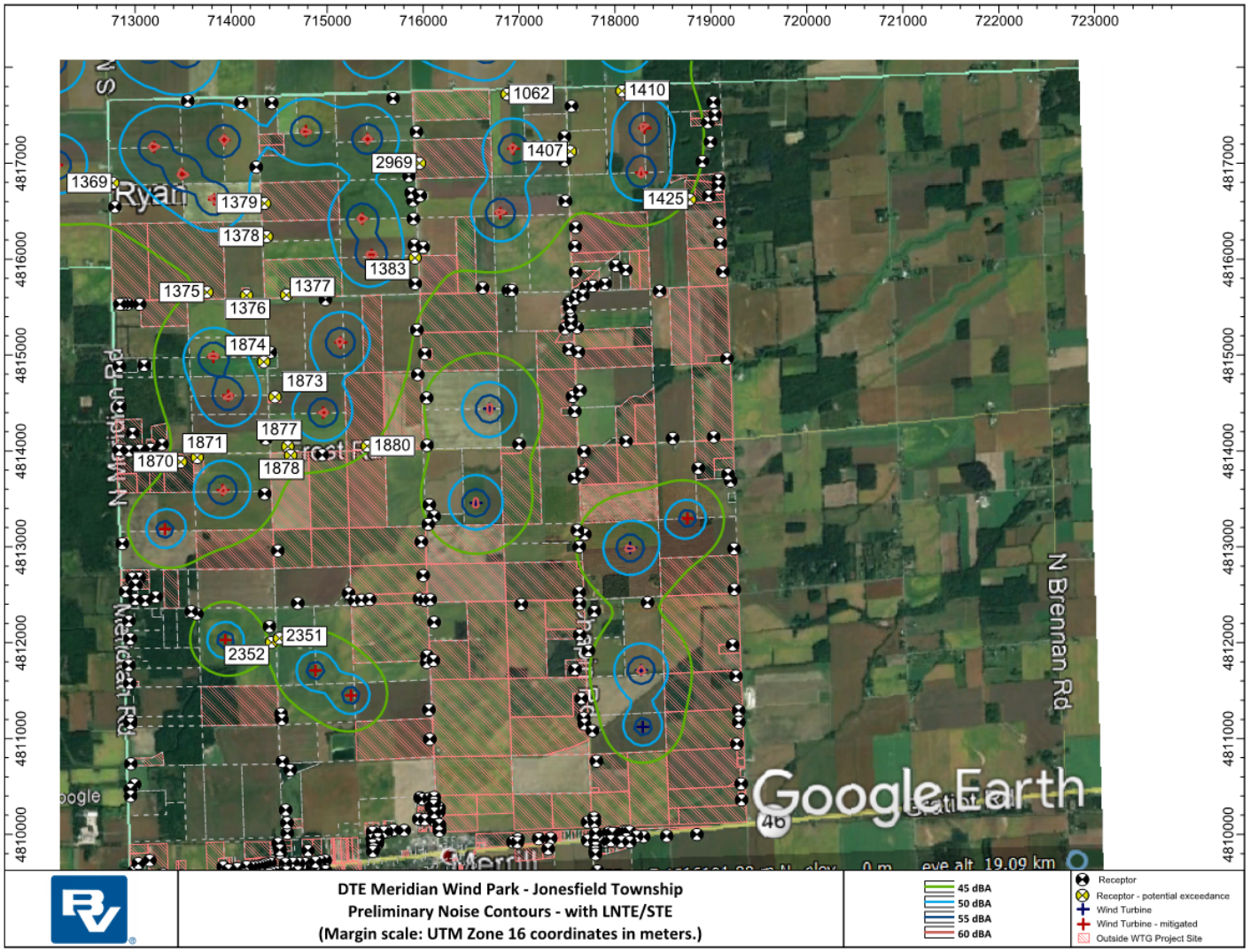


Figure 9 - Predicted Sound Levels in Jonesfield Township from Meridian Wind Park – with LNTE/STE

Appendix A.

Table 2 - Acoustical model results - with LNTE/STE

Receptor	Easting (m)	Northing (m)	Township	Applicable Limit	Potential Exceedance
1410	718072.6	4817755	Jonesfield	45 dBA	4
1873	714456.5	4814564	Jonesfield	45 dBA	3.9
1874	714341	4814930	Jonesfield	45 dBA	3.8
1062	716875.5	4817720	Jonesfield	45 dBA	3.5
1379	714346.6	4816582	Jonesfield	45 dBA	3.4
1383	715914.8	4816014	Jonesfield	45 dBA	3.3
1369	712766.5	4816794	Jonesfield	45 dBA	3.2
1871	713645.8	4813932	Jonesfield	45 dBA	3.1
2969	715962.7	4817000	Jonesfield	45 dBA	2.6
1877	714590.7	4814046	Jonesfield	45 dBA	2.3
1407	717533.2	4817123	Jonesfield	45 dBA	2.3
1378	714368.2	4816235	Jonesfield	45 dBA	1.8
1870	713473.9	4813884	Jonesfield	45 dBA	1.7
1878	714619.5	4813951	Jonesfield	45 dBA	1.7
1377	714577.4	4815626	Jonesfield	45 dBA	1.2
1376	714161.2	4815621	Jonesfield	45 dBA	1
1375	713747.1	4815655	Jonesfield	45 dBA	0.9
1880	715418.7	4814050	Jonesfield	45 dBA	0.8
2352	714421.8	4812002	Jonesfield	45 dBA	0.5
2351	714503.2	4812045	Jonesfield	45 dBA	0.2
1425	718779.7	4816621	Jonesfield	45 dBA	0.1

Appendix B.

Scantek, Inc.
CALIBRATION LABORATORY
ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP®
CALIBRATION
NVLAP Lab Code: 200625-0

Calibration Certificate No.41168

Instrument:	**Sound Level Meter**	*Date Calibrated:* **7/30/2018**	*Cal Due:* **7/30/2019**
Model:	**NA27**	*Status:*	**Received** / **Sent**
Manufacturer:	**Rion**	*In tolerance:*	X / X
Serial number:	**01191119**	*Out of tolerance:*	
Tested with:	**Microphone UC53A s/n 99858** **Preamplifier NH20 s/n 94641**	*See comments:*	
Type (class):	**1**	*Contains non-accredited tests:*	__ Yes X No
Customer:	**Black & Veatch**	*Calibration service:*	__ Basic X Standard
Tel/Fax:	**913-458-7823 / 913-458-7823**	*Address:*	**11401 Lamar Avenue** **Overland Park, KS 66211**

Tested in accordance with the following procedures and standards:
Calibration of Sound Level Meters, Scantek Inc., Rev. 6/26/2015
SLM & Dosimeters – Acoustical Tests, Scantek Inc., Rev. 7/6/2011

Instrumentation used for calibration: Nor-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	31052	Oct 30, 2017	Scantek, Inc./ NVLAP	Oct 30, 2018
DS-360-SRS	Function Generator	33584	Oct 24, 2017	ACR Env./ A2LA	Oct 24, 2019
34401A-Agilent Technologies	Digital Voltmeter	US36120731	Oct 25, 2017	ACR Env. / A2LA	Oct 25, 2018
HM30-Thommen	Meteo Station	1040170/39633	Oct 25, 2017	ACR Env./ A2LA	Oct 25, 2018
PC Program 1019 Norsonic	Calibration software	v.6.1T	Validated Nov 2014	Scantek, Inc.	-
1251-Norsonic	Calibrator	30878	Nov 10, 2017	Scantek, Inc./ NVLAP	Nov 10, 2018

Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK).

Environmental conditions:

Temperature (°C)	Barometric pressure (kPa)	Relative Humidity (%)
22.3	100.40	58.9

Calibrated by:	Lydon Dawkins	Authorized signatory:	Steven E. Marshall
Signature	Lydon Dawkins	Signature	Steven E Marshall
Date	7/30/2018	Date	7/31/2018

Document stored Z:\Calibration Lab\SLM 2018\RIONA27_0119119_M1.doc
Page 1 of 2

Scantek, Inc.
CALIBRATION LABORATORY

ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP®
CALIBRATION
NVLAP Lab Code: 200625-0

Calibration Certificate No.41164

Instrument:	**Sound Level Meter**
Model:	**NL32**
Manufacturer:	**Rion**
Serial number:	**00630458**
Tested with:	**Microphone UC53A s/n 321772** **Preamplifier NH21 s/n 08156**
Type (class):	**1**
Customer:	**Black & Veatch**
Tel/Fax:	**913-458-7823 / 913-458-7823**

Date Calibrated: **7/28/2018** *Cal Due:* **7/28/2019**

Status:	Received	Sent
In tolerance:	X	X
Out of tolerance:		
See comments:		

Contains non-accredited tests: __Yes X No
Calibration service: __ Basic X Standard
Address: **11401 Lamar Avenue**
Overland Park, KS 66211

Tested in accordance with the following procedures and standards:
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PC Program 1019 Norsonic	Calibration software	v.6.1T	Validated Nov 2014	Scantek, Inc.	-
1251-Norsonic	Calibrator	30878	Nov 10, 2017	Scantek, Inc./ NVLAP	Nov 10, 2018

Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK).

Environmental conditions:

Temperature (°C)	Barometric pressure (kPa)	Relative Humidity (%)
21.9	100.11	58.8

Calibrated by:	Lydon Dawkins	**Authorized signatory:**	Steven E. Marshall
Signature	Lydon Dawkins	Signature	Steven E Marshall
Date	7/28/2018	Date	7/30/2018

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Scantek, Inc.
CALIBRATION LABORATORY

ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP®
CALIBRATION
NVLAP Lab Code: 200625-0

Calibration Certificate No.41163

Instrument:	**Sound Level Meter**
Model:	**NL42**
Manufacturer:	**Rion**
Serial number:	**00546407**
Tested with:	**Microphone UC52 s/n 158311** **Preamplifier NH24 s/n 46620**
Type (class):	**2**
Customer:	**Black & Veatch**
Tel/Fax:	**913-458-7823 / 913-458-7823**

Date Calibrated: **7/28/2018** *Cal Due:* **7/28/2019**

Status:	Received	Sent
In tolerance:	X	X
Out of tolerance:		
See comments:		

Contains non-accredited tests: __Yes _X_ No
Calibration service: __ Basic _X_ Standard
Address: **11401 Lamar Avenue**
Overland Park, KS 66211

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DS-360-SRS	Function Generator	33584	Oct 24, 2017	ACR Env./ A2LA	Oct 24, 2019
34401A-Agilent Technologies	Digital Voltmeter	US36120731	Oct 25, 2017	ACR Env. / A2LA	Oct 25, 2018
HM30-Thommen	Meteo Station	1040170/39633	Oct 25, 2017	ACR Env./ A2LA	Oct 25, 2018
PC Program 1019 Norsonic	Calibration software	v.6.1T	Validated Nov 2014	Scantek, Inc.	-
1251-Norsonic	Calibrator	30878	Nov 10, 2017	Scantek, Inc./ NVLAP	Nov 10, 2018
4226-Brüel&Kjær	Multifunction calibrator	2305103	Sep 5, 2017	B&K / A2LA	Sep 5, 2018

Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK).

Environmental conditions:

Temperature (°C)	Barometric pressure (kPa)	Relative Humidity (%)
21.7	100.15	58.3

Calibrated by:	Lydon Dawkins	Authorized signatory:	Steven E. Marshall
Signature	Lydon Dawkins	Signature	Steven E Marshall
Date	7/28/2018	Date	7/30/2018

Document stored Z:\Calibration Lab\SLM 2018\RIONL42_00546407_M1.doc

Scantek, Inc.
CALIBRATION LABORATORY

ISO 17025: 2005, ANSI/NCSL Z540:1994 Part 1
ACCREDITED by NVLAP (an ILAC MRA signatory)

NVLAP®
CALIBRATION
NVLAP Lab Code: 200625-0

Calibration Certificate No.41161

Instrument: **Sound Level Meter**
Model: **NL52**
Manufacturer: **Rion**
Serial number: **01232541**
Tested with: **Microphone UC-59 s/n 05979**
Preamplifier NH25 s/n 32569
Type (class): **1**
Customer: **Black & Veatch**
Tel/Fax: **913-458-7823 / 913-458-7823**

Date Calibrated: **7/28/2018** *Cal Due:* **7/28/2019**

Status:	Received	Sent
In tolerance:	X	X
Out of tolerance:		
See comments:		

Contains non-accredited tests: __Yes _X_ No
Calibration service: __ Basic _X_ Standard
Address: **11401 Lamar Avenue**
Overland Park, KS 66211

Tested in accordance with the following procedures and standards:
Calibration of Sound Level Meters, Scantek Inc., Rev. 6/26/2015
SLM & Dosimeters – Acoustical Tests, Scantek Inc., Rev. 7/6/2011

Instrumentation used for calibration: Nor-1504 Norsonic Test System:

Instrument - Manufacturer	Description	S/N	Cal. Date	Traceability evidence Cal. Lab / Accreditation	Cal. Due
483B-Norsonic	SME Cal Unit	31052	Oct 30, 2017	Scantek, Inc./ NVLAP	Oct 30, 2018
DS-360-SRS	Function Generator	33584	Oct 24, 2017	ACR Env./ A2LA	Oct 24, 2019
34401A-Agilent Technologies	Digital Voltmeter	US36120731	Oct 25, 2017	ACR Env. / A2LA	Oct 25, 2018
HM30-Thommen	Meteo Station	1040170/39633	Oct 25, 2017	ACR Env./ A2LA	Oct 25, 2018
PC Program 1019 Norsonic	Calibration software	v.6.1T	Validated Nov 2014	Scantek, Inc.	-
1251-Norsonic	Calibrator	30878	Nov 10, 2017	Scantek, Inc./ NVLAP	Nov 10, 2018

Instrumentation and test results are traceable to SI (International System of Units) through standards maintained by NIST (USA) and NPL (UK).

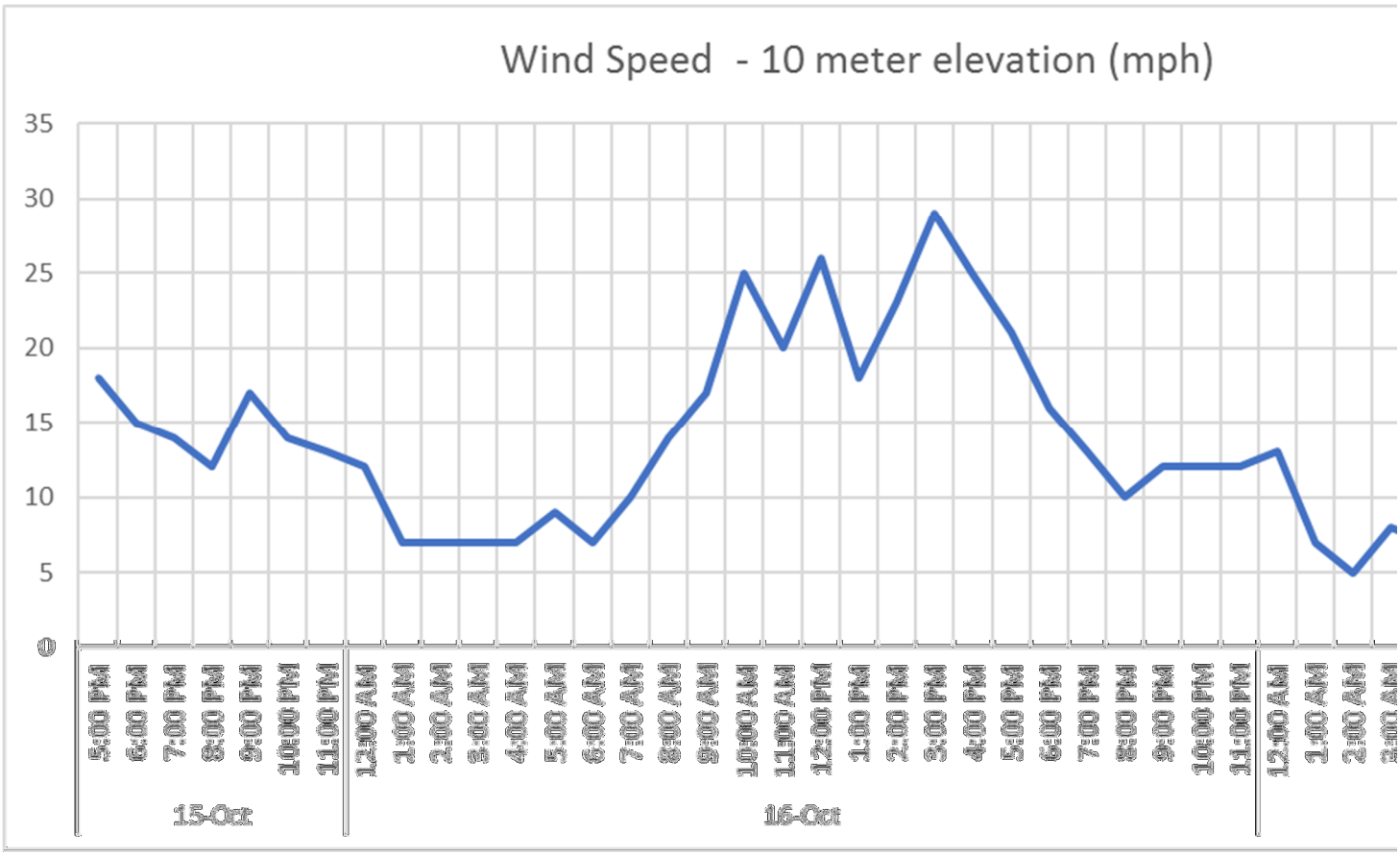
Environmental conditions:

Temperature (°C)	Barometric pressure (kPa)	Relative Humidity (%)
21.9	100.09	52.2

Calibrated by:	Lydon Dawkins	**Authorized signatory:**	Steven E. Marshall
Signature	Lydon Dawkins	Signature	Steven E Marshall
Date	7/23/2018	Date	7/30/2018

Document stored Z:\Calibration Lab\SLM 2018\RIONL52_01232541_M1.doc

Appendix C.


Wind Speed - 10 meter elevation (mph)
35
30
25
20
15
10
5
0
5:00 PM
6:00 PM
7:00 PM
8:00 PM
9:00 PM
10:00 PM
11:00 PM
12:00 AM
1:00 AM
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2:00 AM
3:00 AM
15-Oct
16-Oct

Appendix E

Appendix E. Shadow Flicker Analysis

SHADOW FLICKER ANALYSIS – JONESFIELD TOWNSHIP

Meridian Wind Park

B&V PROJECT NO. 198674

PREPARED FOR

DTE Electric Company

22 JULY 2020

BLACK & VEATCH

Table of Contents

LIST OF TABLES

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1.0 Executive Summary

Though the Jonesfield Township Zoning Ordinance does not include regulations governing shadow flicker associated with the operation of wind turbine generators, by letter dated May 15, 2019, DTE committed to limiting shadow flicker at residential buildings to no more than 30 hours in a year.

Using modeling software that estimates shadow flicker using worst-case assumptions and historical sunshine data, of the 405 residential buildings analyzed, it is estimated that over a typical year in Jonesfield Township, 30 residential buildings may experience 30 hours or more of shadow flicker, 126 residential buildings are likely to experience less than 30 hours of shadow flicker, and 249 residential buildings are predicted to experience no shadow flicker.

The extent to which shadow flicker may fall upon residential buildings in excess of 30 hours per year will depend on whether existing vegetation and structures – which are not factored into the shadow flicker model – block the shadow cast by the turbine, and will also depend on future weather events. Where natural and man-made barriers to shadow flicker do not fully mitigate potential issues, additional mitigation measures, such as curtailment of turbine operations during defined periods, will be applied so that all wind turbines operate in compliance with the 30 hour per year limit.

2.0 Introduction and Modeling

2.1 SHADOW FLICKER OVERVIEW

Like any tall structure, wind turbines can cast shadows in sunny conditions. As the wind turbine rotor turns, the blades can cast moving shadows, resulting in an effect known as shadow flicker. The strength of this effect depends greatly on distance and atmospheric conditions. Whether shadow flicker will fall on a property depends on the position of the sun and the yaw orientation of the turbine. Shadow flicker does not occur when the sun is obscured by clouds or fog at the turbine or receptor (a residential building), or when turbines are not operating. Shadow flicker also does not occur when the receptor is shaded by other objects, including trees or buildings.

The distance between a wind turbine and a shadow flicker receptor affects the strength of the shadows cast at the receptor, and therefore the perceptibility of the flicker effect. Shadows cast near a turbine are more distinct, while those cast farther away tend to be significantly less distinct, with weaker effect. Shadow flicker effects are typically considered negligible at distances greater than 10 rotor diameters (up to approximately 4,462 feet, or 0.85 mile, in this case.)

This report examines the predicted extent of shadow flicker that may fall on residential buildings in Jonesfield Township that are located within 1 mile of the proposed site of a wind turbine.

2.2 STUDY METHODOLOGY

WindFarmer is an industry-standard software program used to estimate potential shadow flicker effects on nearby receptors. The program calculates sun positions throughout the year and determines those positions relative to the wind turbines and any shadow receptors throughout a full year. The presence of shadow flicker at a given location and time is determined based on a line of sight calculation between the sun and the turbines, and the projection of the shadow from the turbine rotor to the receptor. The shadow flicker calculations include the effects of terrain on shadow projection and visibility.

The WindFarmer shadow model incorporates several very conservative assumptions that overestimate the number of hours that flicker may be visible, and tends to present what could be considered a "worst case" scenario. These assumptions include that the sky is always clear, the turbines are always operating and are always facing directly into the sun, creating maximum shadowed areas behind them. Under actual operating conditions, cloudy or hazy weather may reduce or eliminate the casting of defined shadows, buildings and trees may block the shadows, or turbines may be facing into oncoming wind in a manner that does not correspond to the position of the sun, and low wind or turbine maintenance periods may result in turbines idling during shading hours.

Inputs to the WindFarmer shadow flicker model include:

- All proposed wind turbine locations shown on the site plan submitted to Jonesfield Township as part of DTE's special land use permit application, including primary

and alternate sites. The turbine layout is Revision 20, which is current as of July 9, 2020.

- The locations of all residential buildings within Jonesfield Township. Buildings were identified based on review of aerial photography.
- Elevation data from the USGS National Map at an approximately 10 meter (approximately 32.8 feet) resolution.

As the results of the WindFarmer model represent a worst-case scenario, statistical post-processing of the raw results is required to produce realistic results for a typical operating year. The primary inputs to the statistical analysis are historical weather and cloud cover data for the region and estimated typical wind conditions for the project site based on measurements at two SODAR wind profiling units within the project area.

Historical monthly sunshine data for the project area based on 20 years of annual data from 1998 to 2017 was also obtained from the National Solar Radiation Database (NSRDB) (https://nsrdb.nrel.gov/). Average sunshine hours for each month as a percent of total possible sunshine hours for is shown in Table 2-1.

Table 2-1 Average Sunshine Hours from NSRDB (1998 to 2017)

MONTH	SUNSHINE PERCENTAGE[1]
January	32%
February	40%
March	50%
April	52%
May	54%
June	60%
July	65%
August	61%
September	62%
October	47%
November	40%
December	35%
Annual	**52%**

* Calculated as percentage of sunny hours from sunrise to sunset

On an annual basis, approximately 52 percent of available daylight hours are considered sunny hours, capable of casting shadows. In addition, as turbines will not operate continuously because of low winds and maintenance, and will not always be oriented directly between the sun

and homes, it is estimated that actual shadow flicker effects will be significantly lower than the worst-case impacts forecast by the WindFarmer shadow model. Based on review of historical wind speed data and average sunshine hours, annual shadow flicker hours are estimated to be approximately 32 percent of the maximum "worst case" results calculated by the WindFarmer model for the Meridian Wind Park in a typical operating year.

Additionally, shadow flicker effects will typically be reduced by the presence of trees and awnings, which will also serve to reduce the actual perceived flicker impact hours, however these effects have not been incorporated into the results.

Figure 2-1 shows a representative annual 30-hour shadow flicker contour for a single wind turbine in Jonesfield Township, after accounting for sunshine hours and other effects as summarized above. A consolidated map including cumulative effects from all wind turbines is included in Appendix B.

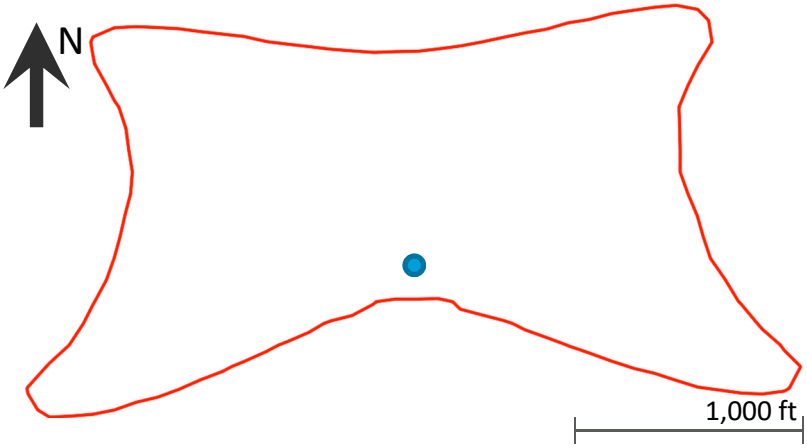


Figure 2-1. Typical 30-hour Shadow Flicker Contour

3.0 Study Results

DTE has committed to limit shadow flicker to no more than 30 hours per year at the nearest wall of a residential building. Table 3-1 summarizes the expected shadow flicker effect by hours for residential buildings located within Jonesfield Township.

Table 3-1 Predicted Shadow Flicker Impact Summary*

HOURS PER YEAR	TOTAL STRUCTURES	PERCENTAGE
0	249	61.5%
0 to 1	1	0.2%
1 to 10	62	15.3%
10 to 20	45	11.1%
20 to 30	18	4.4%
Over 30	30	7.4%

* Estimated, not actual hours, without mitigating conditions (trees, buildings) or operational controls factored in.

The predicted shadow flicker for each residential building examined as part of this study is provided in Appendix A. In total, of the 405 residential buildings analyzed, it is estimated that over a typical year in Jonesfield Township, 30 residential buildings may experience 30 hours or more of shadow flicker, 126 residential are likely to experience less than 30 hours of shadow flicker, and 249 residential buildings are predicted to experience no shadow flicker. Where natural and man-made barriers to shadow flicker do not fully mitigate potential issues, additional mitigation measures, such as curtailment of turbine operations during defined periods, will be applied so that all wind turbines operate in compliance with the 30 hour per year limit.

Appendix A. Shadow Flicker Receptors

The table below summarizes the shadow flicker results by receptor, sorted by predicted impact in a typical year. The list includes only the receptors in Jonesfield Township that may exceed DTE target limits before mitigation is implemented. Coordinates are NAD83 Michigan State Plane, South Zone, International Feet.

RECEPTOR	X	Y	LIMIT	PREDICTED HOURS BEFORE MITIGATION
SR_1225	13,127,604	713,034	30	79.9
SR_784	13,128,268	721,927	30	75.8
SR_799	13,138,069	719,643	30	57.5
SR_1101	13,127,569	703,445	30	56.2
SR_1415	13,127,840	703,578	30	52.8
SR_739	13,132,873	717,776	30	52.3
SR_736	13,127,558	719,720	30	50.5
SR_797	13,133,171	716,800	30	46.1
SR_1067	13,122,575	706,986	30	45.3
SR_728	13,127,797	718,470	30	45.2
SR_1169	13,133,266	707,564	30	44.7
SR_337	13,138,301	719,913	30	43.3
SR_795	13,122,644	719,319	30	42.9
SR_1048	13,127,948	711,840	30	42.6
SR_1081	13,127,830	713,368	30	42.0
SR_792	13,132,885	716,878	30	41.0
SR_1122	13,124,854	704,592	30	40.2
SR_766	13,132,769	719,245	30	39.6
SR_335	13,132,880	716,445	30	39.5
SR_722	13,125,290	722,047	30	35.7
SR_1156	13,138,094	701,197	30	35.5
SR_768	13,128,455	715,312	30	34.5
SR_1092	13,138,156	706,396	30	32.9
SR_1105	13,127,488	708,540	30	32.9
SR_1149	13,127,586	710,412	30	32.9

RECEPTOR	X	Y	LIMIT	PREDICTED HOURS BEFORE MITIGATION
SR_1046	13,125,225	709,855	30	32.5
SR_798	13,133,125	718,561	30	32.2
SR_1084	13,138,390	706,803	30	31.1
SR_777	13,138,123	720,427	30	30.5
SR_725	13,132,881	718,400	30	30.0

Appendix B. Shadow Flicker Map

DTE

Meridian Wind Park
Jonesfield Township

Shadow Flicker Study

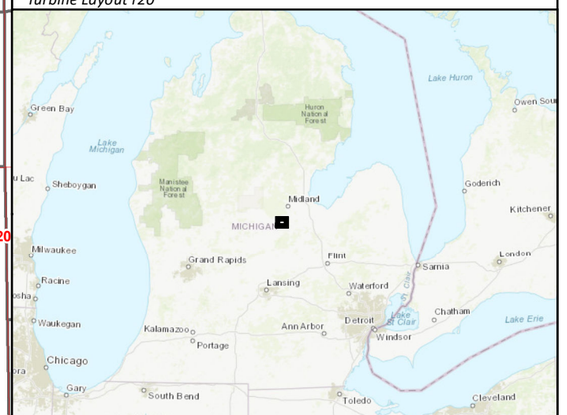
Cumulative Shadow Flicker Contours

Saginaw County, Michigan

11 August 2020

- Primary Turbine Location
- Alternate Turbine Location
- Primary Access Road
- Alternate Access Road
- Collection Substation
- Shadow Flicker 10 Hour Line
- Shadow Flicker 20 Hour Line
- Shadow Flicker 30 Hour Line
- Shadow Receptor
- Shadow Flicker Mitigation Required
- Participating Land
- Project Area

Turbine Layout r20



0 0.25 0.5 1 Miles

0 0.25 0.5 1 Kilometers

N

NAD 1983 2011 StatePlane Michigan South FIPS 2113 Ft Intl

BLACK & VEATCH

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

Appendix F

Appendix F. Summary of Project Decommissioning Activities and Decommissioning Cost Estimate

Black & Veatch Ltd. of Michigan
3550 Green Court, Ann Arbor, MI 48105 USA
P +1 734-622-8619 E BekkalaBP@bv.com

09 June 2020

DTE Electric Company
One Energy Plaza
Detroit, MI 48226-1221

Jonesfield Twp. Wind Park Decommissioning
Black & Veatch Project 198674
Black & Veatch File 14.4100

Attention: Mr. Paul Funk

Subject: Jonesfield Township – Wind Park Decommissioning

Dear Mr. Funk:

Black & Veatch has prepared a summary of the decommissioning activities and costs in current dollars that are anticipated for the wind turbines located in Jonesfield Township, Michigan. The basis of the decommissioning costs is that the entire Meridian Wind Park sites will be dismantled at the same time, and the costs stated in this report are itemized in Appendix B only include the removal of those turbines located in Jonesfield Township.

1.0 Introduction

The Meridian Wind Park includes twenty-seven (27) turbines in Jonesfield Township. There are seventeen (17) GE 2.8 MW turbines and ten (10) Vestas 3.6 MW turbines.

The project facilities are in Saginaw County, MI. The scope of this decommissioning report is limited to the twenty-seven (27) turbines located in Jonesfield Township. Site plans of the entire Meridian Wind Park project is attached as Appendix A.

2.0 Purpose

The purpose of this report is to summarize the tasks and costs associated with decommissioning the project. The following sections address the sequence for removal of the wind park system components, as well as the earthwork and soil restorations.

3.0 Decommissioning Activities

Decommissioning can be separated into three primary phases: (1) dismantling of project components, (2) transportation and hauling of dismantled components, and (3) the site reclamation portion of the project.

The modular nature of wind turbine towers, blades, and generators allows for relative ease in the removal and salvage of individual wind turbine components. While there may be a potential resale value for the turbine components, advances in technology will likely eliminate any resale value. The only salvage value that has been considered in this study is the actual scrap salvage value of the wind park components.

1. Dismantling of Project Components

A torch cut, controlled fall will be the primary method of removal of all wind turbines. The base of the tower will be cut into a hinge pointing toward the direction of the fall. After the hinge point is cut, it can safely stay there for a short amount of time prior to pulling the tension cable engaging the final fall. The steel tower base is approximately an inch thick and will require significant acetylene torch cutting. With the hinge point set and tension on the cables, the hinge point is cut, and the tower will likely fall on its own without further tension pull. This controlled fall method will involve using experienced demolition engineers and contractors and completing the work in ambient weather conditions (low wind speeds and above freezing) for safety. A detailed drop plan will be established prior to cutting operations to ensure the intended landing location does not have any overhead or underground obstructions.

Prior to falling the tower, the oil and fluids will be drained, and the system will be flushed to eliminate the possibility of a spill upon impact with the ground. Once the wind turbine has been safely landed on the ground, the components will be separated into two categories, salvage or disposal. Copper from the generator and steel from the tower will be cut and prepared for transport. The blades will be transported to a landfill or material reclamation center, as available.

The foundations will be removed to a depth of four foot below grade, including concrete, rebar and anchor bolts. Any soils disturbed during the process will be backfilled with soil like the soil found in the immediate area. Underground cabling and raceway containing no hazardous materials below a 4-foot depth will remain in place and not be removed since they will not interfere with normal farming activities.

Any overhead cabling, support structures, and substation components will be disassembled and transported off the site.

2. Transportation and Hauling

The transportation and hauling portion of decommissioning is critical and will require careful logistics planning. Although crawler cranes will not be required, there will be crews and construction equipment to move from one turbine location to another on the county roads. County road agreements/permits will be obtained, as required. The turbine steel and copper components will be broken down into manageable sized pieces in preparation for hauling to a salvage or disposal location. The blades will also be cut and prepared for transportation to a landfill.

3. Site Reclamation

After all material and debris have been removed, the site will be regraded. Salvaged sub-soil will be replaced and capped with native topsoil as required in disturbed areas. Seed mixes and fertilizer will then be applied to the disturbed areas.

The Meridian Wind Park will be decommissioned in accordance with the applicable laws and regulations that apply at the time of decommissioning. DTE Electric Company will follow all best management and safety practices for the decommissioning of the projects.

4.0 Decommissioning Cost Estimate

This report analyzes the costs to decommission the wind turbines located in Jonesfield Township from the Meridian Wind Park. The value of savage materials which could be used to offset a portion of the decommissioning costs are provided. This report assumes salvage as the only option as opposed to reuse of material by selling components to other wind parks. Details of the decommissioning cost estimate can be found in Appendix B.

The GE and Vestas wind turbines include steel components estimated at approximately 333 tons per turbine and copper windings in the generator estimated at approximately 2 tons per turbine. The June 2020 Detroit scrap price steel is estimated at $120 per ton when configured into precise sizes and delivered to the end user, and $3,571 for the copper transformer windings per turbine. From these scrap values, the costs to size the turbine components to comply with the end users' requirements and transport must be subtracted. This cost is estimated to be $100 per ton. The net total estimated salvage value per turbine is $20,469, using these preparation and shipping costs. Other potential items for salvage include reinforcing steel from pedestal foundations, anchor bolts, copper grounding cable within 4-foot below grade, aluminum cable within 4-foot below grade, substation, and transmission line cable.

The wind turbine foundation decommissioning consists of removing all foundations to a depth of 4 foot below grade. The sequence will consist of sufficiently excavating around the pedestal to provide access to, and a working platform around, the foundation. Each foundation will be pulverized and removed to the minimum depth of 4 feet and properly disposed of. While removing the foundation, the collector cables at the foundation will be removed to the depth of 4 feet. The excavation will then be backfilled the full depth with native soils to complete the decommissioning activity.

On a per turbine basis, the decommissioning costs are estimated at $93,200. These costs could be reduced by $20,469 per turbine including dollars spread from steel scrap, copper and aluminum wire, transformer copper, recovered aggregate material, and substation.

Once all components are removed, the necessary earthwork and topsoil restoration will be performed to return the areas occupied by the project to as near as practical to the same conditions that existed prior to the development of the project.

All permanent project access roads may be maintained for farming purposes if so desired by the landowner. For purposes of this decommissioning report, all access roads located in Jonesfield Township are assumed to be removed. However, a landowner may not wish to remove the access roads because they provide improved access to their fields. This decision will be left to the landowner at the time of decommissioning. All unwanted access roads will be restored as per the method used for decommissioning concrete foundations. Any aggregate removed on-site will be disposed of at a licensed landfill.

The overall cost to decommission the Jonesfield Township portion of the Meridian Wind Parks is $3,083,100, and net of salvage, the cost is $2,530,400. Refer to Appendix B for details.

Very truly yours,

BLACK & VEATCH LTD OF MICHIGAN

Bruce P. Bekkala, P.E.
Project Manager

amt
Enclosure[s]

cc: Matthew Wagner, DTE Electric Company
Brian Dantas, DTE Electric Company
Ryan Hendrickson, Black & Veatch
Michael Baldwin, Black & Veatch
Dusty Miller, Black & Veatch

APPENDIX A. MERIDIAN WIND PARK LAYOUT MAP

DTE

Meridian Wind Park

Wind Park Layout

Saginaw and Midland Counties, Michigan

13 July 2020

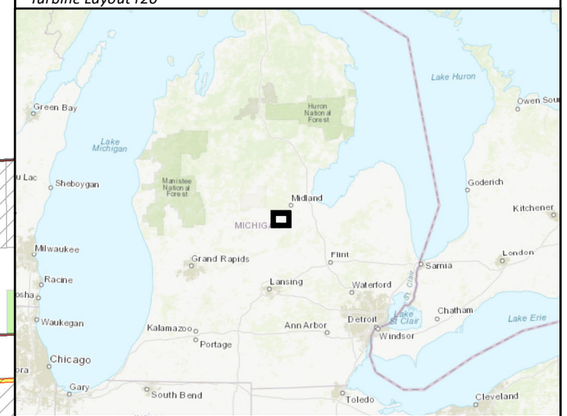
Preliminary/Subject to Change

- Primary Turbine Location
- Safe Harbor Location
- Alternate Turbine Location
- Primary Access Road
- Alternate Access Road
- Crane Paths
- Junction Box
- Collection Easements
- Planned Substation Location
- Project Area
- Transmission Line
- Pipelines
- Public Roads

Collection System Circuits

1 2 3 4 5 6 7 8 9 10

Turbine Layout r20



0 0.5 1 2 Miles

0 0.5 1 2 Kilometers

N

NAD 1983 2011 StatePlane Michigan South FIPS 2113 Ft Intl

BLACK & VEATCH

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

APPENDIX B. COST ESTIMATE

APPENDIX C - DECOMMISSIONING WITH SALVAGE MERIDIAN WIND PARK - JONESFIELD TOWNSHIP Cost Estimate	
ITEM	**COST**
Dismantling of Project Components (each Turbine)	
- Torch Cut & Controlled Fall	$7,700
- Drain and Flush Fluids	$3,500
- Break down and prepare scrap material	$14,400
- Foundation and Collection System Removal	$14,900
Transportation and Traffic (each Turbine)	
- Mobilization	$250
- Loading/Hauling	$20,500
- Demobilization	$350
Site Reclamation (each Turbine)	
- Recontour/Regrade – WTG foundation	$2,800
- Access Roads	$26,800
- Erosion control	$400
- Seed mix and Fertilizer of site, path and roads	$1,600
Subtotal per turbine	**$93,200**
Subtotal for 27 Turbines – Jonesfield Township	**$2,516,400**
Auxiliary infrastructure removal of wind park	
- Substation & HV Transmission Line	$566,700
Total Project Decommissioning Costs for Jonesfield Township	**$3,083,100**
Salvage	
- Scrap Salvage of Steel & Copper (from turbine & BOP components)	($1,373,200)
- Preparation Costs	$916,200
- Scrap Salvage of Substation & T-Line Equipment	($95,700)
Total Chandler Township Project Decommissioning Costs Less Salvage	**$2,530,400**