



Date: October 10, 2012
Time: 12 p.m. CST
Duration: 120 minutes

Wind Projects and Land Value

Presenters:

P. Barton DeLacy, MAI, CRE, FRICS
Director, National Energy Practice, CBRE

Mike McCann, CRA
McCann Appraisal, LLC

Moderator:

Ray Martinez
Senior Manager
Technology-Based Education
Appraisal Institute

Mike McCann



Mike McCann, CRA
McCann Appraisal, LLC

- Michael S. McCann has been exclusively engaged in the real estate appraisal profession since 1980, and is the owner of Chicago based McCann Appraisal, LLC.
- His appraisal experience has included market value appraisals in 20+ states of virtually all types of commercial, office, residential, retail, industrial and vacant property, along with a wide variety of unique or special purpose real estate, such as limestone quarries, hotels, contaminated properties, etc..
- Mr. McCann has been a speaker at seminars for the Appraisal Institute, the Illinois State Bar Association and Lorman Education Services on topics including the vacation of public right of ways (1986), Property Taxation in the New Millennium (2000), Zoning and Land Use in Illinois (2005,2006), and for community based organizations regarding Industrial Wind energy Project impacts in Illinois, Michigan, California, Massachusetts, etc. (2009 -2012).

Wind Projects & Land Value

Michael S. McCann, CRA
McCann Appraisal, LLC
Chicago, Illinois © 2012



Qualifications

- 30 years appraisal & consulting
- Most types of commercial, industrial & residential property
- State Certified General Appraiser
- Certified Review Appraiser (CRA)
- Member – Lambda Alpha International
- Qualified & testified as expert witness in 21 states, circuit courts & federal court
- Appraised variety of property value damage situations
- Consultant to governmental bodies, developers, corporations, attorneys, investors and private owners
- Appointed by Federal Court as a Condemnation Commissioner
- Evaluated & consulted 20+ utility scale wind projects in over a dozen states

ZONING

“Public regulation of the use of private land through application of police power; accomplished by establishing districts or areas with uniform requirements relating to lot coverage, setbacks, type of improvement, permitted activities, signage, structure height, minimum lot area, density, landscaping, and other aspects of land use and development. Zoning regulations are established by enactment of a local (city, town, or county) zoning ordinance.”

Source: Appraisal Institute, *The Dictionary of Real Estate Appraisal*, 5th ed. (Chicago: Appraisal Institute, 2010).

Definition encompasses core issues that are typical of industrial scale wind energy project zoning applications.

- Character of the area
- Compatibility - noisy, moving power plants with residential (& Ag uses)
- Height – often 35 foot height limit without a SU, CU, exception or variance
- 500 foot to tip of blade is typical of recent proposals
- Bulk – ranges from 1 to 100+ turbines
- Density of population – setbacks from residential property lines
- Project “footprints” often encompass thousands of acres, along with homes that have no lease or other form of participation

Zoning

➤ Example – Shelburne, MA

1.1 PURPOSE OF BY-LAW

to promote the health, safety, convenience and general welfare of the inhabitants of the Town of Shelburne, to **protect the value of land and buildings**, to conserve natural resources, to preserve the Town's cultural heritage, rural character and open farmland, and to facilitate residential, commercial and industrial development in a responsible manner.

(d) The ZBA may grant a Special Permit for structures higher than 35 feet where the ZBA determines that said higher structure is **compatible with the surrounding structures** and does not unreasonably interfere with existing structures

Conditional or Special Use Standards

- Example - 8.35-2 Bureau County, Illinois

The conditional Use will not be injurious to the ***use and enjoyment*** of other property in the immediate vicinity for the purposes already permitted nor ***substantially diminish property values*** within the neighborhood.

- Typical Industrial use requires completely enclosed structure to prevent nuisance to neighbors
- Lighting directed away from residences
- Restricted hours of operation
- Other standards exist for Health, Safety & Welfare of community.

Question for appraisers is what if any impact will the proposed use have on the market value of neighboring property, and the proposed use's compatibility with the character of the area?

Nuisance & Related Issues

- Noise – Audible & LFN (Increases above ambient = nuisance)
- Pulsating nature (Amplitude Modulation)
- 24/7 potential
- Shadow flicker
- Aesthetics & Vistas
- FAA lights
- Blade throw & ice throw
- Aviation safety – aerial spraying (rural)
- Radar interference (DOD & other countries have identified Doppler effect)
- Bird & bat mortality
- Essential character of area changes to Industrial Overlay
- Wind Turbine Syndrome
- Wide range of symptoms
- Established via clinical studies & research by M.D.'s
- Annoyance has different clinical meaning – causes health impacts
- Many adverse health reports to 2 miles or more
- LFN impacts parallel health reports – Not limited to view
- LFN travels great distances
- Over 50, children & pre-existing medical conditions are high risk
- Wind industry typically denies LFN impact, but cites no empirical, epidemiological or clinical health study – selective literature review



Typical of poor siting

09/20/2012 15:15

Source: Ben Lansink AACI, P.App, MRCS

Slide 9

What's Missing?

Typical of Wind Industry PR images



© Alamy

Detrimental Conditions

*Appraisal Institute text: Real Estate Damages – An Analysis of Detrimental Conditions;
Randall Bell, MAI*

- 10 standard categories
- Turbines represent at least 2 conditions:
- **VIII – Environmental Condition**; via noise, audible dBA & LFN – noise pollution (McCann).

Text examples:

- Soil contamination
- Building contamination
- Hydrocarbons/metals/solvents
- Asbestos/radiation
- Groundwater/Landfill/LUST

- **X – Incurable Condition**
 - Applicable to many DC's in severe situations where a complete loss or net liability exists.
 - Could be deemed incurable when DC is expected to continue for indeterminately long period of time (20-50 year lease terms) (McCann)

- **V – Imposed Condition**
 - Sewage/Power/Nuclear Plant/Blight
 - Illegal Use/Jail/EMF/Traffic/Airport
 - Noise

Zoning - Conclusion

- Many jurisdictions are facing industrial scale wind project applications
- Competent evidence and expert testimony can help ZBA's (etc) with findings of fact & decisions
- Objective, professional analysis by the appraiser is an important element of Codes and Bylaws
- Thorough research on value trends is necessary
- Understanding stigma issues is important to understanding both buyer & seller sides of market for property near proposed turbines
- Acceptable to rely on expert opinions to understand probable impacts, i.e., objective acoustical engineers, M.D.'s, scientists, etc.
- Appraisers must satisfy themselves that other expert reports are reliable; qualified, and not simply accept at face value claims made by applicant in advocate reports or in "PR" material.
- USPAP applies – Impact or No Impact on value is a value opinion!



Audience Survey

Question

- What is an acceptable setback for current generation (500 ft., 2 MW) of turbines from existing residential uses?
 - A. Whatever developer says is safe
 - B. 1.1X the height of turbine (tip over)
 - C. 2-3 miles
 - D. Far enough that no one can see them (10+ miles)
 - E. Based on 35 dBA at property line; 20 dBA indoors

Answer

- ✓ In order to comply with Zoning Codes, the use (turbines) must not impair property values. Value loss examples occur most frequently within 2-3 miles and closer, so “C” is a reasonable answer.
- ✓ Nuisance & “clinical” annoyance occur with ambient background noise exceeded by 10+ dBA; LFN equivalent of 20 dBA indoors. Compliance with Bylaws may dictate distance based on turbine size, etc., and “E” is a reasonable answer. Helpful to consult with acoustic engineer on ALL noise impacts; not dBA exclusively!
- ✓ A & B tend to be profit-driven rather than by community compatibility. *(Avoids compensation for easement in gross over non-participating property as well)*
- ✓ D implies that owners have “viewshed” rights over all surrounding land. Probably not a sustainable position, overall, but may be reasonable in context of local codes requiring no impairment of natural surroundings, i.e., mountain ridges, historic districts, national parks, etc.

Cautionary Case Studies

Poor siting
Value Impairment
Home abandonment

Canadian Example of abandoned home



Abandoned Homes - Shirley Wind Project

- Duke Energy project in Wisconsin
- 2.5 MW wind turbines.
- cluster in a direction that puts the home downwind of turbines
- Issues are both the infra and low frequency noise causing owners to feel dizzy, off balance, stuffy ears, etc.
- seldom hear the wind turbines inside their homes.
- not a case where the audible noise is a problem. Just the inaudible
- 2 homes abandoned

Source: Rick James, E-Coustic Solutions



Figure 2-Location of Shirley Wind Project Wind Turbines relative to Enz Home

NOISE POLLUTION FROM WIND TURBINES

Wind turbines create noise from either the blades moving through the air or from the mechanical hub that produces the electricity. Sounds from wind turbines are a problem for some who live closest to the machines.

2 PULSING SOUNDS

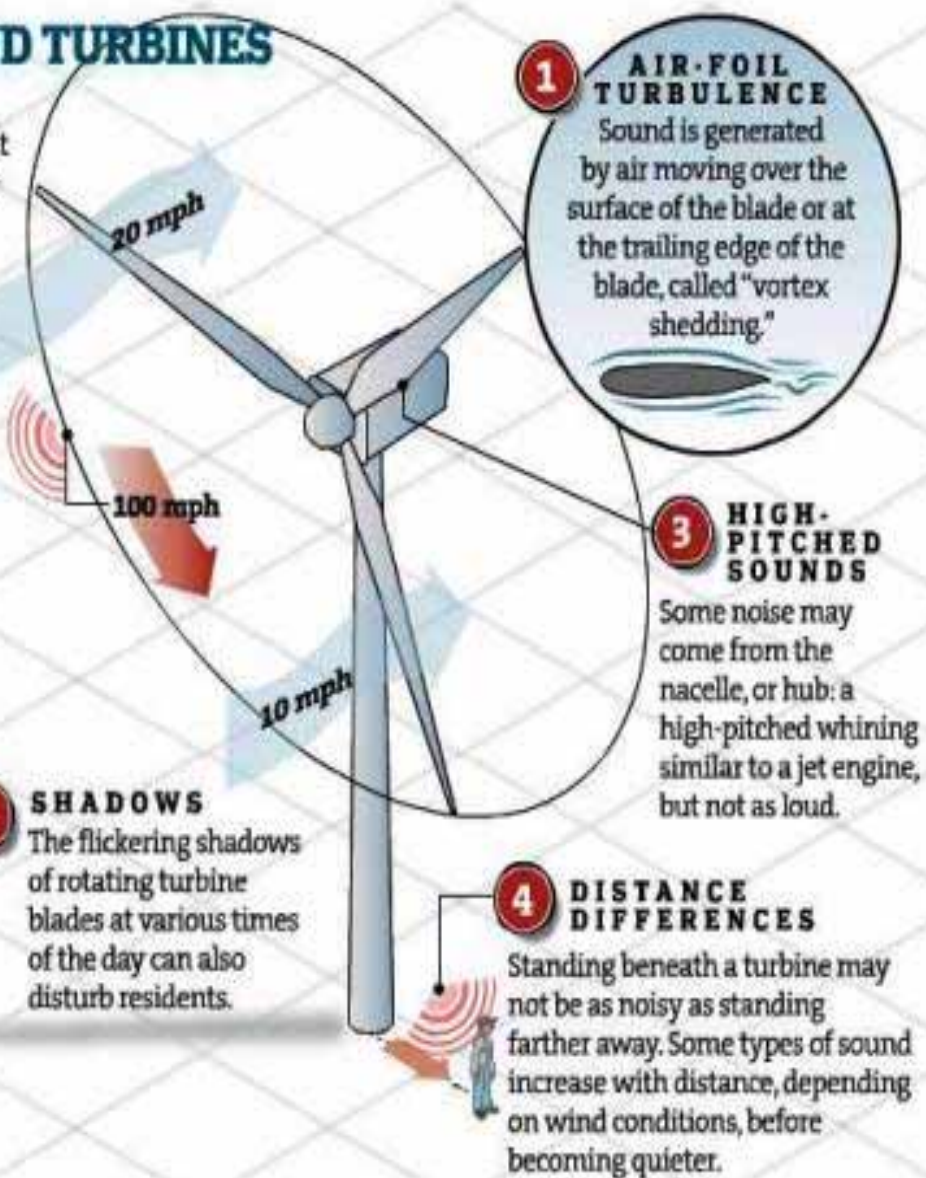
Outdoors: Turbines may appear to move slowly, but the tips of their blades often reach speeds of over 100 mph. This, coupled with wind conditions that may include faster moving air at the top of the arc and slower winds at the bottom, can produce a pulsing or oscillating sound.

Indoors: Low-frequency sounds can penetrate walls and windows and are sensed as vibrations and pressure changes.

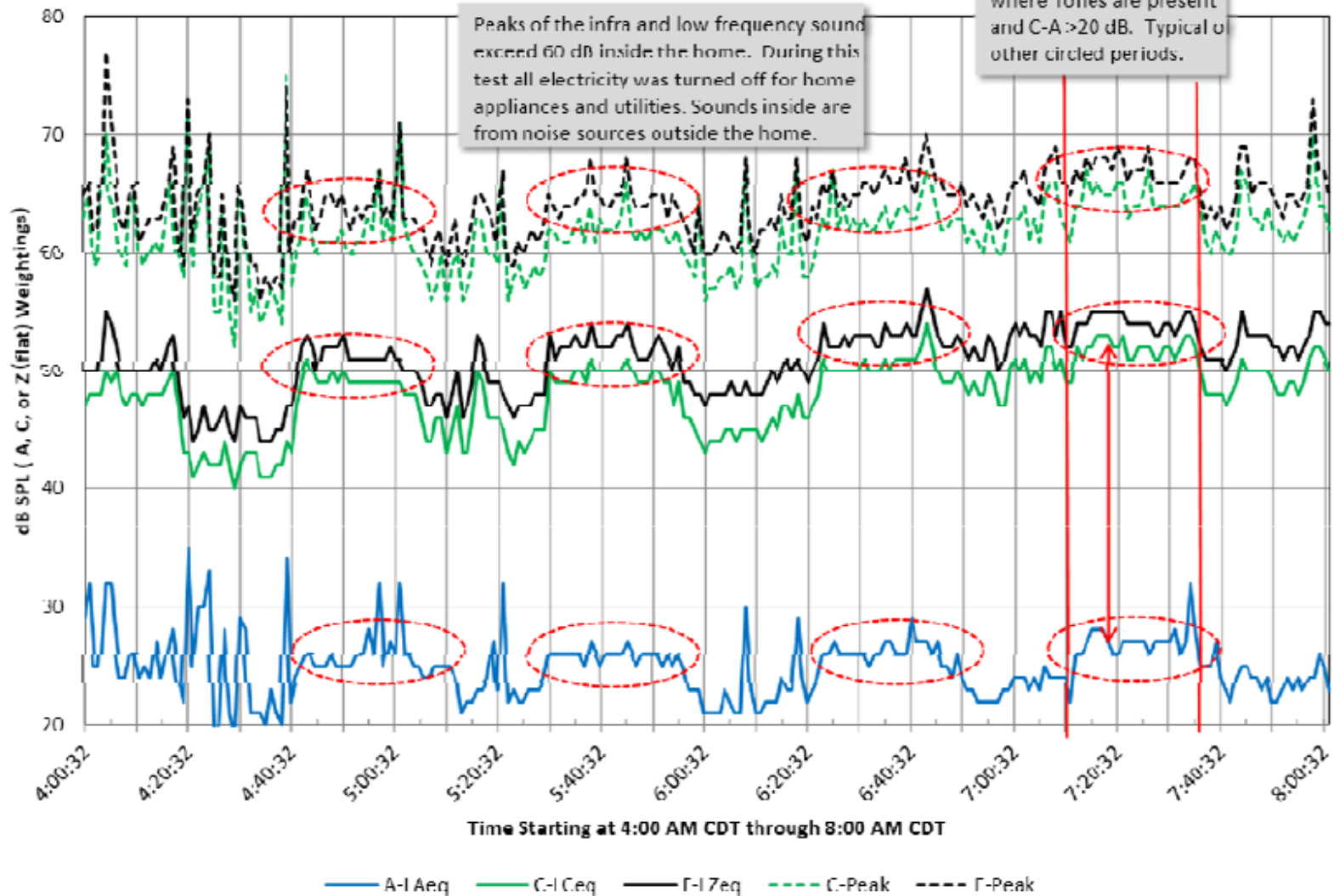


Sources: American and Canadian Wind Energy Associations

MARK BOSWELL • Star Tribune



Enz Home- Indoor Overnight Test, July 29, 2011
Measured at Kitchen Window Seating Area



Schineldecker Home, Mason County, MI



- 1,139 ft. from property line
 - 7 within ½ mile
 - 14 within 1 mile
 - 25 within 1.5 miles
 - 18 seen from yard
 - 45 dBA max (Developer Claim)
 - No LFN protection or limit
-
- Marketed since May 2011 – \$260,000; No showings or offers
 - 2700 SQ. FT. FULLY REMODELED FARM HOUSE IN WIND FARM. 16 acres, 40x60 pole barn, 30x40 work shop, 2 car garage, greenhouse, huge garden, rich soil, in ground irrigation, paved driveway, pond/ wetland. House is heated with biofuel (wood boiler), high efficiency forced air furnace back up, central air, hot tub, fully insulated

Pigeon, Michigan



Case Study – Mason County, MI



476 ft. to blade tip

Michigan Case Study Summary

Before Wind Project

Value \$207,000

- Property Appraised June 2011 @ \$190,000; adjusted to \$207,000 based on 9% MLS increase between appraisal & sale dates.

After Wind Project

Sale Price \$159,000

Diminution \$48,000 (23%)

- Turbine(s) constructed but not yet operating 24/7. No established noise impact at sale date; only visual and “stigma”.
- Realtors would not list unless price was discounted to \$169,000, due to turbines.
- Seller had to pay \$4k of buyer costs; adjust price to \$155,000 , or (25%)

Wisconsin Case Study



In March of 2008 the 86 turbine Invenergy Forward Energy wind project went on line in Dodge and Fond du Lac Counties, Wisconsin. The setback from non-participating homes is 1000 feet. Two months later this home in the project went up for sale.

LISTED MAY 29, 2008: For Sale: Country home on five wooded acres. 1900 square feet, four bedrooms, 3.5 baths, central air, new roof, sky lights in kitchen, deck, family room with wood burning fireplace, vaulted ceilings, first floor laundry, exercise room, whirlpool tub in master bath, 3.5 car garage, your own nature trail through black walnut woods behind the house.

MAY 29, 2008: Asking \$219,000. **\$115/Square foot**. No buyers.

WINTER of 2009: Asking Price: \$179,900. No buyers.

SPRING of 2010: Asking Price: \$158,900. No buyers.

JUNE 4, 2010: After **740 days on the market**, SOLD for \$129,000. **\$68/Square foot**.

\$90,000 loss = 41% value loss.

Falmouth, MA – Paired Sale

Falmouth Paired Sale Data



62 Nye Rd., Falmouth MA

833 W. Falmouth Hwy., Falmouth, MA



Falmouth Comparison

Address	Sale Date	Sale price	House Sq. Ft	Price per Sq. Ft	List/ % Sold Orig. List %Sold	MT CMT
62 Nye Rd. Falmouth, MA	10/11	\$360,000	1,224	\$294.12	\$369,000 / 97.6%	47 47
833 W. Falmouth Hwy Falmouth, MA	10/11	\$350,000	1,752	\$199.77	\$399,000 / 87.7%	179 199
Falmouth Average (D)				\$272.29		
Barnstable Average (E)				\$261.69		

*Original 9/08 listing withdrawn – Market Time from beginning of marketing efforts = 37 months. Original List Price of \$459,900 = \$262.50 per Sq. Ft.

Falmouth Value Diminution

	Sale Price \$ / Sq. Ft.	Indicated Discount % VS. Comp Data	Indicated Discount \$/Sq. Ft.
833 W. Falmouth Hwy, Falmouth, MA	\$199.77		
62 Nye Rd. Falmouth, MA	\$294.12	32%	\$94.35
Falmouth Average	\$272.29	27%	\$75.52
Barnstable Average	\$261.69	24%	\$61.92
	Avg. Discount	27%	\$77.26

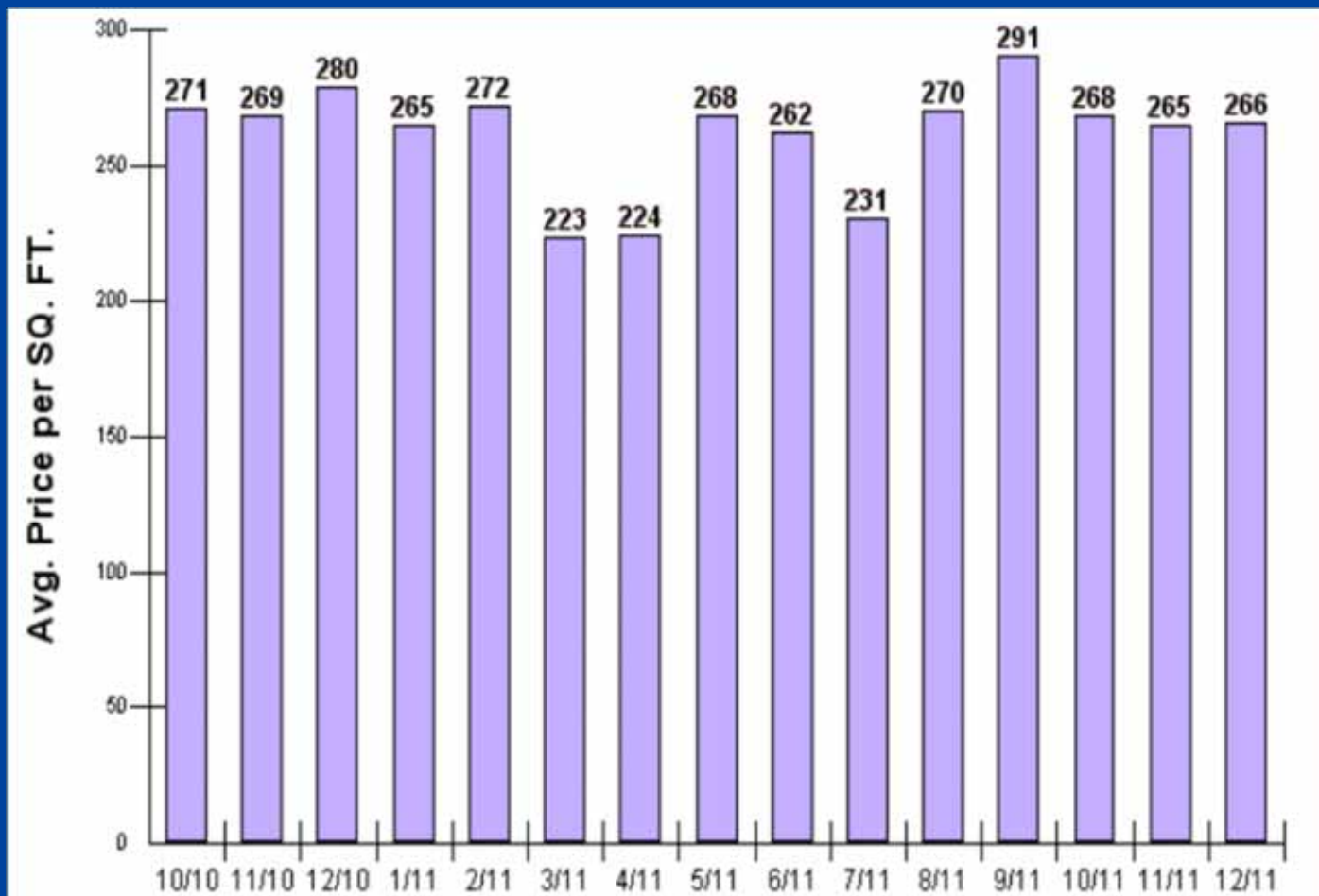
Analysis

833 W. Falmouth Hwy has a clear view of the turbines, and is a sale that is contemporary with the paired sale at 62 Nye Rd. It is also compared to Falmouth & Barnstable County average sale prices per square foot.

Comparison reveals that the 833 Falmouth Hwy property, located in close proximity to the Wind 1, 2 and Webb turbines has sold for a discounted or below market price, despite its superior historic appeal, a 1.1 acre lot size (larger than typical) and a 199 day marketing time. It is also noted that 833 Falmouth Hwy home had been previously marketed and withdrawn, for a total time from beginning to end of marketing efforts of about 37 months.

All indicators reflect a market derived discount from 24% to 32%, and average 27%. However, if the 833 Falmouth sale is adjusted down by \$50,000 for the additional value of the larger lot, the indicated discount increases to 37% compared to Falmouth market average.

Barnstable County, MA – Market Area Comparison



Average = \$261.69 per square foot

DeKalb County, Illinois Case Study



- FPL project – ¼ of County footprint
- 1 turbine about 2,000 ft., 7 others within ¾ mile. Edge of footprint
- Appraised @ \$290,000; listed @ \$269,900 to get “quick” sale
- Sold May 29, 2011 after 13 months on market for \$200,000
- 31% under appraisal
- 26% below (reduced) list price
- Seller filed claim under PVG required by County as a condition for approval of SU
- Seller reported noise impacts
- Damages/payment confidential
- House vacant as of July 2012

Lee County, Illinois Case Study



Original list date: Fall, 2005

Original list price: \$329,900

Sale date: February, 2008

Price: \$265,000

Time on market: 840 days

Price reduction: \$64,900 (19.7%)

Typical reduction: 0% to 5%

Proximity damages: \$48,405 to \$64,900

Comparable new construction selling in 30 – 90 days, typically at 95-100% of list price 5+ miles from project

Marketing Time – No Turbines near

ADDRESS:	DAYS ON MKT.	SALE PRICE	SALE DATE
3588 HOUGHTBY RD., PAW PAW	LESS THAN 90 DYS.	\$320,000.00	11-18-05
4468 N. IL. RT. 23, LELAND	LESS THAN 30 DYS.	\$335,000.00	01-27-06
157 CHICAGO RD. PAW PAW	LESS THAN 45 DYS.	\$370,000.00	12-15-05
1829 QUAIL HOLLOW RD., STEWARD	LESS THAN 60 DYS.	\$304,500.00	01-30-06
1832 QUAIL HOLLOW RD., STEWARD	LESS THAN 60 DYS.	\$360,000.00	06-20-07

Lee County – Control Data > 2 miles

16	1310 Melugins Grove	Apr 2004	\$179,000	Lyons	Overton	2	1,952	\$91.70
17	2612 Shady Oaks Rd.	Apr 2003	\$131,000	Smith	Papiech	1.5	1,208	\$108.44
18	3448 Cyclone Rd.	Mar 2003	\$105,900	Munyon	Pippenger	2	1,456	\$72.73
19	2524 Johnson St.	Aug 2004	\$61,800	Copeland	Lampson	1.5	948	\$65.19
20	741 Third St.	Feb 2004	\$63,500	Eckhardt	Rosales	1.5	868	\$73.16
21	613 Church Rd.	May 2003	\$115,000	Merkel	Parpart	1.5	1,458	\$78.88
22	3435 Willow Creek	Jun 2003	\$118,000	Swiatek	Brydun	2	884	\$133.48
23	3021 Cottage Hill	Mar 2005	\$182,000	Russ	Curtis	1.5	1,239	\$146.89
24	3385 Willow Creek	Mar 2003	\$180,000	McCoy	Carver	2	2,840	\$63.38
25	745 Second St.	Dec 2004	\$59,000	Wilson	Calderon	1.5	1,161	\$50.82
26	761 4th St.	Mar 2003	\$68,000	Stewart	Elsinger	1	724	\$93.92
27	2774 Welland Rd.	Apr 2003	\$93,000	Batha	Crumpton	1.5	1,104	\$84.24
28	558 Earlville Rd.	Jan 2003	\$145,000	Hodge	Ikeier	2	1,280	\$113.28
29	2505 Wood St.	Aug 2004	\$105,000	Janiak	Bullock	2	1,812	\$57.95
30	385 Earlville Rd.	Aug 2004	\$280,000	Rago	Diehl	2	2,142	\$130.72
31	3095 Cyclone Rd.	Dec 2004	\$169,900	Summerhill	Rainbolt	2	2,048	\$82.96
32	742 Second St.	Jan 2003	\$103,000	Delhotal	Stewart	2	1,876	\$54.90
33	305 Angling Rd.	Mar 2005	\$110,000	BMV Prop.	Herendeen	1	680	\$175.00
34	2515 Wood St.	Apr 2004	\$80,000	Jones	Sarver	1	912	\$87.72
35	1218 Locust Rd.	Jan 2005	\$169,000	Wachowski	Gembeck	1	1,040	\$162.50
36	901 Melugens Grove	Aug 2003	\$228,000	Kidd	Rajan	1	2,000	\$114.00
37	1490 German Rd.	Aug 2004	\$85,000	Firlit	Challand	2	2,144	\$39.65
38	603 Ogee Rd.	Apr 2004	\$285,000	Anderson	Miller	1	1,920	\$148.44
39	546 Carnahan Rd.	Jan 2005	\$110,000	Coley	Sarabia	1	1,296	\$84.88
40	1353 County Line	Nov 2003	\$185,000	Vallejo	Bozaeth	1.5	1,338	\$138.27
41	2512 Johnson St.	Feb 2005	\$123,000	Montavon	Sutton	2	2,232	\$55.11
42	2509 Herman Rd.	Apr 2004	\$142,900	Bresson	Arjes	1	1,404	\$101.78
43	955 Woodlawn	Jul 2003	\$265,000	Swan	LaRosa	1.5	1,918	\$138.16
44	1279 Locust Rd.	Mar 2003	\$270,000	Witte	olin	1	2,156	\$125.23
45	648 Ogee	Nov 2003	\$225,000	Fickenscher	Rojas	1	1,768	\$127.26
46	1339 Woodlawn Rd.	Sep 2003	\$230,000	Howell	Barnhill	1	1,701	\$135.21
47	1349 Woodlawn Rd.	May 2003	\$207,500	Howell	Wiskari	1	1,809	\$114.70
48	711 O'Gee Rd.	Aug 2004	\$185,000	Groevengoed	Carabal	1	1,352	\$136.83
49	1295 Locust Rd.	May 2004	\$300,000	Hagan	Lowe	1	2,672	\$112.28
50	860 Paw Paw Rd.	May 2004	\$185,000	Wiskur	Pogreba	1	1,148	\$161.15
51	3011 Honeysuckle	Mar 2005	\$355,000	Abbott	Brandt	2	3,655	\$97.13
52	489 Earlville Rd.	Nov 2004	\$165,000	Schlafke	Fromhertz	2	1,400	\$127.86
53	2512 Shaw Rd.	Jun 2004	\$153,500	Hlavin	Kapinski	2	1,638	\$93.71
							Average sale price	\$104.72

Sales within 2 miles

Sale #	Address	Sale Date	Price	Grantor	Grantee	Style	Size SF	\$/SF
1	629 W. Chestnut	Oct 2003	\$37,000	Estes	Lipe	1.5	1,161	\$31.87
2	323 W. Chestnut	Oct 2004	\$40,000	Reed	Hovious	1.5	1,425	\$28.07
3	1019 Steward Rd.	May 2003	\$40,000	Houle-Ward	Reyns	2	1,408	\$28.41
4	91143 Paw Paw	Mar 2005	\$187,000	Zaylik	Pachero	2	1,571	\$119.03
5	1224 IL Rte. 251	Jun 2003	\$138,000	Gittleson	Kowalski	2	1,272	\$108.49
6	339 Chestnut St.	Jan 2003	\$72,000	White	Flynn	2	1,684	\$42.76
7	630 W. Chestnut	Sep 2003	\$126,000	Eddy	Morath, Sr.	1.5	1,728	\$72.92
8	427 Chestnut St.	Oct 2003	\$87,000	Hesik	Rourke, Jr.	1.5	1,380	\$63.04
9	138 Cherry St.	Sep 2004	\$80,000	Hammond	Alexander	1.5	1,326	\$60.33
10	536 W. Cherry	Oct 2004	\$63,500	Johnson	Fitzpatrick	1.5	999	\$63.56
11	885 Compton Rd.	Oct 2004	\$68,900	Boysen	Gellings	1	480	\$143.54
12	518 W. Cherry St.	Apr 2003	\$87,500	Allen	Beckman	1	927	\$94.39
13	222 Maple St.	Dec 2004	\$150,000	Clark	Cummings	1	1,852	\$80.99
14	444 W. Main St.	Mar 2005	\$109,900	Miller	Michaels	1	1,402	\$78.39
15	2874 Beemerville	Jul 2003	\$367,000	Finkboner	DGNB TRT	1	2,201	\$166.74
							Average sale price	\$78.84

McCann Study Data Summary

Avg Sale Price > 2 miles = \$104.72 SF

Avg Sale Price < 2 miles = \$ 78.84 SF

Difference in Sale Price = \$ 25.89 SF

Average Value Diminution Within 2 miles of turbines **25%**

PVG's are necessary

- Financial gain to developer and landowner/lessor should not be at expense of neighboring property owner equity.
- If applicant believes claim of no property value impact, then there will be no significant impact to them with a PVG requirement or condition.
- Several Illinois counties and numerous examples nationwide have required some form of PVG
- Historically, wind energy developers preferred to wait for continuous health, noise and nuisance complaints and lawsuits – then settle with only a few neighbors, or buy them out

Effective PVG

- Homeowner option to sell within minimum of 2 miles
- Give owners adequate time to exercise option - 2 years
- Based on Certified appraisal process – Common practice!
- Current value at time of option/sale
- Bonding or adequate insurance (Lloyd's?), when developer has no LOC to guarantee probable range of value diminution
- Decommissioning of turbines bonded
- Possible value reduction when mortgage lenders refuse to lend on homes near turbines
- Possible higher insurance cost, or uninsurable (San Diego County report)

Ben Hoen Interview – PVG's

-You might know about a Property Value Guarantee. It's a dicey situation and complicated, but I think homes that are very close, there is just too much unknown right now; that seems reasonable. I think **one of the things that often happens is that (wind) developers put our report forward and say look property values aren't affected, and that's not what we would say specifically.** On the other hand, they have little ground to stand on if they say we won't guarantee that.
- *Reported by:*
Clif Schneider
April 12, 2010 – recorded interview available online

Acoustical Background Measurement

- L90 is the level exceeded 90 percent of the time- the background sound level. The L90 is a "statistical" sound level obtained by measuring over a period of time (10 minute, 1 hour, as examples)
- The Leq is the "energy equivalent" sound level- the level equivalent to the energy summed average over a period of time (10 minute, 1 hour, as examples).
- Community response is usually pegged to increases OVER the L90 background. The ISO chart/table shows expected community response.

Community Response

Increase in Noise	Estimated Community Response
5 dB	Sporadic Complaints
10 dB	Widespread Complaints
15 dB	Threats of Community Action
20 dB	Vigorous Community Action

International Standards Organization, ISO/TC 43
New York: United Nations, November 1969.

Table D-7

**CORRECTIONS TO BE ADDED TO THE MEASURED DAY-NIGHT SOUND LEVEL
(L_{dn}) OF INTRUDING NOISE TO OBTAIN NORMALIZED L_{dn}¹**

Type of Correction	Description	Amount of Correction to be Added to Measured L _{dn} in dB
Seasonal Correction	Summer (or year-round operation)	0
	Winter only (or windows always closed)	-5
Correction for Outdoor Noise Level Measured in Absence of Intruding Noise	Quiet suburban or rural community (remote from large cities and from industrial activity and trucking)	+10
	Normal suburban community (not located near industrial activity)	+5
	Urban residential community (not immediately adjacent to heavily traveled roads and industrial areas)	0
	Noisy urban residential community (near relatively busy roads or industrial areas)	-5
	Very noisy urban residential community	-10
Correction for Previous Exposure & Community Attitudes	No prior experience with the intruding noise	+5
	Community has had some previous exposure to intruding noise but little effort is being made to control the noise. This correction may also be applied in a situation where the community has not been exposed to the noise previously, but the people are aware that bona fide efforts are being made to control the noise.	0
	Community has had considerable previous exposure to the intruding noise and the noise maker's relations with the community are good	-5
	Community aware that operation causing noise is very necessary and it will not continue indefinitely. This correction can be applied for an operation of limited duration and under emergency circumstances.	-10
Pure Tone or Impulse	No pure tone or impulsive character	0
	Pure tone or impulsive character present	+5

WHO 2009 Health Effects Guidelines and Mars Hill Highest Hourly Leq

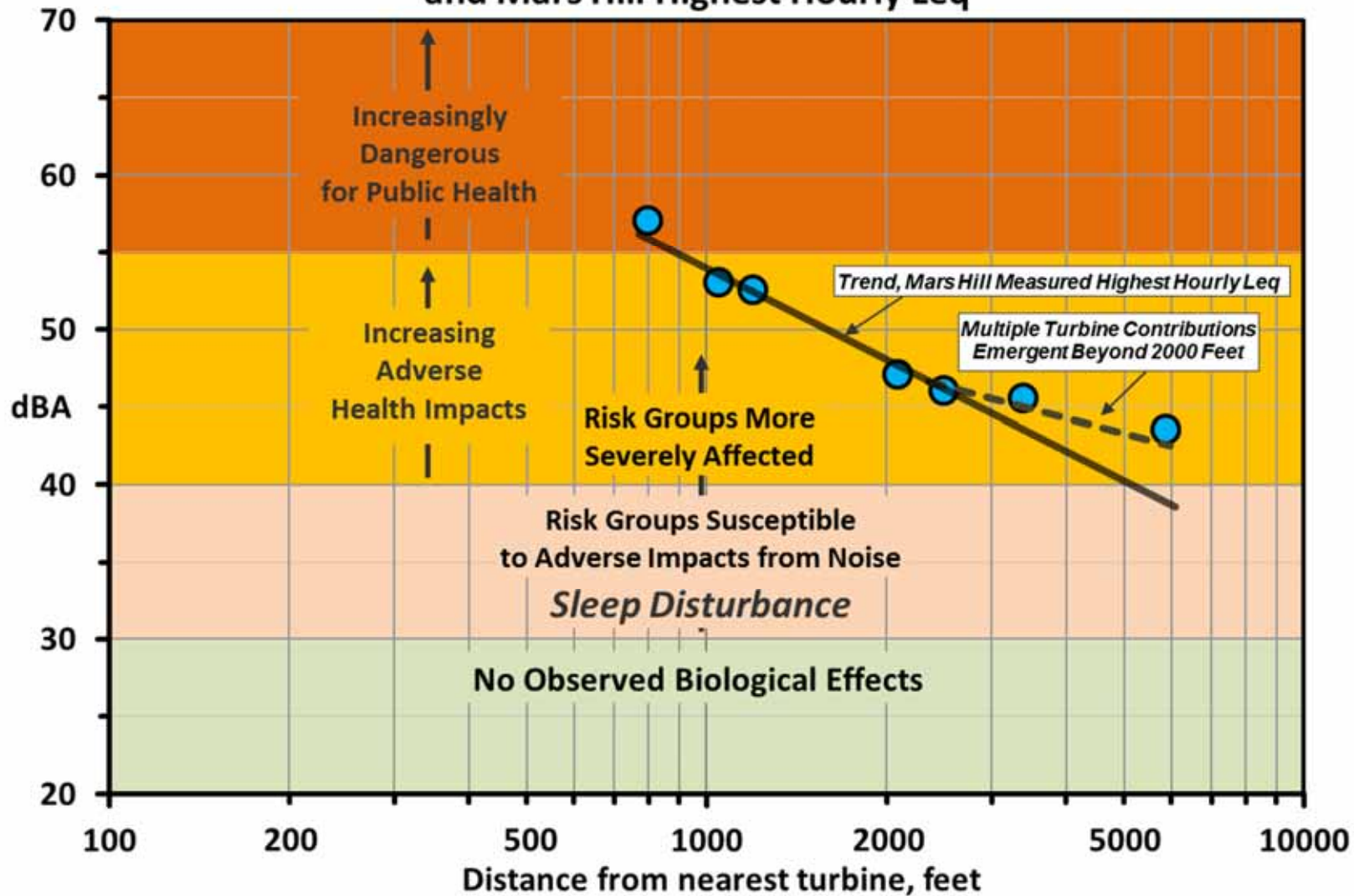


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COMMUNITY REACTION TO WIND TURBINE NOISE

EPA Data normalized to:

- Leq
- Year-round operation
- Quiet rural community
- No prior exposure to intruding noise
- Pure tone or impulsive noise character.

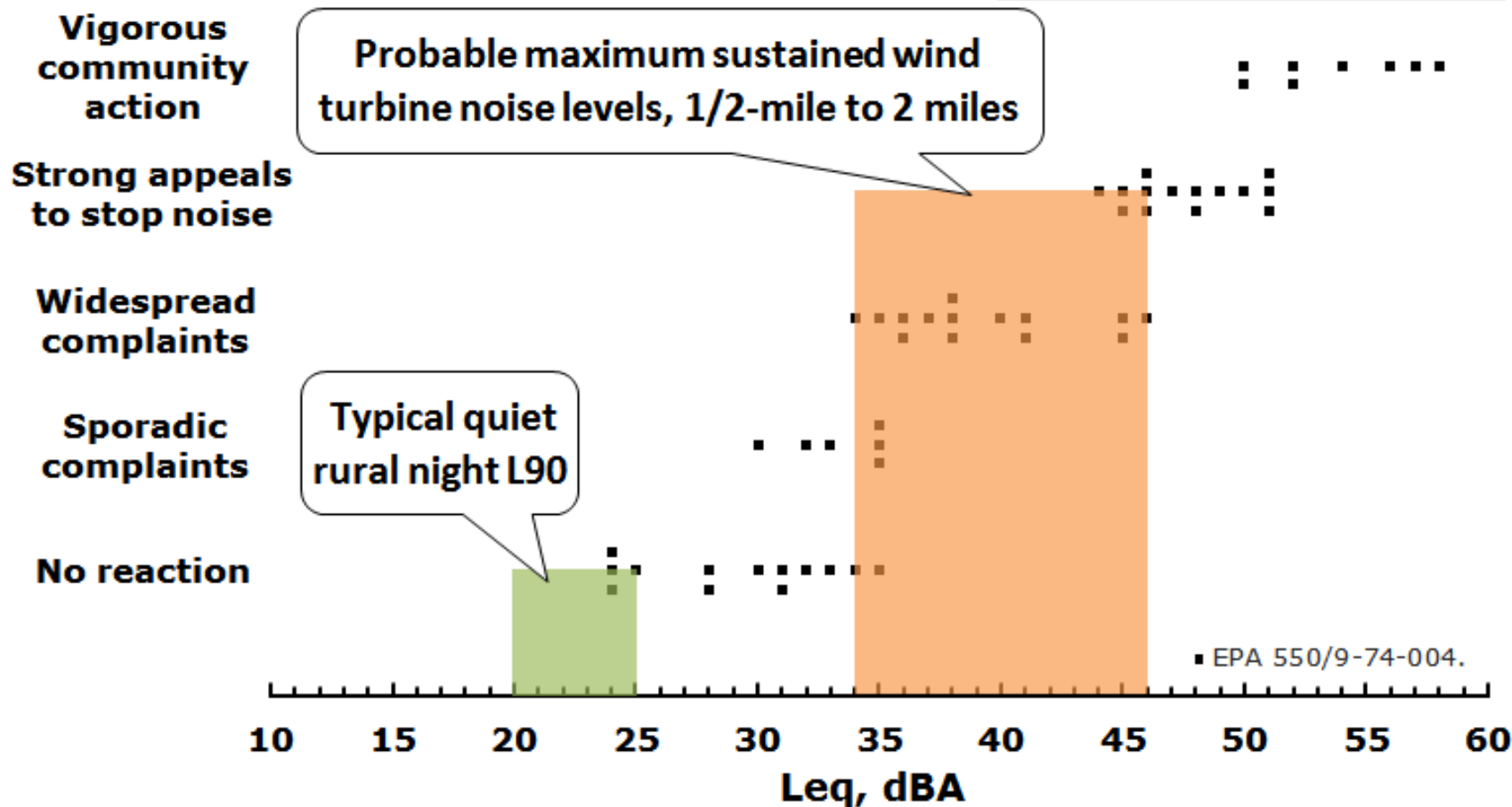


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WHAT CRITERIA PREVENT ADVERSE IMPACT?

- “Hold paramount the safety, health and well-being of the public.” (Ethics requirement; engineers, INCE.)
- The only reliable noise control engineering method for wind turbines is distance. (NROs fail in high wind shear.)
- Design to avoid widespread complaints. (Sound levels higher than 33 dBA are associated with widespread complaints in quiet rural areas due to noise increases.)
- Design to avoid Low Frequency sound levels above 20 dBA indoors. (Apply Danish wind turbine LF noise limit).

Sick Building Syndrome vs. Wind Turbine Syndrome

- LFN produced by large fans
- Modulated “rumble”
- Some workers refused to work in buildings
- ASHRACE study over 20 years
- LFN fluctuated rapidly
- Symptoms & cause similar to ***“Wind Turbine Syndrome”***
- Dizziness
- Nausea
- Sleep deprivation; “panic” awakening
- Tinnitus
- Cognitive dysfunction
- Moodiness – irritability
- Blood pressure increases
- False sense of motion – sea sickness
- Headaches
- fatigue
- Etc.

NASA/Department of Energy Studies

While the effects of inaudible modulated infra and low frequency sound were being investigated for buildings and large jet engines, NASA and the Department of Energy funded a series of research studies from the early 1980s to about 1991 on wind turbine noise.

The two primary researchers, Hubbard and Shepherd (1990), reported the following:

- Wind turbines produce primarily infra and low frequency sound.
- Sound propagates from wind turbines at a decay rate half that of common “point” sources.
- Wind turbine noise travels farther than other sounds.
- Wind turbine noise will be a significant indoor noise problem due to room resonance and a dominance of infra and low-frequency acoustic energy.

Source: Rick James, INCE E-Coustic Solutions

Wind Turbines Are More of an Indoor Problem Than an Outdoor Problem

During the preceding discussion regarding the NASA (Hubbard & Shepherd, 1990) research, it was mentioned that it was anticipated wind turbine noise, especially at moderate distances from the turbines, is more likely to be an indoor problem than an outdoor problem.

This concern is not addressed in noise impact studies conducted for wind turbine utilities. In many cases, the opposite occurs. The noise reports may claim that wind turbine sound levels of 45 dBA outside a home will not be a source of indoor annoyance or sleep disturbance.

This assertion has not been supported by recent research conducted in Sweden and the Netherlands. A recent study found that for a wind turbine utility producing a steady 45 dBA (equivalent continuous noise level [Leq]) outside the walls of a home, **18% of the home's occupants would find the noise heard inside as highly annoying while 32% would be annoyed**

(Janssen, Vos, Eisses, & Pedersen, 2010).

Health Impacts

- In 2012 the Brown County Board of Health resolution made a formal request for “...temporary emergency financial relocation assistance from the State of Wisconsin for those Brown County families that are suffering adverse health effects and undue hardships caused by the irresponsible placement of industrial wind turbines around their homes and property.”
- Some individuals living in the environs of wind turbines report experiencing adverse health effects including annoyance and/or sleep disturbance and/or stress related health impacts and/or reduced quality of life.
- In some cases the adverse effects have been severe enough that families have elected to abandon (or vacate) their homes.
- Ontario Environmental Review Decision found ““serious harm to human health” includes ... indirect impacts (e.g., a person being exposed to noise and then exhibiting stress and developing other related symptoms).

Litigation – What's Ahead?

- Lawyer for MOE, Frederika Rotter, told the Environmental Review Tribunal (ERT) during the appeal of the Suncor Wind Project approval in Chatham Kent, “We will see in the course of this hearing that lots of people are worried about windmills. They may not like the noise, they may think the noise makes them sick, but really ***what makes them sick is just the windmills being on the land because it does impact their property values. That's what makes them sick is that, you know, they'll get less money for their properties,*** and that's what's causing all this annoyance and frustration and all of that.”

<http://www.ert.gov.on.ca/english/decisions/index.htm>

- Failure of seller to disclose proposed turbines
- Numerous decisions finding 20% -25% value diminution
- Assessment Appeals
- Damage claims
- Class action lawsuits
- Possible inverse condemnation claims for “easement in gross”

SCHEDULE

TRANSFER OF EASEMENT IN GROSS

Transferor: Malcolm Keith McDonald

Transferee: Canadian Hydro Developers, Inc.

Re: Part Lot 29, Concession 5, Part 1 on Plan 7R787, Amaranth (PIN: 34055-0033 (LT))

The Transferor hereby transfers, sells, grants, and conveys to the Transferee, to use and enjoy for the benefit of the Transferee, the right, liberty, privilege, and free and unencumbered easement (hereinafter "Easement") in perpetuity commencing on the date hereof, over, along, and upon the Transferor's Lands for the right and privilege to permit heat, sound, vibration, shadow, flickering of light, noise (including grey noise) or any other adverse effect or combination thereof resulting directly or indirectly from the operation of the Transferee's wind turbine facilities situated on the Transferee's leasehold interests located within the Townships of Melancthon and Amaranth, in the County of Dufferin, for the Transferee's Melancthon EcoPower Centre, which shall include but not be limited to any and all options to lease and lease agreements and any renewals, extensions, amendments or replacements thereof, in any abutting, adjoining, neighbouring or other lands (hereinafter, collectively, the 'Leasehold Lands'). The Transferor further acknowledges and agrees that the operation of the Transferee's wind turbine facilities located on the Leasehold Lands may affect the living environment of the Transferor and that the Transferee will not be responsible or liable for, of and from any of the Transferor's complaints, claims, demands, suits, actions, or causes of action of every kind known or unknown which may arise directly or indirectly from the Transferee's wind turbine facilities on the Leasehold Lands to the extent permitted by this Easement. In addition, the Transferor hereby covenants and agrees to indemnify, defend, and hold harmless the Transferee from any and all liabilities, claims, demands, costs and expenses arising from any direct, indirect or consequential damages arising out of a complaint, claim, action or cause of action initiated by the Transferor as against the Transferee for anything permitted by this Easement in relation to the Transferee's wind turbine facilities located on the Leasehold Lands.

This Easement and all acknowledgements contained herein shall enure to the benefit of and be binding upon the Transferor and Transferee and their respective heirs, executors, successors, servants, agents and assigns, as the case may be. This Easement will also be registered on title and shall remain with the Transferor's Lands.

This is an easement in gross.

Transferor further acknowledges and agrees that the operation of the Transferee's wind turbine facilities located on the Leasehold Lands may affect the living environment of the Transferor and that the Transferee will not be responsible or liable for, of and from any of the Transferor's complaints, claims, demands, suits, actions, or causes of action of every kind known or unknown which may arise directly or indirectly from the Transferee's wind turbine facilities on the Leasehold Lands to the extent permitted by this Easement. In addition, the Transferor hereby covenants and agrees to indemnify, defend, and hold harmless the Transferee from any and all liabilities, claims, demands, costs and expenses arising from any direct, indirect or consequential damages arising out of a complaint, claim, action or cause of action initiated by the Transferor as against the Transferee for anything permitted by this Easement in relation to the Transferee's wind turbine facilities located on the Leasehold Lands.

Literature Review

Summary Wind Turbine - Property Value Impact Studies

Independent Studies

Author	Type	Year	Location	Method	Distance	Impact %
Lansink	Appraiser	2012	Ontario	Resale (1)	< 2 miles	(39%) Avg. 23%-59%
Sunak	Academic RWTH Aachen University	2012	Rheine & Neuenkirchen	Geographic Weighted Regression (2)	2 Km	(25%)
Heintzelman Tuttle	Academic Clarkson University	2011	Upstate NY	Regression Resale & Census Block	1/10 to 3 miles	Varies to > (45%)
McCann	Appraiser	2009 - 2012	Illinois, (3) MI, MA, WI	Paired Sales & resale	< 2 miles	(25%) 20% - 40%
Gardner	Appraiser	2009	Texas	Paired Sales	1.8 miles	(25%)
Kielisch	Appraiser	2009	Wisconsin (4)	Regression & Survey	Visible vs. not visible	(30-40%) (24-39%)
Luxemburger	Broker	2007	Ontario	Paired Sales	3 NM	(15%) \$48,000
Lincoln Twp.	Committee (5)	2000-2002	Wisconsin	AV ratio 104% v. 76%	1 mile	(24%)

Wind Industry Funded Studies

Canning & Simmons	Appraisers (CANWEA)	2010	Ontario	Regression Paired Sales	Viewshed (6)	(7%-13%) (9%)
Hinman	Academic ISU - REP Student thesis	2010	Illinois	Pooled Regression Realtor survey	3 miles ½ mile	No SS (11.8%) (7)
Hoer	USDOE funded LBNL	2009	9 states	Pooled regression	5 miles 3k ft – 1 mile	Increases (5.6%) (8)

Footnotes

- (1) Lansink Resale study uses resales from developer to private buyers, with Easement in Gross condition of sale. Buyer accepts noise impacts, etc., waives liability
- (2) Lots only. No pooling of data
- (3) McCann Illinois study & research updated, multiple states
- (4) Kielisch regression lot sales; Realtor survey residential
- (5) Committee compared actual sale prices vs. AV and found homes up to 1 mile sold @ 76% of AV, and > 1 mile @ 104% of AV
- (6) Usually cited as being a study that found no impact. However, all methods used yielded negative numeric indication. Author concludes no statistical significance.
- (7) Cites Realtor who believes no impact on value > 3 miles. Concludes some results indicate “wind farm anticipation stigma” (11.8%)/Pg.55. Author states “the results neither support nor reject the existence of a wind farm nuisance stigma after the wind farm achieved commercial operation.....likely due to only 11 properties selling during operations within 1 mile of wind farm.” Good neighbor payments to some nearby neighbors. Values near wind farm appreciated \$13,524 after operation, following \$21,916 decline measured under anticipation stigma theory. (Net loss of \$8,392 pre- vs. post operation./Pg. 120.
- (8) Study excludes developer resales with 36% & 80% discounts from buyout price. Pooled data from 9 states 24 projects insures lack of statistical significance for value loss examples near turbines. Other sales nearby excluded due to deviation too far from mean and resale.

Ben Lansink Resale Study - 2012

Sale and Resale, Property: 504059 Highway 89, Melancthon		
<p>The average Orangeville & District Real Estate Board Residential MLS® price January 2007 was \$254,803 and August 2009 when 504059 Highway 89, Melancthon resold the average price was \$302,550 resulting in a Change of 18.74%.</p>	Average Price January 2007	\$254,803
	Average Price August 2009	\$302,550
	\$Change	\$47,747
	%Change	18.74%
<p>The property, 504059 Highway 89, Melancthon, was purchased by Canadian Hydro Developers, Inc. in January 2007 for \$305,000 but would have resold August 2009 for \$362,153 as a result of the passage of time.</p>	Actual Price January 2007	\$305,000
	%Change	18.74%
	\$Change	\$57,153
	Adjusted Price August 2009	\$362,153
<p>However the Actual Price when the property resold to Egresits / Gooder in August 2009 was \$278,000, a loss of -\$84,153.</p>	Actual Price August 2009	\$278,000
	\$Difference	-\$84,153
<p>Diminution in Value: -23.24%.</p>	%Difference	-23.24%

Sale and Resale Property 504059 Highway 89, Melancthon, Ontario



Lansink Study Summary

Developer buyout – Resales w/ Easement in Gross Sale Condition

Trans Alta Melancthon 133 Wind Turbine Facility		
1	ID 15797 – 375557 6 th Line, Amaranth	-48.27%
2	ID 15798 – 97121 4th Line, Melancthon	-58.56%
3	ID 15799 – 504059 Highway 89, Melancthon	-23.24%
4	ID 15800 – 582340 County Road 17, Melancthon	-26.66%
5	ID 16339 – 582328 County Road 17, Melancthon	-37.30%
Median		-37.30%
Average		-38.81%

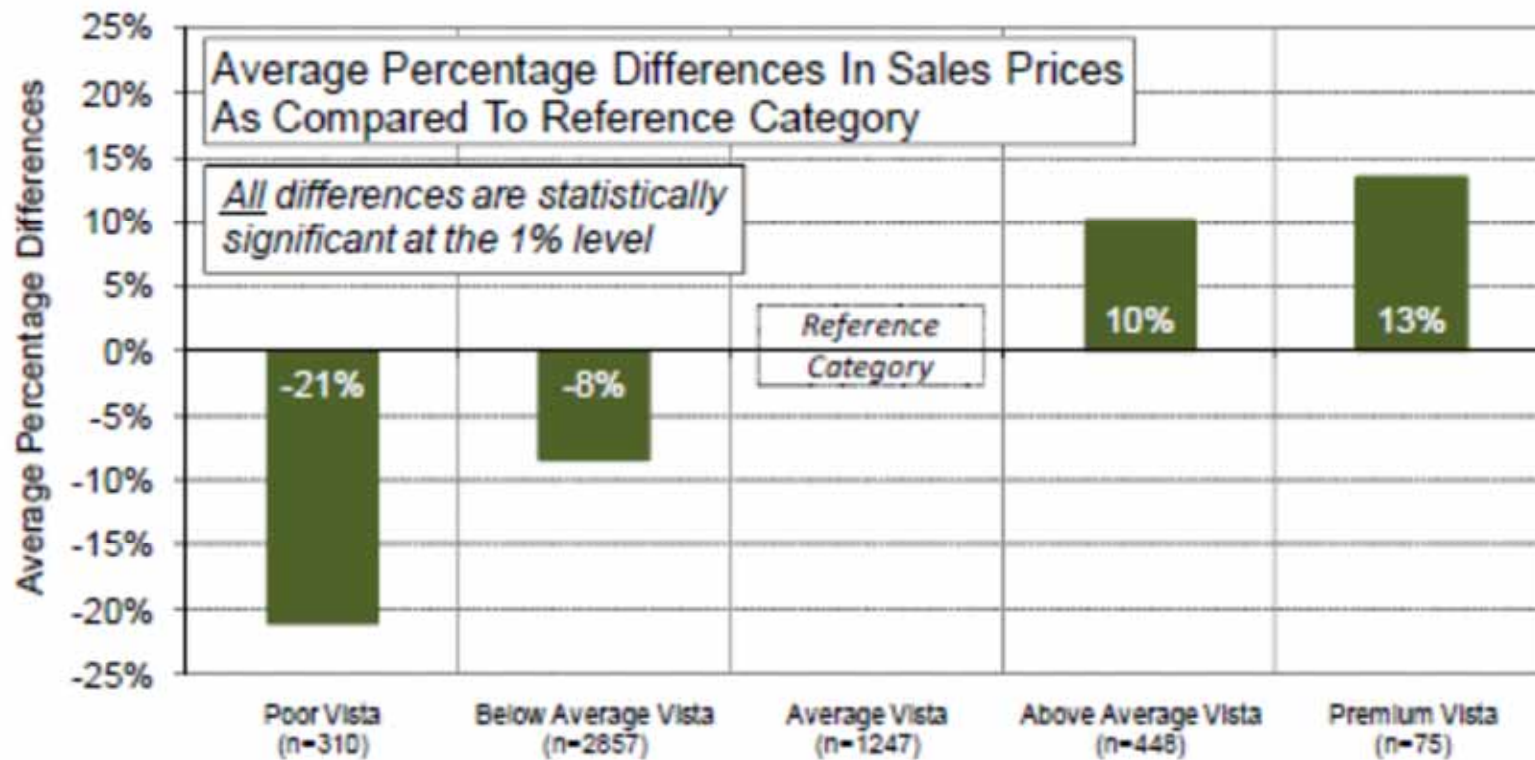
Clarkson University 2011 Study

Distance to Nearest Turbine (Miles)	Clinton County		Franklin County	
	Repeat Sales	Census Block	Repeat Sales	Census Block
Initial Distance=25 Miles	$\beta = -0.041^{**}$	$\beta = -0.052^{***}$	$\beta = -0.044$	$\beta = -0.111^{***}$
0.1	19.82	27.80	21.57	45.82
0.25	16.82	23.79	18.34	40.02
0.5	14.49	20.61	15.81	35.22
1	12.08	17.30	13.21	30.04
2	9.61	13.84	10.52	24.45
3	8.13	11.76	8.91	20.97
Initial Distance= 15 Miles				
0.1	18.16	22.94	19.79	42.66
0.25	15.11	19.18	16.49	36.52
0.5	12.72	16.21	13.90	31.44
1	10.27	13.14	11.23	25.96
2	7.74	9.95	8.48	20.04
3	6.23	8.03	6.84	16.36
Initial Distance= 5 Miles				
0.1	14.49	18.41	15.81	35.22
0.25	11.29	14.43	12.35	28.29
0.5	8.80	11.28	9.64	22.55
1	6.23	8.03	6.84	16.36
2	3.60	4.65	3.95	9.67
3	2.02	2.62	2.22	5.51

note: *** p<0.01, ** p<0.05, * p<0.1

Vista Value Contribution – LBNL Study

Figure ES-2: Base Model Results: Scenic Vista



The reference category consists of transactions for homes with an Average Vista, and that occurred after construction began on the wind facility

Conclusion

- ✓ Independent studies consistently find significant value diminution
- ✓ Appraisal studies are superior – Focus on paired sale data, resale studies, “nearby” data
- ✓ Wind Industry commissioned studies use only regression analysis
- ✓ Data “pooling” assures no statistical significance of any value loss examples
- ✓ Non-appraisers do not comply with USPAP, on several levels
- ✓ Industry favored LBNL study found to not be reliable for any public policy purposes
- ✓ Clarkson & Sunak studies use regression, but do not pool data
- ✓ Value loss conclusions are statistically significant
- ✓ Clarkson useful for distances as near as 1/10 mile
- ✓ Clarkson, Sunak & Lansink studies collectively support hypothesis that view impact alone impacts values +/- (25%)
- ✓ Nearest data subject to noise impacts, and value loss +/- (40%)
- ✓ **More study on correlation of noise/health and value impacts is needed to prevent poor siting decisions!**

Acknowledgments

Ben Lansink, AACI, P.App
Lansink Appraisals and Consulting
507 Colborne Street
London, Ontario
Canada

Robert W. Rand, Member INCE
Rand Acoustics
65 Mere Point Road
Brunswick, Maine 04011

Richard James, INCE
E-Coustic Solutions
Okemos, MI 48805