DELAY DENIAL AND DISAPPOINTMENT

An Analysis of the Chief Medical Officer of Health (CMOH) of Ontario "The Potential Health Impacts of Wind Turbines May 2010"

Prepared by The Society for Wind Vigilance

www.windvigilance.com

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NOTICE TO READER

The Society for Wind Vigilance uses authoritative references to support the assertions contained within this analysis. This analysis also contains statements and citations from individuals and or organizations associated with the wind energy industry.

Most of the citations used in this analysis are from references contained in "The Potential Health Impacts of Wind Turbines May 2010" (CMOH Review).

The Society for Wind Vigilance has made repeated attempts to contact the Chief Medical Officer of Health of Ontario to clarify information about or contained in the CMOH Review. To date the Chief Medical Officer of Health of Ontario has failed to provide answers to our queries.

The Society for Wind Vigilance has made every reasonable attempt to ensure the accuracy of this analysis. Accordingly any errors or omissions contained within this analysis are unintentional.

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EXECUTIVE SUMMARY

"The Potential Health Impacts of Wind Turbines May 2010" (CMOH Review) is a literature review and contains no original research. As a consequence the report has little relevance to addressing the issues of adverse health effects of an emerging technology. The report does acknowledge the relative paucity of existing medical evidence but paradoxically declines to offer any remedial action – to wit further research.

In addition the conclusions of the CMOH Review are not supported by the content of the references cited and other relevant authoritative references.

Studies of European wind turbine facilities have consistently concluded that wind turbine noise is more annoying than other commonly experienced noise sources such as traffic, aircraft and rail. ¹, ², ³, ⁴

Current research demonstrates that annoyance must not be trivialized. Annoyance is acknowledged to be an adverse health effect ⁵ which contributes to stress, ⁶ sleep disturbance ⁷ and an increased risk of regulation diseases. ⁸

"Annoyance with wind turbine noise was associated with psychological distress, stress, difficulties to fall asleep and sleep interruption." 9

Instead the CMOH Review misleadingly asserts "40 dB... limit is consistent with limits used to control noise from other commonly experienced environmental sources." ¹⁰

Unfortunately current Ontario noise guidelines for industrial wind turbines permit, in principle, levels up to 51 dBA at a family home 24 hours a day. ¹¹, ¹² These noise levels are significant as an increase of 10 dBA is a 10-fold increase in acoustic energy.

The CMOH Review acknowledges that Ontario does not have a protocol to verify compliance with these wind turbine noise limits nor has Ontario determined appropriate guidelines for wind turbine low frequency noise. ¹³

The CMOH Report appears to be a government-convened attempt to justify unsound practices of wind turbine development while denying the adverse health effects being reported by Ontario families.

The Society for Wind Vigilance does concur with the CMOH Review on one point. World Health Organization guidance on noise and health is authoritative

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and must be adhered to in order to protect human health. In view of this accord many of the references contained in this analysis are direct citations from the World Health Organization.

This acknowledgement by the CMOH Review puts to rest the wind energy industry's position that World Health Organization standards regarding community noise are irrelevant to industrial wind turbine regulations. ¹⁴

World Health Organization endorses the precautionary principle to protect human health and well-being in the presence of potential health threats. ¹⁵ However the CMOH Report does not reference the precautionary principle. In addition the report ignores authoritative recommendations such as "The need for guidelines for maximum exposure to wind turbine noise is urgent…" ¹⁶

It is imperative that development of authoritative setbacks and noise guideline be based on independent third party clinical research. It is remarkable that a public health authority denies the need for evidence-based regulations.

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INTRODUCTION

There are over one hundred Ontario residents who are reporting adverse health from exposure to industrial wind turbines. ¹⁷ Some of these victims are currently being or have been billeted by wind energy developers at the developer's expense. ¹⁸ Others have had their homes bought out by the wind energy and are now silenced by non disclosure clauses. Other victims live in self funded safe houses or have abandoned their homes to protect their health. The balance continues to suffer in their existing homes. These statements cannot be denied.

In the fall of 2009 Dr. Arlene King, Chief Medical Officer of Health for Ontario (CMOH), took on the task of investigating the issue of industrial wind turbines and potential adverse health effects.

An October 21 2009 memorandum addressed to Medical Officers of Health and Environmental Health Directors issued by Dr Arlene King advised:

"...sound produced by wind turbines is sometimes found to be annoying to some people which may result in stress and sleep disturbance." ¹⁹

An August 2009 peer reviewed article had already determined that "Wind turbines are a new source of community noise to which relatively few people have been exposed.... No generalized dose-response curves have yet been modeled for wind turbines primarily due the lack of results of published field studies....The need for guidelines for maximum exposure to wind turbine noise is urgent..." ²⁰

Rather than calling for the development of authoritative setbacks and noise guidelines based on independent third party clinical research Dr. King decided to invest approximately seven months to produce a 14 page literature review. Repetitive literature reviews are of little value when dealing with emerging technologies particularly when there is an acknowledged "...lack of results of published field studies." ²¹

On May 20, 2010, the Chief Medical Officer of Health of Ontario (CMOH) issued "The Potential Health Impacts of Wind Turbines May 2010" (CMOH Review).

In response, an analysis was conducted by The Society for Wind Vigilance of the CMOH Review. Details of the analysis are included in Tables 1 to 10 of this document.

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The summary and related points cover a broad spectrum of claims. For convenience the remainder of the analysis and critique is done in a tabulated format of point - counter point. The volume of material necessitated this approach and hopefully will enhance the clarity of the critique being put forward.

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PRINCIPLE FINDINGS

The CMOH Review is a document fraught with inaccuracies, contradictions and misinformation:

Specifically the CMOH Review

- is not a study: it is an incomplete literature review.
- contains conclusions which contradict the content of the CMOH Review.
- contains conclusions which contradict listed and cited references.
- contains conclusions which contradict authoritative research on noise and health including that of the World Health Organization.
- contains conclusions which have no references to support their scientific validity.
- displays selective bias in the presentation of the referenced material.
- displays selective bias by omission of relevant references including recent research on issues related to noise and health.
- contains misleading statements.
- contains statements without appropriate supporting references.
- exhibits a deficient understanding of Ontario setback regulations and noise guidelines for wind turbines.
- exhibits a deficient understanding of the authoritative research and noise guidelines of the World Health Organization.

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CONCLUSIONS

- 1. The CMOH Report is a literature review with no original research.
- 2. There are a number of errors of commission and omission.
- 3. The reality of global reports of adverse health effects has not been addressed.
- 4. The report does acknowledge the World Health Organization as a definitive authority broadly writ as well as on the subject of community noise.
- 5. Crucial evidence gaps remain unaddressed but paradoxically the widely affirmed and urgent need for further research is not acknowledged.
- The Society of Wind Vigilance expresses both its surprise and disappointment with the quality of the CMOH's report. The victims deserve consideration not denial.

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DETAILED ANALYSIS

The following tables contain a detailed analysis of the CMOH Paper in a point-counter-point format.

The method utilized was to excerpt each of the claims and place it in the context of authoritative and contrary information. In addition an effort has been made to identify the errors of omission as well as those of commission.

The analysis is presented in 10 tables grouped by topic:

- Table 1 Analysis of CMOH Review Conclusions
- Table 2 Analysis of Research Gaps
- Table 3 Analysis of CMOH Review Summary and Introduction
- Table 4 Analysis of CMOH Review Section on Sound and Noise
- Table 5 Analysis of CMOH Review Section on Low Frequency Sound, Infrasound
- Table 6 Analysis of CMOH Review Section on Vibro-Acoustic Disease
- Table 7 Analysis of CMOH Review Section on Shadow Flicker
- Table 8 Analysis of CMOH Review Section on Ice Throw and Structural Hazards
- Table 9 Analysis of CMOH Review Section on Setbacks
- Table 10 Analysis of CMOH Review Section on Community Consultation

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| 71 | Table 1 |
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| Reference | Analysis of CMOH Review Conclusions |
| nce | CMOH Review contents in <i>italics</i> |
| | SWV Analysis in non italics |
| 1 | CMOH Review statement (Conclusions - page 10): |
| | "While some people living near wind turbines report symptoms such as dizziness, headaches, and sleep disturbance, the scientific evidence available to date does not demonstrate a direct causal link between wind turbine noise and adverse health effects." |
| | SWV Analysis |
| | The above stated conclusion contradicts relevant references including those contained in the CMOH Review. |
| | The CMOH Review conclusion directly contradicts an October 21 2009 memorandum issued by Dr Arlene King. The memorandum addressed to Medical Officers of Health and Environmental Health Directors states: |
| | "sound produced by wind turbines is sometimes found to be annoying to some people which may result in stress and sleep disturbance." ²² |
| | Recent literature reviews on wind turbines ²³ , ²⁴ , ²⁵ , ²⁶ acknowledge that wind turbine noise may cause annoyance, stress and sleep disturbance. |
| | "The sound level associated with wind turbines at common residential setbacks is not sufficient to damage hearing, but may lead to annoyance and sleep disturbance." ²⁷ and evidence demonstrates "Annoyance and sleep disruption are common when sound levels are 30 to 45 dBA." ²⁸ |
| | The American Wind Energy Association and Canadian Wind Energy Association sponsored literature review entitled "Wind Turbine Sound and Health Effects" acknowledges wind turbine noise, including low frequency noise, may cause annoyance, stress and sleep disturbance and as a result people may experience adverse physiological and psychological symptoms. ²⁹ |

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| Reference | Analysis of CMOH Review Conclusions |
| nce | CMOH Review contents in <i>italics</i> SWV Analysis in non italics |
| | This wind industry sponsored review does not deny that the symptoms reported by individuals could be caused by wind turbine noise and elaborates by stating that these "symptoms are not new and have been published previously in the context of "annoyance" to environmental sounds The following symptoms are based on the experience of noise sufferers extending over a number of years: distraction, dizziness, eye strain, fatigue, feeling vibration, headache, insomnia, muscle spasm, nausea, nose bleeds, palpitations, pressure in the ears or head, skin burns, stress, and tension" ³⁰ |
| | Geoff Leventhall, an author of the wind industry sponsored review, reportedly elaborated : |
| | " there was no doubt people living near the turbines suffered a range of symptoms, including abnormal heart beats, sleep disturbance, headaches, tinnitus, nausea, visual blurring, panic attacks and general irritabilityit's ruining their lives – and it's genuine" 31 |
| | Studies of European wind turbine facilities have consistently concluded that wind turbine noise is more annoying than equally loud noise sources such as airport and traffic noise. ³² , ³³ , ³⁴ , ³⁵ |
| | Contrary to the conclusion of the CMOH Review there exists a consensus that acknowledges a direct causal link between wind turbine noise and adverse health effects such as dizziness, headaches, and sleep disturbance. |
| | The SWV will expand on these acknowledgements in the following sections. See discussion in SWV Analysis Table 1 References 2 and 3. |
| 2 | CMOH Review statement (Conclusions - page 10): |
| | "The sound level from wind turbines at common residential setbacks is not sufficient to cause hearing impairment or other direct adverse health |

effects. However, some people might find it annoying. It has been suggested that annoyance may be a reaction to the characteristic

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Analysis of CMOH Review Conclusions

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"swishing" or fluctuating nature of wind turbine sound rather than to the intensity of sound."

SWV Analysis

This CMOH Review conclusion contradicts the findings of peer reviewed research and articles.

"Health Canada advises...that there are peer-reviewed scientific articles indicating that wind turbines may have an adverse impact on human health." ³⁶

World Health Organization recognizes annoyance and sleep disturbance as adverse health effects of noise. ³⁷, ³⁸ These direct adverse health effects of noise are acknowledged to have other potential consequences.

Annoyance contributes to stress ³⁹, sleep disturbance ⁴⁰ and an increased risk of regulation diseases. ⁴¹

Acknowledged consequences of sleep disturbance include poor performance at work, fatigue, memory difficulties, concentration problems, motor vehicle accidents, mood disorders (depression, anxiety), alcohol and other substance abuse, cardiovascular, respiratory, renal, gastrointestinal, musculoskeletal disorders, obesity, impaired immune system function and a reported increased risk of mortality. 42

The CMOH Review acknowledges the authority of World Health Organization and thereby contradicting itself by acknowledging wind turbine noise causes annoyance while at the same time denying any direct adverse health effects.

The CMOH Review is misleading as it suggests the sound level from wind turbines at common residential setbacks is not sufficient to cause direct adverse health effects.

"The sound level associated with wind turbines at common residential

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| nce | CMOH Review contents in <i>italics</i> SWV Analysis in non italics |
| | setbacks is not sufficient to damage hearing, but may lead to annoyance and sleep disturbance." 43 |
| | There is no definition of "wind turbines at common residential setbacks". |
| | Wind turbine noise limits are generally used to determine residential setbacks and noise limits vary by jurisdiction. 44 |
| | It is acknowledged that wind turbine noise limits of 40 dBA may cause annoyance and sleep disturbance ⁴⁵ and evidence demonstrates "Annoyance and sleep disruption are common when sound levels are 30 to 45 dBA." ⁴⁶ |
| | The CMOH Review acknowledges that sound pressure levels above "40 dB" are known to cause adverse health effects. ⁴⁷ |
| | Ontario noise guidelines permit wind turbine noise limits to exceed 50 dBA 24 hours as day. 48, 49, 50, 51, 52 |
| | The CMOH Review must revise their conclusion to state sound level from wind turbines is sufficient to cause direct adverse health effects including annoyance, stress and sleep disturbance. |
| | The CMOH Review demonstrates lack of understanding of noise management by concluding that annoyance from wind turbine noise is not a reaction to the intensity of sound (sound pressure level). |
| | This contradicts the CMOH Review statement that "The impact of sound on health is directly related to its pressure level." 53 |
| | According to World Health Organization "The capacity of a noise to induce annoyance depends upon its physical characteristics, including the sound pressure level, spectral characteristics and variations of these properties with time." ⁵⁴ |

The most comprehensive of three studies of European wind turbines

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| Reference | Analysis of CMOH Review Conclusions |
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| | facilities found a stronger relationship between emission levels of wind turbine noise and annoyance than previous studies. 55 The study concluded: |
| | "The probability of being annoyed by wind turbine sound increased with increasing levels of wind turbine sound." and that more sound mitigation should be considered. 56 |
| | To protect against adverse health effects noise level limits "should be based on annoyance responses to noise." 57 |
| | Furthermore the CMOH Review acknowledges that wind turbine low frequency noise may cause annoyance. ⁵⁸ (See discussion in SWV Analysis Table 1 Reference 3) |
| | The effects of low frequency induced noise annoyance and stress can be serious. "The claim that their "lives have been ruined" by the noise is not an exaggeration," 59 |
| | Ontario has established an environmental noise limit of 40 dBA. ⁶⁰ "For industrial sources in quiet areas in Ontario the regulated noise limit is 40 dBA at the property line of the nearest noise sensitive receptor." ⁶¹ |
| | Current Ontario guidelines for wind turbine permit, in principle, up to 51 dBA at the noise receptor such as family home. ⁶² , ⁶³ |
| | According to Ontario Minister of the Environment John Gerrestsen: |
| | "The 40 decibel standard is the accepted noise standard not just for wind turbines but for the amount of noise that people can subject other people to without them having to put mitigating measures into place in issues other than wind turbines." ⁶⁴ |
| | To protect people from the adverse health effect of noise annoyance World Health Organization states "Noise with low-frequency components require lower guideline values." 65 |

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Logic dictates that the permitted wind turbine noise should be less than the established regulated noise limit of 40 dBA in order to protect humans from the adverse effects of wind turbine low frequency noise. The exact opposite has occurred and Ontario guidelines for wind turbine noise permit families to be exposed to wind turbine sound pressure levels of up to 53 dBA. ⁶⁶, ⁶⁷ Current Ontario guidelines for wind turbine noise permit, in principle, up to 51 dBA. ⁶⁸, ⁶⁹

The CMOH Review also acknowledges "annoyance may be a reaction to the characteristic "swishing" or fluctuating nature of wind turbine sound." This is commonly referred to as amplitude modulation.

The CMOH Review neglects to mention that a UK report documented sleep disturbance caused by wind turbine amplitude modulation and recommended a penalty adjustment to noise guidelines to protect the local population. ⁷⁰ Other researchers believe a penalty should be considered for wind turbine noise. ⁷¹

It is relevant to note that for other sources of noise Ontario specifies a +5 dB adjustment for a project that contains "an audible cyclic variation in sound level such as beating or amplitude modulation", but notably this adjustment is not applied to Ontario wind turbines. ⁷²

Yet another example of wind turbine noise polluters being permitted to circumvent established noise guidance.

On page 8 of the CMOH Review the reader is given the impression that Ontario's is an international leader in wind turbine noise regulations and guidelines. ⁷³ The reality is wind turbine developers can subject Ontario families to noise levels up to 53 dBA while families in British Columbia or South Australia would be limited to 40dBA and 35 dBA respectively. ⁷⁴

Ontario has systematically circumvented established noise guidance including its own existing standards.

Ontario guidelines for wind turbine noise are measured at noise receptors

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| Reference | Analysis of CMOH Review Conclusions |
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| | such as family homes. The SWV notes that wind turbine noise limits must be applied at the property line of non-participating land owners in order to protect humans from acknowledged adverse health effects such as annoyance and stress. |
| | Authoritative noise management principles dictate that wind turbine noise limits should be less than other sources of noise. The exact opposite has occurred in Ontario. Ontario guidelines permit wind turbines noise to exceed the limits established for other community noise sources. The tragic outcome is Ontario families are reporting suffering adverse health effects and in some cases compelled to abandon their homes. |
| 3 | CMOH Review statement (Conclusions - page 10): |
| | "Low frequency sound and infrasound from current generation upwind model turbines are well below the pressure sound levels at which known health effects occur. Further, there is no scientific evidence to date that vibration from low frequency wind turbine noise causes adverse health effects." |
| | SWV Analysis |
| | The above stated conclusion contradicts relevant references including those contained in the CMOH Review. |
| | The above stated conclusion is not supported the contents of the CMOH Review. |
| | Wind turbines emit audible and inaudible low frequency noise. 75, 76 |
| | Audible low frequency noise may cause adverse health effects. 77, 78 |
| | As stated earlier annoyance is an adverse health effect. 79, 80 |
| | The CMOH Review acknowledges that wind turbine low frequency noise may cause annoyance. 81 |

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| Reference | Analysis of CMOH Review Conclusions |
| enc | CMOH Review contents in <i>italics</i> |
| Ф | SWV Analysis in non italics |
| | The American Wind Energy Association and Canadian Wind Energy Association sponsored literature review entitled "Wind Turbine Sound and Health Effects" acknowledges wind turbine low frequency noise, may cause annoyance and " in the context of "annoyance" to environmental sounds The following symptoms are based on the experience of noise sufferers extending over a number of years: distraction, dizziness, eye strain, fatigue, feeling vibration, headache, insomnia, muscle spasm, nausea, nose bleeds, palpitations, pressure in the ears or head, skin burns, stress, and tension" 82 |
| | The effects of low frequency noise induced annoyance and stress may be serious and it is acknowledged that "The claim that their "lives have been ruined" by the noise is not an exaggeration" 83 |
| | It is acknowledged that "LFN (low frequency noise) does not need to be considered "loud" for it to cause such forms of annoyance and irritation." 84 |
| | Some of the documented effects of low frequency noise induced annoyance include task performance deterioration, reduced wakefulness, sleep disturbance, headaches, and irritation. 85 |
| | "Unlike higher frequency noise issues, LFN is very difficult to suppress. Closing doors and windows in an attempt to diminish the effects sometimes makes it worse because of the propagation characteristics and the low-pass filtering effect of structures. Individuals often become irrational and anxious as attempts to control LFN fail, serving only to increase the individual's awareness of the noise, accelerating the above symptoms" ⁸⁶ |
| | World Health Organization advises that "Health effects due to low-frequency components in noise are estimated to be more severe than for community noises in generalThe evidence on low-frequency noise is sufficiently strong to warrant immediate concern." and consequently "Noise with low-frequency components require lower guideline values." ⁸⁷ |

Regarding low frequency noise sufferers: "Those exposed may adopt

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protective strategies, such as sleeping in their garage if the noise is less disturbing there. Or they may sleep elsewhere, returning to their own homes only during the day." 88

The SWV is in contact with Ontario residents who have resorted to sleeping in a tent or their car to escape the wind turbine noise that has invaded their home. This cannot be denied.

A Minnesota Department of Health report on health impacts of wind turbines stated in its conclusion that "Most available evidence suggests that reported health effects are related to audible low frequency noise." 89

In a 2009 Environmental Review Report for an Ontario wind turbine project the consultant acknowledged that regarding wind turbine infrasound and adverse health effects "...it is recognized that this be an area of scientific uncertainty." ⁹⁰ The same report also stated with regards to wind turbine low frequency noise (LFN) and adverse health effects "It is acknowledged that LFN may be one area of scientific uncertainty in the wind industry as a whole." ⁹¹

The National Research Council concurs: "Low-frequency vibration and its effects on humans are not well understood. Sensitivity to such vibration resulting from wind-turbine noise is highly variable among humans.... studies on human sensitivity to very low frequencies are recommended." ⁹²

It is incorrect to assume that inaudible low frequency (infrasound) noise cannot cause adverse health effects since peer reviewed studies have demonstrated "...non-aural physiological and psychological effects may be caused by levels of low frequency noise below the individual hearing threshold." 93

"Low-frequency noise may also produce vibrations and rattles as secondary effects." 94

"Although infrasound levels from large turbines at frequencies below 20 Hz are too low to be audible, they may cause structural elements of buildings

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| Reference | Analysis of CMOH Review Conclusions |
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| | to vibrate." 95 |
| | A NASA technical paper on wind turbine noise states "People who are exposed to wind turbine noise inside buildings experience a much different acoustic environment than do those outsideThey may actually be more disturbed by the noise inside their homes than they would be outsideOne of the common ways that a person might sense the noise-induced excitation of a house is through structural vibrations. This mode of observation is particularly significant at low frequencies, below the threshold of normal hearing." ⁹⁶ |
| | The CMOH Review acknowledges The Ministry of the Environment has recently hired independent consultants "to develop recommendations regarding low frequency sound." |
| | More appropriately, as stated in a January, 2010 request for proposal, The Ministry of Environment is soliciting assistance in "determining how or whether to regulate low frequency noise emissions from wind turbines." ⁹⁷ |
| | In other words The Ministry of Environment does not know what it is doing. Meanwhile development of industrial wind turbines facilities continues in Ontario. |
| 4 | CMOH Review statement (Conclusions - page 10): |
| | "Community engagement at the outset of planning for wind turbines is important and may alleviate health concerns about wind farms." |
| | SWV Analysis |
| | The CMOH Review does not provide any scientific basis for this conclusion. This policy statement contributes no insight into the issue of protecting human health from wind turbine noise exposure. |

noise regulation results in low negative impact to the community. 98

Strong noise regulation is the foundation for health protection. Weak or no noise regulation results in high negative impact to the community. Strong

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| | The SWV notes that unless authoritative wind turbines regulations and noise guidelines are developed based on independent third party clinical research the risk to public health will continue to exist. No amount of "community engagement" will negate this scientific certainty. |
| | The CMOH Review does discuss the consultative process incorporated in the Green Energy Act and regulations. |
| | In a media report Mr. George Smitherman, then Minister of Energy and Infrastructure, is reported to have pronounced "We passed a law, and the law does not create an opportunity for municipalities to resist these projects just because they may have a concern." ⁹⁹ |
| | Mr. Smitherman's reported pronouncement demonstrates the lack of sincerity incorporated into the community consultation described in section 3.2 of the CMOH Review. |
| | The SWV has no further comment. |
| 5 | CMOH Review statement (Conclusions - page 10): |
| | "Concerns about fairness and equity may also influence attitudes towards wind farms and allegations about effects on health. These factors deserve greater attention in future developments." |
| | SWV Analysis |
| | See discussion in SWV Analysis Table 1 Reference 4 regarding "community engagement". |
| | The SWV has no further comment. |

| | Table 2 |
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| Reference | Analysis of Research Gaps |
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| 6 | CMOH Review statement (Introduction - page 4): |
| | "Are there data gaps or research needs?" |
| | SWV analysis |
| | The CMOH Review does not contain a section which summarizes the acknowledged research gaps. |
| | The SWV has compiled a list of acknowledged research gaps identified in various references including references listed in the CMOH Review. |
| | Urgently needed: guidelines for maximum exposure limits to wind turbine noise 100 |
| | Dose-response data from published field studies 101 |
| | Research into other potential adverse health effects such as diabetes and annoyance 102 |
| | Research into health effect of low frequency sound 103, 104, 105, 106 |
| | Improved sound modelling techniques 107, 108 |
| | Scientific methods to measure wind turbine noise 109, 110 |
| | Research on wind turbine induced sleep disturbance 111, 112, 113, 114, |
| | Research setbacks to prevent injury from ice throws 116, 117 |

Research setbacks to prevent injury from structural hazard 118

| Reference | Table 2 Analysis of Research Gaps CMOH Review contents in <i>italics</i> SWV Analysis in non italics |
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| | Epidemiological studies on humans 119, 120 |
| | Research into wind turbine amplitude modulation 121, 122 |
| | Research into the health effects associated with wind turbine visual effects such as shadow flicker 123 |
| | Stress-induced health effects from noise, visual impact, shadow flicker 124 |
| | Sound measurements at residential areas around wind turbines and comparisons with sound levels around other rural and urban areas, to assess actual ambient noise levels prevalent in Ontario 125 |
| | Assessment of noise levels around wind power developments and other residential environments, including monitoring for sound level compliance 126 |

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7 | CMOH Review statement (Summary of Review – page 3):

"The review concludes that while some people living near wind turbines report symptoms such as dizziness, headaches, and sleep disturbance, the scientific evidence available to date does not demonstrate a direct causal link between wind turbine noise and adverse health effects."

SWV analysis

The above statement contradicts relevant references including those contained in the CMOH Review.

See discussion in SWV Analysis Table 1 Reference 1.

8 | CMOH Review statement (Introduction – page 4):

"In general, published papers in peer-reviewed scientific journals, and reviews by recognized health authorities such as the World Health Organization (WHO) carry more weight in the assessment of health risks than case studies and anecdotal reports."

SWV analysis

The Society for Wind Vigilance concurs with the CMOH Review on this statement. World Health Organization guidance on noise and health is authoritative and must be adhered to in order to protect human health.

This acknowledgement by the CMOH Review puts to rest the wind energy industry's position that World Health Organization standards regarding community noise are irrelevant to industrial wind turbine regulations. ¹²⁷

SWV notes that the CMOH Review does cite Night Noise Guidelines for Europe, 2009 but neglects to cite World Health Organization, Guidelines

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for Community Noise, 1999 – a conspicuous omission.

The 2009 Night Noise Guidelines for Europe states:

"...Night noise guidelines for Europe complements the 1999 guidelines. This means that the recommendations on government policy framework on noise management elaborated in the 1999 guidelines should be considered valid and relevant for the Member States to achieve the guideline values of this document." ¹²⁸

For example the 2009 guidelines state adverse health effects occur at sound pressure levels above 40 dB but also stipulates:

"Closer examination of the precise impact will be necessary in the range between 30 dB and 55 dB as much will depend on the detailed circumstances of each case." 129

Wind turbine noise is more annoying than other sources of noise. 130 , 131 , 132 , 133

World Health Organization, Guidelines for Community Noise, 1999 states noise level limits "...should be based on annoyance responses to noise." 134

The CMOH review acknowledges that low frequency components and the fluctuating nature of the wind turbine noise contribute to the high level of annoyance.

Therefore, "Noise with low-frequency components require lower guideline values." 135

World Health Organization, Guidelines for Community Noise, 1999 specifies that lower guideline values are required for noise sources which fluctuate and have low frequency components. 136

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Reference

Analysis of CMOH Review Summary and Introduction

Table 3

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Based on World Health Organization guidance on noise management and health protection the World Health Organization 2009 guideline of 40 dB is too high for wind turbine noise.

9 | CMOH Review statement (2.1 Overview – page 5):

"The researcher (Pierpont) suggested that the symptoms were related to wind turbine noise, particularly low frequency sounds and infrasound, but did not investigate the relationships between noise and symptoms. It should be noted that no conclusions on the health impact of wind turbines can be drawn from Pierpont's work due to methodological limitations including small sample size, lack of exposure data, lack of controls and selection bias."

SWV analysis

It is relevant to note that the American Wind Energy Association and Canadian Wind Energy Association sponsored report entitled "Wind Turbine Sound and Health Effects" critiqued Dr Pierpont's published case studies and did not deny that the symptoms reported may be caused by wind turbine noise.

The wind industry sponsored report disputes the mechanism of action offered by Dr. Pierpont and concludes "wind turbine syndrome" symptoms are not new and have been published previously in the context of "annoyance" to environmental sounds The following symptoms are based on the experience of noise sufferers extending over a number of years: distraction, dizziness, eye strain, fatigue, feeling vibration, headache, insomnia, muscle spasm, nausea, nose bleeds, palpitations, pressure in the ears or head, skin burns, stress, and tension..." ¹³⁷

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Reference

Analysis of CMOH Review Section on Sound and Noise

CMOH Review contents in *italics* SWV Analysis in non italics

10 CMOH Review statement (2.2. Sound and Noise – page 5):

"The dominant sound source from modern wind turbines is aerodynamic, produced by the rotation of the turbine blades through air. The aerodynamic noise is present at all frequencies, from infrasound to low frequency to the normal audible range, producing the characteristic "swishing" sound."

SWV analysis

This CMOH Review statement does not provide the reader context regarding the unique characteristics of wind turbine noise.

An informative description of wind turbine noise offers the reader context.

For example:

"Sound generated by wind turbines has particular characteristics and it creates a different type of nuisance compared to usual urban, industrial, or commercial noise." 138

"...wind turbine noise is easily perceived and compared to sounds from other community sources relatively annoying." 139

See discussion in SWV Analysis Table 1 References 2 and 3 regarding the effects of wind turbine amplitude modulation and low frequency noise.

11 | CMOH Review statement (2.2. Sound and Noise – page 5):

"Environmental sound pressure levels are most commonly measured using an A-weighted scale. This scale gives less weight to very low and very high frequency components that is similar to the way the human ear perceives sound."

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Analysis of CMOH Review Section on Sound and Noise

CMOH Review contents in *italics* SWV Analysis in non italics

SWV analysis

The CMOH Review acknowledges that wind turbine low frequency may cause annoyance.

The effects of low frequency induced noise induce annoyance and stress can be serious. "The claim that their "lives have been ruined" by the noise is not an exaggeration..." 140

Some of the documented effects of low frequency noise induced annoyance include task performance deterioration, reduced wakefulness, sleep disturbance, headaches, and irritation. ¹⁴¹

"Since A-weighting underestimates the sound pressure level of noise with low-frequency components, a better assessment of health effects would be to use C-weighting." ¹⁴² Consequently the A-weighted scale is not appropriate to protect humans from the adverse health effects associated with low frequency noise induced annoyance. ¹⁴³, ¹⁴⁴

Ontario wind turbine noise guidelines are based on the A-weighted scale and consequently are not effective at protecting humans from the adverse effects of low frequency noise. 145

See discussion in SWV Analysis Table 1 Reference 3 regarding wind turbine low frequency noise.

12 | CMOH Review statement (2.2. Sound and Noise – page 5):

"Current requirements for wind turbine setbacks in Ontario are intended to limit noise at the nearest residence to 40 dB ... This is a sound level comparable to indoor background sound. This noise limit is consistent with the night-time noise guideline of 40 dB that the World Health Organization

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Reference

Table 4

Analysis of CMOH Review Section on Sound and Noise

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(WHO) Europe recommends for the protection of public health from community noise."

SWV analysis

The CMOH Review statement is misleading.

Ontario regulations permit wind energy developers to move wind turbines closer to receptors if they comply with Ontario noise guidelines for industrial wind turbines. 146

Ontario noise guidelines for industrial wind turbines permit families to be exposed to up 53 dBA of industrial noise pollution 24 hours a day. 147, 148

Current Ontario guidelines for industrial wind turbines permit, in principle, up to 51 dBA. ¹⁴⁹, ¹⁵⁰ These noise levels are significant as an increase of 10 dBA is a 10-fold increase in acoustic energy.

Based on World Health Organization guidance on noise management and health protection the 2009 guideline of 40 dB is too high for wind turbine noise.

See discussion in SWV Analysis Table 1 References 2 and 3 regarding World Health Organization guidance on noise management and health.

13 CMOH Review statement (2.2. Sound and Noise – page 5):

"Studies in Sweden and the Netherlands (Pedersen et al. 2009, Pedersen and Waye 2008, Pedersen and Waye 2007, Pedersen and Waye 2004) have found direct relationships between modelled sound pressure level and self-reported perception of sound and annoyance..."

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Analysis of CMOH Review Section on Sound and Noise

CMOH Review contents in *italics* SWV Analysis in non italics

SWV analysis

This CMOH Review statement does not provide the reader context regarding the findings of these studies.

Relevant findings of these studies omitted in the CMOH Review include but are not limited to:

"Perhaps the main finding is that wind turbine sound is relatively annoying, more so than equally loud sound from aircraft or road traffic. A swishing character is perceived by most respondents, indicating that this is an important characteristic of wind turbine sound. Sound should therefore receive more attention in the planning of wind farms, and (more) sound mitigation measures must be considered." ¹⁵¹

"Annoyance with wind turbine noise was associated with psychological distress, stress, difficulties to fall asleep and sleep interruption." 152

"The study confirms that wind turbine noise is easily perceived and compared to sounds from other community sources relatively annoying." 153

Currently there is no health based generalized dose-response relationship developed to avoid possible adverse health effects from wind turbine noise exposure. 154

"The need for guidelines for maximum exposure to wind turbine noise is urgent:" 155 in order to avoid possible adverse health effects.

See discussion in SWV Analysis Table 1 References 2 and 3.

14 | CMOH Review statement (2.2. Sound and Noise – page 5):

"Available scientific data indicate that sound levels associated with wind turbines at common residential setbacks are not sufficient to damage

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Analysis of CMOH Review Section on Sound and Noise

CMOH Review contents in *italics* SWV Analysis in non italics

hearing or to cause other direct adverse health effects, but some people may still find the sound annoying."

SWV analysis

This statement contradicts the findings of peer reviewed research and articles.

There is no reference provided to support this statement.

This CMOH statement contradicts references contained in the review.

See discussion in SWV Analysis Table 1 Reference 2.

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Reference

Analysis of CMOH Review Section on Low Frequency Sound, Infrasound and Vibration

CMOH Review contents in *italics* SWV Analysis in non italics

15 CMOH Review statement (2.2.1 Low Frequency Sound, Infrasound and Vibration -page 6):

"There is no scientific evidence, however, to indicate that low frequency sound generated from wind turbines causes adverse health effects."

SWV analysis

The above statement contradicts relevant references including those contained in the CMOH Review.

This CMOH statement contradicts its own contents as the Review acknowledges that wind turbine low frequency noise may cause annoyance.

See discussion in SWV Analysis Table 1 Reference 3.

16 CMOH Review statement (2.2.1 Low Frequency Sound, Infrasound and Vibration -page 6):

"Concerns have been raised about human exposure to "low frequency sound" and "infrasound" (see section 2.2 for definitions) from wind turbines. There is no scientific evidence, however, to indicate that low frequency sound generated from wind turbines causes adverse health effects.

Low frequency sound and infrasound are everywhere in the environment. They are emitted from natural sources (e.g., wind, rivers) and from artificial sources including road traffic, aircraft, and ventilation systems. The most common source of infrasound is vehicles. Under many conditions, low frequency sound below 40Hz from wind turbines cannot be distinguished from environmental background noise from the wind itself (Leventhall 2006, Colby et al 2009).

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Reference

Table 5

Analysis of CMOH Review Section on Low Frequency Sound, Infrasound and Vibration

CMOH Review contents in *italics* SWV Analysis in non italics

Low frequency sound from environmental sources can produce annoyance in sensitive people, and infrasound at high sound pressure levels, above the threshold for human hearing, can cause severe ear pain. There is no evidence of adverse health effects from infrasound below the sound pressure level of 90dB (Leventhall 2003 and 2006).

Studies conducted to assess wind turbine noise indicate that infrasound and low frequency sounds from modern wind turbines are well below the level where known health effects occur, typically at 50 to 70dB.

A small increase in sound level at low frequency can result in a large increase in perceived loudness. This may be difficult to ignore, even at relatively low sound pressures, increasing the potential for annoyance. (Jakobsen 2005, Leventhall 2006)."

SWV analysis

There are peer-reviewed studies showing that infra and low frequency sound can cause adverse health effects, especially when dynamically modulated. The extent to which infra and low frequency noise from wind turbines inside or outside homes causes adverse effects upon the human body remains an open question ¹⁵⁶, ¹⁵⁷, ¹⁵⁸, ¹⁵⁹ - there is no settled medical science on this issue as of yet.

See discussion in SWV Analysis Table 1 Reference 3 regarding wind turbine low frequency noise.

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Reference

Analysis of CMOH Review Section on Vibro-Acoustic Disease

CMOH Review contents in *italics* SWV Analysis in non italics

17 CMOH Review statement (page 7):

"A Portuguese research group (Alves-Pereira and Castelo Branco 2007) has proposed that excessive long term exposure to vibration from high levels of low frequency sound and infrasound can cause whole body system pathology (vibro-acoustic disease). This finding has not been recognized by the international medical and scientific community."

SWV analysis

The CMOH Review provides no basis for their assertion "This finding has not been recognized by the international medical and scientific community."

Castelo Branco and Alves Pereira have published numerous peer reviewed articles in international journals. A search on Pubmed using "vibroacoustic disease" as the search criteria resulted in 36 individual articles on vibroacoustic disease. ¹⁶⁰

The peer reviewed "Night Noise Guidelines for Europe 2009" World Health Organization cites Castello Branco and Alves-Pereira's research on "vibroacoustic disease". 161

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Analysis of CMOH Review Section on Shadow Flicker

CMOH Review contents in *italics* SWV Analysis in non italics

18 | CMOH Review statement (2.3 Other Potential Health Hazards of Wind Turbines – page 7):

"Shadow flicker occurs when the blades of a turbine rotate in sunny conditions, casting moving shadows on the ground that result in alternating changes in light intensity appearing to flick on and off. About 3 per cent of people with epilepsy are photosensitive, generally to flicker frequencies between 5-30Hz. Most industrial turbines rotate at a speed below these flicker frequencies."

SWV analysis

The CMOH Review's review of shadow flicker is incomplete and demonstrates a deficient understanding of the adverse effects associated with wind turbine shadow flicker.

The CMOH Review's neglects to disclose relevant knowledge from references cited elsewhere in the CMOH Review.

According to the World Health Organization wind turbines have noise and visual burdens. 162

The National Research Council states "...wind-energy projects create negative impacts on human health and well-being, the impacts are experienced mainly by people living near wind turbines who are affected by noise and shadow flicker." ¹⁶³

Rotating wind turbine blades interrupt the sunlight producing unavoidable flicker bright enough to pass through closed eyelids, and moving shadows cast by the blades on windows can affect illumination inside buildings. ¹⁶⁴ This effect is commonly known as shadow flicker.

Wind turbine shadow flicker has the potential to induce photosensitive epilepsy seizures however the risk is low with large modern models and if

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Reference

Table 7

Analysis of CMOH Review Section on Shadow Flicker

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proper planning is adhered to. ¹⁶⁵ Planning should ensure the flash frequency does not exceed three per second, and the shadows cast by one turbine on another should not have a cumulative flash rate exceeding three per second. ¹⁶⁶

Other acknowledged wind turbine visually induced adverse health effects include annoyance and or stress. ¹⁶⁷, ¹⁶⁸, ¹⁶⁹, ¹⁷⁰, ¹⁷¹, ¹⁷², ¹⁷³

"...shadow flicker can be an issue both indoors and outdoors when the sun is low in the sky. Therefore, shadow flicker may be an issue in locations other than the home." 174

To mitigate risk to human health wind turbines should be sited to ensure people will not be adversely affected. For example in the northern hemisphere people located East-NE or WNW from the turbine must be protected from shadow flicker. ¹⁷⁵

Recommended shadow flicker setbacks for current wind turbine designs are 10 rotational diameters which would typically translate to approximately $800m - 900 \text{ m.}^{176}$

Greater setback distances may be required when wind turbines are sited on elevated ridges as the shadows can be cast over distances of several kilometres.

Wind turbine noise including low frequency noise may also contribute to the overall annoyance. 177

"Wind turbine noise is easily perceived and annoying even at low A-weighted SPLs....Wind turbines are furthermore prominent objects whose rotational movement attracts the eye. Multimodal sensory effects or negative aesthetic response could enhance the risk of annoyance. Adverse reactions could possibly lead to stress-related symptoms due to prolonged physiological arousal and hindrance to psychophysiological restoration." ¹⁷⁸

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Analysis of CMOH Review Section on Shadow Flicker

CMOH Review contents in *italics* SWV Analysis in non italics

Further investigation into the effects of wind turbine stressors including shadow flicker is required to assist in the development of authoritative guidelines designed to mitigate potential adverse health effects. ¹⁷⁹, ¹⁸⁰, ¹⁸¹, ¹⁸²

The CMOH Review makes no mention of these references or the findings documented within.

Currently there are no Ontario regulations to protect families from the adverse effects of shadow flicker inside or outside their homes.

See discussion on research gaps in SWV Analysis Table 2.

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Table 8

Analysis of CMOH Review Section on Ice Throw and Structural Hazards

CMOH Review contents in *italics* SWV Analysis in non italics

19 CMOH Review statement (2.3 Other Potential Health Hazards of Wind Turbines - page 7):

"Ice Throw and Ice Shed

Depending on weather conditions, ice may form on wind turbines and may be thrown or break loose and fall to the ground. Ice throw launched far from the turbine may pose a significant hazard. Ice that sheds from stationary components presents a potential risk to service personnel near the wind farm.

Sizable ice fragments have been reported to be found within 100 metres of the wind turbine. Turbines can be stopped during icy conditions to minimize the risk."

SWV analysis

The CMOH Review's discussion on ice throw is incomplete as it does not disclose that Ontario setbacks are not adequate to protect people or passing vehicles from the physical danger of ice throw.

CMOH Review acknowledges that sizable ice fragments have been reported to be found within 100 metres of the wind turbines.

"Ice throw...presents a potentially severe public hazard since the ice may be launched far from the turbine." and consequently is a "Physical danger to people or passing vehicles." ¹⁸³

Recommended setbacks for ice throw are 200 m to 350 m. 184

The CMOH Review does not mention that Ontario setbacks permit wind turbines to be situated within approximately 50 m (blade length plus 10 m)

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| | Table 8 |
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| Refer | Analysis of CMOH Review Section on Ice Throw and Structural Hazards |
| Reference | CMOH Review contents in <i>italics</i> SWV Analysis in non italics |
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| | of a public roads, ¹⁸⁵ railways ¹⁸⁶ and or non-participating property ¹⁸⁷ lines. |
| | The CMOH Review does not mention that more research is required into the risk of ice throw in regions where glaze ice is common as most research has focused on rime ice. ¹⁸⁸ |
| | See discussion on research gaps in SWV Analysis Table 2. |
| 00 | ONOU Deview etatament (0.0 Other Batantial Health Haranda at Mind |
| 20 | CMOH Review statement (2.3 Other Potential Health Hazards of Wind Turbines - page 7): |
| | "Structural hazards |
| | The maximum reported throw distance in documented turbine blade failure is 150 metres for an entire blade, and 500 metres for a blade fragment. Risks of turbine blade failure reported in a Dutch handbook range from one in 2,400 to one in 20,000 turbines per year (Braam et al 2005). Injuries and fatalities associated with wind turbines have been reported, mostly during construction and maintenance related activities." |
| | SWV analysis |
| | The CMOH Review's discussion on structural hazards is incomplete as it does not disclose that Ontario setbacks are not adequate to protect people or passing vehicles from the physical danger of structural failure. |
| | CMOH Review does not mention: |
| | Wind turbine "structural failure is potentially fatal" and is a "physical danger to people or passing vehicles" ¹⁸⁹ |

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"Although most turbines are designed to withstand temperatures as low as

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Table 8

Analysis of CMOH Review Section on Ice Throw and Structural Hazards

CMOH Review contents in *italics* SWV Analysis in non italics

−20 to −40°C, structural materials can be compromised by extreme cold. Cold stress can cause steel and/or composite components to crack or deform, interfere with electrical equipment, or damage moving parts in the gearbox increasing the risk of turbine failure." ¹⁹⁰

Recommended setbacks for structural failure are 150 m to 500 m. 191

CMOH Review does not mention that Ontario setbacks permit wind turbines to be situated within approximately 50 m (blade length plus 10 m) of a public roads, ¹⁹² railways ¹⁹³ and or non-participating property ¹⁹⁴ lines.

See discussion on research gaps in SWV Analysis Table 2.

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Table 9

Analysis of CMOH Review Section on Setbacks

CMOH Review contents in *italics* SWV Analysis in non italics

21 CMOH Review statement (3.1 Setbacks – page 8):

"Provincial setbacks were established to protect Ontarians from potential health and safety hazards of wind turbines including noise and structural hazards."

SWV analysis

This SWV analysis presents references, including those cited by the CMOH Review, which demonstrate Ontario setbacks are not established to protect Ontarians from noise and structural hazards.

Ontario setbacks and noise guidelines for wind turbines do not adhere to the authoritative limits and guidance of World Health Organization.

Ontario noise guidelines for wind turbines systematically circumvent established Ontario noise standards for environmental noise pollution.

See discussion in SWV Analysis Table 1 References 2 and 3.

Ontario setbacks permit wind turbines to be situated within approximately 50 m (blade length plus 10 m) of a public roads, ¹⁹⁵ railways ¹⁹⁶ and or non-participating property ¹⁹⁷ lines.

Ontario setbacks for wind turbines do not adhere to protective setbacks for ice throw and structural hazards ¹⁹⁸ but rather have adopted setbacks developed by the Canadian Wind Energy Association. ¹⁹⁹

See discussion SWV Analysis Table 8 References 19 and 20 and research gaps in SWV Analysis Table 2.

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Table 9

Reference

Analysis of CMOH Review Section on Setbacks

CMOH Review contents in *italics* SWV Analysis in non italics

22 | CMOH Review statement (3.1 Setbacks – page 8):

"For example, a wind project with five turbines, each with a sound power level of 107dB, must have its turbines setback at a minimum 950 metres from the nearest receptor."

SWV analysis

This CMOH Review statement is incorrect, misleading and demonstrates an inability to comprehend the Ontario regulations for wind turbines.

Ontario regulations permit the wind energy developer to move wind turbines closer if the developer submits a report prepared in accordance with the publication of the Ministry of the Environment entitled "Noise Guidelines for Wind farms", dated October 2008, as amended from time to time and available from the Ministry.

According to Noise Guidelines for Wind Farms, Interpretation for Applying MOE NPC Publications to Wind Power Generation Facilities, Ministry of the Environment, October 2008. "These sound level limits range from the lowest value of 40 dBA for Class 3 Areas and wind speeds at or below 4 m/s to the maximum value of 51 dBA for wind speeds at or above 10 m/s."

The CMOH statement that the developer "must have its turbines setback at a minimum 950 metres from the nearest receptor." Is incorrect and misleading.

The only minimum setback that must be adhered to is 550m and even this can be circumvented in certain situations.

Current Ontario noise guidelines for industrial wind turbines permit, in principle, families to be exposed to up to 51 dBA of industrial noise pollution 24 hours a day. ²⁰², ²⁰³

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| | Table 9 |
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| Reference | Analysis of CMOH Review Section on Setbacks CMOH Review contents in <i>italics</i> SWV Analysis in non italics |
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| | It is acknowledged that wind turbine noise limits of 40 dBA may cause annoyance and sleep disturbance. ²⁰⁴ and evidence demonstrates "Annoyance and sleep disruption are common when sound levels are 30 to 45 dBA." ²⁰⁵ |
| 23 | CMOH Review statement (3.1 Setbacks – page 8): |
| | "Ontario used the most conservative sound modelling available nationally and internationally, which is supported by experiences in the province and in other jurisdictions (MOE 2009)." |
| | SWV analysis |
| | This CMOH statement is not worthy of an independent literature review. This statement is not supported by any peer reviewed or authoritative reference but rather a self promoting fact sheet produced by the Ministry of |

guidelines. ²⁰⁶
With this CMOH statement the reader is given the impression that Ontario's is an international leader in wind turbine noise regulations and guidelines. The reality is wind turbine developers can subject Ontario families to noise levels up to 53 dBA while families in British Columbia or

South Australia would be limited to 40dBA and 35 dBA respectively. 207

Environment, the Ministry responsible for the development of the noise

Wind turbines have been identified by MOE as a unique case that allows wind turbine noise emissions to increase with wind speed. This special consideration is permitted on the false premise that increased background wind noise will cause masking of the sound levels from the turbines.

Health Canada advises wind energy proponents to "...omit statements about noise masking as they can be misleading..." ²⁰⁸

Peer reviewed studies have confirmed "...that wind turbine noise is easily

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Table 9

Analysis of CMOH Review Section on Setbacks

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perceived..." 209 and difficult to mask. 210

Noise masking is complicated and is effective only if "...noises have the same frequency composition and if they actually occur at the same time." ²¹¹

The noise modeling used for Ontario wind projects does not represent a worst case scenario and as a result actual impact will exceeds that predicted. ²¹²

"Health Canada advises that noise monitoring be undertaken under varying climatic conditions in order to ensure that noise levels do not exceed the acceptable level, and if exceedences are identified, that appropriate mitigation be implemented to reduce the noise level to an acceptable level." ²¹³ The MOE Noise Guidelines for Wind Farms do not meet this standard.

MOE Noise Guidelines for wind turbines do not adhere to World Health Organization on noise management. For example World Health Organization states "When making environmental noise measurements it is important that the measurement sample is representative of all the variations in the noise in question including variations of the source and variations in sound propagation such as due to varying atmospheric conditions." ²¹⁴ The MOE Noise Guidelines for Wind Farms do not meet this standard. Wind turbine noise modeling is conducted using the assumption the 10°C temperature and 70% relative humidity. ²¹⁵

Ontario wind turbine noise guidelines have systematically circumvented established noise guidance including Ontario's own existing standards.

See discussion in SWV Analysis Table 1 Reference 2.

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Table 9

Analysis of CMOH Review Section on Setbacks

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24 | CMOH Review statement (3.1 Setbacks – page 8):

"As yet, a measurement protocol to verify compliance with the modelled limits in the field has not been developed. The Ministry of the Environment has recently hired independent consultants to develop a procedure for measuring audible sound from wind turbines and also to review low frequency sound impacts from wind turbines, and to develop recommendations regarding low frequency sound."

SWV analysis

This acknowledgement demonstrates Ontario's reckless approach to wind energy development.

For years Ontario guidelines for wind turbine have permitted families to be exposed to levels noise of up to 53 dBA. ²¹⁶, ²¹⁷

The Ministry of Environment acknowledges that it cannot determine if wind turbine noise emissions are in compliance.

Furthermore the CMOH Review acknowledges wind turbine low frequency noise may cause annoyance yet the Ministry of Environment has no guidelines to protect people from the adverse effects of low frequency noise annoyance.

25 CMOH Review statement (3.1 Setbacks – page 8):

"Ontario setback distances for wind turbine noise control also take into account potential risk of injury from ice throw and structural failure of wind turbines. The risk of injury is minimized with setbacks of 200 to 500 metres."

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Table 9

Analysis of CMOH Review Section on Setbacks

CMOH Review contents in *italics* SWV Analysis in non italics

SWV analysis

The above statement contradicts references contained in the CMOH Review.

This SWV analysis presents references, including those cited by the CMOH Review, which demonstrate Ontario setbacks are not established to protect Ontarians from noise and structural hazards.

Wind turbine ice throw and structural failure are potentially severe public hazards. Ice throw and structure failure are physical dangers to people or passing vehicles. ²¹⁸

Ontario setbacks permit wind turbines to be situated within approximately 50 m (blade length plus 10 m) of a public roads, ²¹⁹ railways ²²⁰ and or non-participating property ²²¹ lines.

Ontario setbacks for wind turbines do not adhere to protective setbacks for ice throw and structural hazards ²²² but rather have adopted setbacks developed by the Canadian Wind Energy Association. ²²³

See discussion SWV Analysis Table 8 References 19 and 20 and research gaps in SWV Analysis Table 2.

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Table 10

Analysis of CMOH Review Section on Community Consultation

CMOH Review contents in *italics* SWV Analysis in non italics

26 CMOH Review statement (3.2 Community Consultation - page 9):

"The applicant must also consult directly with local municipalities prior to applying for a Renewable Energy Approval on specific matters related to municipal lands, infrastructure, and services."

SWV analysis

In a media report Mr. George Smitherman, then Minister of Energy and Infrastructure, is reported to have pronounced:

"We passed a law, and the law does not create an opportunity for municipalities to resist these projects just because they may have a concern." 224

Mr. Smitherman's reported pronouncement demonstrates the lack of sincerity incorporated into the community consultation.

The SWV has no further comment.

See discussion in SWV Analysis Table 1 Reference 4.

Delay Denial and Disappointment
An Analysis of the Chief Medical Officer of Health (CMOH) of Ontario
"The Potential Health Impacts of Wind Turbines May 2010"

Delay Denial and Disappointment An Analysis of the Chief Medical Officer of Health (CMOH) of Ontario "The Potential Health Impacts of Wind Turbines May 2010"

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