

Ministry of the Environment
Guelph District Office

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April 9, 2010

MEMORANDUM

TO: Jane Glassco and Dave Bray
District Manager Supervisor
Guelph District Office Guelph District Office

FROM: Cameron Hall
Senior Environmental Officer, Guelph District Office

**Re: Comments - March 1, 2010 draft document, "Renewable Energy Approvals
Technical Bulletin Six Required Setbacks for Wind Turbines"**

I have reviewed the subject document per your request and offer the following comments.

The Technical Bulletin is essentially an interpretation of the requirements already spelled out in the Renewable Energy Approvals Regulation, Ontario Regulation 359/09. As such, any comments about the Technical Bulletin must ultimately be comments about the Renewable Energy Approvals Regulation, Ontario Regulation 359/09.

The setbacks were reportedly determined in accordance with the Ministry of Environment's 2009 Publication "Development of Noise Setbacks for Wind Farms" ("2009 Ministry Setback Development Publication"). The setbacks were determined using a computer model which reportedly has an output error of +/- 3 dB. The computer model uses sound level emissions data provided by the manufacturer of the wind turbines generators (WTGs). In the case of the Melancthon Ecopower Centre General Electric WTGs the sound level emissions are reported to have an error of +/- 2 dB. So in fact, the Ministry is using a computer program with an output error of +/- 3 dB, where the data input into the computer program may have a +/- 2 dB error. It is not clear if these errors are added, subtracting, multiplied or divided by each other. If the errors are simply added, then the potential error in the predicted sound level limit at the receptor is +/- 5 dB. In the Melancthon Ecopower Centre case, an approval was issued where the predicted sound levels at most of the receptors was 40 dBA (rounded-off). If a 5 dB error is applied, then the predicted sound level at the receptor could actually be as low as 35 dBA or as high as 45 dBA. Given the errors involved in the computer modelling it appears reasonable to suggest that a conservative approach might be to only establish setbacks and approve locating WTGs where the predicted sound levels at the receptors are 35 to 37 dBA.

The setback distances were determined on the assumption that the sound discharged from WTGs does not have a special quality of sound. In other words it is assumed the sound contamination

discharged into the natural environment from WTGs does not have a tonal quality or a cyclic variation quality. The assumption that the sound contamination discharged from WTGs does not have a tonal characteristic or a cyclic variation characteristic is not supported by our field observations. Furthermore, the assumption that the sound contamination discharged from WTGs does not have a cyclic variation characteristic is not supported in the report, Acoustic Consulting Report prepared for the Ministry of the Environment Wind Turbine Facilities Noise Issues, by Ramani Ramakrishnan, December 28, 2007 (the "Ministry 2007 Acoustic Consulting Report").

The Ministry's Publication Noise Pollution Control 104 states, "(1) Tonality If a sound has a pronounced audible tonal quality such as a whine, screech, buzz or hum then the observed value shall be increased by 5"; "If a sound has an audible cyclic variation in sound level such as beating or other amplitude modulation then the observed value shall be increased by 5"; and, "(4) One Adjustment Only An adjustment may be made under one only of subsections (1), (2) and (3), provided that, if subsection (3) applies, it shall be used in preference to subsection (1) or (2)."

Our field observations at the Melancthon Ecopower Centre and those reported by HGC on behalf of Canadian Hydro Developers, Inc. conclude some of the WTGs at the Melancthon Ecopower Centre have an audible tonal characteristic. This tonal characteristic does not appear to be properly identified as a result of the manufacturer's testing done in accordance with the testing procedures deemed acceptable in the 2008 NPC Guidelines Interpretation and consequently the Technical Bulletin. It appears reasonable to suggest that a 5 dB penalty for tonal quality of the sound discharged into the natural environment from the WTGs may be required. I also noted tonal characteristics when making observations of the sound contamination discharged into the natural environment from the Vesta manufactured WTGs at Clear Creek.

Most of the complainants who have contacted the Ministry about sound contamination from the Melancthon Ecopower Centre WTGs identify the characteristic "blade swoosh" or "swishing" sound contamination discharged into the natural environment from the WTGs as a quality of the WTG sound contamination which they find offensive. Provincial Officers have confirmed the "blade swoosh" quality of the sound contamination discharged into the natural environment from the WTGs throughout the Melancthon Ecopower Centre wind plant.

The Ministry 2007 Acoustic Consulting Report discusses the sound contamination characteristics of WTGs and includes discussing "the swishing (thumping) sound normally termed as the amplitude modulation phenomenon". The Ministry 2007 Acoustic Consulting Report includes the following:

"Due to the nature of the amplitude modulation phenomenon, the swishing or thumping exists all the time.";

"Reference 30 has addressed the issues connected with modulation. One of its principle findings is and we quote, "the common cause of complaint was not associated with low-frequency noise, but the occasional audible modulation of aerodynamic noise, especially at night."; and,

“Finally, Reference 30 discussed the many possible mechanisms that can cause the amplitude modulation as well as provided measurement results to show that modulation can produce changes in noise levels of the order of 10 dB.”

It should be noted that the more recent 2008 NPC Guidelines Interpretation differs from the 2004 NPC Guidelines Interpretation by stating no adjustment should apply to the cyclic variation quality “swishing sound” of the noise contamination discharged from the WTGs. The 2008 NPC Guidelines Interpretation suggests the blade swish noise is temporal. This conclusion is not supported by our field observations, or the findings in the Ministry 2007 Acoustic Consulting Report.

It appears it is reasonable to suggest the setback calculations should have included a 5dB addition to the sound level emissions from the WTGs to account for the amplitude modulation or blade swooshing sound of the WTGs. A 5 dB addition would address the Ministry observations and the Ministry 2007 Acoustic Consulting Report finding that the sound contamination from WTGs has a blade swoosh or amplitude modulation characteristic. A 5 dB addition for this cyclic variation of the quality of the sound discharged into the natural environment from WTGs would also be consistent with the Ministry’s Publication Noise Pollution Control 104.

The Ministry’s Publication Noise Pollution Control 104 only allows for one 5 dB adjustment. It appears reasonable to suggest that a conservative approach to calculating setback distances might have been to include a 5 dB adjustment to the predicted sound levels at the receptors to account for the tonal and cyclic variation of the qualities of the sound contamination discharged into the natural environment from WTGs.

If a 5 dB adjustment is added to the 3 to 5 dBA error in the computer modelling results, then the acceptable sound level at the receptor would be 30 to 32 dBA (40 dBA minus 10 or 8 dB). Observations by several Provincial Officers at the Melancthon Ecopower Wind Plant indicate sound levels at the receptors below 35 dBA and in the range of 30 to 32 dBA would not cause or be likely to cause adverse effects in the opinion of the Provincial Officers. As such, it appears reasonable to suggest the setback distances should be calculated using a sound level limit of 30 to 32 dBA at the receptor, instead of the 40 dBA sound level limit.

Observations at the Melancthon Ecopower Wind Plant and at Clear Creek in Hamilton District indicate the sound contamination discharged into the natural environment from WTGs is directional. This directional nature of the sound contamination from WTGs is also reported in the scientific literature. EAAB was advised about our observations that the sound contamination was directional, but has not replied. It is not clear if the directional nature of the sound contamination discharged into the natural environment from WTGs has been considered in the development of the setbacks.

The setbacks were established using computer modelling where the receptor location was located to one side of an array of WTGs where the WTGs were located in a grid pattern with 400 metre separation between the WTGs. As such, only one WTG would be the stated setback distance

away from the receptor in the model used to develop the setbacks. All other WTGs would be located a distance greater than the setback distance from the receptor. For example, the calculation for the 600 metre setback, for five 104 dBA WTGs in the 2009 Ministry Setback Development Publication shows the first WTG located 605 metres from the receptor, the second and third WTGs located 725 metres from the receptor, and the fourth and fifth WTGs located 1003 metres from the receptor. The total calculated sound level at the receptor for these 5 WTGs is shown as 39.6 dBA.

The approach used to establish the setbacks failed to account for locating multiple WTGs the same setback distance from the receptor (the receptor could be located within the wind plant and not off to the side of the wind plant). If a receptor is located within a wind plant and five 104 dBA WTGs are each located 605 metres from the receptor, then the resultant sound level at the receptor is 42 dBA.

It appears reasonable to suggest a conservative approach might be to calculate the setback distances where the receptor is located within the wind plant and not off to the side of the wind plant.

The setbacks and modelling continue to use wind speeds at 10 metres above the ground level to establish sound levels at ground level receptors. Our field observations at the Melancthon Ecopower Centre wind plant suggest there are many occasions where there is little or no ground level wind at the receptor and yet the nearby WTGs are producing electricity and discharging sound contamination at unacceptable levels. The use of wind speeds at 10 metres above the ground level appears to not address ground level wind speeds which may be significantly less than 10 metre wind speeds, and which therefore may not result in the assumed increase in background noise at the receptor. It appears reasonable to suggest that consideration should be given to modifying the approach of increasing acceptable sound level limits at the receptors with increasing wind speed at 10 metres above the ground level. This may require increasing the setback distances to ensure sound levels at the receptors do not exceed the applicable sound level limits.

The sound level limits used to establish the setbacks fail to recognize the potential quietness of some rural areas. As a consequence, meeting the minimum sound level limits may still result in significant sound contamination levels intruding into the rural environment.

The Ministry 2007 Acoustic Consulting Report referred to a study which produced an "annoyance table". The annoyance table reportedly provides an estimated community response to the actual wind turbine generator sound levels measured at a receptor compared to the background sound level. The referenced study was reportedly conducted in the early 1980s using old type wind turbine generators; and the Ministry 2007 Acoustic Consulting Report suggests a more modern study is required to assess the threshold for modern wind turbine generators. Notwithstanding these limitations, the annoyance table suggests a 10 dB increase in sound level above background would result in estimated "widespread complaints"; a 15 dB increase in sound level above background would result in estimated threats of "community action"; and a 20 dB increase in sound level above background would result in estimated

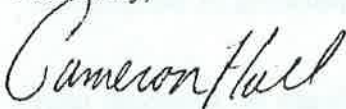
“vigorous community action”.

Sound measurements undertaken by HGC and the Ministry within the Melancthon Ecopower Centre wind plant during periods when there was little or no ground level wind and when the nearby WTGs were not operating have found background sound levels to be equal to or less than L_{90} equal to 20 dBA and L_{eq} equal to 23 dBA. The 2008 NPC Guidelines Interpretation approved maximum sound level limits for the sound contamination discharged into the natural environment from WTGs is 40 dBA with 10 metre height wind speeds less than 6 m/s, rising to 51 dBA with 10 metre height winds speeds of 10 m/s or greater. The 2008 NPC Guidelines Interpretation approved sound limits, without adjustment for tonal or cyclic variation qualities of the sound contamination, would allow the sound contamination discharged into the natural environment from WTGs to exceed the background sound level by 17 to 28 dBA. According to the report referenced in the Ministry 2007 Acoustic Consulting Report, the estimated community response would be “threats of community action” to “vigorous community action” where the sound contamination from wind turbine generators intrudes 15 to 20 dB above background levels.

Developing the setbacks in accordance with the 2009 Ministry Setback Development Publication 2009 might have including considering the details provided in the Ministry 2007 Acoustic Consulting Report with respect to allowing the intrusion of sound levels greater than 7 to 10 dB above background. An intrusion of 7 to 10 dBA above background in our case would result in sound level limits at the receptors in the range of 30 to 33 dBA. As noted earlier, observations by several Provincial Officers indicate sound levels at the receptor in the range of 30 to 32 dBA would not cause or be likely to cause adverse effects in the opinion of the Provincial Officers.

Given all of the above, the following statement in the Technical Bulletin on page 6 should likely be amended: “While the minimum setback of 550 m must be met in all cases, proponents are given the option of conducting a noise study to prove that siting turbines closer than the setbacks in Table 1 will not cause an adverse effect.” It appears compliance with the minimum setbacks and the noise study approach currently being used to approve the siting of WTGs will result or likely result in adverse effects contrary to subsection 14(1) of the EPA. As such the sentence might be changed to read as follows: “While the minimum setback of 550 m must be met in all cases, proponents are given the option of conducting a noise study to prove that siting turbines closer than the setbacks in Table 1 will not cause exceedances of the applicable sound level limits.”

Yours truly,



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Ontario

07 April, 2009

Thompson Rogers
Barristers and Solicitors
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390 Bay Street
Toronto, Ontario
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Attention: Al Barton

Dear Sir:

Re: Township of Amaranth re Canadian Hydro Developers
Your File No. 050548
MOE File: DUME A100 Canadian Hydro Developers

I am in receipt of your letter dated 16 March, 2009 regarding the above noted matter.

With regard to the "Transformer Noise Complaints" referenced in your letter please be advised that based on a review of data provided to this Office, and this Ministry's Environmental Assessment and Approvals Branch, (EAAB), by consultants acting for Canadian Hydro Developers, Inc., (CHD); as well as observations made by Staff from this Office of the Ministry of the Environment, (MOE), it is the opinion of this Office that as of the date of this letter CHD is operating in compliance with Certificate of Approval (Air) 7257-7DHJP3.

With regard to "Turbines Noise Complaints" related to the operation of the CHD wind turbines in Amaranth Township referenced in your letter, please be advised that based on a review of data provided to this Office, and MOE EAAB by consultants acting for CHD; as well as observations made by Staff from this Office of the MOE, it is the opinion of this Office that as of the date of this letter CHD is operating in compliance with Certificate of Approval (Air) 2429-7DZHCV, (see attached).

As you are aware, despite the apparent compliance with Certificate of Approval (Air) 2429-7DZHCV by CHD, there is a continuing issue related to a low frequency "hum" that is impacting on at least one residence located on the north end of 7th Line Amaranth. This Office is continuing to work with CHD to bring this issue to a satisfactory conclusion, (see attached 31 March, 2009 letter to MOE from CHD).

Nothing in this letter should be misunderstood or misconstrued as approval or permission for any violations of the Environmental Protection Act, and/or Ontario Water Resources Act, and/or Pesticides Act, and/or Nutrient Management Act, 2000 by

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