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Summary of the Windsor Hum Study Results

Investigation of the Windsor Hum, University of Windsor

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Final Report

Executive Summary

Since early 2011, residents of the City of Windsor and nearby communities have reported an intermittent low frequency noise, which has been labeled as the Windsor Hum. A previous study confirmed the existence of the low frequency excitation and estimated the source to be in the vicinity of Zug Island; a highly industrialized island located on the US side of the Detroit River.

A subsequent investigation by the University of Western Ontario (UWO) and the University of Windsor was supported by the Canadian Department of Foreign Affairs and International Trade (DFAIT) to try to locate the source of the Hum. The research conducted by the University of Windsor's NVH-SQ Research Group was comprised of two phases. The first phase was to identify and characterize the acoustic signature of the Hum using noise monitoring equipment deployed throughout the Windsor-Essex community. Once the Hum was measured and characterized, the second phase was to determine the exact source of the noise using noise source identification (NSI) hardware and software using a beamforming algorithm.

This report includes an in-depth discussion of possible sources capable of producing the reported Hum sound. The results of the literature study compared the potential sources to the characterised sounds measured in the first phase of the project. For the duration of the project, the Hum manifested on only a handful of days, which made the identification of the source difficult. Good data representative of the Hum was measured using the stationed noise monitors. Conclusive evidence of the source was not achieved using the NSI system since the Hum was not present on those days that this equipment was deployed on the river.

The conclusion of the research is that the Windsor Hum does exist and has both qualitative and quantitative characteristics that surmise the likely source of the Hum to be from the blast furnace operations on Zug Island. It is recommended that community noise monitoring be continued and that efforts be given to allow NSI measurements to be made on Zug Island lands during the periods that the monitors identify occurrence of the Hum sound.

Scientific Research to Characterize and Localize the Windsor Hum, University of Western Ontario

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Final Report

Introduction

Approximately three years ago, the citizens of Windsor, Ontario began noticing and reporting a bothersome and persistent noise, most noticeable in Southern Windsor and La Salle. The noise, now popularly termed the 'Windsor Hum', is commonly described as either a deep, low-frequency hum, like a furnace or an idling diesel truck or as a deep, pulsating and vibrating noise, which is perceived more as a sensation rather than an audible sound.

The Ontario Ministry of the Environment (MOE) has been receiving ongoing complaints since March 2011 related to the Windsor Hum. The reports described the rumblings as intermittent in nature, but often persisting for

several hours. From June 2011 to August 2011, Natural Resources Canada (NRCan) performed a seismic study in an attempt to identify the nature (underground or airborne) source of the rumblings and the probable location (Bent and Withgold, 2011). While this seismic study did not ascertain the exact source of the Hum, it suggested Zug Island as the most probable location of a monotone signal correlated with Hum reports by the public and having a dominant frequency of approximately 35 Hz. The report also suggested that the signal was an acoustic wave propagating through the air rather than a seismic wave traveling through the ground.

Based on these initial results, an acoustic study, which would further characterize the nature and location of the Hum seemed warranted.

In January of 2013, the Department of Foreign Affairs and International Trade (DFAIT) contracted Western University and University of Windsor to conduct a joint acoustic study pertaining to the Windsor Hum. The role of Western University was to deploy two portable infrasound arrays in the Windsor area over the period of approximately one month to monitor the Hum and determine its frequency, direction and source. The portable array instrumentation was provided by Natural Resources Canada (NRCan).

The Infrasound array deployment occurred during late February/early March, 2013 and terminated on April 8, 2013. This report summarizes the array deployments, the data examination and analysis, the findings and ancillary data collection associated with local Hum reports. A goal of this study was to geolocate (through cross bearing association) any commonly detected signals at both arrays occurring during time periods when the Hum was reported based on public reports. The temporal and spectral characteristics of signals detected at the arrays were also examined during such time periods to try and identify the most probable linkage of public Hum reports to acoustic signals.

Findings and Conclusions

Two infrasound arrays were deployed from late February to early March 2013 in the Windsor and La Salle area. In total, they were operating for a period of just over a month.

Our findings are:

1. We do not find common signals at both arrays which could plausibly be associated with the Hum. We are unable to geolocate a definite source for the Hum using common cross-bearings.
2. Array 2 (Transport Canada Site) shows acoustic arrivals from the direction of downtown Windsor (Figure 29). No clear signals are seen at this site which can be associated with common signals at Array 1 (based on timing, azimuth or spectral content). Some public Hum reports coincide with an infrequent 35 Hz signal at this site which also appears to be coming from downtown Windsor. This may indicate either a source of 35 Hz in downtown Windsor or that the actual direction of the 35 Hz signal is being masked by the consistent, strong acoustic signal from the center of Windsor.
3. Array 1 (Windsor Salt Site) shows a wide spectrum of signals from nearly all directions.
4. Array 1 shows signals at the time of public Hum reports predominantly in the 30 Hz and 35 Hz frequency bands, suggesting these are the most likely signal among those we have detected to be associated with the Hum. This is consistent with the earlier NRCan seismic study. The point of origin of the airwave is most probably somewhere along the line from Array 2 in the 265 ± 4 degrees (nearly due west) direction (e.g. Figure 28). Without a second bearing we cannot definitely pinpoint the source, other than to say that it could be as close as the waterline, or much further away.
5. We note that the bearing from Array 1 to the most probable source of the Hum points well to the South of Zug Island. The bulk of our observations from both stations do not support the hypothesis that the source of the Hum emanates from Zug Island

The complexities of acoustic propagation in the local Windsor conditions, including geology (Windsor is a syncline), vegetation, ground reflections, propagation paths, interference, turbulence, etc., may all or in part play a role in sound propagation. While it is not possible to ascertain the exact source of the Hum, possible sources may include quarry activity or industrial ventilation systems. For example, quarry activity is known to produce impulsive sounds (Job, 1988) and there could be some coupling mechanism of line blasting with the ventilation/release systems.