

February 23, 2019

IN RESPONSE TO: Dillon Consulting Limited (2019). Northern Pulp Nova Scotia environmental assessment registration document: replacement effluent treatment facility.
<https://www.novascotia.ca/nse/>

Dear Linda Pannozzo,

Thank you for your interest in our study, "*Pilot study investigating ambient air toxics emissions near a Canadian kraft pulp and paper facility in Pictou County, Nova Scotia*" (Hoffman et al. 2017). In response to your question, Northern Pulp's Environmental Assessment (EA) does not "discredit" this study; rather the EA misrepresents the scientific contributions it provides.

Explanation of key topics (Hoffman et al. 2017):

- There is growing concern about the toxicity of volatile organic compounds (VOCs) (Cicolella 2008), their presence in air, and the consequences of long-term, low-dose exposure to these agents. Airborne VOCs are varied and widespread pollutants (e.g., hydrocarbons, aromatics, and some chlorinated compounds) and are increasingly recognized as important precursors to PM_{2.5} and ground-level O₃ formation through photochemical reactions (Ryerson et al. 2001). Many VOCs are included in the US Environmental Protection Agency (EPA) air toxics list.
- "Air toxics" are defined as "those pollutants that cause or may cause cancer or other serious health effects [...] or adverse environmental and ecological effects" (EPA 2015a).
- Ambient air monitoring in the US is conducted in accordance with the Clean Air Act (CAA) (Clean Air Act 1970). CAA amendments identify 187 air toxics, which form the basis for EPA's approach to regulating emissions (EPA 2015a). Of these, EPA identified 30 air toxics that pose the greatest potential health threat in urban areas (EPA 2015b). Using the risk-based principles outlined in CAA, EPA developed the National Air Toxics Assessment (NATA), a comprehensive evaluation tool that prioritizes efforts to regulate emissions of air toxics (EPA 2015c). Such a rigorous initiative has not been implemented in Canada, where no federal guidelines exist for ambient air toxics. Yet, some of these air toxics, as noted in our publication, have been identified as associated with increased risks for chronic disease. See, for example, Paul Villeneuve et al. (2013) (<https://www.ncbi.nlm.nih.gov/pubmed/23369806>) which showed an increase risk of cancer mortality associated with elevated ambient air benzene concentrations in urban Toronto.
- The National Air Pollution Surveillance (NAPS) program was established to monitor and assess ambient (outdoor) air quality at various urban and rural areas across Canada. This program focuses primarily on the criterion air pollutants (nitrogen dioxide, ozone, PM_{2.5} and sulphur dioxide). Several EPA-designated air toxics are routinely quantified in Canada; however, at a subset of NAPS monitoring sites.
- VOCs selected for analysis in this investigation were based on EPA's list of 30 urban air toxics (EPA 2015b) and *National Air Toxics Trends Station Work Plan Template* (EPA

2015d). Therefore, this investigation represents one of the few peer-reviewed published studies on record about airborne VOCs in rural Canada.

This was a “*pilot*” study (as indicated by the title and subsequent sections of the study); therefore, it was not meant to provide causal evidence to implicate the presence of airborne VOCs as solely emanating from Northern Pulp (“the mill”), as the EA suggests. Nevertheless, we were interested in documenting VOC-related air quality in the vicinity of the mill, given that pulp mills are present across rural Canada. Publicly accessible Environment and Climate Change Canada (ECCC) data (VOC concentrations [Granton NAPS ID: 31201, located southwest of the mill], and local meteorological conditions [Caribou Point]) (<http://climate.weather.gc.ca/climateData/>; <http://maps-cartes.ec.gc.ca/rnspa-naps/>) were examined using temporal (2006–2013) and spatial analytic methods to investigate prioritized air toxic ambient VOC concentrations near a pulp plant to determine whether these emissions concentrations were in the range of US EPA air toxic levels (EPA 2015d) (<https://www3.epa.gov/ttnamti1/files/ambient/airtox/nattsworkplantemplate.pdf>).

Results highlight associations with wind direction and the Granton NAPS site’s ambient VOC concentrations in relation to the location of the mill. Compared to all other wind directions, prevailing winds from the northeast and the mill typically resulted in higher VOC concentrations for all compounds, except carbon tetrachloride, suggesting that the mill is likely a contributor to increased concentrations; however (as stated in the study), the origin(s) of VOCs are “*inconclusive*”, and “*other local sources likely contribute to air toxics emissions*”. The mill’s EA states that “[this study] did not attempt to rule out contributions from other potential sources of VOCs in the area”, which is clearly not a true statement - other potential local emission sources were discussed in detail in the publication. Figure 1, for example, is a map displaying other local point source emitters in the community (e.g., tire manufacturing facility, coal-fired thermal electrical generating station).

VOCs (1,3-butadiene, benzene, and carbon tetrachloride) routinely exceeded EPA air toxics-associated cancer risk thresholds, regardless of whether the mill contributed to these VOC levels, and is a significant finding that warrants further investigation. The EA’s statement: “*When other study uncertainties are considered [...] there is no current air quality issue with the seven targeted VOCs in the Pictou County area*” is misleading. Due to the limited number of sampling sites, the problem with the location of the sampling site in relation to the location of the mill, and the short duration of our study, we explicitly identified the need for further investigation on this question. As commonly identified by environmental researchers, absence of evidence is not necessarily evidence of absence. Therefore, the limitations caused by sparse data does not necessarily mean there is no problem with air emissions in this community and there is no justification for this erroneous conclusion, as stated in the EA.

The EA statement, “*The seven VOCs are not known (based on literature review) to be associated with pulp and paper mill activities and air emissions to any significant extent*”, is both unclear and undefined. Furthermore, the EA does not specify how the literature was reviewed/cited to support this statement. According to the mill’s own self-reported NPRI report in 2012, 143.18

tonnes of VOCs were atmospherically emitted on-site (ECCC 2012). An estimated 3.195 tonnes of benzene were released to the air from a stack higher than 50 m and 0.022 tonnes were released within 50 m of the ground. Benzene can combine with chlorinated hydrocarbons associated with the Kraft bleaching process to form a range of toxic compounds which can be volatilized. Although trichloroethylene, tetrachloroethylene, and carbon tetrachloride were not officially reported to have been released by Northern Pulp, these VOCs may become airborne through evaporation from pulp and paper wastewater (Soskolne and Sieswerda 2010). Boat Harbour (the mill's effluent treatment facility) may therefore contribute to ambient concentrations of VOCs. The major chlorinated hydrocarbon emitted into the air from bleached kraft pulp mills of concern is chloroform, which is produced by heating a mixture of chlorine and either chloromethane or methane (EPA 1985). However, we address other local and area sources which likely contribute to the observed VOC concentrations, which warrants further investigation. We note that direct links between 1,3-butadiene and vinyl chloride with pulp and paper industries have not been reported in the scientific literature to date.

With regards to the EA statement, "For the carcinogenic inhalation TRVs that were applied, the authors did not adjust these values from the default USEPA target cancer risk level of 1 in 1 million to the target cancer risk level that is current public health policy in Nova Scotia and most other provinces (i.e., 1 in 100,000). Thus, the TRVs for carcinogens cited in the paper should have been ten times higher than indicated. This correction would alter the conclusions of the study substantially in that for the seven VOCs considered, there would be no to negligible exceedances of the TRVs that were applied", their proposal is not relevant given that Health Canada has no guidelines nor process in place that is required for such comparisons. In contrast, the US NATA process is based upon a 2005 scientific risk assessment process well laid out by EPA which established the cancer risk levels to which the ECCC data were compared (Hoffman et al. 2017). Furthermore, it should be stated that our study was published in an excellent, internationally-recognized environmental science peer-reviewed journal (*Environmental Science and Pollution Research*) and met the journal's quality control standards.

To reiterate the value of this study: *"Despite study limitations, this is one of few investigations documenting elevated concentrations of certain VOCs air toxics to be associated with pulp and paper emissions in a community. Findings support the need for more research on the extent to which air toxics emissions exist in pulp and paper towns and contribute to poor health in nearby communities."* Various recommendations were put forth to improve the rigor and validity of the present study (e.g., a field component consisting of real-time measurements of ambient air toxics; a comprehensive risk assessment to investigate uncertainties that have implications for risk estimates in the present study).

Furthermore, we addressed various limitations and gaps in air quality monitoring, not only locally but nationally, and provided recommendations how air quality management could be improved to support informed public health decisions (e.g., epidemiological research of human exposures to air toxics emissions in the ambient Pictou environment with appropriate considerations, as outlined; more strategically placed air monitoring stations; evaluation of a wide-suite of air toxics) - topics ECCC and applicable stakeholders should consider. To the

contrary and to my surprise, the Granton NAPS station has now been decommissioned. This information vacuum only emphasizes the need for more research on these questions.

In summary, the intent of this pilot study was to address local air quality conditions in a Nova Scotia rural community, which clearly indicates the need for further investigation. Moreover, this pilot study serves as a precursor to gaining awareness, so that government agencies adopt more stringent air quality regulations and monitoring programs to ensure health of all citizens is safeguarded and prioritized.

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