PEER REVIEW OF REPORTED HUMAN HEALTH RISKS ASSOCIATED WITH LOUISIANA PACIFIC CANADA'S SWAN VALLEY MANITOBA OSB MILL APPLICATION TO AMEND EMISSION LIMITS

FINAL REPORT

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1.0 INTRODUCTION

Dr. Gordon L. Brown, Ph.D., QEP, of Intrinsik Environmental Inc. was retained by the Manitoba Public Interest Law Centre to conduct a peer review of the following Application, with particular emphasis on potential human health risks associated with decommissioning of certain emission control equipment:

> Louisiana-Pacific Canada Ltd. Request to Amend Manitoba Environment Act License 1900 S4 Emission Limits for Pressing and Drying Operations. Swan Valley OSB. November 18, 2008. (referred to as LP Application, 2008)

In addition to the Application *per se* the following materials were reviewed:

- Appendix A: Dispersion Modeling Results: Isoconcentration graphs; frequency analysis; and, percentile tables. November 18, 2008 (29 pages) (referred to as Appendix A, 2009)
- Appendix C: National Council for Air and Stream Improvement, Inc. (NCASI) October 27, 2008 letter to Mr. Allan Hambley, Louisiana-Pacific Canada Ltd. Signed by Vickie Tatum, Ph.D., Project Leader (5 pages). (referred to as Appendix C, 2008)
- National Council for Air and Stream Improvement, Inc. (NCASI) July 1, 2009 letter to Mr. Allan Hambley, Louisiana-Pacific Canada Ltd. Signed by Vickie Tatum, Ph.D., Project Leader (5 pages).(referred to as NCASI, 2009)
- National Council for Air and Stream Improvement, Inc. (NCASI) March 14, 2008 memorandum to Kirsten Vice, regarding "CIIT Acrolein Studies and Their Potential Impact on Ambient Air Quality Standard Development in Ontario", from Vickie Tatum (3 pages). (referred to as NCASI, 2008)
- Swan Valley OSB (Power Point) Presentation to Clean Environment Commission July 2009. By Louisiana Pacific Canada. (Referred to as LP PPT, 2009).
- Clean Environment Commission. Louisiana Pacific Strandboard Plant Air Emissions Review. Transcript of presentation by LP on July 28, 2009. (229 pp) (Referred to as LP transcript, 2009)
- Cordilleran a division of Olsson Associates. 2009. Swan Valley Oriented Strand Board (OSB) Modelling Project. Dispersion Modelling Analysis, Minitonas, Manitoba Canada. Modelling study performed for the Swan Valley Facility of Louisiana-Pacific Canada, Ltd. June 22, 2009

My review is presented in two parts: (a) General comments, and (b) Specific comments on the human health risk assessment component of the LP Application.

2.0 GENERAL COMMENTS

The materials reviewed contain documents from NCASI regarding potential health risks associated with decommissioning of the RTOs. In all cases and for all chemicals included in the assessment, the conclusion in the NCASI documents is that decommissioning of the RTOs will result in "negligible health risks", "no unacceptable level of increased cancer", or that the "likelihood of non-cancer adverse effects is negligible", and so on. These conclusions are based on separate air dispersion modeling predictions and the exposure limits that were adopted, the latter of which are addressed in specific comments below.

My overall general comment is that the human risk calculations provided by LP Canada DO NOT represent current accepted practice for human health risk assessment in Canada and the United States. In other words a conventional human health risk assessment (HHRA) was not conducted by LP in support of this Application.

Based on our risk assessment experience throughout Canada (we have offices in Calgary, Mississauga, Ottawa and Halifax), operating industrial facilities applying to increase their emission limits would be required to submit a comprehensive HHRA based on the standard paradigm presented below, consistent with guidance developed by Health Canada (2004), the Canadian Council of Ministers of the Environment (CCME 1996; 2006), the US National Research Council (NRC 1983; 1994) and the US Environmental Protection Agency (US EPA 2004; 2005). This risk assessment methodology has been endorsed by a number of provincial regulatory authorities, such as Alberta Environment (AENV), Alberta Health and Wellness (AHW), Ontario Ministry of Environment, and BC Ministry of Environment.

In general, there are four distinct steps to the risk assessment paradigm (Figure 1), including:

- Problem Formulation: characterization of people potentially "at risk". The determination of the relevant exposure pathways and identification of the chemicals of potential concern (COPCs) associated with Project emissions;
- Exposure Assessment: identification of potentially affected environmental media (i.e., air, soil, country foods, wildlife, fish, garden produce, agricultural commodities) and quantification of the amount or dose of each COPC received by people through all relevant exposure pathways;
- Toxicity Assessment: identification of potential adverse health effects associated with each of the COPC, the conditions under which these effects may occur and determination of the maximum safe dose for the chemical for the most sensitive subjects following exposure for a prescribed period (i.e., identification of acute and chronic exposure limits for COPC);
- Risk Characterization: comparison of exposure limits (established in the toxicity assessment) with estimated exposures (determined in the exposure assessment) to identify potential health risks for the different assessment cases, as well as discussion of sources of uncertainty and how these were addressed in the risk assessment.

In addition, the following cases or scenarios are typically assessed in an HHRA:

- Baseline case: represents existing conditions, including contributions from community sources and existing facilities in the area. The baseline case represents "background" air quality based upon measured data in the area, for the relevant COPCs, and is typically based on local ambient air quality monitoring results over a year or more.

- Project case: represent the emissions of the project alone, for predicting incremental non-cancer health risks and lifetime cancer risks (ILCR).
- Application case: includes the Baseline case, plus the contribution of the Project emissions, for predicting non-cancer risks.
- Cumulative Effects Assessment (CEA): represents the combination of the Application case and other future emission sources in the area, for non-cancer risks, if relevant, air quality for the CEA case is again based on air quality modelling predictions.

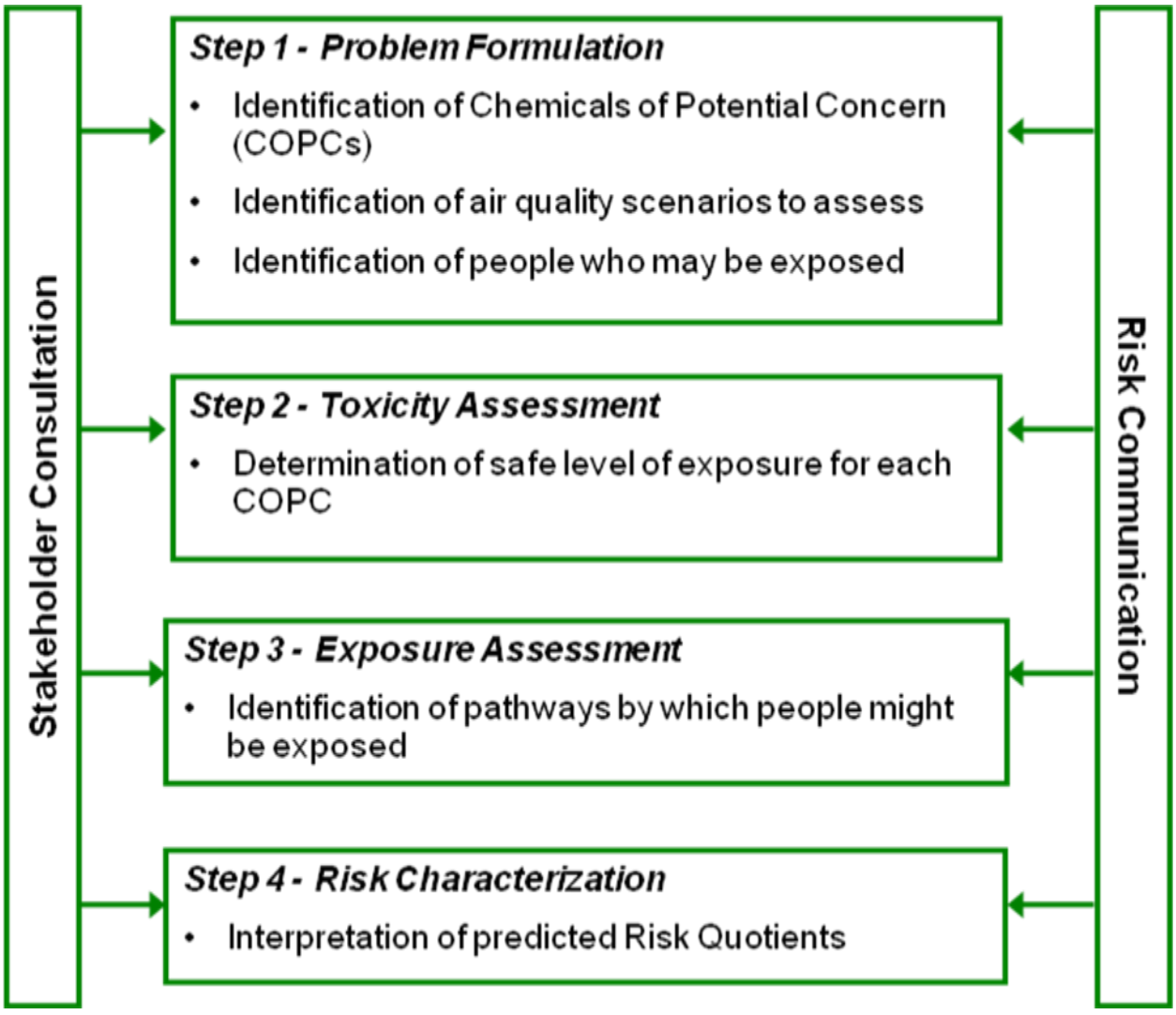


Figure 1: Conventional Health Risk Assessment Paradigm

As chemical exposures rarely occur in isolation, the potential health effects associated with COPC mixtures should also be assessed in an HHRA. For example potential health effects associated with predicted air concentrations of all respiratory irritants combined should be assessed, typically by assuming risks are additive. This was not done in support of the LP Application.

The key features influencing the scope of the human health risk assessment (HHRA) are typically based on Terms of Reference (TOR) issued by provincial regulatory agencies, as well as through public consultation with local stakeholders, so that their concerns can be addressed in the HHRA, as shown in the sidebar in Figure 1.
A typical terms of reference for an HHRA recently conducted in Alberta appears below.

- Identify and discuss the data and methods used to assess the impacts of the Project on human health and safety
- Assess the potential health implications of the compounds that will be released to the environment from the proposed Project in relation to exposure limits established to prevent acute and chronic adverse effects on human health
- Identify the human health impact of potential contamination of country foods and natural foods sources taking into consideration all Project activities
- Provide information on compounds released from the Project in samples of selected species of vegetation and wildlife known to be consumed by humans and incorporated into the assessment
- Discuss the potential to increase human exposure to contaminants from changes to water quality, air quality, and soil quality taking into account all project activities
- Document any health concerns identified by (local) stakeholders during consultation on the Project (including aboriginals regarding impacts on their traditional lifestyle)
- Assess cumulative health effects to receptors that are likely to result from the Project in combination with other existing, approved and planned Projects
- As appropriate, identify anticipated follow-up work, including regional cooperative studies. Identify how such work will be implemented and coordinated with ongoing air quality monitoring.

The conventional HHRA paradigm described above is very similar to that proposed by the US EPA (US EPA OSW 2005. Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities.) The conventional risk assessment paradigm recommended in that document is shown in Appendix A of this document, and contains many of the HHRA elements described above.

The LP human health data provided in their application could be described as “screening level” calculations at best, but certainly do not represent the scope of HHRA that would typically be required for an application today to increase emissions from an existing, operating industrial facility.

3.0 SPECIFIC COMMENTS

3.1 Ambient Air Quality Monitoring Locations

LP refers to a comprehensive ambient air quality monitoring network that measures PM_{10}, formaldehyde, total VOCs, benzene, MDI, phenol and hydrogen cyanide. The submission goes on to state that "the existing ambient air quality monitoring programs will continue to ensure protection of human health and the environment following the decommissioning of the RTOs". This assertion is reasonable only if the monitoring stations are (i) placed in locations where they "capture" the targeted emissions' maximum ground-level air concentrations and (ii) provide strong scientific evidence that air quality near area residents' homes is not adversely affected by LP air contaminants.

In regard to item (i) LP states dispersion modeling was conducted in order to estimate "worst-case" ground-level air concentrations of licensed emission parameters resulting from the elimination of the RTOs. LP describes two air quality monitoring stations: LP1, located approximately 1.5 km north-northeast of the mill; and LP2, located approximately 2.0 km west of the mill. As shown in the isoconcentration graphs (in Appendix A, 2009) the maximum ground-level air concentrations for all modeled parameters (i.e., formaldehyde, benzene, hydrogen cyanide, MDI, phenol, nitrogen dioxide, total VOC and TSP) are predicted to occur in areas away from the two monitoring stations. As such, the results of the air dispersion modeling suggest that the monitoring stations may not be located in areas where the maximum ground-level air concentrations attributable to the OSB mill are expected to occur. Further, no indication is given whether the monitoring stations are nearby residences. This brings into question item (ii) the statement by LP that the air monitoring data provides strong scientific evidence that air quality near area residents' homes is not adversely affected by LP air contaminants.

3.2 Background Air Concentrations

As stated in the LP Application (page 9), the modeled ground-level air concentrations do not account for background concentrations of any of the modeled parameters. However, LP acknowledges that "ambient air quality in the area is dominated by regional sources rather than point sources". This statement clearly demonstrates that background concentrations associated with regional sources should have been incorporated in the air quality assessment and associated health risk calculations. Failure to do so would have resulted in cumulative ground-level air concentrations being underestimated, which would mean that many of the conclusions regarding "negligible health risks", etc., are not valid.

For example, graphs presented by LP (LP PPT, 2009) clearly show that average background (not LP) concentrations of PM_{10} are about 10 $\mu g/m^3$, and of formaldehyde are about 3 to 4 $\mu g/m^3$. Thus (non-LP) background contribution should have been added to modelled maximum predictions to assess total health risks associated with each contaminant assessed.

In support of this, recent HHRA guidance from Health Canada (Wilson, R., 2005, page A-2) states that:

> "background air quality must be considered in the exposure assessment of new developments. Background concentrations should be obtained from the region in question to approximate the actual background conditions at the site, where data are available. The background concentrations of [chemicals] should be added to the estimated concentrations associated with the proposed development."

3.3 Quantification of Incremental Health Risks

In order to properly assess the incremental health risks posed by the decommissioning of the RTOs at the LP OSB mill, ground-level air concentrations and associated health risk calculations (including background) should be provided at the present time using similar assessment models and methods for both (i) the existing case and (ii) the amended case for which LP is applying. This was not done, only the amended case without RTOs was presented. Assessing both cases using the same input data and simulation models is the only way that any increase in potential health risks can accurately be quantified.

LP is relying on its original Application and EIA from over 10 years ago to provide the base case with RTOs. This does not provide a suitable comparison due to the newer technology, current environmental data and assessment methods being applied to the current Application. Ideally, for example, we would like to see two corresponding contaminant isopleth maps generated by the same computer software and met data (for each contaminant and averaging period) for both the RTO and non-RTO cases. All modelling would follow "Guidelines for Air Dispersion Modeling in Manitoba" (November 2006), using *ISC Prime,* approved in advance by MB Conservation, and performed by Olsson Associates, an outside consultant. This approach would allow us to "overlay" the two cases on top of each other, which would clearly show the air quality impact associated with switching off the RTOs. Incremental health risks could then be accurately determined.

It seems plausible that concerns by local citizens may exist if risks were shown to increase substantially as a result of decommissioning of the RTOs, even if the resulting risks are deemed "safe". The increased health risks would have to be weighed by regulators against the economic and other benefits cited by LP in their Application.

3.4 Human Receptor Locations

None of the LP reports describe where the nearest residences are in relation to the OSB mill, although some of this information is presented in the LP PPT (2009). In order to properly characterize the risks posed to the area residents, a map should be provided that identifies the location of local communities, residences, parks, recreation areas, and cabins in relation to the OSB mill. Health risks should have been predicted and identified for all local "receptor locations" to provide specific risk information to local residents rather than the generic "worst case" information presented.

3.5 Odours

None of the LP reports addressed the additional VOC odours that may result from the decommissioning of the RTOs. An increase in VOC emissions that results in previously unnoticeable odours by nearby residents can result in legitimate concerns about possible health impacts by local residents, even if VOC air concentrations are below documented adverse effect levels. At the minimum, any new odours will likely result in aesthetic "quality of life" issues for local residents, and thus should be addressed through an "odour assessment" that compares maximum predicted air concentrations to literature-based odour thresholds.

3.6 Assumed Exposure Limits

When characterizing potential health risks, it is imperative that the nature and basis of the exposure limits (e.g., toxicity reference values, air quality objectives, etc.) used in the health risk assessment are clearly defined. Health Canada states that when alternate limits to Health

Canada's are used, a "clear description of the inadequacies of the [limits] presented by Health Canada, along with a convincing rationale (with citations) to support the use of the alternate value".

The 2008 health risk assessment of the LP OSB mill (Appendix C, 2008) cites exposure limits from the Chemical Industry Institute of Toxicology (CIIT), ATSDR, EPA, American Conference of Industrial Hygienists (ACGIH), and Manitoba, with no apparent consideration of available Health Canada exposure limits. The Health Canada exposure limits appear to have been considered only in the case of acrolein, which was addressed in NCASI (2009).

There are a number of regulatory agencies that provide peer-reviewed, scientifically defensible exposure limits that are intended to be protective of public health. These agencies include: Health Canada; World Health Organization (WHO); United States Environmental Protection Agency (EPA); Agency for Toxic Substances and Disease Registry (ATSDR); California Office of Environmental Health Hazard Assessment (OEHHA) and the Texas Commission on Environmental Quality (TCEQ), to name a few. In their *Guidance on Human Health Preliminary Quantitative Risk Assessment*, Health Canada (2004) states that it's exposure limits should be applied in risk assessments. In the absence of Health Canada limits, the following hierarchy should be applied: (i) EPA; (ii) WHO; (iii) Netherlands Institute of Public Health and the Environment (RIVM); and (iv) ATSDR.

The following sections compare the exposure limits used for the LP human health risk assessment against those recommended by various regulatory agencies. Only those exposure limits with supporting scientific documentation are presented. The exposure limits used in the LP HHRA were typically not Health Canada limits and were frequently not the most "stringent" of the available limits. As such, the rationale for selecting the exposure limits adopted by LP should be provided. (The shaded lines refer to what is being proposed by LP Canada).

3.6.1 Formaldehyde

	Source	Exposure limit (µg/m^3)
Acute	LP HHRA (Manitoba)	60
	ATSDR	50
	OEHHA	55
	TCEQ	50
Chronic (cancer, based on 1-in-a-million risk)	LP HHRA (CIIT)	182
	Health Canada	0.19
	US EPA (IRIS)	0.08
	OEHHA	0.2
	TCEQ	1.8
	RIVM	-
Chronic (non-cancer)	ATSDR	10
	OEHHA	9
	TCEQ	11
	RIVM	-

Potential health risks associated with formaldehyde were characterized by LP as being "acceptable" using the CIIT unit risk value of 5.5 x 10^{-9}/(µg/m^3), which equates to a risk-specific air concentration of 182 µg/m^{3,} based on an assumed "acceptable" lifetime cancer risk of 1 in 1,000,000. The reason for using the CIIT limit is based on assumption "that the revised IRIS listing for formaldehyde will adopt [the] CIIT unit risk estimate" (Appendix C, 2008, page 1). However, as of August 31, 2009, the EPA continues to list the unit risk value of 1.3 x 10^{-5}/(µg/m^3) in its IRIS database (http://www.epa.gov/ncea/iris/subst/0419.htm), corresponding

with a cancer risk level of 16.5 in 1,000,000 at an annual average formaldehyde concentration of 1.27 µg/m^3.

Health Canada's current risk-specific concentration for formaldehyde (based on a 1 in 1,000,000 cancer risk) is 0.19 µg/m^3. Use of the current Health Canada limit results in a predicted cancer risk level of 6.7 in 1,000,000. While this incremental risk is still considered low, it does exceed the 1 in 1,000,000 benchmark referenced by LP.

For the assessment of formaldehyde acute health risks, the maximum predicted 1-hour air concentration (56.9 µg/m^3) was compared against the Manitoba ambient air quality objective of 60 µg/m^3. The rationale for disregarding the lower ATSDR minimal risk level (MRL) of 50 µg/m^3, which is exceeded by the predicted maximum air concentration, and therefore may indicate potential health risks, was not provided. In fact, the maximum predicted 1-hour air concentration exceeds the guidelines endorsed by a number of agencies, including the ATSDR, OEHHA (55 µg/m^3) and TCEQ (50 µg/m^3). The rationale for selecting the Manitoba air quality objective of 60 µg/m^3 is needed.

In addition, the average background formaldehyde concentration of 3 to 4 µg/m^3 (from LP PPT, 2009) should have been added to the predicted 56.9 µg/m^3 value, which would yield a total concentration of right around the Manitoba ambient air quality objective of 60 µg/m^3.

3.6.2 Benzene

	Source	Exposure limit (µg/m^3)
Acute	LP HHRA (ACGIH TLV)	1,579[(1)]
	ATSDR	30
	OEHHA	1,300
	TCEQ	580
Chronic (cancer, based on 1-in-a-million risk)	LP HHRA (US EPA IRIS)	0.13
	Health Canada	0.3
	OEHHA	0.03
	RIVM	0.2
	WHO	0.17
[(1)] Page 19, November 18, 2008, 22 pp.		

LP states that the "ISC-PRIME dispersion model prediction for the maximum 1-hour average ambient fence-line concentration of benzene following RTO elimination (2.058 µg/m^3) might be compared to the ACGIH TLV or STEL" (NCASI, 2008). The use of ACGIH values for a public health risk assessment is inappropriate. The ACGIH TLV and STEL are intended to characterize potential risks for occupational exposures only. The maximum predicted 1-hour fence line concentration should have been compared to the ATSDR, in which case the apparent margin of safety is approximately 50-fold lower than that stated by LP.

3.6.3 Hydrogen cyanide

	Source	Exposure limit (µg/m^3)
Acute	LP HHRA (Manitoba)	40
	ATSDR	-
	OEHHA	340
	TCEQ	-
	OMOE (1/2-h & 24-h)	24 & 8

	Source	Exposure limit (µg/m^3)
Chronic	LP HHRA (US EPA IRIS)	3
	Health Canada	-
	OEHHA	9
	ATSDR	-
	RIVM	25

Hydrogen cyanide limits assumed by LP are appropriate in this Application.

3.6.4 Methylene diphenyl diisocyanate (MDI)

	Source	Exposure limit (µg/m^3)
Acute	LP HHRA (Manitoba)	3
	ATSDR	-
	OEHHA	-
	TCEQ	-
	OMOE (1/2 h & 24-h)	2 & 0.7
Chronic	LP HHRA (US EPA IRIS)	0.6
	Health Canada	-
	OEHHA	0.7
	ATSDR	-
	Health Canada/Environment Canada	60
	WHO	40

MDI limits assumed by LP are appropriate in this Application.

3.6.5 Nitrogen dioxide

	Source	Exposure limit (µg/m^3)
Acute	LP HHRA (Manitoba)	400
	Health Canada/Environment Canada	400
	ATSDR	-
	OEHHA	470
	TCEQ	
	WHO	200
Chronic	LP HHRA (US EPA NAAQS)	100
	Health Canada/Environment Canada	60
	WHO	40

The acute nitrogen dioxide limit assumed by LP is equivalent to the Health Canada limit and is considered appropriate, although it is higher than the more conservative WHO limit of 200 µg/m³. The maximum predicted 1-hour NO_2 concentration of 147.8 µg/m^3 is less than the WHO limit, but with a lower apparent margin of safety than stated by LP.

The chronic nitrogen dioxide limit assumed by LP is higher than the Health Canada and WHO limits, so is less conservative. The maximum predicted annual average NO_2 concentration of 8.54 µg/m^3 is less than the Health Canada or WHO limits, but with a lower apparent margin of safety than stated by LP, especially when background NO_2 concentration is factored in (see comment 2.2).

3.6.6 Acrolein

	Source	Exposure limit (µg/m^3)
Acute	LP HHRA	Range of values presented
	ATSDR	6.9
	OEHHA	2.5
	TCEQ	-
	OMOE	0.08
Chronic	LP HHRA (US EPA IRIS)	Range of values presented
	Health Canada	0.4
	US EPA (IRIS)	0.02
	OEHHA	0.35
	RIVM	-
	TCEQ	0.23
	WHO	-

LP compares the maximum predicted 1-h and 24-h acrolein concentrations to several limits and notes that the Ontario limits are exceeded. In the July 1, 2009 letter to LP, a US EPA reference concentration (RfC) of 0.5 µg/m^3 was cited for acrolein, compared to a predicted annual average acrolein concentration of 0.02 µg/m^3 . This cited value of 0.5 µg/m^3 is incorrect. The correct IRIS RfC for acrolein is 0.02 µg/m^3, which is equivalent to the predicted air concentration and is 25-fold more stringent than the value cited. (It should be noted that the EPA's oral reference dose (RfD) for acrolein is 0.5 µg/kg bw/day for acrolein). The addition of any amount of background average acrolein concentrations to the predicted maximum annual value from LP would therefore result in a predicted health risk.

3.6.7 PM_{10}

	Source	Exposure limit (µg/m^3)
Acute	LP HHRA (Manitoba)	50
	WHO	50
	OEHHA	50
	US EPA NAAQS	150
Chronic	LP HHRA	Not assessed
	WHO	20
	OEHHA	20

The predicted maximum PM_{10} concentration of 32.3 µg/m^3 is less than 24 hour limits, but this value does not include background concentration of PM_{10}, which may be substantial at times as it is generated by road dust, agricultural activities etc. It appears from a graph in LP PPT (2009) that average background PM_{10} concentration is around 10 to 15 µg/m^3. This background value should be added to the predicted value before the conclusion is made that the "likelihood of adverse effects is negligible".

LP did not assess potential chronic effects based on the annual average limits shown in the table above.

3.6.8 $PM_{2.5}$

	Source	Exposure limit (µg/m^3)
Acute	LP HHRA (CWS)	30
	WHO	25
	US EPA NAAQS	35
	OEHHA	25
Chronic	LP HHRA	Not assessed
	WHO	10
	US EPA	15
	OEHHA	12

The predicted 98th percentile $PM_{2.5}$ concentration of 14.6 µg/m^3 is less than the CWS of 30 µg/m^3, but this value does not include background concentration of $PM_{2.5}$, which should be added to the predicted value before conclusions regarding risks are drawn.

LP did not assess potential chronic effects based on the annual average limits shown in the table above.

3.6.9 Phenol

	Source	Exposure limit (µg/m^3)
Acute	LP HHRA (Manitoba)	63
	ATSDR	-
	OEHHA	5,800
	TCEQ	-
	OMOE (1/2-h & 24-h)	100 & 30
Chronic	LP HHRA (US EPA IRIS)	Not assessed
	Health Canada	-
	US EPA (IRIS)	-
	OEHHA	200
	WHO	-
	RIVM	20

Predicted 1-h phenol concentrations are lower than acute exposure limits, but phenol was not assessed on a chronic basis, even though chronic guidelines are available. A graph in the LP PPT (2009) indicates that background phenol concentrations are very low, which is expected since it is likely that the only major source is the OSB mill.

3.6.10 Acetaldehyde

	Source	Exposure limit (µg/m^3)
Acute	LP HHRA (Alberta)	90
	ATSDR	-
	OEHHA	470
Chronic (cancer, based on 1-in-a-million)	LP HHRA (US EPA IRIS)	0.5
	Health Canada	1.7
	OEHHA	0.37
	WHO	-

Predicted acute 1-h and 24-h acetaldehyde concentrations are well below available limits, but background concentrations should be added before comparisons to exposure limits are made.

The predicted annual average concentration of 0.11 µg/m^3 is lower than 1 in 1 million cancer risk values. As assumed by LP, background concentrations are not added to incremental lifetime cancer risk (ILCR) calculations.

3.6.11 Methanol

	Source	Exposure limit (µg/m^3)
Acute	LP HHRA (Alberta)	2,600
	ATSDR	-
	OEHHA	28,000
	TCEQ	-
	RIVM	-
Chronic	LP HHRA	Not assessed
	Health Canada	-
	US EPA (IRIS)	-
	OEHHA	4,000
	WHO	-
	RIVM	-

Methanol was not assessed on a chronic basis, even though a chronic guideline is available.

3.6.12 Propionaldehyde

	Source	Exposure limit (µg/m^3)
Acute	LP HHRA (Ontario)	10
	ATSDR	-
	OEHHA	-
	TCEQ	-
Chronic	LP HHRA (US EPA IRIS)	8
	Health Canada	-
	WHO	-

Maximum predicted 1-h and annual concentrations of 2.41 and 0.03 µg/m^3 are below respective exposure limits, although background concentrations should have been added before potential risks were calculated.

3.7 Food and Water Ingestion Pathways

The LP reports only address the potential health risks associated with the “inhalation exposure pathway”. Non-volatile chemicals can be deposited in the local environment and may accumulate in soils, vegetation, fish and wildlife. The US EPA uses the following criteria to identify non-volatile air contaminants that may accumulate in the environment and thus enter the human “food chain”: molecular weight greater than 200g/mol; log K_{ow} greater than 3.5; Henry’s Law Constant less than 0.00001 at-m^3/mol; and, vapour pressure less than 0.001 mm Hg. Chemicals that meet any of these criteria should be assessed via a “country food” ingestion exposure pathway, in addition to the inhalation pathway.

4.0 SUMMARY AND CONCLUSIONS

My overall general comment is that the human risk calculations provided by LP Canada DO NOT represent current accepted practice for human health risk assessment in Canada and the US. In other words a conventional human health risk assessment (HHRA) was not conducted by LP in support of this Application. The LP human health data provided in their application could be described as “screening level” calculations at best, but certainly do not represent the scope of HHRA that would typically be required for an application today to reduce emission limits in an existing, operating industrial facility.

In addition several specific issues were identified regarding the following items:

- Ambient air quality monitoring locations improperly placed
- Background air concentrations were not added to modelled OSB mill predictions
- Incremental health risk increases could not be quantified due to lack of an appropriate and current “base case” with RTOs operating
- Risk estimates were not generated for nearby human receptor locations
- The potential for odour generation, which can generate health concerns, was not assessed
- A scientific rationale was not provided for the exposure limits that were assumed, some of which may be inappropriate, as discussed in this review
- Inclusion of country food and water ingestion pathways would likely provide additional predicted health risks, but were not assessed.

Review of these documents and materials resulted in identification of several issues that should be addressed, in my opinion, before a final decision is made by Manitoba Environment regarding the Application by LP Canada to decommission their RTOs.

5.0 REFERENCES

CCME (Canadian Council of Ministers of the Environment). 1996. A Protocol for the Derivation of Environmental and Human Health Soil Quality Guidelines. CCME, Winnipeg.

CCME (Canadian Council of Ministers of the Environment). 2006. A Protocol for the Derivation of Environmental and Human Health Soil Quality Guidelines. ISBN-10 1-896997-45-7 PDF. ISBN-13 978-1-896997-45-2 PDF. PN 1332.

Health Canada. 2004. Federal Contaminated Site Risk Assessment in Canada. Part I: Guidance on Human Health Preliminary Quantitative Risk Assessment (PQRA). Prepared by Environmental Health Assessment Services Safe Environments Program. September, 2004.

NRC (United States National Research Council. 1983. Risk assessment in the federal government: Managing the process. National Research Council, National Academy Press, Washington, DC.

NRC (United States National Research Council). 1994. Science and Judgement in Risk Assessment. Taylor and Francis. Washington, DC.

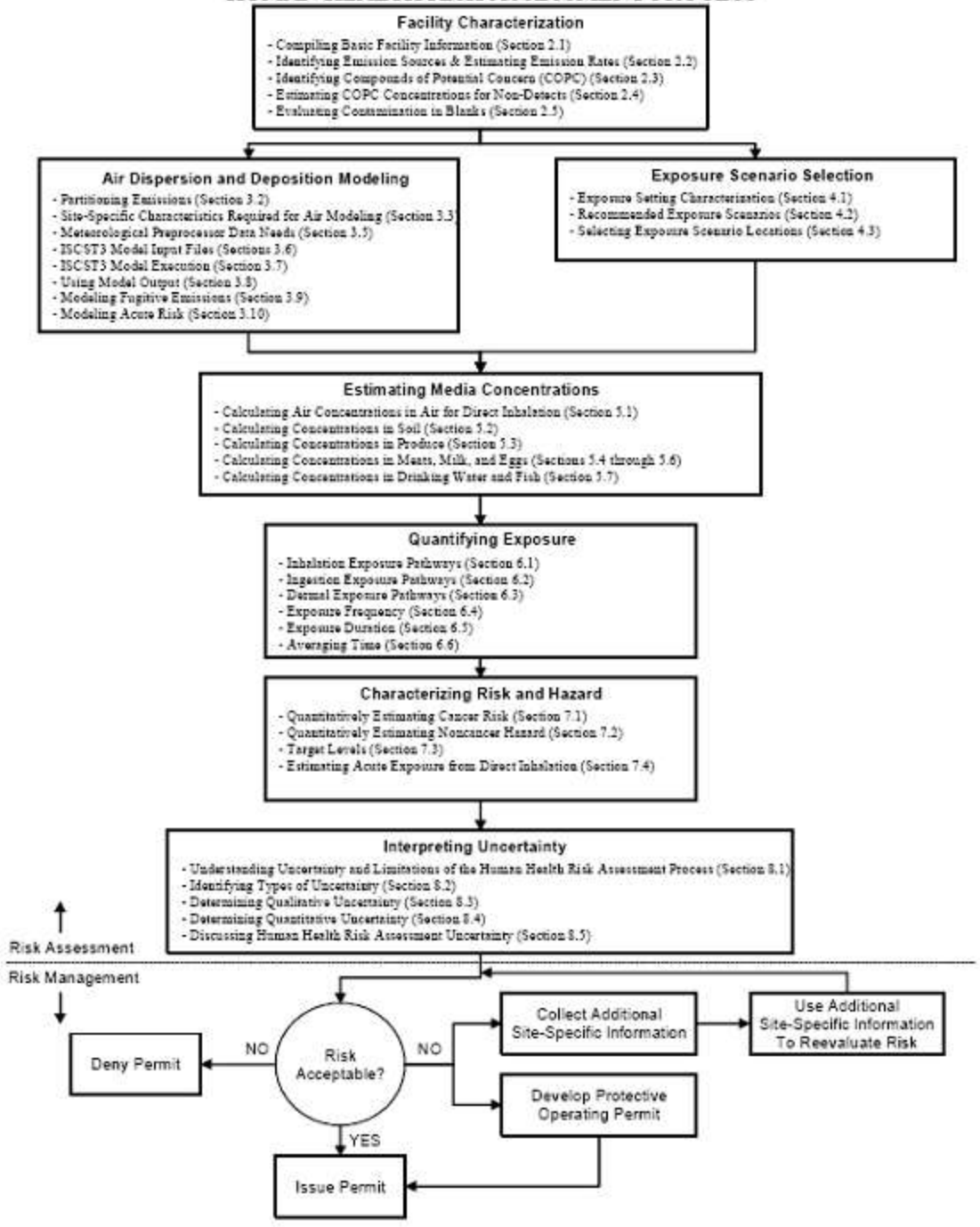
US EPA OSW (United States Environmental Protection Agency Office of Solid Waste). 2005. Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities. Final. United States Environmental Protection Agency Region 6. Multimedia Planning and Permitting Division. Center for Combustion Science and Engineering. Office of Solid Waste. EPA530-R-05-006.

US EPA. 2004. An Examination of EPA Risk Assessment Principles and Practices. Staff paper prepared for the U.S. Environmental Protection Agency by members of the Risk Assessment Task Force. March 2004. EPA/100/B-04/001.

Wilson, R. 2005. Guidance on Air Quality Risk Assessment. Version 1.0. HECS-SEP-BC/Yukon-04/05-06. Prepared for Health Canada. August 8, 2005.

APPENDIX A
Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities

FIGURE 1-1
HUMAN HEALTH RISK ASSESSMENT PROCESS



US EPA OSW. 2005. Human Health Risk Assessment Protocol for Hazardous Waste Combustion Facilities, Final. US EPA Region VI. Multimedia Planning and Permitting Division. Center for Combustion Science and Engineering. Office of Solid Waste.