

**Projet de contournement sud de l'agglomération de Sherbrooke**  
**dans le prolongement de l'autoroute 410 par le ministère des Transports :**  
**que laisserons-nous à nos enfants ?**

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**Projet de contournement sud de l'agglomération de Sherbrooke dans le prolongement de l'autoroute 410 par le ministère des Transports : que laisserons-nous à nos enfants ?**

En tant que citoyenne, mère de famille et professionnelle de la santé œuvrant dans le domaine de la pédiatrie et du suivi de grossesse, j'ai d'importantes réserves quant au projet de contournement sud de l'agglomération de Sherbrooke dans le prolongement de l'autoroute 410 par le ministère des Transports, plus particulièrement en ce qui a trait à l'option du tracé Sud.

Je suis particulièrement sensible aux impacts qu'un tel projet représente, tant pour la protection de l'environnement que pour la qualité de vie et la santé des résidents affectés. Sans vouloir reprendre toute l'argumentation qui a déjà été ou qui sera débattue devant la Commission, j'aimerais élaborer sur deux points qui me tiennent particulièrement à cœur.

1) Santé humaine

De nombreuses études font état de risques nettement plus élevés pour la santé humaine en bord des autoroutes, notamment pour les troubles respiratoires<sup>1</sup> (tels que l'asthme<sup>2</sup>, la maladie pulmonaire obstructive chronique et la pneumonie), les maladies cardio-vasculaires ainsi que le cancer<sup>3</sup> et ce, autant chez les sujets immunitairement affaiblis que chez les sujets normaux<sup>4</sup>.

Une récente recherche canadienne a réussi à démontrer que le taux de mortalité se trouvait devancé de 2½ ans pour les gens habitant à 100 mètres ou moins d'une autoroute<sup>5</sup>.

En fait, la distance semble être un facteur de risque encore plus important que le volume du trafic routier pour le sifflement respiratoire chez les enfants de moins d'un an<sup>6</sup>.

Pour ces raisons, je crois qu'il est important d'éviter le tracé Sud qui met en danger les quartiers résidentiels de l'Indiana et de l'Ivoire, ce dernier étant particulièrement défavorisé par les vents dominants.

Il n'en demeure pas moins que le tracé Nord aura lui aussi des répercussions négatives<sup>7</sup>. Je me permets donc de faire les suggestions suivantes :

- i. que les options de drainage et de filtration soient méticuleusement étudiées<sup>8, 9, 10, 11, 12, 13, 14</sup> afin de réduire les problèmes de contamination des eaux de surface au minimum et
- ii. que la plantation d'arbres et d'arbustes le long de la route soit optimisée autant pour favoriser une purification de l'air naturelle que pour augmenter le confort et la sécurité des utilisateurs de l'autoroute en faisant office de brise-vent.

## 2) Pollution lumineuse

Les éclairages mal conçus, mal orientés ou utilisés abusivement causent le voilement des étoiles, créent de l'éblouissement non sécuritaire et génèrent de la lumière intrusive. Tous ces phénomènes contribuent à la pollution lumineuse qui met en péril notre patrimoine stellaire, porte atteinte à l'équilibre des écosystèmes et génère d'importantes pertes énergétiques<sup>15</sup>.

Il ne faut pas oublier que le besoin d'éclairage s'accroît avec le suréclairage. Par contre, si un éclairage supplémentaire s'avérait indispensable le long de l'autoroute, quelques suggestions seraient à considérer :

- i. s'assurer d'utiliser les niveaux d'éclairage minimum et en réduire l'intensité après 22h ou 23h
- ii. limiter la hauteur des poteaux afin d'éviter l'éparpillement de lumière hors de la route

- iii. utiliser des lampadaires qui ne causent pas de déperdition de lumière vers le ciel
- iv. privilégier l'utilisation des lampes au sodium basse pression qui génèrent une lumière monochrome pouvant facilement être filtrée pour les besoins des études et observations astronomiques; bien que cette lumière soit plus jaunâtre, elle offre un meilleur rendement d'éclairage en fonction de l'énergie consommée que les lampes au sodium haute pression ou à vapeur de mercure.

« L'efficacité en éclairage extérieur comme moyen de réduire la pollution lumineuse »  
est un document pertinent sur le sujet produit par l'ASTROLab pour l'Agence de l'efficacité énergétique du Québec.

Ces quelques commentaires, suggestions et recommandations permettront, à mon avis, de contribuer à un meilleur héritage au niveau de l'environnement et de la santé de nos enfants dans la perspective d'un développement durable avec le prolongement de l'autoroute 410. En épargnant le tracé Sud, le projet protégera l'avenir de nombreuses familles des quartiers de l'Ivoire et de l'Indiana.

Christine Renaud, D.C., D.A.C.C.P.

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<sup>1</sup> Janssen NA. Schwartz J. Zanobetti A. Suh HH. Air conditioning and source-specific particles as modifiers of the effect of PM(10) on hospital admissions for heart and lung disease. [Journal Article] Environmental Health Perspectives. 110(1):43-9, 2002 Jan.

Studies on acute effects of particulate matter (PM) air pollution show significant variability in exposure-effect relations among cities. Recent studies have shown an influence of ventilation on personal/indoor-outdoor relations and stronger associations of adverse effects with combustion-related particles. We evaluated whether differences in prevalence of air conditioning (AC) and/or the contribution of different sources to total PM(10) emissions could partly explain the observed variability in exposure-effect relations. We used regression coefficients of the relation between PM(10) and hospital admissions for chronic obstructive pulmonary disease (COPD), cardiovascular disease (CVD), and pneumonia from a recent study in 14 U.S. cities. We obtained data on the prevalence of AC from the 1993 American Housing Survey and data on PM(10) emissions by source category, vehicle miles traveled (VMT), and population density from the U.S. EPA. We analyzed data using meta-regression techniques. PM(10) regression coefficients for CVD and COPD decreased significantly with increasing percentage of homes with central AC

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exposure to traffic exhausts increases oxidative DNA damage. Urinary 8-OHdG is a promising biomarker of traffic exhaust induced oxidative stress.

<sup>4</sup> Holgate ST. Sandstrom T. Frew AJ. Stenfors N. Nordenhall C. Salvi S. Blomberg A. Helleday R. Soderberg M. Health effects of acute exposure to air pollution. Part I: Healthy and asthmatic subjects exposed to diesel exhaust. [Clinical Trial. Controlled Clinical Trial. Journal Article] Research Report - Health Effects Institute. (112):1-30; discussion 51-67, 2003 Dec.

The purpose of this study was to assess the impact of short-term exposure to diluted diesel exhaust on inflammatory parameters in human airways. We previously exposed control subjects for 1 hour to a high ambient concentration of diesel exhaust (particle concentration 300 pg/m<sup>3</sup>—a level comparable with that found in North Sea ferries, highway underpasses, etc). Although these exposures did not have any measurable effect on standard indices of lung function, there was a marked neutrophilic inflammatory response in the airways accompanied by increases in blood neutrophil and platelet counts. Endothelial adhesion molecules were upregulated, and the expression of interleukin 8 messenger RNA (IL-8 mRNA\*) was increased in a pattern consistent with neutrophilia. Individuals with asthma have inflamed airways and are clinically more sensitive to air pollutants than are control subjects. The present study was designed to assess whether this clinical sensitivity can be explained by acute neutrophilic inflammation or an increase in allergic airway inflammation resulting from diesel exhaust exposure. For this study, we used a lower concentration of diesel exhaust (100 microg/m<sup>3</sup> PM<sub>10</sub>) for a 2-hour exposure. At this concentration, both the control subjects and those with asthma demonstrated a modest but statistically significant increase in airway resistance following exposure to diesel exhaust. This increase in airway resistance was associated with an increased number of neutrophils in the bronchial wash (BW) fluid obtained from control subjects (median after diesel exhaust 22.0 vs median after air 17.2; P = 0.015), as well as an increase in lymphocytes obtained through bronchoalveolar lavage (BAL) (15.0% after diesel exhaust vs 12.3% after air; P = 0.017). Upregulation of the endothelial adhesion molecule P-selectin was noted in bronchial biopsy tissues from control subjects (65.4% of vessels after diesel exhaust vs 52.5% after air). There was also a significant increase in IL-8 protein concentrations in BAL fluid and IL-8 mRNA gene expression in the bronchial biopsy tissues obtained from control subjects after diesel exhaust exposure (median IL-8 expression 65.7% of adenine phosphoribosyl transferase [APRT] gene expression value after diesel exhaust vs 51.0% after air; P = 0.007). There were no significant changes in total protein, albumin, or other soluble inflammatory markers in the BW or BAL fluids. Red and white blood cell counts in peripheral blood were unaffected by diesel exhaust exposure. Airway mucosal biopsy tissues from subjects with mild asthma (defined as forced expiratory volume in 1 second [FEV<sub>1</sub>] greater than or equal to 70% of the predicted value) showed eosinophilic airway inflammation after air exposure compared with the airways of the corresponding control subjects. However, among the subjects with mild asthma, diesel exhaust did not induce any significant change in airway neutrophils, eosinophils, or other inflammatory cells; cytokines; or mediators of inflammation. The only clear effect of diesel exhaust on the airways of subjects with asthma was a significant increase in IL-10 staining in the biopsy tissues. This study demonstrated that modest concentrations of diesel exhaust have clear-cut inflammatory effects on the airways of nonasthmatic (or control) subjects. (notre souligné) The data suggest a direct effect of diesel exhaust on IL-8 production leading to upregulation of endothelial adhesion molecules and neutrophil recruitment. Despite clinical reports of increased susceptibility of patients with asthma to diesel exhaust and other forms of air pollution, it does not appear that this susceptibility is caused either directly by induction of neutrophilic inflammation or indirectly by worsening of preexisting asthmatic airway inflammation. The increased level of IL-10 after diesel exhaust exposure in airways of subjects with asthma suggests that this pollutant may induce subtle changes in airway immunobiology. This is an important topic for further investigation. Other possible explanations for the apparent lack of response to diesel exhaust among subjects with asthma include (1) the time course of the response to diesel may differ from the response to allergens, which peaks 6 to 8 hours after exposure; (2) a different type of

inflammation may occur that was not detectable by the standard methods used in this study; and (3) the increased sensitivity of patients with asthma to particulate air pollution may reflect the underlying bronchial hyperresponsiveness found in asthma rather than any specific increase in inflammatory responses.

<sup>5</sup> Finkelstein MM, Jerrett M, Sears MR. Traffic air pollution and mortality rate advancement periods. [Journal Article] *American Journal of Epidemiology*. 160(2):173-7, 2004 Jul 15.

Chronic exposure to air pollution is associated with increased mortality rates. The impact of air pollution relative to other causes of death in a population is of public health importance and has not been well established. In this study, the rate advancement periods associated with traffic pollution exposures were estimated. Study subjects underwent pulmonary function testing at a clinic in Hamilton, Ontario, Canada, between 1985 and 1999. Cox regression was used to model mortality from all natural causes during 1992-2001 in relation to lung function, body mass index, a diagnosis of chronic pulmonary disease, chronic ischemic heart disease, or diabetes mellitus, household income, and residence within 50 m of a major urban road or within 100 m of a highway. Subjects living close to a major road had an increased risk of mortality (relative risk = 1.18, 95% confidence interval: 1.02, 1.38). The mortality rate advancement period associated with residence near a major road was 2.5 years (95% confidence interval: 0.2, 4.8). By comparison, the rate advancement periods attributable to chronic pulmonary disease, chronic ischemic heart disease, and diabetes were 3.4 years, 3.1 years, and 4.4 years, respectively.

<sup>6</sup> Ryan PH, LeMasters G, Biagini J, Bernstein D, Grinshpun SA, Shukla R, Wilson K, Villareal M, Burkle J, Lockey J. Is it traffic type, volume, or distance? Wheezing in infants living near truck and bus traffic. [Journal Article] *Journal of Allergy & Clinical Immunology*. 116(2):279-84, 2005 Aug.

**BACKGROUND:** Previous studies of air pollution have not examined the association between exposure to varying types, distance, and amounts of traffic and wheezing in very young infants. **OBJECTIVE:** We sought to determine the relationship between types of traffic, traffic volume, and distance and wheezing among infants less than 1 year of age. **METHODS:** A geographic information system and a classification scheme were developed to categorize infants enrolled in the study as living near moving truck and bus traffic (highway >50 miles per hour, >1000 trucks daily, <400 m), stop-and-go truck and bus traffic (<50 miles per hour, <100 m), or unexposed and not residing near either. Symptom data were based on health questionnaires administered to parents when the infants were 6 months of age and monthly health diaries. **RESULTS:** Infants living very near (<100 m) stop-and-go bus and truck traffic had a significantly increased prevalence of wheezing (adjusted odds ratio, 2.50; 95% CI, 1.15-5.42) when compared with unexposed infants. The prevalence of wheezing among nonwhite infants was at least twice that of white infants, regardless of exposure. Infants living less than 400 m from a high volume of moving traffic, however, did not have an increased prevalence of wheezing. **CONCLUSION:** These results suggest that the distance from and type of traffic exposures are more significant risk factors than traffic volume for wheezing in early infancy.

<sup>7</sup> Korenstein S, Piazza B. An exposure assessment of PM10 from a major highway interchange: are children in nearby schools at risk?. [Journal Article] *Journal of Environmental Health*. 65(2):9-17, 37, 2002 Sep.

In urban areas, elementary schools may be in close proximity to major roadways. Major roadways have been shown to be a significant source of particulate (PM10) air pollution. In several recent studies, particulate air pollution has been demonstrated to be an important factor associated with negative respiratory health effects, especially in minority children. In response to community concerns, during April 2000 the Office of Environmental Health and Safety of the Los Angeles Unified School District conducted an exposure assessment study in the East Los Angeles area, a region populated predominantly by ethnic minorities (predominantly Hispanic). The purpose of this study was to determine if children attending some of these schools are exposed to PM10 at sufficient levels to cause negative respiratory health effects. Results of this study show that

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students in close proximity to major roadways receive a dose of PM10 at levels approaching 10-15 micrograms per cubic meter, an exposure predicted to cause negative health effects.

<sup>8</sup> Han J. Wu JS. Allan C. Suspended sediment removal by vegetative filter strip treating highway runoff. [Journal Article] *Journal of Environmental Science & Health Part A-Toxic/Hazardous Substances & Environmental Engineering*. 40(8):1637-49, 2005.

Structural best management practices (BMPs) are often used to mitigate the impact of storm water runoff on receiving waters. Vegetative filter strips (VFS) are an example of a structural BMP that has been used to treat storm water and highway runoff. Physical factors affecting the performance of VFS include pollutant characteristics, vegetation composition and density, soil properties, and the physical dimensions of the filter strip. In this study, field-suspended sediment data were collected from an experimental VFS treating highway runoff in eastern North Carolina. Field data were used to test the design concepts of the VFS treatment train and to validate a simulation model for evaluating the impact of these physical factors on sediment removal as a function of filter strip length. It was concluded that the experimental filter strip was effective in removing more than 85% of the incoming total suspended sediment (TSS). Simulation results support field observations that a 10-m or longer filter strip can retain most of the medium and large particles (> 8 microm) transported in runoff. Simulations also indicate infiltration loss is largely responsible for the retention of small-size sediment particles (< 8 microm). Saturated hydraulic conductivity and initial water contents have little effects on TSS removal. The condition of vegetative coverage, in particular vegetation density, is another factor affecting the performance of filter strip.

<sup>9</sup> Revitt DM. Shutes RB. Jones RH. Forshaw M. Winter B. The performances of vegetative treatment systems for highway runoff during dry and wet conditions. [Journal Article] *Science of the Total Environment*. 334-335:261-70, 2004 Dec 1.

The performances of two different highway runoff treatment systems, a horizontal subsurface flow-constructed wetland and a vegetated balancing pond, are described. Both systems have been assessed by collecting inlet and outlet grab samples during wet and dry weather conditions, and automatically controlled storm event samples have been obtained for the constructed wetland. Removal efficiencies are discussed for BOD (grab samples only), suspended solids, Cd, Cr, Cu, Ni, Pb, Zn, nitrate and sulphate, and explanations are offered for the trends observed under different weather conditions. The large variabilities in the removal efficiencies derived for both treatment systems, based on the analyses of grab samples, make accurate comparisons of the performances difficult and also raise concerns about using this type of sampling approach for this purpose. Treatment systems are required to function satisfactorily during the increased inlet loadings experienced during storm events, and this is shown to be the case for the constructed wetland for the majority of the monitored pollutants. The large removal efficiency ranges for five separate storm events, exhibited by Cu and Pb, are discussed and compared to the other monitored pollutants which showed positive median wet weather removal efficiencies of between 43% and 85%. Despite the existence of performance fluctuations, the generally low monitored inlet concentrations in the highway runoff indicated that the pond discharges did not threaten the environmental quality of the receiving waters.

<sup>10</sup> Ellis JB. Deutsch JC. Mouchel JM. Scholes L. Revitt MD. Multicriteria decision approaches to support sustainable drainage options for the treatment of highway and urban runoff. [Journal Article] *Science of the Total Environment*. 334-335:251-60, 2004 Dec 1.

The control and treatment of urban and highway runoff involves a variety of stakeholders in the selection of sustainable drainage systems (SUDS) as the design process needs to consider not only water quantity but also water quality and amenity. Thus, technical, environmental/ecological, social/community and economic cost factors become prime potential sustainability criteria in terms of assessing long-term, cost-effective drainage options. The paper develops a multicriteria analysis methodology for the evaluation and accreditation of SUDS structures within the context

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of an overall decision-support framework. Approaches independently developed in the UK and France are outlined with the common multicriteria structures defining generic performance criteria together with supporting benchmark standards and exclusion thresholds. A French case study is presented to illustrate the approach and to highlight the inherent constraints and subjectivity embedded in the decision-making process.

<sup>11</sup> Viklander M. Marsalek J. Malmquist PA. Watt WE. Urban drainage and highway runoff in cold climates: conference overview. [Journal Article] *Water Science & Technology*. 48(9):1-10, 2003.

This overview of research findings presented at the conference on urban drainage and highway runoff in cold climates starts with generation of urban runoff and snowmelt, followed by snowmelt and winter runoff quality, best management practices for urban snowmelt and winter runoff, and snow management in urban areas. Research on the urban hydrological cycle is lagging behind the needs in this field, particularly in terms of data availability. The current studies of winter urban runoff quality focus on road salts in the urban environment and their environmental effects. The needs for better source controls in salt applications, improved management of chloride-laden runoff, and selective adoption of environmentally safer alternative de-icers were reported. Adaptation of the conventional stormwater best management practices (BMPs) for winter operation remains a challenge. The first step in refining the existing BMPs for winter operation is to advance the understanding of their operation, as reported for some cases at the conference. Finally, snow management in urban areas may require local storage of fresh (unpolluted) snow and disposal of more polluted snow at central snow disposal sites.

<sup>12</sup> Shutes RB. Revitt DM. Lagerberg IM. Barraud VC. The design of vegetative constructed wetlands for the treatment of highway runoff. [Journal Article] *Science of the Total Environment*. 235(1-3):189-97, 1999 Sep 1.

The Environment Agency for England and Wales are responsible for assessing the effects of highway runoff and for monitoring the treatment systems/procedures which have been introduced for the reduction of deleterious effects. The Agency is looking into the improvement of surface water management in terms of best management practices and plans to work in partnership with the Highways Agency to achieve this aim. Among the treatment options being considered are constructed wetlands. Draft Guidelines have been developed to provide information on their design. This paper describes procedures for carrying out an Environmental Sensitivity Analysis to determine whether treatment by a constructed wetland is appropriate. Information on water quality and quantity is required as well as the sensitivity of the receiving environment. The legislative position, particularly in relation to the discharge quality of the water and the conservation status of the receiving environment, needs also to be considered. The factors that will determine the most appropriate wetland design criteria include traffic loadings, road drainage area, land availability, cost and the size/extent and type of the receiving water body. The following structures are recommended for incorporation in the overall design; oil separator and silt trap, spillage containment, settlement pond, vegetative wetland and final settlement tank. The operation and maintenance procedures and the monitoring requirements for a functioning wetland are described.

<sup>13</sup> Berbee R. Vermij P. van de Laak WJ. Policy development for the reduction of pollution caused by traffic experiences from The Netherlands. [Journal Article] *Water Science & Technology*. 49(3):183-8, 2004.

Road traffic is a diffuse source of heavy metals and oil that leads to pollution of verges and surface water in areas immediately surrounding roads. The Commission for Integrated Water Management (CIW) has drawn up a policy document addressing methods for managing this type of pollution. The document is based on results from numerous studies in The Netherlands targeting pollution caused by traffic. The Commission concludes that measures at the source are the only way to realise sustainable solutions. For example, attention should be devoted to the issue of zinc emissions from car tyres and crash barriers. The concept of controlled infiltration is recommended for combating pollution caused by spray and runoff from roads. This includes



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periodic chemical inspection of verge pollution and, where necessary, replacement of the verge's top layer. The application of porous asphalt on highways in The Netherlands has also proven highly effective in limiting pollution caused by traffic, with far less pollution caused by spray from the highway and runoff as compared to traditional asphalt.

<sup>14</sup> Pontier H. Williams JB. May E. Progressive changes in water and sediment quality in a wetland system for control of highway runoff. [Journal Article] *Science of the Total Environment*. 319(1-3):215-24, 2004 Feb 5.

Innovative wetland based systems were designed and installed on the Newbury Bypass, Berkshire, England to provide flow balancing and pollution control for road runoff. The systems were monitored over 18 months to evaluate performance, pollutant removal processes and offer improved design and operation codes for this new application of wetlands. Water quality, sediment accumulation rates, and metal concentrations in size-fractionated, settling solids and deposited sediments were determined in parts of the system to provide information on spatial and temporal variability. The results presented here show that over the long term, there were progressive changes in parts of the system for BOD and COD and for metal concentrations in the sediment fractions, which occurred with linear (or semi log-linear) rates, despite variability in flow rates, retention times and in pollutant loading to the system. Future work will continue monitoring to increase the data set, examine possible processes contributing to the regression constants, and test the potential use of the regressions in system modelling. Attempts at modelling road runoff treatment using wetlands must allow for progressions, since the systems can only be effective if they retain removed metals in the sediment sink.

<sup>15</sup> Le 27 septembre 2006, du site Internet de l'ASTROLab du parc national du Mont-Mégantic : [www.astrolab.qc.ca](http://www.astrolab.qc.ca).