

MEMO / NOTE DE SERVICE

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SUBJECT :	2004 and 2008 GREENHOUSE GAS INVENTORIES, REDUCTION MEASURES AND APPROACH TO FUTURE TARGETS	
OBJET :	INVENTAIRES 2004 ET 2008 DES ÉMISSIONS DE GAZ À EFFET DE SERRE, MESURES DE RÉDUCTION ET ÉTABLISSEMENT DES PROCHAINS OBJECTIFS	

PURPOSE

The purpose of this memorandum is to present the results of the 2004 and 2008 *Corporate and Community Greenhouse Gas Inventories* for the City of Ottawa, highlight the emission reduction measures undertaken since 2009, and discuss how this information can be used in terms of future emission reduction targets.

EXECUTIVE SUMMARY

Greenhouse Gas (GHG) emissions have become a common indicator of environmental performance and resource use. GHG emission inventories measure emissions that are related largely to energy use that results from the burning of fossil fuels (oil and gas) to

produce electricity, heat and cool buildings, and power vehicles. Landfill gas emissions in the form of methane are also counted.

The City has recently completed corporate and community inventories for 2004 and 2008 which show that good progress has been made towards reducing GHG emissions. Corporate emissions – which include emissions from City buildings, fleets, water and wastewater treatment and solid waste – decreased by 12.5% between 2004 and 2008. A number of corporate initiatives including the Energy Reduction Program for City facilities, and landfill gas capture, contributed to this reduction. Community emissions saw an increase of only 0.9% between 2004 and 2008. Given that there was a 5.2% increase in population over the same period, per capita emissions have actually dropped from 7.14 tonnes per person to 6.84 tonnes per person.

Since 2009, the City has implemented a wide range of measures, such as reducing building energy demand and the introduction of hybrid vehicles, which will continue to reduce GHG emissions. These measures will be reflected in the next inventory planned for the 2012 calendar year. When complete in early 2014, the 2012 inventory can be used along with the results of the 2004 and 2008 inventories to provide a more complete trend analysis, assess progress relative to current targets and to consider future projections and targets.

RÉSUMÉ

Les émissions de gaz à effet de serre (GES) sont maintenant un indicateur commun de la performance environnementale et de l'utilisation des ressources. Les inventaires des émissions de GES tiennent surtout compte des émissions provenant de l'utilisation de combustibles fossiles (pétrole et gaz) pour la production d'électricité, pour le chauffage et la climatisation des édifices et comme carburant. Le méthane émanant des décharges est également pris en compte.

La Ville a récemment effectué les inventaires de GES municipal et communautaire pour les années 2004 et 2008, qui révèlent des progrès intéressants en matière de réduction des émissions de GES. En effet, les émissions de la Ville, qui comprennent les GES provenant du parc automobile et des édifices municipaux, ainsi que les émissions résultant du traitement de l'eau, des eaux usées et des déchets solides, ont diminué de 12,5 % entre 2004 et 2008. Cette réduction est en partie attribuable à la mise en œuvre d'initiatives stratégiques, dont le Programme de réduction de la consommation d'énergie pour les installations de la Ville et la capture des gaz d'enfouissement. Quant aux émissions de la communauté, elles n'ont augmenté que de 0,9 % entre 2004 et 2008. Étant donné qu'une croissance de la population de 5,2 % a été observée au cours de cette même période, les émissions ont en réalité diminué, passant de 7,14 à 6,84 tonnes par habitant.

Depuis 2009, la Ville a mis en œuvre diverses mesures, comme la réduction des besoins énergétiques de ses édifices et l'introduction de véhicules hybrides dans son parc automobile, qui permettront de maintenir cette tendance en matière de réduction des émissions de GES. Les effets de ces initiatives pourront être observés dans le prochain inventaire, qui portera sur l'année civile 2012. Tôt en 2014, une fois cet inventaire terminé, les résultats qui y figureront pourront être mis en parallèle avec ceux des inventaires 2004 et 2008, ce qui permettra une analyse plus complète des tendances, une évaluation des progrès réalisés vers l'atteinte de nos objectifs actuels et un réexamen des prévisions et des objectifs à venir.

BACKGROUND

As one of Council's *Term of Council* priorities, the City has committed to *Environmental Stewardship* – “promoting long-term sustainability and reducing our environmental footprint by maintaining and improving the quality of our air and water, by using green technology and promoting energy efficiency, and by protecting our natural resources and land to enhance the quality of the environment of our residents.”

One way to assess the city's environmental performance and overall sustainability is by measuring greenhouse gas emissions (GHGs) and carbon footprint. These indicators are a function of our collective energy use and transportation choices. Adopting more environmentally friendly actions that lower fuel consumption and reduce GHG emissions benefits both the City and the community through:

- Reduced energy costs for citizens, businesses, and the municipality resulting from greater energy efficiency
- Less dependence on, and vulnerability to, increasingly expensive fossil fuels through the installation and use of alternative energy sources
- Improved air quality and healthier lifestyles due to more active transportation (walking and biking)
- Reduced respiratory and cardiovascular impacts on vulnerable populations due to better air quality
- Lower pollution and road wear-and-tear.

For the City, the GHG inventories show how various City policies and initiatives such as the Smart Energy Initiative, Green Building Policy, Green Municipal Fleet Plan, Transit Vehicle Emissions Reduction Strategy, Idling Control By-law and more - have impacted emissions. As a member of the Federation of Canadian Municipalities Partners for Climate Protection (PCP) program, the City has committed to maintaining GHG inventory information as one of the program milestones.

The 2004 and 2008 GHG inventories provide a starting point from which the municipality can track and forecast its GHG emissions. The GHG inventories, by their very nature, are designed to capture the corporate and community emission profile at past points in time, and as such, will not reflect more recent actions and investments that have been made to further reduce emissions. Consideration of the 2004-2008 results should be done in conjunction with the measures undertaken since 2009 as discussed in this memo.

DISCUSSION

New Corporate and Community GHG inventories were prepared for two points in time, a baseline year (2004) and benchmark year (2008). The inventories document the amount of fuel used for transportation, as well as the energy consumed from heating and cooling houses/buildings, the energy used to treat wastewater and sewage, and the emissions resulting from the decomposition of waste. The GHG inventories were coordinated by the Environmental Services Department, Environmental Sustainability Branch, with the assistance of many staff and agencies.

The **Corporate GHG Inventory** was calculated using data from Transit Services (OC Transpo, O-Train, Para Transpo), Planning and Growth Management (transportation modeling, population statistics), Environmental Services (wastewater, sewage, waste), Public Works (municipal fleet, buildings, streetlights, traffic lights), and Ottawa Police Services.

The **Community GHG Inventory** used energy usage data obtained through Statistics Canada (Census of Agriculture, Census for Population, Waste Management Industry Survey), Natural Resources Canada (National Energy Use Database), City of Ottawa (Transportation Strategic Planning Unit, Research and Forecasting Unit, Planning and Growth Management; Operations Engineering Unit, Environmental Services), and the US Environmental Protection Agency (LandGEM model).

The Canadian Standards Association was contracted to validate these inventories and to develop a procedural manual to maintain consistency in future inventories. The inventories are based on protocols recommended by the Intergovernmental Panel on Climate Change and the World Resource Institute. The City followed the principles of the ISO 14064 standard, ensuring accuracy and transparency but did not apply for accreditation due to the time and cost associated with attaining formal certification.

The reported GHG emissions are in tonnes of equivalent carbon dioxide emissions (t eCO₂) and are calculated based on carbon dioxide (CO₂), methane (CH₄) and nitrogen oxide (N₂O) emissions.

The two inventories provide a relatively short timeline, so any trend interpretation should be treated with caution. The next inventory is scheduled to be done in 2013/2014 for the 2012 calendar year with the intent to undertake inventories every four years. It should also be noted that the 2004 and 2008 inventories are based on more stringent international reporting protocols and as a result are not directly comparable with previous inventory work.

Corporate GHG Inventory Results 2004-2008

The *Corporate* GHG Inventory shows that the City made good progress to reduce its GHG emissions between 2004 and 2008, with total emissions decreasing by 12.5%. This represents a reduction of almost 42,000 tonnes of eCO₂ emissions. This decrease is significant considering that over this period the city's population grew resulting in further demand for some services, and some changes were made to the reporting protocol which require the City to include transit emissions in its corporate inventory.

Table 1 shows the corporate GHG emissions in 2004 and 2008 for each of the City's four emissions sources: solid waste; facilities; fleets and wastewater/sewage. While the reduction in corporate GHG emissions from 2004 to 2008 was largely due to the solid waste sector, a variety of other actions contributed to the decrease such as corporate vehicle and equipment idling policy, purchase of hybrid vehicles, replacement of older buses, biodiesel testing and more.

Table 1: Corporate GHG emissions in 2004 and 2008

Emission Source	2004 (t eCO ₂)	2008 (t eCO ₂)	Change from 2004 to 2008 (t eCO ₂)	Tonnage Change 2004 to 2008
Solid Waste*	98,754.96	51,512.67	-47,242.29	-47.8%
Facilities	93,189.37	87,695.14	-5,494.23	-5.9%
Fleets*	136,111.47	146,334.89	10,223.42	7.5%

Wastewater / Sewage	7,28 8.46	7,93 5.39	646.9 3	8.9%
Total	335, 344. 26	293, 478. 09	- 41,86 6.17	-12.5%

*Excludes biogenic emissions

The City's **Solid Waste sector** was responsible for the majority of reductions in corporate GHG emissions with a decrease of 47.8% from 2004 to 2008, where landfill gas from the Trail Rd. Landfill was captured and converted to electricity, thereby minimizing the amount of gas that is flared to the atmosphere. The efficiency of its capture system has improved yearly.

The City's **Facilities sector** also reduced its GHG emissions with a decrease of 5.9% (5,494 t eCO₂) between 2004 and 2008. This decrease was principally the result of the provincial closures of the coal plants and the introduction of the City's Energy Reduction Program that used effective and efficient energy procurement, retrofitting and conservation measures. Offsetting these reductions was increased demand from new City facilities and growing demand from new street lighting and water distribution requirements. Another initiative that helped mitigate emissions was the 2007 Green Building Policy which mandates high performance (LEED certified minimum, LEED Silver preferred) sustainable City buildings.

The City's **Fleets sector**, including Transit, Municipal and Police, was responsible for the majority of the increase in GHG emissions, 7.5% over the four-year period. The Transit component of this sector is a recent addition to the corporate inventory (from the community inventory) due to changes in accounting protocols.

The Transit component of the Fleets sector was responsible for almost three quarters of the fleet emissions. Transit increased its GHG emissions by only 2.7% (2,895 t eCO₂) between 2004 and 2008 despite OC Transpo's increase in ridership (5.8%), in kilometers driven (6.5%) and in buses (116). On a per-rider basis, the emissions decreased from 1.12 to 1.11 kg of GHG emissions for 2004 and 2008 respectively. It's important to recognize that while Transit GHGs increase as ridership increases, this will be more than offset by community GHG reductions due to reduced personal vehicle use. In this instance the corporate increase has an overall community benefit.

Within this same timeframe many initiatives took place that facilitated the increase in ridership and reduced GHG emissions per rider. These included the Terry Fox and Standherd Park and Rides, the Millennium, Standherd, and Hawthorne bus stations, dedicated bus lanes on the 417 in Kanata, and 'SmartDriver' training for bus drivers. The Transit Fleet retired 331 buses that were well above 18 years in age and replaced them with 404 new and more fuel efficient buses, two of which were hybrid buses. In addition to

this, successful trial studies took place on biodiesel fuel, air pressure monitoring, and double decker buses that provided the necessary data for decision makers on future bus operations, maintenance and equipment.

The Municipal Fleet portion of the Fleet sector was responsible for almost 20% of GHG emissions in 2008. Between 2004 and 2008, their GHG emissions increased by 29.8%. Vehicle growth accounted for half the emissions increase with the remainder caused by a year of very unusual weather including the “2008 North American Blizzard” where 52 cm of snow fell. Between 2004 and 2008 many City initiatives reduced the Fleet sector’s GHGs. These include the replacement of unregulated emission vehicles, the purchase of three hybrid vehicles and internal anti-idling awareness campaigns.

The Police Fleet was responsible for 4% of the emissions from the Fleet sector. From 2004 to 2008 their emissions increased by 12%. During this time the Police Fleet undertook a study to monitor their vehicle idling and found that they idled 67% of the time. At that time idling reduction measures were explored and were then adapted for use on two police cars as a pilot.

The **Wastewater sector** was responsible for the smallest amount of emissions. The wastewater treatment plant cogenerates electricity and heat resulting in this sector producing a consistently low amount of GHGs. 2008 emissions was higher (647 t eCO₂) than 2004 levels. This variation is mostly due to the emissions from effluent discharge.

A summary of the initiatives that helped to reduce corporate GHG emissions from 2004 to 2008 is attached as Document 1.

Corporate GHG Emission Reduction Measures 2009-2012

The City of Ottawa has implemented a wide range of additional measures since 2009 that will continue to reduce the city’s GHG emissions. Further reductions will also result from measures that are already planned as they come into fruition. The emission reductions that result from these initiatives are not yet reflected in the City’s corporate GHG emission inventory, but will be captured as part of the next update for the calendar year 2012. Some of these initiatives will also positively impact community emissions.

Environmentally friendly actions such as the Green Bin, and future initiatives such as bi-weekly solid waste curbside collection (reduced fuel use), and a 30-year municipal waste management plan will continue to further reduce GHGs in the **Waste sector**.

In addition, GHGs will be reduced by the City’s **Facilities sector** which has embarked on further initiatives to reduce energy demand including building automation systems, solar energy, and lighting upgrades.

Furthermore, since 2008 the **Fleet sector** has had not only the Transit Emissions Reduction Strategy approved but has placed 175 hybrid electric diesel buses in service and retired 70 older buses. In addition, 306 new buses (2010 EPA low-emission diesel engines) were acquired, 75 double decker buses were approved for purchase (more fuel efficient and less polluting) and an intensive fuel management program is being launched. Together these initiatives will further increase ridership and at the same time reduce GHG emissions. In the case of the double decker buses - they have the same ridership capacity but use less road space thereby alleviating some congestion.

The Municipal Fleet has further mitigated its GHGs by acquiring four Electric Zamboni's and 37 Hybrid vehicles. Staff continue to right-size vehicles, replace vehicles with better fuel efficiencies, and consider new technologies. Since 2008, the Police Fleet has used the results of the anti-idling technology pilot and further developed it with the assistance of the National Research Council into a viable solution. The Police are installing the systems in 10 vehicles in the first half of 2012 with more to come in the fall. This initiative will significantly reduce fuel use, pollution and GHGs from the Police Fleet.

Finally, the **Wastewater sector** will further reduce its emissions by continuing its water conservation efforts through water efficiency, water loss control and infrastructure renewal programs. Taken together, these programs will result in lower production, distribution, collection and treatment requirements, thereby reducing energy demand and consequent GHG emissions.

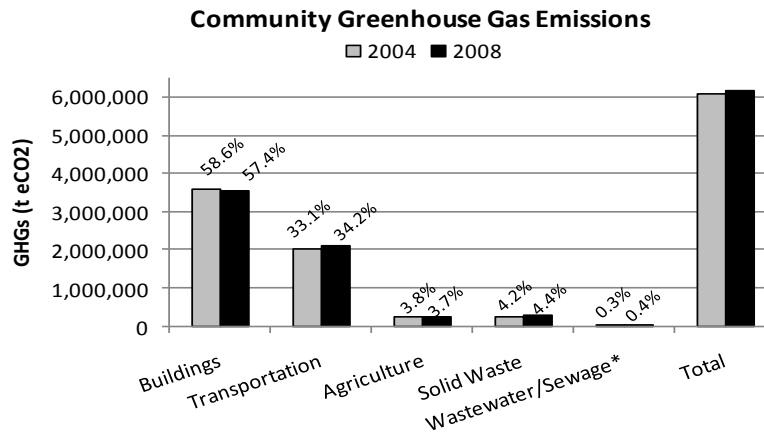
A summary of many of the initiatives that will reduce corporate GHG emissions since 2008 that have been completed or are approved for implementation are attached as Document 1.

Additional reduction measures approved in the 2012 Budget include the Mobile Workforce Solutions that reduce travel and more Smart Energy Measures through retrofits that increase energy efficiency. Further GHG reductions will be achieved in the near future with six Alstrom Trains that were approved that will facilitate transit and reduce single occupancy vehicle trips.

Community Inventory Results 2004-2008

The *Community* GHG Inventory showed that Ottawa's community emissions were 6,153,819 t eCO₂ in 2008, representing an increase of only **0.9%** between 2004 and 2008. This compares to a population increase of 5.2% over this period, resulting in a decrease in the carbon footprint of each resident from 7.14 tonnes per person to 6.84 tonnes per person. This low increase in emissions is largely due to Ontario's closure of several coal-fired electricity producing plants in the province that resulted in lowering the GHG intensity of electricity – so although electricity consumption still increased, GHG

emissions was still less. Also helpful to the reduction of emissions were federal regulations for more stringent exhaust emission standards. There were no significant changes in the sources of emissions from 2004-2008 as the following chart illustrates.



*Includes septic.

The citizens of Ottawa make choices about where and how they live. These choices directly impact their energy consumption, and their related GHG emissions. The City of Ottawa as a corporation influences these choices in many ways, including:

- Programs, policies and projects
- By-laws, regulations and guidelines
- Land use, zoning, and neighborhood planning
- Transportation planning and public transportation servicing
- Wastewater, waste and water management

For example, decisions made by the City affect the flow of traffic, the use of roads, and the transportation mode choice (i.e. walking, biking, transit), which directly impacts fuel consumption and GHG emissions. As well, the City influences development (residential, commercial), which in turn influences building construction and neighbourhood development.

Many decisions taken by citizens reduce greenhouse gases, such as:

- Using energy efficient lighting/heating/cooling technology (e.g. Energy Star Certified)
- Purchasing energy efficient homes (e.g. R-2000 homes)
- Participating in energy audits of their homes/businesses
- Using green vehicles (e.g. hybrids)
- Installing solar-domestic hot water systems
- Reducing and eliminating unnecessary vehicle idling
- Reducing, reusing, and recycling

- Installing water efficient tools such as aerators, low-flush toilets and rain barrels
- Biking, walking, rollerblading, car pooling, car sharing or taking transit instead of driving
- Purchasing alternative energy (e.g. from wind energy suppliers)
- Buying local foods and products

Some City initiatives have helped mitigate community GHGs such as the Idling Control By-law and more recently, since 2008, the Green Bin Program and the segregated bike lane pilot. Community GHG emissions are also influenced by City policies. Examples include increasing the tree canopy, mixed housing and intensification.

The 2012 Budget approved many measures that will reduce GHG emissions. Initiatives include facilitating walking, biking and transit use – from building and maintaining pedestrian and cycling pathways to improved transit technology, and the Coventry (pedestrian) overpass to the train station. Of note is that the City will foster green building development by creating a “Green Express Lane” for building and development approvals for projects that target environmental excellence. Those projects will reduce emissions through energy and water efficiency, construction waste minimization, and an overall reduced environmental footprint. Council has prioritized initiatives that increasing forest cover including tree planting programs in both urban and rural areas, as well as the rehabilitation of urban parks with increased tree planting. This will ensure carbon sequestration.

How the GHG Inventories can be used in terms of Future Targets

The City currently has greenhouse gas reduction targets established based on past data and inventory sources and City programs. These targets, established through Council resolutions, are:

- Reduction of 20% in community emissions by 2012 from 1990 levels (approved in January 2005)
- Reduction of 30% in corporate emissions by 2012 from 1990 levels (approved in October 2009).

As previously mentioned, the next GHG inventory is scheduled for the 2012 calendar year. Once the 2012 inventory is complete – with 2008-2012 measures factored in – Council will have a three point trendline (2004-2008-2012) that can be used to better assess progress made against the targets and consider future projections.

CONCLUSION

As the 2004-2008 results show, the City of Ottawa has made good progress towards reducing its GHG emissions. Completion of the next GHG inventory in early 2014 (for the 2012 calendar year) can be used along with the results of the 2004 and 2008 inventories to assess progress relative to current targets and to consider future projections and targets. In the interim, the kinds of reduction measures discussed in this memo will continue and ongoing progress will be made in reducing GHG emissions in Ottawa.

Should you have any questions or comments in regards to this information, please do not hesitate to Michael Murr, Manager of Environmental Sustainability, at extension 25195.

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cc: Executive Committee

SUPPORTING DOCUMENTATION:

[Document 1](#) – Summary of Emission Reduction Measures